DEPARTMENT
OF
ELECTRONICS AND COMMUNICATION ENGINEERING

B.E – ELECTRONICS AND COMMUNICATION ENGINEERING

CURRICULUM & SYLLABI

Regulations 2020

(Applicable to candidates admitted in the academic year 2020 - 2021)

K.S.R. College of Engineering (Autonomous)

K.S.R. Kalvi Nagar, Tiruchengode – 637 215

Namakkal (Dt), Tamilnadu, India

Email: info@ksrce.ac.in **Website: www.ksrce.ac.in**

K.S.R. COLLEGE OF ENGINEERING: TIRUCHENGODE - 637 215
(Autonomous)
DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING
B.E – Electronics and Communication Engineering

(REGULATIONS 2020)

Vision of the Institution

IV	We envision to achieve status as an excellent educational institution in the global knowledge hub, making self-learners, experts, ethical and responsible engineers, technologists, scientists, managers, administrators and entrepreneurs who will significantly contribute to research and environment friendly sustainable growth of the nation and the world.

Mission of the Institution

IM 1	To inculcate in the students self-learning abilities that enable them to become competitive and considerate engineers, technologists, scientists, managers, administrators and entrepreneurs by diligently imparting the best of education, nurturing environmental and social needs.
IM 2	To foster and maintain a mutually beneficial partnership with global industries and institutions through knowledge sharing, collaborative research and innovation.

Vision of the Department / Programme: (Electronics and Communication Engineering)

DV	We envision as a center of excellence in the field of Electronics and Communication Engineering to produce technically competent graduates with diverse teaching and research environments.

Mission of the Department / Programme: (Electronics and Communication Engineering)

DM 1	To educate the students with the state of art technologies to meet the growing challenges of the industries.
DM 2	To develop an innovate, competent and ethical Electronics and Communication Engineer with strong foundations to enable them for continuing education.

Programme Educational Objectives (PEOs) : (Electronics and Communication Engineering)

The graduates of the programme will be able to	
PEO 1	**Employability and Higher Education:** Excel in Professional career and higher education by acquiring knowledge in mathematical, social, scientific & engineering principles.
PEO 2	**Core Competence:** Analyze, design and develop/implement core-engineering problems in communication systems that are technically sound, economically feasible and socially acceptable.
PEO 3	**Interpersonal Skills and Team Work:** Exhibit professionalism, ethical communicating skills and team work by engaging in lifelong learning for sustainable development of the society.

Programme Outcomes (POs) of B.E. - Electronics and Communication Engineering

Program Outcomes (POs)	
PO1	**Engineering Graduates will be able to:** **Engineering Knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO2	**Problem Analysis:** Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
PO3	**Design/Development of Solutions:** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
PO4	**Conduct Investigations of Complex Problems:** Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
PO5	**Modern Tool Usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.
PO6	**The Engineer and Society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
PO7	**Environment and Sustainability:** understand the impact of the professional engineering solutions in societal and environmental contexts, demonstrate the knowledge of, and need for sustainable development.
PO8	**Ethics:** Apply ethical principles and commit to professional ethics, responsibilities, and norms of the engineering practice.
PO9	**Individual and Team Work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
PO10	**Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
PO11	**Project Management and Finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary Environments.
PO12	**Life-long Learning:** Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.
Program Specific Outcomes (PSOs)	
PSO1	**Professional Skill:** Specify, design and test modern electronic systems that perform analog and digital processing functions.
PSO2	**Problem – Solving Skills:** Design essential elements (circuits and antennas) of modern RF/Wireless communication systems.

KSR College of Engineering	**K.S.R. COLLEGE OF ENGINEERING (Autonomous)** (Approved by AICTE, Accredited by NAAC with A grade & Affiliated to Anna University) **K.S.R. Kalvi Nagar, Tiruchengode – 637 215**	**CURRICULUM** **UG** **R – 2020**

Department	Department of Electronics and Communication Engineering (
Programme	B.E - Electronics and Communication Engineering

SEMESTER – I

Sl.No.	Course Code	Course Name	Category	Hours/ Week			Credit	Maximum Marks		
				L	T	P	C	CA	ES	Total
THEORY										
1.	20EN151	Technical English – I (Common to All Branches)	HSMC	3	0	0	3	30	70	100
2.	20MA151	Engineering Mathematics – I (Common to All Branches)	BSC	3	1	0	4	30	70	100
3.	20PH051	Engineering Physics (Common to AU, EC,EE,ME,SF & PT)	BSC	3	0	0	3	30	70	100
4.	20CS142	Problem solving Techniques	ESC	3	0	0	3	30	70	100
PRACTICAL										
5.	20AU127	Engineering Graphics Laboratory (Common to CE,CS,EC,EE,IT & PT)	ESC	0	0	3	1	50	50	100
6.	20PH028	Physics Laboratory (Common to AU, EC,EE,ME,SF & PT)	BSC	0	0	3	1	50	50	100
7.	20CS171	Problem solving Techniques laboratory	ESC	0	0	3	1	50	50	100
			Total	**11**	**1**	**10**	**16**	**700**		
MANDATORY COURSE										
8.	20MC151	Induction Programme * (Common to All Branches)	MC	3	-	-	-	*	*	*
9.	20MC052	Environmental Science and Engineering (Common to All Branches)	MC	3	0	0	0	*	*	*

*Induction Programme will be conducted for three weeks as per AICTE guidelines

SEMESTER – II

Sl.No.	Course Code	Course Name	Category	Hours/ Week			Credit	Maximum Marks		
				L	T	P	C	CA	ES	Total
THEORY										
1.	20EN251	Technical English – II (Common to All Branches)	HSMC	3	0	0	3	30	70	100
2.	20MA242	Applied Mathematics (Common to EC & EE)	BSC	3	1	0	4	30	70	100
3.	20CH051	Engineering Chemistry (Common to All Branches)	BSC	3	0	0	3	30	70	100
4.	20CS241	Python Programming (Common to AU,CE,CS,EC,EE,ME,PT & SF)	ESC	3	0	0	3	30	70	100
5.	20EC215	Electric Circuits	ESC	3	0	0	3	30	70	100
PRACTICAL										
6.	20CH028	Chemistry Laboratory (Common to All Branches)	BSC	0	0	3	1	50	50	100
7.	20CS227	Python Programming Laboratory (Common to AU,CE,CS,EC,EE,ME,PT & SF)	ESC	0	0	3	1	50	50	100
8.	20GE028	Manufacturing Practices Laboratory (Common to All Branches)	ESC	0	0	3	1	50	50	100
9.	20EC221	Electric Circuits Laboratory	ESC	0	0	3	1	50	50	100
			Total	**14**	**1**	**13**	**20**	**900**		

KSR College of Engineering	**K.S.R. COLLEGE OF ENGINEERING (Autonomous)** (Approved by AICTE, Accredited by NAAC with A grade & Affiliated to Anna University) **K.S.R. Kalvi Nagar, Tiruchengode – 637 215**	**CURRICULUM** **UG** **R – 2020**

Department	Department of Electronics and Communication Engineering (
Programme	B.E - Electronics and Communication Engineering

SEMESTER – III

Sl.No.	Course Code	Course Name	Category	Hours/ Week			Credit	Maximum Marks		
				L	T	P	C	CA	ES	Total
THEORY										
1.	20MA342	Differential Equations and Numerical Methods (Common to EC & EE)	BSC	3	1	0	4	30	70	100
2.	20CS332	C++ and Data Structures	ESC	3	0	0	3	30	70	100
3.	20EC311	Electronic Devices	PCC	3	0	0	3	30	70	100
4.	20EC312	Digital Electronics	PCC	3	0	0	3	30	70	100
5.	20EC313	Electromagnetic Theory	PCC	3	1	0	4	30	70	100
6.	20EE331	Electrical Machines	ESC	3	0	0	3	30	70	100
PRACTICAL										
7.	20CS326	C++ and Data Structures Laboratory	ESC	0	0	3	1	50	50	100
8.	20EC321	Electronic Devices Laboratory	PCC	0	0	3	1	50	50	100
9.	20EC322	Digital Electronics Laboratory	PCC	0	0	3	1	50	50	100
10.	20HR351	Career Development Skill I (Common to All Branches)	EEC	0	2	0	0	50	50	100
			Total	**18**	**4**	**9**	**23**	**1000**		

SEMESTER – IV

Sl.No.	Course Code	Course Name	Category	Hours/ Week			Credit	Maximum Marks		
				L	T	P	C	CA	ES	Total
THEORY										
1.	20MA433	Probability and Stochastic Process	BSC	3	0	0	3	30	70	100
2.	20EC411	Signals and Systems	PCC	3	1	0	4	30	70	100
3.	20EC412	Electronic Circuits	PCC	3	0	0	3	30	70	100
4.	20EC413	Linear Integrated Circuits	PCC	3	0	0	3	30	70	100
5.	20EC414	Microprocessors and Microcontrollers	PCC	3	0	0	3	30	70	100
6.	20EC415	Transmission Lines and Wave Guides	PCC	3	0	0	3	30	70	100
PRACTICAL										
7.	20EC421	Electronic Circuits and Simulation Laboratory	PCC	0	0	3	1	50	50	100
8.	20EC422	Linear Integrated Circuits Laboratory	PCC	0	0	3	1	50	50	100
9.	20EC423	Microprocessors and Microcontrollers Laboratory	PCC	0	0	3	1	50	50	100
10.	20HR442	Career Development Skill II	EEC	0	2	0	0	50	50	100
			Total	**18**	**3**	**9**	**22**	**1000**		

KSR College of Engineering	**K.S.R. COLLEGE OF ENGINEERING (Autonomous)** (Approved by AICTE, Accredited by NAAC with A grade & Affiliated to Anna University) **K.S.R. Kalvi Nagar, Tiruchengode – 637 215**	**CURRICULUM** **UG** **R - 2020**

Department	Department of Electronics and Communication Engineering
Programme	B.E - Electronics and Communication Engineering

SEMESTER – V

Sl.No.	Course Code	Course Name	Category	Hours/ Week			Credit	Maximum Marks		
				L	T	P	C	CA	ES	Total
THEORY										
1.	20EC511	Analog Communication Systems	PCC	3	0	0	3	30	70	100
2.	20EC512	Digital Signal Processing	PCC	3	1	0	4	30	70	100
3.	20EC513	Computer Networks	PCC	3	0	0	3	30	70	100
4.	20EC514	Embedded Systems	PCC	3	0	0	3	30	70	100
5.		Professional Elective – I	PEC	3	0	0	3	30	70	100
6.		Open Elective – I	OEC	3	0	0	3	30	70	100
PRACTICAL										
7.	20EC521	Digital Signal Processing Laboratory	PCC	0	0	3	1	50	50	100
8.	20EC522	Computer Networks Laboratory	PCC	0	0	3	1	50	50	100
9.	20EC523	Embedded System Design Laboratory	PCC	0	0	3	1	50	50	100
10.	20HR543	Career Development Skill III	EEC	0	2	0	0	50	50	100
			Total	**18**	**3**	**9**	**22**	**1000**		

SEMESTER – VI

Sl.No.	Course Code	Course Name	Category	Hours/ Week			Credit	Maximum Marks		
				L	T	P	C	CA	ES	Total
THEORY										
1.	20HS051	Universal human values and understanding harmonics (Common to All Branches)	HSMC	3	0	0	3	30	70	100
2.	20EC611	Digital Communication Systems	PCC	3	0	0	3	30	70	100
3.	20EC612	Digital Image Processing	PCC	3	0	0	3	30	70	100
4.	20EC613	VLSI Design	PCC	3	0	0	3	30	70	100
5.	20EC614	Antenna and Wave Propagation	PCC	3	0	0	3	30	70	100
6.		Professional Elective – II	PEC	3	0	0	3	30	70	100
PRACTICAL										
7.	20EC621	Communication Systems Laboratory	PCC	0	0	3	1	50	50	100
8.	20EC622	VLSI Laboratory	PCC	0	0	3	1	50	50	100
9.	20HR644	Career Development Skill IV	EEC	0	2	0	0	50	50	100
			Total	**18**	**2**	**6**	**20**	**900**		

KSR College of Engineering	**K.S.R. COLLEGE OF ENGINEERING (Autonomous)** (Approved by AICTE, Accredited by NAAC with A grade & Affiliated to Anna University) **K.S.R. Kalvi Nagar, Tiruchengode – 637 215**	**CURRICULUM** **UG** **R - 2020**

Department	Department of Electronics and Communication Engineering
Programme	B.E - Electronics and Communication Engineering

SEMESTER – VII

Sl.No.	Course Code	Course Name	Category	Hours/ Week			Credit	Maximum Marks		
				L	T	P	C	CA	ES	Total
THEORY										
1.	20EC711	Wireless and Cellular Communication	PCC	3	0	0	3	30	70	100
2.	20EC712	RF and Microwave Engineering	PCC	3	0	0	3	30	70	100
3.	20EC713	Fiber Optic Communication	PCC	3	0	0	3	30	70	100
4.		Professional Elective – III	PEC	3	0	0	3	30	70	100
5.		Professional Elective – IV	PEC	3	0	0	3	30	70	100
6.		Open Elective – II	OEC	3	0	0	3	30	70	100
PRACTICAL										
7.	20EC721	RF, Microwave and Optic Laboratory	PCC	0	0	3	1	50	50	100
8.	20EC722	Project Work Phase – I	PW	0	0	6	3	50	50	100
			Total	**18**	**0**	**9**	**22**	**800**		

SEMESTER – VIII

Sl.No.	Course Code	Course Name	Category	Hours/ Week			Credit	Maximum Marks		
				L	T	P	C	CA	ES	Total
THEORY										
1.		Professional Elective – V	PEC	3	0	0	3	30	70	100
2.		Professional Elective – VI	PEC	3	0	0	3	30	70	100
3.		Open Elective – III	OEC	3	0	0	3	30	70	100
PRACTICAL										
4.	20EC821	Project Work Phase - II	PW	0	0	18	6	50	50	200
			Total	**9**	**0**	**18**	**15**	**500**		

KSR College of Engineering	**K.S.R. COLLEGE OF ENGINEERING (Autonomous)** (Approved by AICTE, Accredited by NAAC with A grade & Affiliated to Anna University) **K.S.R. Kalvi Nagar, Tiruchengode – 637 215**	**CURRICULUM** **UG** **R - 2020**
Department	Department of Electronics and Communication Engineering	
Programme	B.E - Electronics and Communication Engineering	

List of Electives

PROFESSIONAL ELECTIVE – I (SEMESTER – V)

Sl.No.	Course Code	Course Name	Specialization	Hours/ Week			Credit	Maximum Marks		
				L	T	P	C	CA	ES	Total
1.	20IE591	Augmented Intelligence Led Managed Services (AIMS) – I (Common To CS,EC,EE & IT)	IE	3	0	0	3	30	70	100
2.	20HS001	Principles of Management (Common to CE, CS, EE, EC, IT & ME)	HSMC	3	0	0	3	30	70	100
3.	20EC561	Advanced Digital Systems Design	S3	3	0	0	3	30	70	100
4.	20EC562	Electronic Instrumentation	S1	2	0	1	3	30	70	100
5.	20CS501	Artificial Intelligence	S5	3	0	0	3	30	70	100

PROFESSIONAL ELECTIVE – II (SEMESTER – VI)

Sl.No.	Course Code	Course Name	Specialization	Hours/ Week			Credit	Maximum Marks		
				L	T	P	C	CA	ES	Total
1.	20EC661	Electronic System Design	S4	3	0	0	3	30	70	100
2.	20EC662	Medical Electronics	S4	3	0	0	3	30	70	100
3.	20EC663	Advanced Microprocessors and Microcontrollers	S3	3	0	0	3	30	70	100
4.	20EC664	Information Theory and Coding	S1	3	0	0	3	30	70	100
5.	20IE691	Augmented Intelligence Led Managed Services (AIMS) – II (Common To CS,EC,EE & IT)	IE	3	0	0	3	30	70	100
6.	20CS601	C# and .NET Framework Technologies (Common to CS & EC)	S6	3	0	0	3	30	70	100
7.	20CS602	Machine Learning	S5	3	0	0	3	30	70	100

PROFESSIONAL ELECTIVE – III (SEMESTER – VII)

Sl.No.	Course Code	Course Name	Specialization	Hours/ Week			Credit	Maximum Marks		
				L	T	P	C	CA	ES	Total
1.	20EC761	Communication and Switching Networks	S1	3	0	0	3	30	70	100
2.	20EC762	Digital Communication Systems - II	S1	3	0	0	3	30	70	100
3.	20EC763	PC Hardware, Installation, Troubleshooting and Servicing	S6	3	0	0	3	30	70	100
4.	20EC764	Embedded System Design	S3	3	0	0	3	30	70	100
5.	20EC765	Wireless Networks	S6	3	0	0	3	30	70	100
6.	20EC770	Pattern Recognition	S5	3	0	0	3	30	70	100

PROFESSIONAL ELECTIVE – IV (SEMESTER – VII)										
Sl.No.	Course Code	Course Name	Specialization	Hours/ Week			Credit	Maximum Marks		
				L	T	P	C	CA	ES	Total
1.	20EC766	CMOS Analog Circuits	S2	3	0	0	3	30	70	100
2.	20EC767	Fundamentals of Nano electronics	S1	3	0	0	3	30	70	100
3.	20EC768	High Performance Networks	S6	3	0	0	3	30	70	100
4.	20EC769	Robotics	S4	3	0	0	3	30	70	100
5.	20HR791	Professional Readiness for Innovation, Employability and Entrepreneurship	S4	3	0	0	3	30	70	100
6.	20EC771	Soft computing techniques	S5	3	0	0	3	30	70	100

PROFESSIONAL ELECTIVE – V (SEMESTER – VIII)										
Sl.No.	Course Code	Course Name	Specialization	Hours/ Week			Credit	Maximum Marks		
				L	T	P	C	CA	ES	Total
1.	20EC861	Satellite Communication	S1	3	0	0	3	30	70	100
2.	20EC862	Optical Networks	S6	3	0	0	3	30	70	100
3.	20EC863	Multimedia Compression and Communication	S5	3	0	0	3	30	70	100
4.	20EC864	Embedded Networks	S3	3	0	0	3	30	70	100
5.	20EC865	VLSI Signal Processing	S2	3	0	0	3	30	70	100
6.	20EC866	CAD for VLSI	S2	3	0	0	3	30	70	100
7.	20EC867	Advanced Signal Processing	S5	3	0	0	3	30	70	100
8.	20EC879	Wireless Sensor Networks	S6	3	0	0	3	30	70	100
9.	20EC880	Bio Medical Signal Processing	S5	3	0	0	3	30	70	100
10.	20EC881	Advanced Digital Image Processing	S5	3	0	0	3	30	70	100
11.	20EC882	Speech Processing	S5	3	0	0	3	30	70	100
12.	20EC883	Medical Image Processing	S5	3	0	0	3	30	70	100

PROFESSIONAL ELECTIVE – VI (SEMESTER – VIII)										
Sl.No.	Course Code	Course Name	Specialization	Hours/ Week			Credit	Maximum Marks		
				L	T	P	C	CA	ES	Total
1.	20EC868	ADHOC Networks	S1	3	0	0	3	30	70	100
2.	20EC869	MEMS Technology	S6	3	0	0	3	30	70	100
3.	20EC870	Telecommunication System Modeling and Simulation	S1	3	0	0	3	30	70	100
4.	20EC871	ARM System Architecture	S3	3	0	0	3	30	70	100
5.	20EC872	Architecture of DSPs	S5	3	0	0	3	30	70	100
6.	20EC873	Cryptography and Network Security	S6	3	0	0	3	30	70	100
7.	20EC874	Neural Networks and Deep Learning	S5	3	0	0	3	30	70	100
8.	20EC875	ASIC Design	S2	3	0	0	3	30	70	100
9.	20EC876	4G/5G Communication Networks	S6	3	0	0	3	30	70	100
10.	20EC877	Cognitive Radio Network	S6	3	0	0	3	30	70	100
11.	20EC878	Wireless Broad Band Networks	S6	3	0	0	3	30	70	100

S1 Communication
S2 VLSI
S3 Embedded
S4 Electronics
S5 Signal Processing
S6 Networks

K.S.R. COLLEGE OF ENGINEERING: TIRUCHENGODE - 637 215

(Autonomous)

(REGULATIONS 2020)

OPEN ELECTIVE COURSES

OPEN ELECTIVE COURSES OFFERED BY OTHER BRANCHES

Sl.No.	Course Code	Course Name	Specialization	Category	Hours/ Week			Credit	Maximum Marks		
					L	T	P	C	CA	ES	Total
Automobile Engineering											
1.	20AU901	Basics of Automobile Engineering	AE	OEC	3	0	0	3	30	70	100
2.	20AU902	Automotive Engine Technology	AE	OEC	3	0	0	3	30	70	100
3.	20AU903	Automotive Vehicle Technology	AE	OEC	3	0	0	3	30	70	100
4.	20AU904	Automotive Safety	AE	OEC	3	0	0	3	30	70	100
5.	20AU905	Hybrid Vehicles	AE	OEC	3	0	0	3	30	70	100
6.	20AU906	Off Highway Vehicles	AE	OEC	3	0	0	3	30	70	100
7.	20AU907	Modern and Intelligent Vehicle Syster	AE	OEC	3	0	0	3	30	70	100
8.	20AU908	Vehicle Maintenance	AE	OEC	3	0	0	3	30	70	100
CIVIL ENGINEERING											
9.	20CE901	Architectural Heritage of India	CE	OEC	3	0	0	3	30	70	100
10.	20CE902	Building Planning and Construction	CE	OEC	3	0	0	3	30	70	100
11.	20CE903	Elementary Civil Engineering	CE	OEC	3	0	0	3	30	70	100
12.	20CE904	Energy and Environment	CE	OEC	3	0	0	3	30	70	100
13.	20CE905	Environmental Laws and Policies	CE	OEC	3	0	0	3	30	70	100
14.	20CE906	Global Warming and Climate Change	CE	OEC	3	0	0	3	30	70	100
15.	20CE907	Introduction to Disaster Management and Mitigation	CE	OEC	3	0	0	3	30	70	100
16.	20CE908	Introduction to Earthquake Engineering	CE	OEC	3	0	0	3	30	70	100
17.	20CE909	Solid Waste Management	CE	OEC	3	0	0	3	30	70	100
18.	20CE910	Water and Air Pollution Management	CE	OEC	3	0	0	3	30	70	100
Computer Science and Engineering											
19.	20CS901	Programming in Java	CSE	OEC	3	0	0	3	30	70	100
20.	20CS902	Basic concepts of Data Structure	CSE	OEC	3	0	0	3	30	70	100
21.	20CS903	Fundamentals of Database Concepts	CSE	OEC	3	0	0	3	30	70	100
22.	20CS904	Internet Programming	CSE	OEC	3	0	0	3	30	70	100
23.	20CS905	Fundamentals of Mobile Application Development	CSE	OEC	3	0	0	3	30	70	100
24.	20CS906	Principles of Ethical Hacking	CSE	OEC	3	0	0	3	30	70	100
25.	20CS907	Green Technology	CSE	OEC	3	0	0	3	30	70	100
26.	20CS908	Artificial Intelligence and Robotics	CSE	OEC	3	0	0	3	30	70	100
27.	20CS909	Big Data and Analytics	CSE	OEC	3	0	0	0	30	70	100
28.	20CS910	Hardware and Trouble Shooting	CSE	OEC	3	0	0	3	30	70	100

Sl.No.	Course Code	Course Name	Specialization	Category	Hours/ Week			Credit	Maximum Marks		
					L	T	P	C	CA	ES	Total
Electrical and Electronics Engineering											
29.	20EE901	Electrical Drives and Control	EE	OEC	3	0	0	3	30	70	100
30.	20EE902	Power Semiconductor Devices	EE	OEC	3	0	0	3	30	70	100
31.	20EE903	Electrical Power Generation Systems	EE	OEC	3	0	0	3	30	70	100
32.	20EE904	Control Engineering	EE	OEC	3	0	0	3	30	70	100
33.	20EE905	Industrial Automation	EE	OEC	3	0	0	3	30	70	100
34.	20EE906	Electrical Instruments and Measurements	EE	OEC	3	0	0	3	30	70	100
35.	20EE907	Energy Conservation and Management	EE	OEC	3	0	0	3	30	70	100
36.	20EE908	Electrical Wiring, Estimation and Costing	EE	OEC	3	0	0	3	30	70	100
37.	20EE909	Fundamentals of Electrical Machinery	EE	OEC	3	0	0	3	30	70	100
38.	20EE910	Principles of Soft Computing Techniques	EE	OEC	3	0	0	3	30	70	100
39.	20EE911	Embedded System Technology	EE	OEC	3	0	0	3	30	70	100
Electronics and Communication Engineering											
40.	20EC901	Basics of Medical Electronics	EC	OEC	3	0	0	3	30	70	100
41.	20EC902	NANO Technology	EC	OEC	3	0	0	3	30	70	100
42.	20EC903	Electronics and Microprocessor	EC	OEC	3	0	0	3	30	70	100
43.	20EC904	Analog and Digital Communication	EC	OEC	3	0	0	3	30	70	100
44.	20EC905	Principles of Communication	EC	OEC	3	0	0	3	30	70	100
45.	20EC906	Fundamentals of Robotics	EC	OEC	3	0	0	3	30	70	100
46.	20EC907	Internet of Things Sensing and Actuator Devices	EC	OEC	3	0	0	3	30	70	100
47.	20EC908	Consumer Electronics	EC	OEC	3	0	0	3	30	70	100
Information Technology											
48.	20IT901	Data Science using R	IT	OEC	3	0	0	3	30	70	100
49.	20IT902	Principles of Cyber Security	IT	OEC	3	0	0	3	30	70	100
50.	20IT903	Fundamentals of Business Intelligence	IT	OEC	3	0	0	3	30	70	100
51.	20IT904	Blockchain Technologies	IT	OEC	3	0	0	3	30	70	100
52.	20IT905	Internet of Things and Applications	IT	OEC	3	0	0	3	30	70	100
53.	20IT906	Principles of Software Testing	IT	OEC	3	0	0	3	30	70	100
54.	20IT907	Foundation Skills in Logic Building	IT	OEC	3	0	0	3	30	70	100
55.	20IT908	Principles of Cloud Computing	IT	OEC	3	0	0	3	30	70	100
56.	20IT909	Open Source Technologies	IT	OEC	3	0	0	3	30	70	100
57.	20IT910	Principles of Software Engineering	IT	OEC	3	0	0	3	30	70	100

Sl.No.	Course Code	Course Name	Specialization	Category	Hours/ Week			Credit	Maximum Marks		
					L	T	P	C	CA	ES	Total
Mechanical Engineering											
58.	20ME901	Basic Mechanical Engineering	ME	OEC	3	0	0	3	30	70	100
59.	20ME902	Solar Energy Utilization	ME	OEC	3	0	0	3	30	70	100
60.	20ME903	Production Technology of Agricultural Machinery	ME	OEC	3	0	0	3	30	70	100
61.	20ME904	Selection of Materials	ME	OEC	3	0	0	3	30	70	100
62.	20ME905	Marine Vehicles	ME	OEC	3	0	0	3	30	70	100
63.	20ME906	Sensors and Transducers	ME	OEC	3	0	0	3	30	70	100
64.	20ME907	Energy Auditing	ME	OEC	3	0	0	3	30	70	100
65.	20ME908	Fiber Reinforced Plastics	ME	OEC	3	0	0	3	30	70	100
66.	20ME909	Lean Manufacturing	ME	OEC	3	0	0	3	30	70	100
67.	20ME910	Surface Engineering	ME	OEC	3	0	0	3	30	70	100
Safety and Fire Engineering											
68.	20SF901	Occupational Health and Hygiene	SF	OEC	3	0	0	3	30	70	100
69.	20SF902	Construction Safety	SF	OEC	3	0	0	3	30	70	100
70.	20SF903	Building Fire Safety	SF	OEC	3	0	0	3	30	70	100
71.	20SF904	Safety in Electrical Engineering	SF	OEC	3	0	0	3	30	70	100
72.	20SF905	Legal Aspects of Safety	SF	OEC	3	0	0	3	30	70	100
73.	20SF906	Safety in Industries	SF	OEC	3	0	0	3	30	70	100
74.	20SF907	Food Safety	SF	OEC	3	0	0	3	30	70	100
75.	20SF908	Safety Management and its Principles	SF	OEC	3	0	0	3	30	70	100
76.	20SF909	Safety in Automobile Engineering	SF	OEC	3	0	0	3	30	70	100
77.	20SF910	Safety in Transportation	SF	OEC	3	0	0	3	30	70	100
Science and Humanities											
78.	20SH901	Applications of Statistics	FYA	OEC	3	0	0	3	30	70	100
79.	20SH902	Combinatorics and Graph Theory	FYA	OEC	3	0	0	3	30	70	100
80.	20SH903	Optimization Techniques	FYA	OEC	3	0	0	3	30	70	100
81.	20SH904	Basic Military Education and Training	FYA	OEC	3	0	0	3	30	70	100
82.	20SH905	Professional Communication	FYA	OEC	3	0	0	3	30	70	100
83.	20SH906	Fundamentals of Nanoscience and Technology	FYA	OEC	3	0	0	3	30	70	100

K.S.R. COLLEGE OF ENGINEERING: TIRUCHENGODE - 637 215 (Autonomous)

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

(REGULATIONS 2020)

LIST OF PROPOSED VALUE-ADDED COURSES

Sl.No.	Course Code	Course Name	Number of hours	Offered by Internal / External
1.	VACEC01	PCB Circuit Design	30 Hours	External
2.	VACEC02	Programming PIC Microcontrollers	30 Hours	External
3.	VACEC03	Real Time Applications of Aurduino	30 Hours	External
4.	VACEC04	LABVIEW	30 Hours	External
5.	VACEC05	MATLAB – Signal and Image Processing Tool box	30 Hours	Department of ECE- KSRCE
6.	VACEC06	Industrial Automation using PLC and SCADA	30 Hours	External
7.	VACEC07	Network Simulator – 2	30 Hours	External
8.	VACEC08	CCNA Fundamentals (Module 1)	30 Hours	External
9.	VACEC09	CCNA - Routing and Switching (Module 2)	30 Hours	External
10.	VACEC10	.Net and PHP	30 Hours	External
11.	VACEC11	Data Base Management Systems	30 Hours	External
12.	VACEC12	VHDL Programming	30 Hours	Department of ECE- KSRCE
13.	VACEC13	Tanner Tool	30 Hours	Department of ECE- KSRCE
14.	VACEC14	Mentor Graphics	30 Hours	Department of ECE- KSRCE
15.	VACEC15	Programming in Digital Signal Processors	30 Hours	Department of ECE- KSRCE
16.	VACEC16	High Frequency Structure Simulator (HFSS)	30 Hours	Department of ECE- KSRCE

S.No	Subject Area	Credits Per Semester								Credits Total	Percentage Credits	Suggested Breakup of credits
		I	II	III	IV	V	VI	VII	VIII			
1	HSMC	3	3				3			9	5.60	12
2	ESC	5	9	7						21	13.125	25
3	BSC	8	8	4	3					23	14.375	24
4	PCC			12	19	16	14	10		71	44.37	48
5	PEC					3	3	6	6	18	11.25	18
6	OEC					3		3	3	9	5.60	18
7	PW							3	6	9	5.60	15
Total		**16**	**20**	**23**	**22**	**22**	**20**	**22**	**15**	**160**	**100**	**160**

Total Credits for Regular Student – 160

Total Credits for Lateral Student - 124

DEPARTMENT
OF
ELECTRONICS AND COMMUNICATION ENGINEERING

B.E – ELECTRONICS AND COMMUNICATION ENGINEERING

CURRICULUM & SYLLABI

Regulations 2020

(Applicable to candidates admitted in the academic year 2021 - 2022)

K.S.R. College of Engineering (Autonomous)

K.S.R. Kalvi Nagar, Tiruchengode – 637 215

Namakkal (Dt), Tamilnadu, India

Email: info@ksrce.ac.in **Website: www.ksrce.ac.in**

K.S.R. COLLEGE OF ENGINEERING: TIRUCHENGODE - 637 215 (Autonomous)

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

(REGULATIONS 2020)

Vision of the Institution

IV	We envision to achieve status as an excellent educational institution in the global knowledge hub, making self-learners, experts, ethical and responsible engineers, technologists, scientists, managers, administrators and entrepreneurs who will significantly contribute to research and environment friendly sustainable growth of the nation and the world.

Mission of the Institution

IM 1	To inculcate in the students self-learning abilities that enable them to become competitive and considerate engineers, technologists, scientists, managers, administrators and entrepreneurs by diligently imparting the best of education, nurturing environmental and social needs.
IM 2	To foster and maintain a mutually beneficial partnership with global industries and institutions through knowledge sharing, collaborative research and innovation.

Vision of the Department / Programme: (Electronics and Communication Engineering)

DV	We envision as a center of excellence in the field of Electronics and Communication Engineering to produce technically competent graduates with diverse teaching and research environments.

Mission of the Department / Programme: (Electronics and Communication Engineering)

DM 1	To educate the students with the state of art technologies to meet the growing challenges of the industries.
DM 2	To develop an innovate, competent and ethical Electronics and Communication Engineer with strong foundations to enable them for continuing education.

Programme Educational Objectives (PEOs) : (Electronics and Communication Engineering)

The graduates of the programme will be able to	
PEO 1	**Employability and Higher Education:** Excel in Professional career and higher education by acquiring knowledge in mathematical, social, scientific & engineering principles.
PEO 2	**Core Competence:** Analyze, design and develop/implement core engineering problems in communication systems that are technically sound, economically feasible and socially acceptable.
PEO 3	**Interpersonal Skills and Team Work:** Exhibit professionalism, ethical communicating skills and team work by engaging in lifelong learning for sustainable development of the society.

Programme Outcomes (POs) of B.E. - Electronics and Communication Engineering

Program Outcomes (POs)	
PO1	**Engineering Graduates will be able to:** **Engineering Knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO2	**Problem Analysis:** Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
PO3	**Design/Development of Solutions:** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
PO4	**Conduct Investigations of Complex Problems:** Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
PO5	**Modern Tool Usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.
PO6	**The Engineer and Society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
PO7	**Environment and Sustainability:** understand the impact of the professional engineering solutions in societal and environmental contexts, demonstrate the knowledge of, and need for sustainable development.
PO8	**Ethics:** Apply ethical principles and commit to professional ethics, responsibilities, and norms of the engineering practice.
PO9	**Individual and Team Work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
PO10	**Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
PO11	**Project Management and Finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary Environments.
PO12	**Life-long Learning:** Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.
Program Specific Outcomes (PSOs)	
PSO1	**Professional Skill:** Specify, design and test modern electronic systems that perform analog and digital processing functions.
PSO2	**Problem – Solving Skills:** Design essential elements (circuits and antennas) of modern RF/Wireless communication systems.

KSR College of Engineering	**K.S.R. COLLEGE OF ENGINEERING (Autonomous)** (Approved by AICTE, Accredited by NAAC with A grade & Affiliated to Anna University) **K.S.R. Kalvi Nagar, Tiruchengode – 637 215**	**CURRICULUM** **UG** **R - 2020**

Department	Department of Electronics and Communication Engineering
Programme	B.E - Electronics and Communication Engineering

SEMESTER – I

Sl.No.	Course Code	Course Name	Category	Hours/ Week			Credit	Maximum Marks		
				L	T	P	C	CA	ES	Total
THEORY										
1.	20EN151	Technical English – I (Common to All Branches)	HSMC	3	0	0	3	40	60	100
2.	20MA151	Engineering Mathematics – I (Common to All Branches)	BSC	3	1	0	4	40	60	100
3.	20PH051	Engineering Physics (Common to AU, EC,EE,ME,SF & PT)	BSC	3	0	0	3	40	60	100
4.	20CS142	Problem solving Techniques	ESC	3	0	0	3	40	60	100
PRACTICAL										
5.	20AU127	Engineering Graphics Laboratory (Common to CE,CS,EC,EE,IT & PT)	ESC	0	0	3	1	60	40	100
6.	20PH028	Physics Laboratory (Common to AU, EC,EE,ME,SF & PT)	BSC	0	0	3	1	60	40	100
7.	20CS171	Problem solving Techniques laboratory	ESC	0	0	3	1	60	40	100
			Total	**11**	**1**	**10**	**16**	**700**		
MANDATORY COURSE										
8.	20MC151	Induction Programme * (Common to All Branches)	MC	3	-	-	-	*	*	*
9.	20MC052	Environmental Science and Engineering (Common to All Branches)	MC	3	0	0	0	*	*	*

*Induction Programme will be conducted for three weeks as per AICTE guidelines

SEMESTER – II

Sl.No.	Course Code	Course Name	Category	Hours/ Week			Credit	Maximum Marks		
				L	T	P	C	CA	ES	Total
THEORY										
1.	20EN251	Technical English – II (Common to All Branches)	HSMC	3	0	0	3	40	60	100
2.	20MA242	Applied Mathematics (Common to EC & EE)	BSC	3	1	0	4	40	60	100
3.	20CH051	Engineering Chemistry (Common to All Branches)	BSC	3	0	0	3	40	60	100
4.	20CS241	Python Programming (Common to AU,CE,CS,EC,EE,ME,PT & SF)	ESC	3	0	0	3	40	60	100
5.	20EC215	Electric Circuits	ESC	3	0	0	3	40	60	100
PRACTICAL										
6.	20CH028	Chemistry Laboratory (Common to All Branches)	BSC	0	0	3	1	60	40	100
7.	20CS227	Python Programming Laboratory (Common to AU,CE,CS,EC,EE,ME,PT & SF)	ESC	0	0	3	1	60	40	100
8.	20GE028	Manufacturing Practices Laboratory (Common to All Branches)	ESC	0	0	3	1	60	40	100
9.	20EC221	Electric Circuits Laboratory	ESC	0	0	3	1	60	40	100
			Total	**14**	**1**	**13**	**20**	**900**		

KSR College of Engineering	**K.S.R. COLLEGE OF ENGINEERING (Autonomous)** (Approved by AICTE, Accredited by NAAC with A grade & Affiliated to Anna University) **K.S.R. Kalvi Nagar, Tiruchengode – 637 215**	**CURRICULUM** **UG** **R - 2020**

Department	Department of Electronics and Communication Engineering
Programme	B.E - Electronics and Communication Engineering

SEMESTER – III

Sl.No.	Course Code	Course Name	Category	Hours/ Week			Credit	Maximum Marks		
				L	T	P	C	CA	ES	Total
THEORY										
1.	20MA342	Differential Equations and Numerical Methods (Common to EC & EE)	BSC	3	1	0	4	40	60	100
2.	20CS332	C++ and Data Structures	ESC	3	0	0	3	40	60	100
3.	20EC311	Electronic Devices	PCC	3	0	0	3	40	60	100
4.	20EC312	Digital Electronics	PCC	3	0	0	3	40	60	100
5.	20EC313	Electromagnetic Theory	PCC	3	1	0	4	40	60	100
6.	20EE331	Electrical Machines	ESC	3	0	0	3	40	60	100
PRACTICAL										
7.	20CS326	C++ and Data Structures Laboratory	ESC	0	0	3	1	60	40	100
8.	20EC321	Electronic Devices Laboratory	PCC	0	0	3	1	60	40	100
9.	20EC322	Digital Electronics Laboratory	PCC	0	0	3	1	60	40	100
10.	20HR351	Career Development Skill I (Common to All Branches)	EEC	0	2	0	0	60	40	100
			Total	**18**	**4**	**9**	**23**	**1000**		

SEMESTER – IV

Sl.No.	Course Code	Course Name	Category	Hours/ Week			Credit	Maximum Marks		
				L	T	P	C	CA	ES	Total
THEORY										
1.	20MA433	Probability and Stochastic Process	BSC	3	0	0	3	40	60	100
2.	20EC411	Signals and Systems	PCC	3	1	0	4	40	60	100
3.	20EC412	Electronic Circuits	PCC	3	0	0	3	40	60	100
4.	20EC413	Linear Integrated Circuits	PCC	3	0	0	3	40	60	100
5.	20EC414	Microprocessors and Microcontrollers	PCC	3	0	0	3	40	60	100
6.	20EC415	Transmission Lines and Wave Guides	PCC	3	0	0	3	40	60	100
PRACTICAL										
7.	20EC421	Electronic Circuits and Simulation Laboratory	PCC	0	0	3	1	60	40	100
8.	20EC422	Linear Integrated Circuits Laboratory	PCC	0	0	3	1	60	40	100
9.	20EC423	Microprocessors and Microcontrollers Laboratory	PCC	0	0	3	1	60	40	100
10.	20HR442	Career Development Skill II	EEC	0	2	0	0	60	40	100
			Total	**18**	**3**	**9**	**22**	**1000**		

KSR College of Engineering	**K.S.R. COLLEGE OF ENGINEERING (Autonomous)** (Approved by AICTE, Accredited by NAAC with A grade & Affiliated to Anna University) **K.S.R. Kalvi Nagar, Tiruchengode – 637 215**	**CURRICULUM** **UG** **R - 2020**

Department	Department of Electronics and Communication Engineering
Programme	B.E - Electronics and Communication Engineering

SEMESTER – V

Sl.No.	Course Code	Course Name	Category	Hours/ Week			Credit	Maximum Marks		
				L	T	P	C	CA	ES	Total
THEORY										
1.	20EC511	Analog Communication Systems	PCC	3	0	0	3	40	60	100
2.	20EC512	Digital Signal Processing	PCC	3	1	0	4	40	60	100
3.	20EC513	Computer Networks	PCC	3	0	0	3	40	60	100
4.	20EC514	Embedded Systems	PCC	3	0	0	3	40	60	100
5.		Professional Elective – I	PEC	3	0	0	3	40	60	100
6.		Open Elective – I	OEC	3	0	0	3	40	60	100
PRACTICAL										
7.	20EC521	Digital Signal Processing Laboratory	PCC	0	0	3	1	60	40	100
8.	20EC522	Computer Networks Laboratory	PCC	0	0	3	1	60	40	100
9.	20EC523	Embedded System Design Laboratory	PCC	0	0	3	1	60	40	100
10.	20HR543	Career Development Skill III	EEC	0	2	0	0	60	40	100
			Total	**18**	**3**	**9**	**22**	**1000**		

SEMESTER – VI

Sl.No.	Course Code	Course Name	Category	Hours/ Week			Credit	Maximum Marks		
				L	T	P	C	CA	ES	Total
THEORY										
1.	20HS051	Universal human values and understanding harmonics (Common to All Branches)	HSMC	3	0	0	3	40	60	100
2.	20EC611	Digital Communication Systems	PCC	3	0	0	3	40	60	100
3.	20EC612	Digital Image Processing	PCC	3	0	0	3	40	60	100
4.	20EC613	VLSI Design	PCC	3	0	0	3	40	60	100
5.	20EC614	Antenna and Wave Propagation	PCC	3	0	0	3	40	60	100
6.		Professional Elective – II	PEC	3	0	0	3	40	60	100
PRACTICAL										
7.	20EC621	Communication Systems Laboratory	PCC	0	0	3	1	60	40	100
8.	20EC622	VLSI Laboratory	PCC	0	0	3	1	60	40	100
9.	20HR644	Career Development Skill IV	EEC	0	2	0	0	60	40	100
			Total	**18**	**2**	**6**	**20**	**900**		

KSR College of Engineering	**K.S.R. COLLEGE OF ENGINEERING (Autonomous)** (Approved by AICTE, Accredited by NAAC with A grade & Affiliated to Anna University) **K.S.R. Kalvi Nagar, Tiruchengode – 637 215**	**CURRICULUM** **UG** **R - 2020**

Department	Department of Electronics and Communication Engineering
Programme	B.E - Electronics and Communication Engineering

SEMESTER – VII

Sl.No.	Course Code	Course Name	Category	Hours/ Week			Credit	Maximum Marks		
				L	T	P	C	CA	ES	Total
THEORY										
1.	20EC711	Wireless and Cellular Communication	PCC	3	0	0	3	40	60	100
2.	20EC712	RF and Microwave Engineering	PCC	3	0	0	3	40	60	100
3.	20EC713	Fiber Optic Communication	PCC	3	0	0	3	40	60	100
4.		Professional Elective – III	PEC	3	0	0	3	40	60	100
5.		Professional Elective – IV	PEC	3	0	0	3	40	60	100
6.		Open Elective – II	OEC	3	0	0	3	40	60	100
PRACTICAL										
7.	20EC721	RF, Microwave and Optic Laboratory	PCC	0	0	3	1	60	40	100
8.	20EC722	Project Work Phase – I	PW	0	0	6	3	60	40	100
			Total	**18**	**0**	**9**	**22**	**800**		

SEMESTER – VIII

Sl.No.	Course Code	Course Name	Category	Hours/ Week			Credit	Maximum Marks		
				L	T	P	C	CA	ES	Total
THEORY										
1.		Professional Elective – V	PEC	3	0	0	3	40	60	100
2.		Professional Elective – VI	PEC	3	0	0	3	40	60	100
3.		Open Elective – III	OEC	3	0	0	3	40	60	100
PRACTICAL										
4.	20EC821	Project Work Phase - II	PW	0	0	18	6	60	40	200
			Total	**9**	**0**	**18**	**15**	**500**		

KSR College of Engineering	**K.S.R. COLLEGE OF ENGINEERING (Autonomous)** (Approved by AICTE, Accredited by NAAC with A grade & Affiliated to Anna University) **K.S.R. Kalvi Nagar, Tiruchengode – 637 215**	**CURRICULUM** **UG** **R - 2020**
Department	Department of Electronics and Communication Engineering	
Programme	B.E - Electronics and Communication Engineering	

List of Electives

PROFESSIONAL ELECTIVE – I (SEMESTER – V)

Sl.No.	Course Code	Course Name	Specialization	Hours/ Week			Credit	Maximum Marks		
				L	T	P	C	CA	ES	Total
1.	20IE591	Augmented Intelligence Led Managed Services (AIMS) – I (Common To CS,EC,EE & IT)	IE	3	0	0	3	40	60	100
2.	20HS001	Principles of Management (Common to CE, CS, EE, EC, IT & ME)	HSMC	3	0	0	3	40	60	100
3.	20EC561	Advanced Digital Systems Design	S3	3	0	0	3	40	60	100
4.	20EC562	Electronic Instrumentation	S1	2	0	1	3	40	60	100
5.	20CS501	Artificial Intelligence	S5	3	0	0	3	40	60	100

PROFESSIONAL ELECTIVE – II (SEMESTER – VI)

Sl.No.	Course Code	Course Name	Specialization	Hours/ Week			Credit	Maximum Marks		
				L	T	P	C	CA	ES	Total
1.	20EC661	Electronic System Design	S4	3	0	0	3	40	60	100
2.	20EC662	Medical Electronics	S4	3	0	0	3	40	60	100
3.	20EC663	Advanced Microprocessors and Microcontrollers	S3	3	0	0	3	40	60	100
4.	20EC664	Information Theory and Coding	S1	3	0	0	3	40	60	100
5.	20IE691	Augmented Intelligence Led Managed Services (AIMS) – II (Common To CS,EC,EE & IT)	IE	3	0	0	3	40	60	100
6.	20CS601	C# and .NET Framework Technologies (Common to CS & EC)	S6	3	0	0	3	40	60	100
7.	20CS602	Machine Learning	S5	3	0	0	3	40	60	100

PROFESSIONAL ELECTIVE – III (SEMESTER – VII)

Sl.No.	Course Code	Course Name	Specialization	Hours/ Week			Credit	Maximum Marks		
				L	T	P	C	CA	ES	Total
1.	20EC761	Communication and Switching Networks	S1	3	0	0	3	40	60	100
2.	20EC762	Digital Communication Systems - II	S1	3	0	0	3	40	60	100
3.	20EC763	PC Hardware, Installation, Troubleshooting and Servicing	S6	3	0	0	3	40	60	100
4.	20EC764	Embedded System Design	S3	3	0	0	3	40	60	100
5.	20EC765	Wireless Networks	S6	3	0	0	3	40	60	100
6.	20EC770	Pattern Recognition	S5	3	0	0	3	40	60	100

PROFESSIONAL ELECTIVE – IV (SEMESTER – VII)										
Sl.No.	Course Code	Course Name	Specialization	Hours/ Week			Credit	Maximum Marks		
				L	T	P	C	CA	ES	Total
1.	20EC766	CMOS Analog Circuits	S2	3	0	0	3	40	60	100
2.	20EC767	Fundamentals of Nano electronics	S1	3	0	0	3	40	60	100
3.	20EC768	High Performance Networks	S6	3	0	0	3	40	60	100
4.	20EC769	Robotics	S4	3	0	0	3	40	60	100
5.	20HR791	Professional Readiness for Innovation, Employability and Entrepreneurship	S4	3	0	0	3	40	60	100
6.	20EC771	Soft computing techniques	S5	3	0	0	3	40	60	100

PROFESSIONAL ELECTIVE – V (SEMESTER – VIII)										
Sl.No.	Course Code	Course Name	Specialization	Hours/ Week			Credit	Maximum Marks		
				L	T	P	C	CA	ES	Total
1.	20EC861	Satellite Communication	S1	3	0	0	3	40	60	100
2.	20EC862	Optical Networks	S6	3	0	0	3	40	60	100
3.	20EC863	Multimedia Compression and Communication	S5	3	0	0	3	40	60	100
4.	20EC864	Embedded Networks	S3	3	0	0	3	40	60	100
5.	20EC865	VLSI Signal Processing	S2	3	0	0	3	40	60	100
6.	20EC866	CAD for VLSI	S2	3	0	0	3	40	60	100
7.	20EC867	Advanced Signal Processing	S5	3	0	0	3	40	60	100
8.	20EC879	Wireless Sensor Networks	S6	3	0	0	3	40	60	100
9.	20EC880	Bio Medical Signal Processing	S5	3	0	0	3	40	60	100
10.	20EC881	Advanced Digital Image Processing	S5	3	0	0	3	40	60	100
11.	20EC882	Speech Processing	S5	3	0	0	3	40	60	100
12.	20EC883	Medical Image Processing	S5	3	0	0	3	40	60	100

PROFESSIONAL ELECTIVE – VI (SEMESTER – VIII)										
Sl.No.	Course Code	Course Name	Specialization	Hours/ Week			Credit	Maximum Marks		
				L	T	P	C	CA	ES	Total
1.	20EC868	ADHOC Networks	S1	3	0	0	3	40	60	100
2.	20EC869	MEMS Technology	S6	3	0	0	3	40	60	100
3.	20EC870	Telecommunication System Modeling and Simulation	S1	3	0	0	3	40	60	100
4.	20EC871	ARM System Architecture	S3	3	0	0	3	40	60	100
5.	20EC872	Architecture of DSPs	S5	3	0	0	3	40	60	100
6.	20EC873	Cryptography and Network Security	S6	3	0	0	3	40	60	100
7.	20EC874	Neural Networks and Deep Learning	S5	3	0	0	3	40	60	100
8.	20EC875	ASIC Design	S2	3	0	0	3	40	60	100
9.	20EC876	4G/5G Communication Networks	S6	3	0	0	3	40	60	100
10.	20EC877	Cognitive Radio Network	S6	3	0	0	3	40	60	100
11.	20EC878	Wireless Broad Band Networks	S6	3	0	0	3	40	60	100

S1 Communication
S2 VLSI
S3 Embedded
S4 Electronics
S5 Signal Processing
S6 Networks

B.E./B.TECH. HONOURS (SPECIALIZATION IN THE SAME DISCIPLINE) : VERTICALS

Emerging Areas: Electronics and Communication Engineering

(ii) B.E Honours (specialization in the same discipline)

a. The student should have earned additionally a minimum of 18 credits from a specified group of Professional Electives of the same programme.
b. Should have passed all the courses in the first attempt.
c. Should have earned a minimum of 7.50 CGPA.

(ii) B.E Honours

a. The students should have taken additional courses from more than one vertical of the same Programme and earned a minimum of 18 credits.
b. Should have passed all the courses in the first attempt.
c. Should have earned a minimum of 7.50 CGPA.

(iii) B.E. minor in other specialization.

The student should have earned additionally a minimum of 18 credits in any one of the verticals of other B.E programmes

- Out of these 18 credits students can earn a maximum of 6 credits in online mode (SWAYAM platform), as approved by Centre for Academic Courses.
- B.E./ B. Tech. (Hons) Specialization in the same discipline, B.E / B.Tech. Honors and B.E./B.Tech. Minor in other specialization degree will be optional for students.
- For the categories (i) to (ii), the students shall be permitted to register for the courses from the V Semester onwards provided the students has earned a minimum CGPA 7.50 of until III Semester and has cleared all the courses in the first attempt.
- For the category (iii), the students will be permitted, to register the courses from Semester V onwards provided the marks earned by the students until Semester III is CGPA 7.50 and above.
- If a student decides not to opt for Honours, after completing certain number of additional courses, the additional courses studied shall be considered instead of the Professional Elective courses, which are part of the curriculum. If the student has studied more number of such courses than the number of Professional Elective courses required as per the curriculum, the courses with higher grades shall be considered for the calculation of CGPA. Remaining courses shall be printed in the mark sheet, however, they will not be considered for calculation of CGPA.

Registration of Professional Elective courses from Verticals:

Professional Elective Courses will be registered in Semesters V to VIII. These courses are listed in groups called verticals that represent a particular area of specialization / diversified group. The student should have earned additionally a minimum of 18 credits in any one of the verticals for obtaining B.E./B.Tech. Honours with specialization in the same disciplines.

PROFESSIONAL ELECTIVE COURSES: VERTICALS

Signal Processing	High Speed Communication Networks
20EC770 - Pattern Recognition	20EC765 - Wireless Networks
20EC771 - Soft computing techniques	20EC768 - High Performance Networks
20EC863 - Multimedia Compression and Communication	20EC862 - Optical Networks
20EC865 - VLSI Signal Processing	20EC868 - ADHOC Networks
20EC867 - Advanced Signal Processing	20EC870 - Telecommunication System Modeling and Simulation
20EC872 - Architecture of DSPs	20EC873 - Cryptography and Network Security
20EC880 - Bio Medical Signal Processing	20EC876 - 4G/5G Communication Networks
20EC881 - Advanced Digital Image Processing	20EC877- Cognitive Radio Network
20EC882 - Speech Processing	20EC878 - Wireless Broad Band Networks
20EC883 - Medical Image Processing	20EC879 - Wireless Sensor Networks

KSR College of Engineering	**K.S.R. COLLEGE OF ENGINEERING (Autonomous)** (Approved by AICTE, Accredited by NAAC with A grade & Affiliated to Anna University) **K.S.R. Kalvi Nagar, Tiruchengode – 637 215**	**CURRICULUM** **UG** **R - 2020**

Department	Department of Electronics and Communication Engineering
Programme	B.E - Electronics and Communication Engineering

VERTICAL – I : SIGNAL PROCESSING

Sl.No.	Course Code	Course Name	Specialization	Category	Hours/ Week			Credit	Maximum Marks		
					L	T	P	C	CA	ES	Total
1.	20EC770	Pattern Recognition	S5	PEC	3	0	0	3	30	70	100
2.	20EC771	Soft computing techniques	S5	PEC	3	0	0	3	30	70	100
3.	20EC863	Multimedia Compression and Communication	S5	PEC	3	0	0	3	30	70	100
4.	20EC865	VLSI Signal Processing	S5	PEC	3	0	0	3	30	70	100
5.	20EC867	Advanced Signal Processing	S5	PEC	3	0	0	3	30	70	100
6.	20EC872	Architecture of DSPs	S5	PEC	3	0	0	3	30	70	100
7.	20EC880	Bio Medical Signal Processing	S5	PEC	3	0	0	3	30	70	100
8.	20EC881	Advanced Digital Image Processing	S5	PEC	3	0	0	3	30	70	100
9.	20EC882	Speech Processing	S5	PEC	3	0	0	3	30	70	100
10.	20EC883	Medical Image Processing	S5	PEC	3	0	0	3	30	70	100

VERTICAL – II : HIGH SPEED COMMUNICATION NETWORKS

Sl.No.	Course Code	Course Name	Specialization	Category	Hours/ Week			Credit	Maximum Marks		
					L	T	P	C	CA	ES	Total
1.	20EC765	Wireless Networks	S6	PEC	3	0	0	3	30	70	100
2.	20EC768	High Performance Networks	S6	PEC	3	0	0	3	30	70	100
3.	20EC862	Optical Networks	S6	PEC	3	0	0	3	30	70	100
4.	20EC868	ADHOC Networks	S6	PEC	3	0	0	3	30	70	100
5.	20EC870	Telecommunication System Modeling and Simulation	S6	PEC	3	0	0	3	30	70	100
6.	20EC873	Cryptography and Network Security	S6	PEC	3	0	0	3	30	70	100
7.	20EC876	4G/5G Communication Networks	S6	PEC	3	0	0	3	30	70	100
8.	20EC877	Cognitive Radio Network	S6	PEC	3	0	0	3	30	70	100
9.	20EC878	Wireless Broad Band Networks	S6	PEC	3	0	0	3	30	70	100
10.	20EC879	Wireless Sensor Networks	S6	PEC	3	0	0	3	30	70	100

S1	Communication	S4	Electronics
S2	VLSI	S5	Signal Processing
S3	Embedded	S6	Networks

K.S.R. COLLEGE OF ENGINEERING: TIRUCHENGODE - 637 215

(Autonomous)

(REGULATIONS 2020)

OPEN ELECTIVE COURSES

OPEN ELECTIVE COURSES OFFERED BY OTHER BRANCHES

Sl.No.	Course Code	Course Name	Specialization	Category	Hours/ Week			Credit	Maximum Marks		
					L	T	P	C	CA	ES	Total
Automobile Engineering											
1.	20AU901	Basics of Automobile Engineering	AE	OEC	3	0	0	3	40	60	100
2.	20AU902	Automotive Engine Technology	AE	OEC	3	0	0	3	40	60	100
3.	20AU903	Automotive Vehicle Technology	AE	OEC	3	0	0	3	40	60	100
4.	20AU904	Automotive Safety	AE	OEC	3	0	0	3	40	60	100
5.	20AU905	Hybrid Vehicles	AE	OEC	3	0	0	3	40	60	100
6.	20AU906	Off Highway Vehicles	AE	OEC	3	0	0	3	40	60	100
7.	20AU907	Modern and Intelligent Vehicle Syster	AE	OEC	3	0	0	3	40	60	100
8.	20AU908	Vehicle Maintenance	AE	OEC	3	0	0	3	40	60	100
CIVIL ENGINEERING											
9.	20CE901	Architectural Heritage of India	CE	OEC	3	0	0	3	40	60	100
10.	20CE902	Building Planning and Construction	CE	OEC	3	0	0	3	40	60	100
11.	20CE903	Elementary Civil Engineering	CE	OEC	3	0	0	3	40	60	100
12.	20CE904	Energy and Environment	CE	OEC	3	0	0	3	40	60	100
13.	20CE905	Environmental Laws and Policies	CE	OEC	3	0	0	3	40	60	100
14.	20CE906	Global Warming and Climate Change	CE	OEC	3	0	0	3	40	60	100
15.	20CE907	Introduction to Disaster Management and Mitigation	CE	OEC	3	0	0	3	40	60	100
16.	20CE908	Introduction to Earthquake Engineering	CE	OEC	3	0	0	3	40	60	100
17.	20CE909	Solid Waste Management	CE	OEC	3	0	0	3	40	60	100
18.	20CE910	Water and Air Pollution Management	CE	OEC	3	0	0	3	40	60	100
Computer Science and Engineering											
19.	20CS901	Programming in Java	CSE	OEC	3	0	0	3	40	60	100
20.	20CS902	Basic concepts of Data Structure	CSE	OEC	3	0	0	3	40	60	100
21.	20CS903	Fundamentals of Database Concepts	CSE	OEC	3	0	0	3	40	60	100
22.	20CS904	Internet Programming	CSE	OEC	3	0	0	3	40	60	100
23.	20CS905	Fundamentals of Mobile Application Development	CSE	OEC	3	0	0	3	40	60	100
24.	20CS906	Principles of Ethical Hacking	CSE	OEC	3	0	0	3	40	60	100
25.	20CS907	Green Technology	CSE	OEC	3	0	0	3	40	60	100
26.	20CS908	Artificial Intelligence and Robotics	CSE	OEC	3	0	0	3	40	60	100
27.	20CS909	Big Data and Analytics	CSE	OEC	3	0	0	0	40	60	100
28.	20CS910	Hardware and Trouble Shooting	CSE	OEC	3	0	0	3	40	60	100

Sl.No.	Course Code	Course Name	Specialization	Category	Hours/ Week			Credit	Maximum Marks		
					L	T	P	C	CA	ES	Total
Electrical and Electronics Engineering											
29.	20EE901	Electrical Drives and Control	EE	OEC	3	0	0	3	40	60	100
30.	20EE902	Power Semiconductor Devices	EE	OEC	3	0	0	3	40	60	100
31.	20EE903	Electrical Power Generation Systems	EE	OEC	3	0	0	3	40	60	100
32.	20EE904	Control Engineering	EE	OEC	3	0	0	3	40	60	100
33.	20EE905	Industrial Automation	EE	OEC	3	0	0	3	40	60	100
34.	20EE906	Electrical Instruments and Measurements	EE	OEC	3	0	0	3	40	60	100
35.	20EE907	Energy Conservation and Management	EE	OEC	3	0	0	3	40	60	100
36.	20EE908	Electrical Wiring, Estimation and Costing	EE	OEC	3	0	0	3	40	60	100
37.	20EE909	Fundamentals of Electrical Machinery	EE	OEC	3	0	0	3	40	60	100
38.	20EE910	Principles of Soft Computing Techniques	EE	OEC	3	0	0	3	40	60	100
39.	20EE911	Embedded System Technology	EE	OEC	3	0	0	3	40	60	100
Electronics and Communication Engineering											
40.	20EC901	Basics of Medical Electronics	EC	OEC	3	0	0	3	40	60	100
41.	20EC902	NANO Technology	EC	OEC	3	0	0	3	40	60	100
42.	20EC903	Electronics and Microprocessor	EC	OEC	3	0	0	3	40	60	100
43.	20EC904	Analog and Digital Communication	EC	OEC	3	0	0	3	40	60	100
44.	20EC905	Principles of Communication	EC	OEC	3	0	0	3	40	60	100
45.	20EC906	Fundamentals of Robotics	EC	OEC	3	0	0	3	40	60	100
46.	20EC907	Internet of Things Sensing and Actuator Devices	EC	OEC	3	0	0	3	40	60	100
47.	20EC908	Consumer Electronics	EC	OEC	3	0	0	3	40	60	100
Information Technology											
48.	20IT901	Data Science using R	IT	OEC	3	0	0	3	40	60	100
49.	20IT902	Principles of Cyber Security	IT	OEC	3	0	0	3	40	60	100
50.	20IT903	Fundamentals of Business Intelligence	IT	OEC	3	0	0	3	40	60	100
51.	20IT904	Blockchain Technologies	IT	OEC	3	0	0	3	40	60	100
52.	20IT905	Internet of Things and Applications	IT	OEC	3	0	0	3	40	60	100
53.	20IT906	Principles of Software Testing	IT	OEC	3	0	0	3	40	60	100
54.	20IT907	Foundation Skills in Logic Building	IT	OEC	3	0	0	3	40	60	100
55.	20IT908	Principles of Cloud Computing	IT	OEC	3	0	0	3	40	60	100
56.	20IT909	Open Source Technologies	IT	OEC	3	0	0	3	40	60	100
57.	20IT910	Principles of Software Engineering	IT	OEC	3	0	0	3	40	60	100

Sl.No.	Course Code	Course Name	Specialization	Category	Hours/ Week			Credit	Maximum Marks		
					L	T	P	C	CA	ES	Total
Mechanical Engineering											
58.	20ME901	Basic Mechanical Engineering	ME	OEC	3	0	0	3	40	60	100
59.	20ME902	Solar Energy Utilization	ME	OEC	3	0	0	3	40	60	100
60.	20ME903	Production Technology of Agricultural Machinery	ME	OEC	3	0	0	3	40	60	100
61.	20ME904	Selection of Materials	ME	OEC	3	0	0	3	40	60	100
62.	20ME905	Marine Vehicles	ME	OEC	3	0	0	3	40	60	100
63.	20ME906	Sensors and Transducers	ME	OEC	3	0	0	3	40	60	100
64.	20ME907	Energy Auditing	ME	OEC	3	0	0	3	40	60	100
65.	20ME908	Fiber Reinforced Plastics	ME	OEC	3	0	0	3	40	60	100
66.	20ME909	Lean Manufacturing	ME	OEC	3	0	0	3	40	60	100
67.	20ME910	Surface Engineering	ME	OEC	3	0	0	3	40	60	100
Safety and Fire Engineering											
68.	20SF901	Occupational Health and Hygiene	SF	OEC	3	0	0	3	40	60	100
69.	20SF902	Construction Safety	SF	OEC	3	0	0	3	40	60	100
70.	20SF903	Building Fire Safety	SF	OEC	3	0	0	3	40	60	100
71.	20SF904	Safety in Electrical Engineering	SF	OEC	3	0	0	3	40	60	100
72.	20SF905	Legal Aspects of Safety	SF	OEC	3	0	0	3	40	60	100
73.	20SF906	Safety in Industries	SF	OEC	3	0	0	3	40	60	100
74.	20SF907	Food Safety	SF	OEC	3	0	0	3	40	60	100
75.	20SF908	Safety Management and its Principles	SF	OEC	3	0	0	3	40	60	100
76.	20SF909	Safety in Automobile Engineering	SF	OEC	3	0	0	3	40	60	100
77.	20SF910	Safety in Transportation	SF	OEC	3	0	0	3	40	60	100
Science and Humanities											
78.	20SH901	Applications of Statistics	FYA	OEC	3	0	0	3	40	60	100
79.	20SH902	Combinatorics and Graph Theory	FYA	OEC	3	0	0	3	40	60	100
80.	20SH903	Optimization Techniques	FYA	OEC	3	0	0	3	40	60	100
81.	20SH904	Basic Military Education and Training	FYA	OEC	3	0	0	3	40	60	100
82.	20SH905	Professional Communication	FYA	OEC	3	0	0	3	40	60	100
83.	20SH906	Fundamentals of Nanoscience and Technology	FYA	OEC	3	0	0	3	40	60	100

K.S.R. COLLEGE OF ENGINEERING: TIRUCHENGODE - 637 215 (Autonomous)

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

(REGULATIONS 2020)

LIST OF PROPOSED VALUE-ADDED COURSES

Sl.No.	Course Code	Course Name	Number of hours	Offered by Internal / External
1.	VACEC01	PCB Circuit Design	30 Hours	External
2.	VACEC02	Programming PIC Microcontrollers	30 Hours	External
3.	VACEC03	Real Time Applications of Aurduino	30 Hours	External
4.	VACEC04	LABVIEW	30 Hours	External
5.	VACEC05	MATLAB – Signal and Image Processing Tool box	30 Hours	Department of ECE- KSRCE
6.	VACEC06	Industrial Automation using PLC and SCADA	30 Hours	External
7.	VACEC07	Network Simulator – 2	30 Hours	External
8.	VACEC08	CCNA Fundamentals (Module 1)	30 Hours	External
9.	VACEC09	CCNA - Routing and Switching (Module 2)	30 Hours	External
10.	VACEC10	.Net and PHP	30 Hours	External
11.	VACEC11	Data Base Management Systems	30 Hours	External
12.	VACEC12	VHDL Programming	30 Hours	Department of ECE- KSRCE
13.	VACEC13	Tanner Tool	30 Hours	Department of ECE- KSRCE
14.	VACEC14	Mentor Graphics	30 Hours	Department of ECE- KSRCE
15.	VACEC15	Programming in Digital Signal Processors	30 Hours	Department of ECE- KSRCE
16.	VACEC16	High Frequency Structure Simulator (HFSS)	30 Hours	Department of ECE- KSRCE

S.No	Subject Area	Credits Per Semester								Credits Total	Percentage Credits	Suggested Breakup of credits
		I	II	III	IV	V	VI	VII	VIII			
1	HSMC	3	3				3			9	5.60	12
2	ESC	5	9	7						21	13.125	25
3	BSC	8	8	4	3					23	14.375	24
4	PCC			12	19	16	14	10		71	44.37	48
5	PEC					3	3	6	6	18	11.25	18
6	OEC					3		3	3	9	5.60	18
7	PW							3	6	9	5.60	15
Total		16	20	23	22	22	20	22	15	160	100	160

Total Credits for Regular Student - 160

Total Credits for Lateral Student - 124

DEPARTMENT
OF
ELECTRONICS AND COMMUNICATION ENGINEERING

B.E – ELECTRONICS AND COMMUNICATION ENGINEERING

CURRICULUM & SYLLABI

Regulations 2020

(Applicable to candidates admitted in the academic year 2022 - 2023)

K.S.R. College of Engineering (Autonomous)

K.S.R. Kalvi Nagar, Tiruchengode – 637 215

Namakkal (Dt), Tamilnadu, India

Email: info@ksrce.ac.in **Website: www.ksrce.ac.in**

K.S.R. COLLEGE OF ENGINEERING: TIRUCHENGODE - 637 215 (Autonomous)

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

(REGULATIONS 2020)

Vision of the Institution

IV	We envision to achieve status as an excellent educational institution in the global knowledge hub, making self-learners, experts, ethical and responsible engineers, technologists, scientists, managers, administrators and entrepreneurs who will significantly contribute to research and environment friendly sustainable growth of the nation and the world.

Mission of the Institution

IM 1	To inculcate in the students self-learning abilities that enable them to become competitive and considerate engineers, technologists, scientists, managers, administrators and entrepreneurs by diligently imparting the best of education, nurturing environmental and social needs.
IM 2	To foster and maintain a mutually beneficial partnership with global industries and institutions through knowledge sharing, collaborative research and innovation.

Vision of the Department / Programme: (Electronics and Communication Engineering)

DV	We envision as a center of excellence in the field of Electronics and Communication Engineering to produce technically competent graduates with diverse teaching and research environments.

Mission of the Department / Programme: (Electronics and Communication Engineering)

DM 1	To educate the students with the state of art technologies to meet the growing challenges of the industries.
DM 2	To develop an innovate, competent and ethical Electronics and Communication Engineer with strong foundations to enable them for continuing education.

Programme Educational Objectives (PEOs) : (Electronics and Communication Engineering)

The graduates of the programme will be able to

PEO 1	**Employability and Higher Education:** Excel in Professional career and higher education by acquiring knowledge in mathematical, social, scientific & engineering principles.
PEO 2	**Core Competence:** Analyze, design and develop/implement core engineering problems in communication systems that are technically sound, economically feasible and socially acceptable.
PEO 3	**Interpersonal Skills and Team Work:** Exhibit professionalism, ethical communicating skills and team work by engaging in lifelong learning for sustainable development of the society.

Programme Outcomes (POs) of B.E. - Electronics and Communication Engineering

Program Outcomes (POs)	
PO1	**Engineering Graduates will be able to:** **Engineering Knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO2	**Problem Analysis:** Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
PO3	**Design/Development of Solutions:** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
PO4	**Conduct Investigations of Complex Problems:** Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
PO5	**Modern Tool Usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.
PO6	**The Engineer and Society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
PO7	**Environment and Sustainability:** understand the impact of the professional engineering solutions in societal and environmental contexts, demonstrate the knowledge of, and need for sustainable development.
PO8	**Ethics:** Apply ethical principles and commit to professional ethics, responsibilities, and norms of the engineering practice.
PO9	**Individual and Team Work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
PO10	**Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
PO11	**Project Management and Finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary Environments.
PO12	**Life-long Learning:** Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.
Program Specific Outcomes (PSOs)	
PSO1	**Professional Skill:** Specify, design and test modern electronic systems that perform analog and digital processing functions.
PSO2	**Problem – Solving Skills:** Design essential elements (circuits and antennas) of modern RF/Wireless communication systems.

KSR College of Engineering	**K.S.R. COLLEGE OF ENGINEERING (Autonomous)** (Approved by AICTE, Accredited by NAAC with A grade & Affiliated to Anna University) **K.S.R. Kalvi Nagar, Tiruchengode – 637 215**	**CURRICULUM** **UG** **R - 2020**
Department	Department of Electronics and Communication Engineering	
Programme	B.E - Electronics and Communication Engineering	

SEMESTER – I

Sl.No.	Course Code	Course Name	Category	Hours/ Week			Credit	Maximum Marks		
				L	T	P	C	CA	ES	Total
THEORY										
1.	20EN151	Technical English – I (Common to All Branches)	HSMC	3	0	0	3	40	60	100
2.	20MA151	Engineering Mathematics – I (Common to All Branches)	BSC	3	1	0	4	40	60	100
3.	20PH051	Engineering Physics (Common to AU, EC,EE,ME,SF & PT)	BSC	3	0	0	3	40	60	100
4.	20CS142	Problem solving Techniques	ESC	3	0	0	3	40	60	100
PRACTICAL										
5.	20AU127	Engineering Graphics Laboratory (Common to CE,CS,EC,EE,IT & PT)	ESC	0	0	3	1	60	40	100
6.	20PH028	Physics Laboratory (Common to AU, EC,EE,ME,SF & PT)	BSC	0	0	3	1	60	40	100
7.	20CS171	Problem solving Techniques laboratory	ESC	0	0	3	1	60	40	100
			Total	**11**	**1**	**10**	**16**	**700**		
MANDATORY COURSE										
8.	20MC151	Induction Programme * (Common to All Branches)	MC	3	-	-	-	*	*	*
9.	20MC052	Environmental Science and Engineering (Common to All Branches)	MC	3	0	0	0	*	*	*

*Induction Programme will be conducted for three weeks as per AICTE guidelines

SEMESTER – II

Sl.No.	Course Code	Course Name	Category	Hours/ Week			Credit	Maximum Marks		
				L	T	P	C	CA	ES	Total
THEORY										
1.	20EN251	Technical English – II (Common to All Branches)	HSMC	3	0	0	3	40	60	100
2.	20MA242	Applied Mathematics (Common to EC & EE)	BSC	3	1	0	4	40	60	100
3.	20CH051	Engineering Chemistry (Common to All Branches)	BSC	3	0	0	3	40	60	100
4.	20CS241	Python Programming (Common to AU,CE,CS,EC,EE,ME,PT & SF)	ESC	3	0	0	3	40	60	100
5.	20EC215	Electric Circuits	ESC	3	0	0	3	40	60	100
PRACTICAL										
6.	20CH028	Chemistry Laboratory(Common to All Branches)	BSC	0	0	3	1	60	40	100
7.	20CS227	Python Programming Laboratory (Common to AU,CE,CS,EC,EE,ME,PT & SF)	ESC	0	0	3	1	60	40	100
8.	20GE028	Manufacturing Practices Laboratory (Common to All Branches)	ESC	0	0	3	1	60	40	100
9.	20EC221	Electric Circuits Laboratory	ESC	0	0	3	1	60	40	100
MANDATORY COURSE										
10.	20GE051	"Heritage of Tamils - தமிழர் மரபு"	MC	1	0	0	1	40	60	100
			Total	**15**	**1**	**13**	**21**	**1000**		

KSR College of Engineering	**K.S.R. COLLEGE OF ENGINEERING (Autonomous)** (Approved by AICTE, Accredited by NAAC with A grade & Affiliated to Anna University) **K.S.R. Kalvi Nagar, Tiruchengode – 637 215**	**CURRICULUM** **UG** **R - 2020**
Department	Department of Electronics and Communication Engineering	
Programme	B.E - Electronics and Communication Engineering	

SEMESTER – III

Sl.No.	Course Code	Course Name	Category	Hours/ Week			Credit	Maximum Marks		
				L	T	P	C	CA	ES	Total
THEORY										
1.	20MA342	Differential Equations and Numerical Methods (Common to EC & EE)	BSC	3	1	0	4	40	60	100
2.	20CS332	C++ and Data Structures	ESC	3	0	0	3	40	60	100
3.	20EC311	Electronic Devices	PCC	3	0	0	3	40	60	100
4.	20EC312	Digital Electronics	PCC	3	0	0	3	40	60	100
5.	20EC313	Electromagnetic Theory	PCC	3	1	0	4	40	60	100
6.	20EE331	Electrical Machines	ESC	3	0	0	3	40	60	100
PRACTICAL										
7.	20CS326	C++ and Data Structures Laboratory	ESC	0	0	3	1	60	40	100
8.	20EC321	Electronic Devices Laboratory	PCC	0	0	3	1	60	40	100
9.	20EC322	Digital Electronics Laboratory	PCC	0	0	3	1	60	40	100
10.	20HR351	Career Development Skill I (Common to All Branches)	EEC	0	2	0	0	60	40	100
MANDATORY COURSE										
11.	20GE052	"Tamils and Technology - தமிழரும் தொழில்நுட்பமும்"	MC	1	0	0	1	60	40	100
			Total	**19**	**4**	**9**	**24**	**1100**		

SEMESTER – IV

Sl.No.	Course Code	Course Name	Category	Hours/ Week			Credit	Maximum Marks		
				L	T	P	C	CA	ES	Total
THEORY										
1.	20MA433	Probability and Stochastic Process	BSC	3	0	0	3	40	60	100
2.	20EC411	Signals and Systems	PCC	3	1	0	4	40	60	100
3.	20EC412	Electronic Circuits	PCC	3	0	0	3	40	60	100
4.	20EC413	Linear Integrated Circuits	PCC	3	0	0	3	40	60	100
5.	20EC414	Microprocessors and Microcontrollers	PCC	3	0	0	3	40	60	100
6.	20EC415	Transmission Lines and Wave Guides	PCC	3	0	0	3	40	60	100
PRACTICAL										
7.	20EC421	Electronic Circuits and Simulation Laboratory	PCC	0	0	3	1	60	40	100
8.	20EC422	Linear Integrated Circuits Laboratory	PCC	0	0	3	1	60	40	100
9.	20EC423	Microprocessors and Microcontrollers Laboratory	PCC	0	0	3	1	60	40	100
10.	20HR442	Career Development Skill II	EEC	0	2	0	0	60	40	100
			Total	**18**	**3**	**9**	**22**	**1000**		

KSR College of Engineering	**K.S.R. COLLEGE OF ENGINEERING (Autonomous)** (Approved by AICTE, Accredited by NAAC with A grade & Affiliated to Anna University) **K.S.R. Kalvi Nagar, Tiruchengode – 637 215**	**CURRICULUM** **UG** **R - 2020**

Department	Department of Electronics and Communication Engineering
Programme	B.E - Electronics and Communication Engineering

SEMESTER – V

Sl.No.	Course Code	Course Name	Category	Hours/ Week			Credit	Maximum Marks		
				L	T	P	C	CA	ES	Total
THEORY										
1.	20EC511	Analog Communication Systems	PCC	3	0	0	3	40	60	100
2.	20EC512	Digital Signal Processing	PCC	3	1	0	4	40	60	100
3.	20EC513	Computer Networks	PCC	3	0	0	3	40	60	100
4.	20EC514	Embedded Systems	PCC	3	0	0	3	40	60	100
5.		Professional Elective – I	PEC	3	0	0	3	40	60	100
6.		Open Elective – I	OEC	3	0	0	3	40	60	100
PRACTICAL										
7.	20EC521	Digital Signal Processing Laboratory	PCC	0	0	3	1	60	40	100
8.	20EC522	Computer Networks Laboratory	PCC	0	0	3	1	60	40	100
9.	20EC523	Embedded System Design Laboratory	PCC	0	0	3	1	60	40	100
10.	20HR543	Career Development Skill III	EEC	0	2	0	0	60	40	100
			Total	**18**	**3**	**9**	**22**	**1000**		

SEMESTER – VI

Sl.No.	Course Code	Course Name	Category	Hours/ Week			Credit	Maximum Marks		
				L	T	P	C	CA	ES	Total
THEORY										
1.	20HS051	Universal human values and understanding harmonics (Common to All Branches)	HSMC	3	0	0	3	40	60	100
2.	20EC611	Digital Communication Systems	PCC	3	0	0	3	40	60	100
3.	20EC612	Digital Image Processing	PCC	3	0	0	3	40	60	100
4.	20EC613	VLSI Design	PCC	3	0	0	3	40	60	100
5.	20EC614	Antenna and Wave Propagation	PCC	3	0	0	3	40	60	100
6.		Professional Elective – II	PEC	3	0	0	3	40	60	100
PRACTICAL										
7.	20EC621	Communication Systems Laboratory	PCC	0	0	3	1	60	40	100
8.	20EC622	VLSI Laboratory	PCC	0	0	3	1	60	40	100
9.	20HR644	Career Development Skill IV	EEC	0	2	0	0	60	40	100
			Total	**18**	**2**	**6**	**20**	**900**		

KSR College of Engineering	**K.S.R. COLLEGE OF ENGINEERING (Autonomous)** (Approved by AICTE, Accredited by NAAC with A grade & Affiliated to Anna University) **K.S.R. Kalvi Nagar, Tiruchengode – 637 215**	**CURRICULUM** **UG** **R - 2020**

Department	Department of Electronics and Communication Engineering
Programme	B.E - Electronics and Communication Engineering

SEMESTER – VII

Sl.No.	Course Code	Course Name	Category	Hours/ Week			Credit	Maximum Marks		
				L	T	P	C	CA	ES	Total
THEORY										
1.	20EC711	Wireless and Cellular Communication	PCC	3	0	0	3	40	60	100
2.	20EC712	RF and Microwave Engineering	PCC	3	0	0	3	40	60	100
3.	20EC713	Fiber Optic Communication	PCC	3	0	0	3	40	60	100
4.		Professional Elective – III	PEC	3	0	0	3	40	60	100
5.		Professional Elective – IV	PEC	3	0	0	3	40	60	100
6.		Open Elective – II	OEC	3	0	0	3	40	60	100
PRACTICAL										
7.	20EC721	RF, Microwave and Optic Laboratory	PCC	0	0	3	1	60	40	100
8.	20EC722	Project Work Phase – I	PW	0	0	6	3	60	40	100
			Total	**18**	**0**	**9**	**22**	**800**		

SEMESTER – VIII

Sl.No.	Course Code	Course Name	Category	Hours/ Week			Credit	Maximum Marks		
				L	T	P	C	CA	ES	Total
THEORY										
1.		Professional Elective – V	PEC	3	0	0	3	40	60	100
2.		Professional Elective – VI	PEC	3	0	0	3	40	60	100
3.		Open Elective – III	OEC	3	0	0	3	40	60	100
PRACTICAL										
4.	20EC821	Project Work Phase - II	PW	0	0	18	6	60	40	200
			Total	**9**	**0**	**18**	**15**	**500**		

KSR College of Engineering	**K.S.R. COLLEGE OF ENGINEERING (Autonomous)** (Approved by AICTE, Accredited by NAAC with A grade & Affiliated to Anna University) **K.S.R. Kalvi Nagar, Tiruchengode – 637 215**	**CURRICULUM UG R - 2020**
Department	Department of Electronics and Communication Engineering	
Programme	B.E - Electronics and Communication Engineering	

List of Electives

PROFESSIONAL ELECTIVE – I (SEMESTER – V)

Sl.No.	Course Code	Course Name	Specialization	Hours/ Week			Credit	Maximum Marks		
				L	T	P	C	CA	ES	Total
1.	20IE591	Augmented Intelligence Led Managed Services (AIMS) – I (Common To CS,EC,EE & IT)	IE	3	0	0	3	40	60	100
2.	20HS001	Principles of Management (Common to CE, CS, EE, EC, IT & ME)	HSMC	3	0	0	3	40	60	100
3.	20EC561	Advanced Digital Systems Design	S3	3	0	0	3	40	60	100
4.	20EC562	Electronic Instrumentation	S1	2	0	1	3	40	60	100
5.	20CS501	Artificial Intelligence	S5	3	0	0	3	40	60	100

PROFESSIONAL ELECTIVE – II (SEMESTER – VI)

Sl.No.	Course Code	Course Name	Specialization	Hours/ Week			Credit	Maximum Marks		
				L	T	P	C	CA	ES	Total
1.	20EC661	Electronic System Design	S4	3	0	0	3	40	60	100
2.	20EC662	Medical Electronics	S4	3	0	0	3	40	60	100
3.	20EC663	Advanced Microprocessors and Microcontrollers	S3	3	0	0	3	40	60	100
4.	20EC664	Information Theory and Coding	S1	3	0	0	3	40	60	100
5.	20IE691	Augmented Intelligence Led Managed Services (AIMS) – II (Common To CS,EC,EE & IT)	IE	3	0	0	3	40	60	100
6.	20CS601	C# and .NET Framework Technologies (Common to CS & EC)	S6	3	0	0	3	40	60	100
7.	20CS602	Machine Learning	S5	3	0	0	3	40	60	100

PROFESSIONAL ELECTIVE – III (SEMESTER – VII)

Sl.No.	Course Code	Course Name	Specialization	Hours/ Week			Credit	Maximum Marks		
				L	T	P	C	CA	ES	Total
1.	20EC761	Communication and Switching Networks	S1	3	0	0	3	40	60	100
2.	20EC762	Digital Communication Systems - II	S1	3	0	0	3	40	60	100
3.	20EC763	PC Hardware, Installation, Troubleshooting and Servicing	S6	3	0	0	3	40	60	100
4.	20EC764	Embedded System Design	S3	3	0	0	3	40	60	100
5.	20EC765	Wireless Networks	S6	3	0	0	3	40	60	100
6.	20EC770	Pattern Recognition	S5	3	0	0	3	40	60	100

PROFESSIONAL ELECTIVE – IV (SEMESTER – VII)										
Sl.No.	Course Code	Course Name	Specialization	Hours/ Week			Credit	Maximum Marks		
				L	T	P	C	CA	ES	Total
1.	20EC766	CMOS Analog Circuits	S2	3	0	0	3	40	60	100
2.	20EC767	Fundamentals of Nano electronics	S1	3	0	0	3	40	60	100
3.	20EC768	High Performance Networks	S6	3	0	0	3	40	60	100
4.	20EC769	Robotics	S4	3	0	0	3	40	60	100
5.	20HR791	Professional Readiness for Innovation, Employability and Entrepreneurship	S4	3	0	0	3	40	60	100
6.	20EC771	Soft computing techniques	S5	3	0	0	3	40	60	100

PROFESSIONAL ELECTIVE – V (SEMESTER – VIII)										
Sl.No.	Course Code	Course Name	Specialization	Hours/ Week			Credit	Maximum Marks		
				L	T	P	C	CA	ES	Total
1.	20EC861	Satellite Communication	S1	3	0	0	3	40	60	100
2.	20EC862	Optical Networks	S6	3	0	0	3	40	60	100
3.	20EC863	Multimedia Compression and Communication	S5	3	0	0	3	40	60	100
4.	20EC864	Embedded Networks	S3	3	0	0	3	40	60	100
5.	20EC865	VLSI Signal Processing	S2	3	0	0	3	40	60	100
6.	20EC866	CAD for VLSI	S2	3	0	0	3	40	60	100
7.	20EC867	Advanced Signal Processing	S5	3	0	0	3	40	60	100
8.	20EC879	Wireless Sensor Networks	S6	3	0	0	3	40	60	100
9.	20EC880	Bio Medical Signal Processing	S5	3	0	0	3	40	60	100
10.	20EC881	Advanced Digital Image Processing	S5	3	0	0	3	40	60	100
11.	20EC882	Speech Processing	S5	3	0	0	3	40	60	100
12.	20EC883	Medical Image Processing	S5	3	0	0	3	40	60	100

PROFESSIONAL ELECTIVE – VI (SEMESTER – VIII)										
Sl.No.	Course Code	Course Name	Specialization	Hours/ Week			Credit	Maximum Marks		
				L	T	P	C	CA	ES	Total
1.	20EC868	ADHOC Networks	S1	3	0	0	3	40	60	100
2.	20EC869	MEMS Technology	S6	3	0	0	3	40	60	100
3.	20EC870	Telecommunication System Modeling and Simulation	S1	3	0	0	3	40	60	100
4.	20EC871	ARM System Architecture	S3	3	0	0	3	40	60	100
5.	20EC872	Architecture of DSPs	S5	3	0	0	3	40	60	100
6.	20EC873	Cryptography and Network Security	S6	3	0	0	3	40	60	100
7.	20EC874	Neural Networks and Deep Learning	S5	3	0	0	3	40	60	100
8.	20EC875	ASIC Design	S2	3	0	0	3	40	60	100
9.	20EC876	4G/5G Communication Networks	S6	3	0	0	3	40	60	100
10.	20EC877	Cognitive Radio Network	S6	3	0	0	3	40	60	100
11.	20EC878	Wireless Broad Band Networks	S6	3	0	0	3	40	60	100

S1 Communication
S2 VLSI
S3 Embedded
S4 Electronics
S5 Signal Processing
S6 Networks

B.E./B.TECH. HONOURS (SPECIALIZATION IN THE SAME DISCIPLINE) : VERTICALS

Emerging Areas: Electronics and Communication Engineering

(iii) B.E Honours (specialization in the same discipline)

a. The student should have earned additionally a minimum of 18 credits from a specified group of Professional Electives of the same programme.
b. Should have passed all the courses in the first attempt.
c. Should have earned a minimum of 7.50 CGPA.

(ii) B.E Honours

a. The students should have taken additional courses from more than one vertical of the same Programme and earned a minimum of 18 credits.
b. Should have passed all the courses in the first attempt.
c. Should have earned a minimum of 7.50 CGPA.

(iii) B.E. minor in other specialization.

The student should have earned additionally a minimum of 18 credits in any one of the verticals of other B.E programmes

- Out of these 18 credits students can earn a maximum of 6 credits in online mode (SWAYAM platform), as approved by Centre for Academic Courses.
- B.E./ B. Tech. (Hons) Specialization in the same discipline, B.E / B.Tech. Honors and B.E./B.Tech. Minor in other specialization degree will be optional for students.
- For the categories (i) to (ii), the students shall be permitted to register for the courses from the V Semester onwards provided the students has earned a minimum CGPA 7.50 of until III Semester and has cleared all the courses in the first attempt.
- For the category (iii), the students will be permitted, to register the courses from Semester V onwards provided the marks earned by the students until Semester III is CGPA 7.50 and above.
- If a student decides not to opt for Honours, after completing certain number of additional courses, the additional courses studied shall be considered instead of the Professional Elective courses, which are part of the curriculum. If the student has studied more number of such courses than the number of Professional Elective courses required as per the curriculum, the courses with higher grades shall be considered for the calculation of CGPA. Remaining courses shall be printed in the mark sheet, however, they will not be considered for calculation of CGPA.

Registration of Professional Elective courses from Verticals:

Professional Elective Courses will be registered in Semesters V to VIII. These courses are listed in groups called verticals that represent a particular area of specialization / diversified group. The student should have earned additionally a minimum of 18 credits in any one of the verticals for obtaining B.E./B.Tech. Honours with specialization in the same disciplines.

PROFESSIONAL ELECTIVE COURSES: VERTICALS

Signal Processing	High Speed Communication Networks
20EC770 - Pattern Recognition	20EC765 - Wireless Networks
20EC771 - Soft computing techniques	20EC768 - High Performance Networks
20EC863 - Multimedia Compression and Communication	20EC862 - Optical Networks
20EC865 - VLSI Signal Processing	20EC868 - ADHOC Networks
20EC867 - Advanced Signal Processing	20EC870 - Telecommunication System Modeling and Simulation
20EC872 - Architecture of DSPs	20EC873 - Cryptography and Network Security
20EC880 - Bio Medical Signal Processing	20EC876 - 4G/5G Communication Networks
20EC881 - Advanced Digital Image Processing	20EC877- Cognitive Radio Network
20EC882 - Speech Processing	20EC878 - Wireless Broad Band Networks
20EC883 - Medical Image Processing	20EC879 - Wireless Sensor Networks

KSR College of Engineering	**K.S.R. COLLEGE OF ENGINEERING (Autonomous)** (Approved by AICTE, Accredited by NAAC with A grade & Affiliated to Anna University) **K.S.R. Kalvi Nagar, Tiruchengode – 637 215**	**CURRICULUM** **UG** **R - 2020**

Department	Department of Electronics and Communication Engineering
Programme	B.E - Electronics and Communication Engineering

VERTICAL – I : SIGNAL PROCESSING

Sl.No.	Course Code	Course Name	Specialization	Category	Hours/ Week			Credit	Maximum Marks		
					L	T	P	C	CA	ES	Total
1.	20EC770	Pattern Recognition	S5	PEC	3	0	0	3	30	70	100
2.	20EC771	Soft computing techniques	S5	PEC	3	0	0	3	30	70	100
3.	20EC863	Multimedia Compression and Communication	S5	PEC	3	0	0	3	30	70	100
4.	20EC865	VLSI Signal Processing	S5	PEC	3	0	0	3	30	70	100
5.	20EC867	Advanced Signal Processing	S5	PEC	3	0	0	3	30	70	100
6.	20EC872	Architecture of DSPs	S5	PEC	3	0	0	3	30	70	100
7.	20EC880	Bio Medical Signal Processing	S5	PEC	3	0	0	3	30	70	100
8.	20EC881	Advanced Digital Image Processing	S5	PEC	3	0	0	3	30	70	100
9.	20EC882	Speech Processing	S5	PEC	3	0	0	3	30	70	100
10.	20EC883	Medical Image Processing	S5	PEC	3	0	0	3	30	70	100

VERTICAL – II : HIGH SPEED COMMUNICATION NETWORKS

Sl.No.	Course Code	Course Name	Specialization	Category	Hours/ Week			Credit	Maximum Marks		
					L	T	P	C	CA	ES	Total
1.	20EC765	Wireless Networks	S6	PEC	3	0	0	3	30	70	100
2.	20EC768	High Performance Networks	S6	PEC	3	0	0	3	30	70	100
3.	20EC862	Optical Networks	S6	PEC	3	0	0	3	30	70	100
4.	20EC868	ADHOC Networks	S6	PEC	3	0	0	3	30	70	100
5.	20EC870	Telecommunication System Modeling and Simulation	S6	PEC	3	0	0	3	30	70	100
6.	20EC873	Cryptography and Network Security	S6	PEC	3	0	0	3	30	70	100
7.	20EC876	4G/5G Communication Networks	S6	PEC	3	0	0	3	30	70	100
8.	20EC877	Cognitive Radio Network	S6	PEC	3	0	0	3	30	70	100
9.	20EC878	Wireless Broad Band Networks	S6	PEC	3	0	0	3	30	70	100
10.	20EC879	Wireless Sensor Networks	S6	PEC	3	0	0	3	30	70	100

S1	Communication	S4	Electronics
S2	VLSI	S5	Signal Processing
S3	Embedded	S6	Networks

K.S.R. COLLEGE OF ENGINEERING: TIRUCHENGODE - 637 215

(Autonomous)

(REGULATIONS 2020)

OPEN ELECTIVE COURSES

OPEN ELECTIVE COURSES OFFERED BY OTHER BRANCHES

Sl.No.	Course Code	Course Name	Specialization	Category	Hours/ Week			Credit	Maximum Marks		
					L	T	P	C	CA	ES	Total
Automobile Engineering											
1.	20AU901	Basics of Automobile Engineering	AE	OEC	3	0	0	3	40	60	100
2.	20AU902	Automotive Engine Technology	AE	OEC	3	0	0	3	40	60	100
3.	20AU903	Automotive Vehicle Technology	AE	OEC	3	0	0	3	40	60	100
4.	20AU904	Automotive Safety	AE	OEC	3	0	0	3	40	60	100
5.	20AU905	Hybrid Vehicles	AE	OEC	3	0	0	3	40	60	100
6.	20AU906	Off Highway Vehicles	AE	OEC	3	0	0	3	40	60	100
7.	20AU907	Modern and Intelligent Vehicle Systen	AE	OEC	3	0	0	3	40	60	100
8.	20AU908	Vehicle Maintenance	AE	OEC	3	0	0	3	40	60	100
CIVIL ENGINEERING											
9.	20CE901	Architectural Heritage of India	CE	OEC	3	0	0	3	40	60	100
10.	20CE902	Building Planning and Construction	CE	OEC	3	0	0	3	40	60	100
11.	20CE903	Elementary Civil Engineering	CE	OEC	3	0	0	3	40	60	100
12.	20CE904	Energy and Environment	CE	OEC	3	0	0	3	40	60	100
13.	20CE905	Environmental Laws and Policies	CE	OEC	3	0	0	3	40	60	100
14.	20CE906	Global Warming and Climate Change	CE	OEC	3	0	0	3	40	60	100
15.	20CE907	Introduction to Disaster Management and Mitigation	CE	OEC	3	0	0	3	40	60	100
16.	20CE908	Introduction to Earthquake Engineering	CE	OEC	3	0	0	3	40	60	100
17.	20CE909	Solid Waste Management	CE	OEC	3	0	0	3	40	60	100
18.	20CE910	Water and Air Pollution Management	CE	OEC	3	0	0	3	40	60	100
Computer Science and Engineering											
19.	20CS901	Programming in Java	CSE	OEC	3	0	0	3	40	60	100
20.	20CS902	Basic concepts of Data Structure	CSE	OEC	3	0	0	3	40	60	100
21.	20CS903	Fundamentals of Database Concepts	CSE	OEC	3	0	0	3	40	60	100
22.	20CS904	Internet Programming	CSE	OEC	3	0	0	3	40	60	100
23.	20CS905	Fundamentals of Mobile Application Development	CSE	OEC	3	0	0	3	40	60	100
24.	20CS906	Principles of Ethical Hacking	CSE	OEC	3	0	0	3	40	60	100
25.	20CS907	Green Technology	CSE	OEC	3	0	0	3	40	60	100
26.	20CS908	Artificial Intelligence and Robotics	CSE	OEC	3	0	0	3	40	60	100
27.	20CS909	Big Data and Analytics	CSE	OEC	3	0	0	0	40	60	100
28.	20CS910	Hardware and Trouble Shooting	CSE	OEC	3	0	0	3	40	60	100

Sl.No.	Course Code	Course Name	Specialization	Category	Hours/ Week			Credit	Maximum Marks		
					L	T	P	C	CA	ES	Total
Electrical and Electronics Engineering											
29.	20EE901	Electrical Drives and Control	EE	OEC	3	0	0	3	40	60	100
30.	20EE902	Power Semiconductor Devices	EE	OEC	3	0	0	3	40	60	100
31.	20EE903	Electrical Power Generation Systems	EE	OEC	3	0	0	3	40	60	100
32.	20EE904	Control Engineering	EE	OEC	3	0	0	3	40	60	100
33.	20EE905	Industrial Automation	EE	OEC	3	0	0	3	40	60	100
34.	20EE906	Electrical Instruments and Measurements	EE	OEC	3	0	0	3	40	60	100
35.	20EE907	Energy Conservation and Management	EE	OEC	3	0	0	3	40	60	100
36.	20EE908	Electrical Wiring, Estimation and Costing	EE	OEC	3	0	0	3	40	60	100
37.	20EE909	Fundamentals of Electrical Machinery	EE	OEC	3	0	0	3	40	60	100
38.	20EE910	Principles of Soft Computing Techniques	EE	OEC	3	0	0	3	40	60	100
39.	20EE911	Embedded System Technology	EE	OEC	3	0	0	3	40	60	100
Electronics and Communication Engineering											
40.	20EC901	Basics of Medical Electronics	EC	OEC	3	0	0	3	40	60	100
41.	20EC902	NANO Technology	EC	OEC	3	0	0	3	40	60	100
42.	20EC903	Electronics and Microprocessor	EC	OEC	3	0	0	3	40	60	100
43.	20EC904	Analog and Digital Communication	EC	OEC	3	0	0	3	40	60	100
44.	20EC905	Principles of Communication	EC	OEC	3	0	0	3	40	60	100
45.	20EC906	Fundamentals of Robotics	EC	OEC	3	0	0	3	40	60	100
46.	20EC907	Internet of Things Sensing and Actuator Devices	EC	OEC	3	0	0	3	40	60	100
47.	20EC908	Consumer Electronics	EC	OEC	3	0	0	3	40	60	100
Information Technology											
48.	20IT901	Data Science using R	IT	OEC	3	0	0	3	40	60	100
49.	20IT902	Principles of Cyber Security	IT	OEC	3	0	0	3	40	60	100
50.	20IT903	Fundamentals of Business Intelligence	IT	OEC	3	0	0	3	40	60	100
51.	20IT904	Blockchain Technologies	IT	OEC	3	0	0	3	40	60	100
52.	20IT905	Internet of Things and Applications	IT	OEC	3	0	0	3	40	60	100
53.	20IT906	Principles of Software Testing	IT	OEC	3	0	0	3	40	60	100
54.	20IT907	Foundation Skills in Logic Building	IT	OEC	3	0	0	3	40	60	100
55.	20IT908	Principles of Cloud Computing	IT	OEC	3	0	0	3	40	60	100
56.	20IT909	Open Source Technologies	IT	OEC	3	0	0	3	40	60	100
57.	20IT910	Principles of Software Engineering	IT	OEC	3	0	0	3	40	60	100

Sl.No.	Course Code	Course Name	Specialization	Category	Hours/ Week			Credit	Maximum Marks		
					L	T	P	C	CA	ES	Total
Mechanical Engineering											
58.	20ME901	Basic Mechanical Engineering	ME	OEC	3	0	0	3	40	60	100
59.	20ME902	Solar Energy Utilization	ME	OEC	3	0	0	3	40	60	100
60.	20ME903	Production Technology of Agricultural Machinery	ME	OEC	3	0	0	3	40	60	100
61.	20ME904	Selection of Materials	ME	OEC	3	0	0	3	40	60	100
62.	20ME905	Marine Vehicles	ME	OEC	3	0	0	3	40	60	100
63.	20ME906	Sensors and Transducers	ME	OEC	3	0	0	3	40	60	100
64.	20ME907	Energy Auditing	ME	OEC	3	0	0	3	40	60	100
65.	20ME908	Fiber Reinforced Plastics	ME	OEC	3	0	0	3	40	60	100
66.	20ME909	Lean Manufacturing	ME	OEC	3	0	0	3	40	60	100
67.	20ME910	Surface Engineering	ME	OEC	3	0	0	3	40	60	100
Safety and Fire Engineering											
68.	20SF901	Occupational Health and Hygiene	SF	OEC	3	0	0	3	40	60	100
69.	20SF902	Construction Safety	SF	OEC	3	0	0	3	40	60	100
70.	20SF903	Building Fire Safety	SF	OEC	3	0	0	3	40	60	100
71.	20SF904	Safety in Electrical Engineering	SF	OEC	3	0	0	3	40	60	100
72.	20SF905	Legal Aspects of Safety	SF	OEC	3	0	0	3	40	60	100
73.	20SF906	Safety in Industries	SF	OEC	3	0	0	3	40	60	100
74.	20SF907	Food Safety	SF	OEC	3	0	0	3	40	60	100
75.	20SF908	Safety Management and its Principles	SF	OEC	3	0	0	3	40	60	100
76.	20SF909	Safety in Automobile Engineering	SF	OEC	3	0	0	3	40	60	100
77.	20SF910	Safety in Transportation	SF	OEC	3	0	0	3	40	60	100
Science and Humanities											
78.	20SH901	Applications of Statistics	FYA	OEC	3	0	0	3	40	60	100
79.	20SH902	Combinatorics and Graph Theory	FYA	OEC	3	0	0	3	40	60	100
80.	20SH903	Optimization Techniques	FYA	OEC	3	0	0	3	40	60	100
81.	20SH904	Basic Military Education and Training	FYA	OEC	3	0	0	3	40	60	100
82.	20SH905	Professional Communication	FYA	OEC	3	0	0	3	40	60	100
83.	20SH906	Fundamentals of Nanoscience and Technology	FYA	OEC	3	0	0	3	40	60	100

K.S.R. COLLEGE OF ENGINEERING: TIRUCHENGODE - 637 215 (Autonomous)

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

(REGULATIONS 2020)

LIST OF PROPOSED VALUE-ADDED COURSES

Sl.No.	Course Code	Course Name	Number of hours	Offered by Internal / External
1.	VACEC01	PCB Circuit Design	30 Hours	External
2.	VACEC02	Programming PIC Microcontrollers	30 Hours	External
3.	VACEC03	Real Time Applications of Aurduino	30 Hours	External
4.	VACEC04	LABVIEW	30 Hours	External
5.	VACEC05	MATLAB – Signal and Image Processing Tool box	30 Hours	Department of ECE- KSRCE
6.	VACEC06	Industrial Automation using PLC and SCADA	30 Hours	External
7.	VACEC07	Network Simulator – 2	30 Hours	External
8.	VACEC08	CCNA Fundamentals (Module 1)	30 Hours	External
9.	VACEC09	CCNA - Routing and Switching (Module 2)	30 Hours	External
10.	VACEC10	.Net and PHP	30 Hours	External
11.	VACEC11	Data Base Management Systems	30 Hours	External
12.	VACEC12	VHDL Programming	30 Hours	Department of ECE- KSRCE
13.	VACEC13	Tanner Tool	30 Hours	Department of ECE- KSRCE
14.	VACEC14	Mentor Graphics	30 Hours	Department of ECE- KSRCE
15.	VACEC15	Programming in Digital Signal Processors	30 Hours	Department of ECE- KSRCE
16.	VACEC16	High Frequency Structure Simulator (HFSS)	30 Hours	Department of ECE- KSRCE

S.No	Subject Area	Credits Per Semester								Credits Total	Percentage Credits	Suggested Breakup of credits
		I	II	III	IV	V	VI	VII	VIII			
1	HSMC	3	3				3			9	5.5%	12
2	ESC	5	9	7						21	13.125	25
3	BSC	8	8	4	3					23	14.375	24
4	PCC			12	19	16	14	10		71	43.82%	48
5	PEC					3	3	6	6	18	11.1%	18
6	OEC					3		3	3	9	5.5%	18
7	PW							3	6	9	5.5%	15
8	MC		1	1						2	1.2%	-
Total		**16**	**21**	**24**	**22**	**22**	**20**	**22**	**15**	**162**	**100**	**160**

Total Credits for Regular Student - 162

Total Credits for Lateral Student - 125

DEPARTMENT
OF
ELECTRONICS AND COMMUNICATION ENGINEERING

B.E – ELECTRONICS AND COMMUNICATION ENGINEERING

CURRICULUM & SYLLABI

Regulations 2020

(Applicable to candidates admitted in the academic year 2023 - 2024)

K.S.R. College of Engineering (Autonomous)

K.S.R. Kalvi Nagar, Tiruchengode – 637 215

Namakkal (Dt), Tamilnadu, India

Email: info@ksrce.ac.in **Website: www.ksrce.ac.in**

K.S.R. COLLEGE OF ENGINEERING: TIRUCHENGODE - 637 215 (Autonomous)

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

(REGULATIONS 2020)

Vision of the Institution

IV	We envision to achieve status as an excellent educational institution in the global knowledge hub, making self-learners, experts, ethical and responsible engineers, technologists, scientists, managers, administrators and entrepreneurs who will significantly contribute to research and environment friendly sustainable growth of the nation and the world.

Mission of the Institution

IM 1	To inculcate in the students self-learning abilities that enable them to become competitive and considerate engineers, technologists, scientists, managers, administrators and entrepreneurs by diligently imparting the best of education, nurturing environmental and social needs.
IM 2	To foster and maintain a mutually beneficial partnership with global industries and institutions through knowledge sharing, collaborative research and innovation.

Vision of the Department / Programme: (Electronics and Communication Engineering)

DV	We envision as a center of excellence in the field of Electronics and Communication Engineering to produce technically competent graduates with diverse teaching and research environments.

Mission of the Department / Programme: (Electronics and Communication Engineering)

DM 1	To educate the students with the state of art technologies to meet the growing challenges of the industries.
DM 2	To develop an innovate, competent and ethical Electronics and Communication Engineer with strong foundations to enable them for continuing education.

Programme Educational Objectives (PEOs) : (Electronics and Communication Engineering)

The graduates of the programme will be able to	
PEO 1	**Employability and Higher Education:** Excel in Professional career and higher education by acquiring knowledge in mathematical, social, scientific & engineering principles.
PEO 2	**Core Competence:** Analyze, design and develop/implement core engineering problems in communication systems that are technically sound, economically feasible and socially acceptable.
PEO 3	**Interpersonal Skills and Team Work:** Exhibit professionalism, ethical communicating skills and team work by engaging in lifelong learning for sustainable development of the society.

Programme Outcomes (POs) of B.E. - Electronics and Communication Engineering

Program Outcomes (POs)	
PO1	**Engineering Graduates will be able to:** **Engineering Knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO2	**Problem Analysis:** Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
PO3	**Design/Development of Solutions:** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
PO4	**Conduct Investigations of Complex Problems:** Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
PO5	**Modern Tool Usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.
PO6	**The Engineer and Society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
PO7	**Environment and Sustainability:** understand the impact of the professional engineering solutions in societal and environmental contexts, demonstrate the knowledge of, and need for sustainable development.
PO8	**Ethics:** Apply ethical principles and commit to professional ethics, responsibilities, and norms of the engineering practice.
PO9	**Individual and Team Work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
PO10	**Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
PO11	**Project Management and Finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary Environments.
PO12	**Life-long Learning:** Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.
Program Specific Outcomes (PSOs)	
PSO1	**Professional Skill:** Specify, design and test modern electronic systems that perform analog and digital processing functions.
PSO2	**Problem – Solving Skills:** Design essential elements (circuits and antennas) of modern RF/Wireless communication systems.

KSR College of Engineering	**K.S.R. COLLEGE OF ENGINEERING (Autonomous)** (Approved by AICTE, Accredited by NAAC with A grade & Affiliated to Anna University) **K.S.R. Kalvi Nagar, Tiruchengode – 637 215**	**CURRICULUM** **UG** **R - 2020**
Department	Department of Electronics and Communication Engineering (2023-24)	
Programme	B.E - Electronics and Communication Engineering	

SEMESTER – I

Sl.No.	Course Code	Course Name	Category	Hours/ Week			Credit	Maximum Marks		
				L	T	P	C	CA	ES	Total
THEORY										
1.	20EN151	Technical English – I (Common to All Branches)	HSMC	3	0	0	3	40	60	100
2.	20MA151	Engineering Mathematics – I (Common to All Branches)	BSC	3	1	0	4	40	60	100
3.	20PH051	Engineering Physics (Common to AU, EC,EE,ME,SF & PT)	BSC	3	0	0	3	40	60	100
4.	20CS142	Problem solving Techniques	ESC	3	0	0	3	40	60	100
PRACTICAL										
5.	20AU127	Engineering Graphics Laboratory (Common to CE,CS,EC,EE,IT & PT)	ESC	0	0	3	1	60	40	100
6.	20PH028	Physics Laboratory (Common to AU, EC,EE,ME,SF & PT)	BSC	0	0	3	1	60	40	100
7.	20CS171	Problem solving Techniques laboratory	ESC	0	0	3	1	60	40	100
MANDATORY COURSE										
8.	20MC151	Induction Programme * (Common to All Branches)	MC	3	-	-	-	*	*	*
9.	20MC052	Environmental Science and Engineering (Common to All Branches)	MC	3	0	0	0	*	*	*
10.	20GE051	"Heritage of Tamils - தமிழர் மரபு"	MC	1	0	0	1	40	60	100
			Total	**18**	**1**	**10**	**17**	**800**		

*Induction Programme will be conducted for three weeks as per AICTE guidelines

SEMESTER – II

Sl.No.	Course Code	Course Name	Category	Hours/ Week			Credit	Maximum Marks		
				L	T	P	C	CA	ES	Total
THEORY										
1.	20EN251	Technical English – II (Common to All Branches)	HSMC	3	0	0	3	40	60	100
2.	20MA242	Applied Mathematics (Common to EC & EE)	BSC	3	1	0	4	40	60	100
3.	20CH051	Engineering Chemistry (Common to All Branches)	BSC	3	0	0	3	40	60	100
4.	20CS241	Python Programming (Common to AU,CE,CS,EC,EE,ME,PT & SF)	ESC	3	0	0	3	40	60	100
5.	20EC215	Electric Circuits	ESC	3	0	0	3	40	60	100
PRACTICAL										
6.	20CH028	Chemistry Laboratory (Common to All Branches)	BSC	0	0	3	1	60	40	100
7.	20CS227	Python Programming Laboratory (Common to AU,CE,CS,EC,EE,ME,PT & SF)	ESC	0	0	3	1	60	40	100
8.	20GE028	Manufacturing Practices Laboratory (Common to All Branches)	ESC	0	0	3	1	60	40	100
9.	20EC221	Electric Circuits Laboratory	ESC	0	0	3	1	60	40	100
MANDATORY COURSE										
10.	20GE052	Tamils and Technology - தமிழரும் தொழில்நுட்பமும்	MC	1	0	0	1	60	40	100
			Total	**15**	**1**	**13**	**21**	**1000**		

KSR College of Engineering	**K.S.R. COLLEGE OF ENGINEERING (Autonomous)** (Approved by AICTE, Accredited by NAAC with A grade & Affiliated to Anna University) **K.S.R. Kalvi Nagar, Tiruchengode – 637 215**	**CURRICULUM** **UG** **R - 2020**
Department	Department of Electronics and Communication Engineering (2023-24)	
Programme	B.E - Electronics and Communication Engineering	

SEMESTER – III											
Sl.No.	**Course Code**	**Course Name**	**Category**	**Hours/ Week**			**Credit**	**Maximum Marks**		
				L	**T**	**P**	**C**	**CA**	**ES**	**Total**
THEORY										
1.	20MA342	Differential Equations and Numerical Methods (Common to EC & EE)	BSC	3	1	0	4	40	60	100
2.	20CS332	C++ and Data Structures	ESC	3	0	0	3	40	60	100
3.	20EC311	Electronic Devices	PCC	3	0	0	3	40	60	100
4.	20EC312	Digital Electronics	PCC	3	0	0	3	40	60	100
5.	20EC313	Electromagnetic Theory	PCC	3	1	0	4	40	60	100
6.	20EE331	Electrical Machines	ESC	3	0	0	3	40	60	100
PRACTICAL										
7.	20CS326	C++ and Data Structures Laboratory	ESC	0	0	3	1	60	40	100
8.	20EC321	Electronic Devices Laboratory	PCC	0	0	3	1	60	40	100
9.	20EC322	Digital Electronics Laboratory	PCC	0	0	3	1	60	40	100
10.	20HR351	Career Development Skill I (Common to All Branches)	EEC	0	2	0	0	60	40	100
			Total	**18**	**4**	**9**	**23**	**1100**		

SEMESTER – IV										
Sl.No.	**Course Code**	**Course Name**	**Category**	**Hours/ Week**			**Credit**	**Maximum Marks**		
				L	**T**	**P**	**C**	**CA**	**ES**	**Total**
THEORY										
1.	20MA433	Probability and Stochastic Process	BSC	3	0	0	3	40	60	100
2.	20EC411	Signals and Systems	PCC	3	1	0	4	40	60	100
3.	20EC412	Electronic Circuits	PCC	3	0	0	3	40	60	100
4.	20EC413	Linear Integrated Circuits	PCC	3	0	0	3	40	60	100
5.	20EC414	Microprocessors and Microcontrollers	PCC	3	0	0	3	40	60	100
6.	20EC415	Transmission Lines and Wave Guides	PCC	3	0	0	3	40	60	100
PRACTICAL										
7.	20EC421	Electronic Circuits and Simulation Laboratory	PCC	0	0	3	1	60	40	100
8.	20EC422	Linear Integrated Circuits Laboratory	PCC	0	0	3	1	60	40	100
9.	20EC423	Microprocessors and Microcontrollers Laboratory	PCC	0	0	3	1	60	40	100
10.	20HR442	Career Development Skill II	EEC	0	2	0	0	60	40	100
			Total	**19**	**3**	**9**	**22**	**1000**		

KSR College of Engineering	**K.S.R. COLLEGE OF ENGINEERING (Autonomous)** (Approved by AICTE, Accredited by NAAC with A grade & Affiliated to Anna University) **K.S.R. Kalvi Nagar, Tiruchengode – 637 215**	**CURRICULUM** **UG** **R - 2020**

Department	Department of Electronics and Communication Engineering
Programme	B.E - Electronics and Communication Engineering

SEMESTER – V

Sl.No.	Course Code	Course Name	Category	Hours/ Week			Credit	Maximum Marks		
				L	T	P	C	CA	ES	Total
THEORY										
1.	20EC511	Analog Communication Systems	PCC	3	0	0	3	40	60	100
2.	20EC512	Digital Signal Processing	PCC	3	1	0	4	40	60	100
3.	20EC513	Computer Networks	PCC	3	0	0	3	40	60	100
4.	20EC514	Embedded Systems	PCC	3	0	0	3	40	60	100
5.		Professional Elective – I	PEC	3	0	0	3	40	60	100
6.		Open Elective – I	OEC	3	0	0	3	40	60	100
PRACTICAL										
7.	20EC521	Digital Signal Processing Laboratory	PCC	0	0	3	1	60	40	100
8.	20EC522	Computer Networks Laboratory	PCC	0	0	3	1	60	40	100
9.	20EC523	Embedded System Design Laboratory	PCC	0	0	3	1	60	40	100
10.	20HR543	Career Development Skill III	EEC	0	2	0	0	60	40	100
			Total	**18**	**3**	**9**	**22**	**1000**		

SEMESTER – VI

Sl.No.	Course Code	Course Name	Category	Hours/ Week			Credit	Maximum Marks		
				L	T	P	C	CA	ES	Total
THEORY										
1.	20HS051	Universal human values and understanding harmonics (Common to All Branches)	HSMC	3	0	0	3	40	60	100
2.	20EC611	Digital Communication Systems	PCC	3	0	0	3	40	60	100
3.	20EC612	Digital Image Processing	PCC	3	0	0	3	40	60	100
4.	20EC613	VLSI Design	PCC	3	0	0	3	40	60	100
5.	20EC614	Antenna and Wave Propagation	PCC	3	0	0	3	40	60	100
6.		Professional Elective – II	PEC	3	0	0	3	40	60	100
PRACTICAL										
7.	20EC621	Communication Systems Laboratory	PCC	0	0	3	1	60	40	100
8.	20EC622	VLSI Laboratory	PCC	0	0	3	1	60	40	100
9.	20HR644	Career Development Skill IV	EEC	0	2	0	0	60	40	100
			Total	**18**	**2**	**6**	**20**	**900**		

KSR College of Engineering	**K.S.R. COLLEGE OF ENGINEERING (Autonomous)** (Approved by AICTE, Accredited by NAAC with A grade & Affiliated to Anna University) **K.S.R. Kalvi Nagar, Tiruchengode – 637 215**	**CURRICULUM** **UG** **R - 2020**

Department	Department of Electronics and Communication Engineering
Programme	B.E - Electronics and Communication Engineering

SEMESTER – VII

Sl.No.	Course Code	Course Name	Category	Hours/ Week			Credit	Maximum Marks		
				L	T	P	C	CA	ES	Total
THEORY										
1.	20EC711	Wireless and Cellular Communication	PCC	3	0	0	3	40	60	100
2.	20EC712	RF and Microwave Engineering	PCC	3	0	0	3	40	60	100
3.	20EC713	Fiber Optic Communication	PCC	3	0	0	3	40	60	100
4.		Professional Elective – III	PEC	3	0	0	3	40	60	100
5.		Professional Elective – IV	PEC	3	0	0	3	40	60	100
6.		Open Elective – II	OEC	3	0	0	3	40	60	100
PRACTICAL										
7.	20EC721	RF, Microwave and Optic Laboratory	PCC	0	0	3	1	60	40	100
8.	20EC722	Project Work Phase – I	PW	0	0	6	3	60	40	100
			Total	**18**	**0**	**9**	**22**	**800**		

SEMESTER – VIII

Sl.No.	Course Code	Course Name	Category	Hours/ Week			Credit	Maximum Marks		
				L	T	P	C	CA	ES	Total
THEORY										
1.		Professional Elective – V	PEC	3	0	0	3	40	60	100
2.		Professional Elective – VI	PEC	3	0	0	3	40	60	100
3.		Open Elective – III	OEC	3	0	0	3	40	60	100
PRACTICAL										
4.	20EC821	Project Work Phase - II	PW	0	0	18	6	60	40	200
			Total	**9**	**0**	**18**	**15**	**500**		

KSR College of Engineering	**K.S.R. COLLEGE OF ENGINEERING (Autonomous)** (Approved by AICTE, Accredited by NAAC with A grade & Affiliated to Anna University) **K.S.R. Kalvi Nagar, Tiruchengode – 637 215**	**CURRICULUM** **UG** **R - 2020**
Department	Department of Electronics and Communication Engineering	
Programme	B.E - Electronics and Communication Engineering	

List of Electives

PROFESSIONAL ELECTIVE – I (SEMESTER – V)

Sl.No.	Course Code	Course Name	Specialization	Hours/ Week			Credit	Maximum Marks		
				L	T	P	C	CA	ES	Total
1.	20IE591	Augmented Intelligence Led Managed Services (AIMS) – I (Common To CS,EC,EE & IT)	IE	3	0	0	3	40	60	100
2.	20HS001	Principles of Management (Common to CE, CS, EE, EC, IT & ME)	HSMC	3	0	0	3	40	60	100
3.	20EC561	Advanced Digital Systems Design	S3	3	0	0	3	40	60	100
4.	20EC562	Electronic Instrumentation	S1	2	0	1	3	40	60	100
5.	20CS501	Artificial Intelligence	S5	3	0	0	3	40	60	100

PROFESSIONAL ELECTIVE – II (SEMESTER – VI)

Sl.No.	Course Code	Course Name	Specialization	Hours/ Week			Credit	Maximum Marks		
				L	T	P	C	CA	ES	Total
1.	20EC661	Electronic System Design	S4	3	0	0	3	40	60	100
2.	20EC662	Medical Electronics	S4	3	0	0	3	40	60	100
3.	20EC663	Advanced Microprocessors and Microcontrollers	S3	3	0	0	3	40	60	100
4.	20EC664	Information Theory and Coding	S1	3	0	0	3	40	60	100
5.	20IE691	Augmented Intelligence Led Managed Services (AIMS) – II (Common To CS,EC,EE & IT)	IE	3	0	0	3	40	60	100
6.	20CS601	C# and .NET Framework Technologies (Common to CS & EC)	S6	3	0	0	3	40	60	100
7.	20CS602	Machine Learning	S5	3	0	0	3	40	60	100

PROFESSIONAL ELECTIVE – III (SEMESTER – VII)

Sl.No.	Course Code	Course Name	Specialization	Hours/ Week			Credit	Maximum Marks		
				L	T	P	C	CA	ES	Total
1.	20EC761	Communication and Switching Networks	S1	3	0	0	3	40	60	100
2.	20EC762	Digital Communication Systems - II	S1	3	0	0	3	40	60	100
3.	20EC763	PC Hardware, Installation, Troubleshooting and Servicing	S6	3	0	0	3	40	60	100
4.	20EC764	Embedded System Design	S3	3	0	0	3	40	60	100
5.	20EC765	Wireless Networks	S6	3	0	0	3	40	60	100
6.	20EC770	Pattern Recognition	S5	3	0	0	3	40	60	100

PROFESSIONAL ELECTIVE – IV (SEMESTER – VII)										
Sl.No.	Course Code	Course Name	Specialization	Hours/ Week			Credit	Maximum Marks		
				L	T	P	C	CA	ES	Total
1.	20EC766	CMOS Analog Circuits	S2	3	0	0	3	40	60	100
2.	20EC767	Fundamentals of Nano electronics	S1	3	0	0	3	40	60	100
3.	20EC768	High Performance Networks	S6	3	0	0	3	40	60	100
4.	20EC769	Robotics	S4	3	0	0	3	40	60	100
5.	20HR791	Professional Readiness for Innovation, Employability and Entrepreneurship	S4	3	0	0	3	40	60	100
6.	20EC771	Soft computing techniques	S5	3	0	0	3	40	60	100

PROFESSIONAL ELECTIVE – V (SEMESTER – VIII)										
Sl.No.	Course Code	Course Name	Specialization	Hours/ Week			Credit	Maximum Marks		
				L	T	P	C	CA	ES	Total
1.	20EC861	Satellite Communication	S1	3	0	0	3	40	60	100
2.	20EC862	Optical Networks	S6	3	0	0	3	40	60	100
3.	20EC863	Multimedia Compression and Communication	S5	3	0	0	3	40	60	100
4.	20EC864	Embedded Networks	S3	3	0	0	3	40	60	100
5.	20EC865	VLSI Signal Processing	S2	3	0	0	3	40	60	100
6.	20EC866	CAD for VLSI	S2	3	0	0	3	40	60	100
7.	20EC867	Advanced Signal Processing	S5	3	0	0	3	40	60	100
8.	20EC879	Wireless Sensor Networks	S6	3	0	0	3	40	60	100
9.	20EC880	Bio Medical Signal Processing	S5	3	0	0	3	40	60	100
10.	20EC881	Advanced Digital Image Processing	S5	3	0	0	3	40	60	100
11.	20EC882	Speech Processing	S5	3	0	0	3	40	60	100
12.	20EC883	Medical Image Processing	S5	3	0	0	3	40	60	100

PROFESSIONAL ELECTIVE – VI (SEMESTER – VIII)										
Sl.No.	Course Code	Course Name	Specialization	Hours/ Week			Credit	Maximum Marks		
				L	T	P	C	CA	ES	Total
1.	20EC868	ADHOC Networks	S1	3	0	0	3	40	60	100
2.	20EC869	MEMS Technology	S6	3	0	0	3	40	60	100
3.	20EC870	Telecommunication System Modeling and Simulation	S1	3	0	0	3	40	60	100
4.	20EC871	ARM System Architecture	S3	3	0	0	3	40	60	100
5.	20EC872	Architecture of DSPs	S5	3	0	0	3	40	60	100
6.	20EC873	Cryptography and Network Security	S6	3	0	0	3	40	60	100
7.	20EC874	Neural Networks and Deep Learning	S5	3	0	0	3	40	60	100
8.	20EC875	ASIC Design	S2	3	0	0	3	40	60	100
9.	20EC876	4G/5G Communication Networks	S6	3	0	0	3	40	60	100
10.	20EC877	Cognitive Radio Network	S6	3	0	0	3	40	60	100
11.	20EC878	Wireless Broad Band Networks	S6	3	0	0	3	40	60	100

S1 Communication
S2 VLSI
S3 Embedded
S4 Electronics
S5 Signal Processing
S6 Networks

B.E./B.TECH. HONOURS (SPECIALIZATION IN THE SAME DISCIPLINE) : VERTICALS

Emerging Areas: Electronics and Communication Engineering

(iv) B.E Honours (specialization in the same discipline)

a. The student should have earned additionally a minimum of 18 credits from a specified group of Professional Electives of the same programme.
b. Should have passed all the courses in the first attempt.
c. Should have earned a minimum of 7.50 CGPA.

(ii) B.E Honours

a. The students should have taken additional courses from more than one vertical of the same Programme and earned a minimum of 18 credits.
b. Should have passed all the courses in the first attempt.
c. Should have earned a minimum of 7.50 CGPA.

(iii) B.E. minor in other specialization.

The student should have earned additionally a minimum of 18 credits in any one of the verticals of other B.E programmes

- Out of these 18 credits students can earn a maximum of 6 credits in online mode (SWAYAM platform), as approved by Centre for Academic Courses.
- B.E./ B. Tech. (Hons) Specialization in the same discipline, B.E / B.Tech. Honors and B.E./B.Tech. Minor in other specialization degree will be optional for students.
- For the categories (i) to (ii), the students shall be permitted to register for the courses from the V Semester onwards provided the students has earned a minimum CGPA 7.50 of until III Semester and has cleared all the courses in the first attempt.
- For the category (iii), the students will be permitted, to register the courses from Semester V onwards provided the marks earned by the students until Semester III is CGPA 7.50 and above.
- If a student decides not to opt for Honours, after completing certain number of additional courses, the additional courses studied shall be considered instead of the Professional Elective courses, which are part of the curriculum. If the student has studied more number of such courses than the number of Professional Elective courses required as per the curriculum, the courses with higher grades shall be considered for the calculation of CGPA. Remaining courses shall be printed in the mark sheet, however, they will not be considered for calculation of CGPA.

Registration of Professional Elective courses from Verticals:

Professional Elective Courses will be registered in Semesters V to VIII. These courses are listed in groups called verticals that represent a particular area of specialization / diversified group. The student should have earned additionally a minimum of 18 credits in any one of the verticals for obtaining B.E./B.Tech. Honours with specialization in the same disciplines.

PROFESSIONAL ELECTIVE COURSES: VERTICALS

Signal Processing	High Speed Communication Networks
20EC770 - Pattern Recognition	20EC765 - Wireless Networks
20EC771 - Soft computing techniques	20EC768 - High Performance Networks
20EC863 - Multimedia Compression and Communication	20EC862 - Optical Networks
20EC865 - VLSI Signal Processing	20EC868 - ADHOC Networks
20EC867 - Advanced Signal Processing	20EC870 - Telecommunication System Modeling and Simulation
20EC872 - Architecture of DSPs	20EC873 - Cryptography and Network Security
20EC880 - Bio Medical Signal Processing	20EC876 - 4G/5G Communication Networks
20EC881 - Advanced Digital Image Processing	20EC877- Cognitive Radio Network
20EC882 - Speech Processing	20EC878 - Wireless Broad Band Networks
20EC883 - Medical Image Processing	20EC879 - Wireless Sensor Networks

KSR College of Engineering	**K.S.R. COLLEGE OF ENGINEERING (Autonomous)** (Approved by AICTE, Accredited by NAAC with A grade & Affiliated to Anna University) **K.S.R. Kalvi Nagar, Tiruchengode – 637 215**	**CURRICULUM** **UG** **R - 2020**

Department	Department of Electronics and Communication Engineering
Programme	B.E - Electronics and Communication Engineering

VERTICAL – I : SIGNAL PROCESSING

Sl.No.	Course Code	Course Name	Specialization	Category	Hours/ Week			Credit	Maximum Marks		
					L	T	P	C	CA	ES	Total
1.	20EC770	Pattern Recognition	S5	PEC	3	0	0	3	30	70	100
2.	20EC771	Soft computing techniques	S5	PEC	3	0	0	3	30	70	100
3.	20EC863	Multimedia Compression and Communication	S5	PEC	3	0	0	3	30	70	100
4.	20EC865	VLSI Signal Processing	S5	PEC	3	0	0	3	30	70	100
5.	20EC867	Advanced Signal Processing	S5	PEC	3	0	0	3	30	70	100
6.	20EC872	Architecture of DSPs	S5	PEC	3	0	0	3	30	70	100
7.	20EC880	Bio Medical Signal Processing	S5	PEC	3	0	0	3	30	70	100
8.	20EC881	Advanced Digital Image Processing	S5	PEC	3	0	0	3	30	70	100
9.	20EC882	Speech Processing	S5	PEC	3	0	0	3	30	70	100
10.	20EC883	Medical Image Processing	S5	PEC	3	0	0	3	30	70	100

VERTICAL – II : HIGH SPEED COMMUNICATION NETWORKS

Sl.No.	Course Code	Course Name	Specialization	Category	Hours/ Week			Credit	Maximum Marks		
					L	T	P	C	CA	ES	Total
1.	20EC765	Wireless Networks	S6	PEC	3	0	0	3	30	70	100
2.	20EC768	High Performance Networks	S6	PEC	3	0	0	3	30	70	100
3.	20EC862	Optical Networks	S6	PEC	3	0	0	3	30	70	100
4.	20EC868	ADHOC Networks	S6	PEC	3	0	0	3	30	70	100
5.	20EC870	Telecommunication System Modeling and Simulation	S6	PEC	3	0	0	3	30	70	100
6.	20EC873	Cryptography and Network Security	S6	PEC	3	0	0	3	30	70	100
7.	20EC876	4G/5G Communication Networks	S6	PEC	3	0	0	3	30	70	100
8.	20EC877	Cognitive Radio Network	S6	PEC	3	0	0	3	30	70	100
9.	20EC878	Wireless Broad Band Networks	S6	PEC	3	0	0	3	30	70	100
10.	20EC879	Wireless Sensor Networks	S6	PEC	3	0	0	3	30	70	100

S1	Communication	S4	Electronics
S2	VLSI	S5	Signal Processing
S3	Embedded	S6	Networks

K.S.R. COLLEGE OF ENGINEERING: TIRUCHENGODE - 637 215

(Autonomous)

(REGULATIONS 2020)

OPEN ELECTIVE COURSES

OPEN ELECTIVE COURSES OFFERED BY OTHER BRANCHES

Sl.No.	Course Code	Course Name	Specialization	Category	Hours/ Week			Credit	Maximum Marks		
					L	T	P	C	CA	ES	Total
Automobile Engineering											
1.	20AU901	Basics of Automobile Engineering	AE	OEC	3	0	0	3	40	60	100
2.	20AU902	Automotive Engine Technology	AE	OEC	3	0	0	3	40	60	100
3.	20AU903	Automotive Vehicle Technology	AE	OEC	3	0	0	3	40	60	100
4.	20AU904	Automotive Safety	AE	OEC	3	0	0	3	40	60	100
5.	20AU905	Hybrid Vehicles	AE	OEC	3	0	0	3	40	60	100
6.	20AU906	Off Highway Vehicles	AE	OEC	3	0	0	3	40	60	100
7.	20AU907	Modern and Intelligent Vehicle System	AE	OEC	3	0	0	3	40	60	100
8.	20AU908	Vehicle Maintenance	AE	OEC	3	0	0	3	40	60	100
CIVIL ENGINEERING											
9.	20CE901	Architectural Heritage of India	CE	OEC	3	0	0	3	40	60	100
10.	20CE902	Building Planning and Construction	CE	OEC	3	0	0	3	40	60	100
11.	20CE903	Elementary Civil Engineering	CE	OEC	3	0	0	3	40	60	100
12.	20CE904	Energy and Environment	CE	OEC	3	0	0	3	40	60	100
13.	20CE905	Environmental Laws and Policies	CE	OEC	3	0	0	3	40	60	100
14.	20CE906	Global Warming and Climate Change	CE	OEC	3	0	0	3	40	60	100
15.	20CE907	Introduction to Disaster Management and Mitigation	CE	OEC	3	0	0	3	40	60	100
16.	20CE908	Introduction to Earthquake Engineering	CE	OEC	3	0	0	3	40	60	100
17.	20CE909	Solid Waste Management	CE	OEC	3	0	0	3	40	60	100
18.	20CE910	Water and Air Pollution Management	CE	OEC	3	0	0	3	40	60	100
Computer Science and Engineering											
19.	20CS901	Programming in Java	CSE	OEC	3	0	0	3	40	60	100
20.	20CS902	Basic concepts of Data Structure	CSE	OEC	3	0	0	3	40	60	100
21.	20CS903	Fundamentals of Database Concepts	CSE	OEC	3	0	0	3	40	60	100
22.	20CS904	Internet Programming	CSE	OEC	3	0	0	3	40	60	100
23.	20CS905	Fundamentals of Mobile Application Development	CSE	OEC	3	0	0	3	40	60	100
24.	20CS906	Principles of Ethical Hacking	CSE	OEC	3	0	0	3	40	60	100
25.	20CS907	Green Technology	CSE	OEC	3	0	0	3	40	60	100
26.	20CS908	Artificial Intelligence and Robotics	CSE	OEC	3	0	0	3	40	60	100
27.	20CS909	Big Data and Analytics	CSE	OEC	3	0	0	0	40	60	100

Sl.No.	Course Code	Course Name	Specialization	Category	Hours/ Week			Credit	Maximum Marks		
					L	T	P	C	CA	ES	Total
28.	20CS910	Hardware and Trouble Shooting	CSE	OEC	3	0	0	3	40	60	100
Electrical and Electronics Engineering											
29.	20EE901	Electrical Drives and Control	EE	OEC	3	0	0	3	40	60	100
30.	20EE902	Power Semiconductor Devices	EE	OEC	3	0	0	3	40	60	100
31.	20EE903	Electrical Power Generation Systems	EE	OEC	3	0	0	3	40	60	100
32.	20EE904	Control Engineering	EE	OEC	3	0	0	3	40	60	100
33.	20EE905	Industrial Automation	EE	OEC	3	0	0	3	40	60	100
34.	20EE906	Electrical Instruments and Measurements	EE	OEC	3	0	0	3	40	60	100
35.	20EE907	Energy Conservation and Management	EE	OEC	3	0	0	3	40	60	100
36.	20EE908	Electrical Wiring, Estimation and Costing	EE	OEC	3	0	0	3	40	60	100
37.	20EE909	Fundamentals of Electrical Machinery	EE	OEC	3	0	0	3	40	60	100
38.	20EE910	Principles of Soft Computing Techniques	EE	OEC	3	0	0	3	40	60	100
39.	20EE911	Embedded System Technology	EE	OEC	3	0	0	3	40	60	100
Electronics and Communication Engineering											
40.	20EC901	Basics of Medical Electronics	EC	OEC	3	0	0	3	40	60	100
41.	20EC902	NANO Technology	EC	OEC	3	0	0	3	40	60	100
42.	20EC903	Electronics and Microprocessor	EC	OEC	3	0	0	3	40	60	100
43.	20EC904	Analog and Digital Communication	EC	OEC	3	0	0	3	40	60	100
44.	20EC905	Principles of Communication	EC	OEC	3	0	0	3	40	60	100
45.	20EC906	Fundamentals of Robotics	EC	OEC	3	0	0	3	40	60	100
46.	20EC907	Internet of Things Sensing and Actuator Devices	EC	OEC	3	0	0	3	40	60	100
47.	20EC908	Consumer Electronics	EC	OEC	3	0	0	3	40	60	100
Information Technology											
48.	20IT901	Data Science using R	IT	OEC	3	0	0	3	40	60	100
49.	20IT902	Principles of Cyber Security	IT	OEC	3	0	0	3	40	60	100
50.	20IT903	Fundamentals of Business Intelligence	IT	OEC	3	0	0	3	40	60	100
51.	20IT904	Block chain Technologies	IT	OEC	3	0	0	3	40	60	100
52.	20IT905	Internet of Things and Applications	IT	OEC	3	0	0	3	40	60	100
53.	20IT906	Principles of Software Testing	IT	OEC	3	0	0	3	40	60	100
54.	20IT907	Foundation Skills in Logic Building	IT	OEC	3	0	0	3	40	60	100
55.	20IT908	Principles of Cloud Computing	IT	OEC	3	0	0	3	40	60	100
56.	20IT909	Open Source Technologies	IT	OEC	3	0	0	3	40	60	100

Sl.No.	Course Code	Course Name	Specialization	Category	Hours/ Week			Credit	Maximum Marks		
					L	T	P	C	CA	ES	Total
57.	20IT910	Principles of Software Engineering	IT	OEC	3	0	0	3	40	60	100
Mechanical Engineering											
58.	20ME901	Basic Mechanical Engineering	ME	OEC	3	0	0	3	40	60	100
59.	20ME902	Solar Energy Utilization	ME	OEC	3	0	0	3	40	60	100
60.	20ME903	Production Technology of Agricultural Machinery	ME	OEC	3	0	0	3	40	60	100
61.	20ME904	Selection of Materials	ME	OEC	3	0	0	3	40	60	100
62.	20ME905	Marine Vehicles	ME	OEC	3	0	0	3	40	60	100
63.	20ME906	Sensors and Transducers	ME	OEC	3	0	0	3	40	60	100
64.	20ME907	Energy Auditing	ME	OEC	3	0	0	3	40	60	100
65.	20ME908	Fiber Reinforced Plastics	ME	OEC	3	0	0	3	40	60	100
66.	20ME909	Lean Manufacturing	ME	OEC	3	0	0	3	40	60	100
67.	20ME910	Surface Engineering	ME	OEC	3	0	0	3	40	60	100
Safety and Fire Engineering											
68.	20SF901	Occupational Health and Hygiene	SF	OEC	3	0	0	3	40	60	100
69.	20SF902	Construction Safety	SF	OEC	3	0	0	3	40	60	100
70.	20SF903	Building Fire Safety	SF	OEC	3	0	0	3	40	60	100
71.	20SF904	Safety in Electrical Engineering	SF	OEC	3	0	0	3	40	60	100
72.	20SF905	Legal Aspects of Safety	SF	OEC	3	0	0	3	40	60	100
73.	20SF906	Safety in Industries	SF	OEC	3	0	0	3	40	60	100
74.	20SF907	Food Safety	SF	OEC	3	0	0	3	40	60	100
75.	20SF908	Safety Management and its Principles	SF	OEC	3	0	0	3	40	60	100
76.	20SF909	Safety in Automobile Engineering	SF	OEC	3	0	0	3	40	60	100
77.	20SF910	Safety in Transportation	SF	OEC	3	0	0	3	40	60	100
Science and Humanities											
78.	20SH901	Applications of Statistics	FYA	OEC	3	0	0	3	40	60	100
79.	20SH902	Combinatory and Graph Theory	FYA	OEC	3	0	0	3	40	60	100
80.	20SH903	Optimization Techniques	FYA	OEC	3	0	0	3	40	60	100
81.	20SH904	Basic Military Education and Training	FYA	OEC	3	0	0	3	40	60	100
82.	20SH905	Professional Communication	FYA	OEC	3	0	0	3	40	60	100
83.	20SH906	Fundamentals of Nanoscience and Technology	FYA	OEC	3	0	0	3	40	60	100

K.S.R. COLLEGE OF ENGINEERING: TIRUCHENGODE - 637 215 (Autonomous)

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

(REGULATIONS 2020)

LIST OF PROPOSED VALUE-ADDED COURSES

Sl.No.	Course Code	Course Name	Number of hours	Offered by Internal / External
1.	VACEC01	PCB Circuit Design	30 Hours	External
2.	VACEC02	Programming PIC Microcontrollers	30 Hours	External
3.	VACEC03	Real Time Applications of Aurduino	30 Hours	External
4.	VACEC04	LABVIEW	30 Hours	External
5.	VACEC05	MATLAB – Signal and Image Processing Tool box	30 Hours	Department of ECE- KSRCE
6.	VACEC06	Industrial Automation using PLC and SCADA	30 Hours	External
7.	VACEC07	Network Simulator – 2	30 Hours	External
8.	VACEC08	CCNA Fundamentals (Module 1)	30 Hours	External
9.	VACEC09	CCNA - Routing and Switching (Module 2)	30 Hours	External
10.	VACEC10	.Net and PHP	30 Hours	External
11.	VACEC11	Data Base Management Systems	30 Hours	External
12.	VACEC12	VHDL Programming	30 Hours	Department of ECE- KSRCE
13.	VACEC13	Tanner Tool	30 Hours	Department of ECE- KSRCE
14.	VACEC14	Mentor Graphics	30 Hours	Department of ECE- KSRCE
15.	VACEC15	Programming in Digital Signal Processors	30 Hours	Department of ECE- KSRCE
16.	VACEC16	High Frequency Structure Simulator (HFSS)	30 Hours	Department of ECE- KSRCE

S.No	Subject Area	Credits Per Semester								Credits Total	Percentage Credits	Suggested Breakup of credits
		I	II	III	IV	V	VI	VII	VIII			
1	HSMC	3	3				3			9	5.5%	12
2	ESC	5	9	7						21	13.125	25
3	BSC	8	8	4	3					23	14.375	24
4	PCC			12	19	16	14	10		71	43.82%	48
5	PEC					3	3	6	6	18	11.1%	18
6	OEC					3		3	3	9	5.5%	18
7	PW							3	6	9	5.5%	15
8	MC	1	1							2	1.2%	-
Total		**17**	**21**	**23**	**22**	**22**	**20**	**22**	**15**	**162**	**100**	**160**

Total Credits for Regular Student - 162
Total Credits for Lateral Student - 124

K.S.R. COLLEGE OF ENGINEERING (Autonomous) **R 2020**

SEMESTER - I

		L	T	P	C
20EN151	**TECHNICAL ENGLISH – I** (Common to all branches)	3	0	0	3

Prerequisite: *No prerequisites are needed for enrolling into the course*

Course Objectives: On successful completion of the course, the student will be able to		***Cognitive Level***
CO1:	*Comprehend and apply Grammar in context for professional communication*	*Understand*
CO2:	*Infer the gist and specific information.*	*Apply*
CO3:	*Discuss, express and interact in the society and place of study.*	*Create*
CO4:	*Critically interpret and comprehend a given text.*	*Evaluate*
CO5:	*Prioritize the listening skills for academic and professional purposes.*	*Apply*

UNIT - I **[09]**

Synonyms & Antonyms –- Use of Modal Auxiliaries – Infinitive and Gerund - Parts of Speech -Intensive Reading – Predicting Content – Interpretation - Active Listening - Listening for the main idea - Need based Correspondence (request for joining hostel, bonafide certificate)-Self Introduction- Introducing others

UNIT - II **[09]**

British & American Terminology –- Tenses (Simple Present, Present Continuous, Present Perfect, Simple Past, and Simple Future) -Predicting Content - Drawing inferences - Listening for specific details - Listening to News – Job Application and Resume – Writing Instructions- Delivering Welcome Address

UNIT - III **[09]**

Standard Abbreviations and Acronyms -Preposition of Time, Place and Movement – Active Voice & Passive Voice – Consonant Sounds – Pronunciation guidelines related to Vowels and Consonant – Skimming & Scanning - Inference – Context Based Meaning – Recommendation Writing - Proposing Vote of Thanks.

UNIT - IV **[09]**

Vocabulary Building – Phrasal Verbs (Put, Give, Look, Take, Get, Call)- Impersonal passive -Newspaper Reading –- Note making – Listening to Dialogues – E Mail Etiquettes & E-mail Writing.- MoC – Anchoring – Role play in academic context

UNIT - V **[09]**

Homonyms - Concord (Subject & Verb Agreement)- Rearranging the jumbled sentences - Listening to Telephonic Conversation - Letter of Invitation (inviting, accepting and declining) – Paragraph writing - Letter to the Editor of a News paper – Drills using Minimal pairs – Presentation Skills.

Total (L= 40, T = 5) = 45 Periods

Text Books :

1 Meenakshi Raman, Technical Communication, Oxford University Press, New Delhi, First Edition, 2017

2 S.Sumant, Technical English – I, Vijay Nicole, Chennai, Second Edition, 2018

Reference Books :

1 Dr.P.Rathna, English Work Book – I, VRB Publishers Pvt. Ltd., Chennai, Second Edition,2018

2 Seely, The Oxford Guide to Writing and Speaking, Oxford University Press, New Delhi, First Edition, 2016

3 M Ashra Rizvi, Effective Technical Communication, Tata McGraw HILL, New Delhi, First Edition,2005

4 P.Kiranmani Dutt, A course in Communication Skills, Cambridge University Press, New Delhi, First Edition, 2014

K.S.R. COLLEGE OF ENGINEERING, TIRUCHENGODE – 637215
DEPARTMENT OF SCIENCE AND HUMANITIES
CO-PO MAPPING

Regulation : R 2020

Course Code: 20EN151 **Course Name : Technical English – I**

CO	Course Outcomes	Programme Outcomes													
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	*Comprehend and apply Grammar in context for professional communication.*	-	-	-	-	-	-	-	-	2	3	-	1	-	-
CO2	*Infer the gist and specific information.*	-	-	-	-	-	-	-	-	2	3	-	1	-	-
CO3	*Discuss, express and interact in the society and place of study.*	-	-	-	-	-	-	-	-	2	3	-	1	-	-
CO4	*Critically interpret and comprehend a given text.*	-	-	-	-	-	-	-	-	2	3	-	1	-	-
CO5	*Prioritize the listening skills for academic and professional purposes.*	-	-	-	-	-	-	-	-	2	3	-	1	-	-
	Average	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2**	**3**	**-**	**1**	**-**	**-**

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

K.S.R. COLLEGE OF ENGINEERING (Autonomous) **R 2020**

SEMESTER – I

		L	T	P	C
20MA151	**ENGINEERING MATHEMATICS – I** (Common to All Branches)	3	1	0	4

Prerequisite: No prerequisites are needed for enrolling into the course

Course Outcomes : On Completion of this course, the student will be able to		**Cognitive Level**
CO1	*Interpret the concepts of Matrix applications in the field of engineering.*	Understand
CO2	*Acquire knowledge in solving ordinary differential equations.*	Evaluate
CO3	*Extend and apply the concepts of differential calculus problems.*	Apply
CO4	*Develop the skills in solving the functions of several variables.*	Remember
CO5	*Applying the concepts and solving the Vector Calculus problems.*	Apply

UNIT– I LINEAR ALGEBRA [12]

Characteristic equation – Eigen values and Eigen vectors of a real matrix – Properties of Eigen values and Eigen vectors (Excluding proof) – Cayley Hamilton theorem (excluding proof) – Quadratic forms – Reduction of quadratic form to canonical form by orthogonal transformation.

UNIT – II ORDINARY DIFFERENTIAL EQUATIONS [12]

Linear differential equations of second and higher order with constant coefficients – Differential equations with variable coefficients – Cauchy's and Legendre's linear equations – Method of variation of parameters.

UNIT – III DIFFERENTIAL CALCULUS [12]

Curvature – Radius of curvature (Cartesian co-ordinates only) – Centre of curvature and Circle of curvature – Involutes and Evolutes.

UNIT – IV FUNCTIONS OF SEVERAL VARIABLES [12]

Partial derivatives – Total derivatives – Euler's theorem for homogenous functions – Taylor's series expansion – Maxima and Minima for functions of two variables – Method of Lagrangian multipliers.

UNIT – V VECTOR CALCULUS [12]

Gradient, Divergence and Curl – Directional derivative – Irrotational and solenoidal vector fields – Green's theorem in plane, Gauss divergence theorem and Stoke's theorem – Problems in Cube, Cuboid and Rectangular parallelopiped only.

Total (L: 45 T:15) = 60 Periods

Text Books :

1 Ravish R Singh and Mukul Bhatt, Engineering Mathematics – I, McGraw Hill Publications, Fourth Edition, New Delhi 2016.

2 Grewal B.S, Higher Engineering Mathematics, Tata McGraw Hill Publishing Company, Forty Third Edition, New Delhi, 2015.

Reference Books :

1 Bali N. P and Manish Goyal, Textbook on Engineering Mathematics, Laxmi Publications (p) Ltd.,Seventh Edition, 2016.

2 H.K. Dass, Advance Engineering Mathematics, S. Chand and company, Eleventh Edition, 2015.

3 Jain R.K. and Iyengar S.R.K., - Advanced Engineering Mathematics, Narosa Publicaitons, Eighth Edition, 2012.

4 Narayanan.S and Manicavachagom Pillai. T.K. – Calculasvol I and Vol II, S.chand& Co. Sixth Edition, 2014.

K.S.R. COLLEGE OF ENGINEERING, TIRUCHENGODE – 637215
DEPARTMENT OF SCIENCE AND HUMANITIES
CO-PO MAPPING

Regulation : R 2020

Course Code: 20MA151 **Course Name : Engineering Mathematics – I**

CO	Course Outcomes	Programme Outcomes													
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	*Interpret the concepts of Matrix applications in the field of engineering.*	3	3	3	3	-	-	-	-	-	-	-	-	-	-
CO2	*Acquire knowledge in solving ordinary differential equations.*	3	3	3	3	-	-	-	-	-	-	-	-	-	-
CO3	*Extend and apply the concepts of differential calculus problems.*	3	3	3	3	-	-	-	-	-	-	-	-	-	-
CO4	*Develop the skills in solving the functions of several variables.*	3	3	3	3	-	-	-	-	-	-	-	-	-	-
CO5	*Applying the concepts and solving the Vector Calculus problems.*	3	3	3	3	-	-	-	-	-	-	-	-	-	-
	Average	3	3	3	**3**		**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

K.S.R. COLLEGE OF ENGINEERING (Autonomous) **R 2020**

SEMESTER – I

		L	T	P	C
20PH051	**ENGINEERING PHYSICS** (Common to All Branches)	3	0	0	3

Prerequisite: NIL

Course Outcomes: On Completion of this course, the student will be able to		**Cognitive *level***
CO1	*Describe the impact of engineering solutions in the constructional and designing environment.*	Remember
CO2	*Categorize the types of laser and utilize it for specific application based on their desirable requisite.*	Analyze
CO3	*Utilize the conceived concepts and techniques for synthesizing novel crystals with enhanced multifunctional properties.*	Apply
CO4	*Enumerate the preambles of quantum physics and implement its concepts to tackle the cumbersome engineering problems.*	Apply
CO5	*Comprehend the fundamental ideas of optoelectronic materials and to fabricate it for the potential applications*	Understand

UNIT – I ACOUSTICS AND ULTRASONICS [9]

Acoustics–Introduction – Classification of sound – Characteristics of musical sound – Loudness – Weber – Fechner law – Decibel – Absorption coefficient – Reverberation – Reverberation time – Sabine's formula: growth and decay (derivation) – Factors affecting acoustics of buildings and their remedies. Ultrasonics – Production –piezoelectric method – Properties – Velocity measurement: acoustical grating –Engineering applications– SONAR.

UNIT – II LASER TECHNOLOGY [9]

Introduction – Principle of Spontaneous emission and stimulated emission – Population inversion, pumping – Einstein's A and B coefficients (derivation). Types of lasers – Nd-YAG, CO_2 and Semiconductor lasers (homo-junction and hetero-junction) – Qualitative Industrial Applications: Lasers in welding, heat treatment and cutting – Medical applications – Holography (construction and reconstruction of images).

UNIT – III CRYSTAL PHYSICS [9]

Introduction to crystalline and amorphous solids – lattice and unit cell – seven crystal system and Bravais lattices – Miller indices(hkl) –d-spacing in cubic lattice – atomic radius – coordination number – packing factor calculation for sc, bcc, fcc and hcp– crystal defects – point, line and surface defects.

UNIT – IV QUANTUM PHYSICS [9]

Black body radiation – Planck's theory (derivation) – Deduction of Wien's displacement law and Rayleigh – Jeans' Law from Planck's theory – Compton effect - Theory and experimental verification – Matter waves – Schrödinger's wave equation – Time independent and time dependent equations – Physical significance of wave function – Particle in a one dimensional box.

UNIT – V OPTOELECTRONIC DEVICES [9]

Photoconductive materials – Light Dependent Resistor (LDR) – Working – Applications – Photovoltaic materials – Solar cell – Construction, working and applications – Light Emitting Diode (LED) – Principle, construction and working - Liquid crystal Display (LCD) – Types and applications.

Total = 45 Periods

Text Books :

1 M.N. Avadhanulu and P.G. Kshirsagar, A text book of Engineering Physics, S. Chand and Company, New Delhi, seventh Edition, 2014.

2 R.K.Gaur & S.L.Gupta, Engineering Physics, Dhanpat Rai Publication, New Delhi, seventh Edition, 2014.

Reference Books :

1 D. Halliday, R. Resnick and J. Walker, Fundamentals of Physics, John Wiley & sons, USA, nineth Edition, 2011.

2 V. Rajendran, Engineering Physics, Tata McGraw Hill, New Delhi, first Edition, 2011.

3 R. A. Serway and J. W. Jewett, Physics for Scientists and Engineers with Modern Physics, nineth edition, Cengage Learning, USA, 2013.

4 Arthur Beiser, Concepts of Modern Physics, Tata McGraw Hill, New Delhi, sixth Edition, 2010.

K.S.R. COLLEGE OF ENGINEERING, TIRUCHENGODE – 637215
DEPARTMENT OF SCIENCE AND HUMANITIES
CO-PO MAPPING

Regulation : R 2020

Course Code: 20PH051 **Course Name : Engineering Physics**

CO	Course Outcomes	Programme Outcomes													
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	*Describe the impact of engineering solutions in the constructional and designing environment.*	3	3	-	-	2	-	-	1	-	2	-	2	-	-
CO2	*Categorize the types of laser and utilize it for specific application based on their desirable requisite.*	3	3	-	-	2	-	-	1	-	2	-	2	-	-
CO3	*Utilize the conceived concepts and techniques for synthesizing novel crystals with enhanced multifunctional properties.*	3	3	-	-	2	-	-	1	-	2	-	2	-	-
CO4	*Enumerate the preambles of quantum physics and implement its concepts to tackle the cumbersome engineering problems.*	3	3	-	-	2	-	-	1	-	2	-	2	-	-
CO5	*Comprehend the fundamental ideas of optoelectronic materials and to fabricate it for the potential applications*	3	3	-	-	2	-	-	1	-	2	-	2	-	-
	Average	3	3	-	-	2	-	-	1	-	2	-	2	-	-

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

K.S.R. COLLEGE OF ENGINEERING (Autonomous) **R 2020**

SEMESTER – I

20CS142	**PROBLEM SOLVING TECHNIQUES** (Common To CS & EC)	L	T	P	C
		3	0	0	3

Prerequisite: No prerequisites are needed for enrolling into the course.

Course Outcomes : On Completion of this course, the student will be able to		***Cognitive Level***
CO1:	*Identify the basic concepts of computer and internet.*	*Understand*
CO2:	*Recognize the problem solving strategies.*	*Understand*
CO3:	*Design the fundamental algorithm.*	*Understand*
CO4:	*Factorize the numbers using methods.*	*Understand*
CO5:	*Process the array for different operations.*	*Understand*

UNIT – I FUNDAMENTALS OFCOMPUTER AND INTERNET [9]

Introduction and Organization of Computer – History and Generation of Computer – Types of Computer – Components of Computer (Hardware, Software and Firmware) – Classification of Software – Introduction to Algorithms, Pseudo code and Flowchart – Introduction to Network and Internet – Terminologies in Internet – WWW.

UNIT – II COMPUTER PROBLEM SOLVING [9]

Introduction – Problem solving aspect – Top Down Design – Implementation of Algorithm – Program Verification – Efficiency of Algorithm – Analysis of Algorithm

UNIT – III FUNDAMENTAL ALGORITHMS [9]

Exchanging the Values – Counting – Summation of Set of Number – Factorial Computation – Sine Function Computation – Generation of the Fibonacci Sequence – Reversing the Digits of an Integer – Base conversion – Character to Number conversion.

UNIT – IV FACTORING METHODS [9]

Finding the Square Root of a Number – Smallest Divisor of an Integer – GCD of Two Integers – Generating Prime Numbers – Computing Prime Factors of an Integer – Generation of Pseudo random numbers – Raising a number to a larger power – Computing the n^{th} Fibonacci number.

UNIT – V ARRAY TECHNIQUES [9]

Array order reversal – Array counting – Finding the maximum number in the set – Removal of duplicates from an ordered array – Finding the k^{th} smallest element – Longest monotone subsequence.

Total = 45 Periods

Text Books :

1 R.G.Dromey, How to Solve it by Computer, Pearson Education, India, Fifth Edition, 2008.

2 Shelly, Freund, Vermaat, Introduction to Computers, Shelly Cashman Series, Course Technology Inc, United States, Eighth Edition, 2010.

Reference Books :

1 ITL Educational Solutions Limited, Introduction to Information Technology, Pearson Education, India, Second Edition, India, 2012.

2 G. Polya, How to Solve It : A New Aspect of Mathematical Method, Princeton University Press, New Jersey, Second Edition, 2008

3 Ellis Horowitz, Fundamentals of Programming languages, Galgotia Publications, New Delhi, Second Edition, 2012.

4 www.nptel.ac.in/courses/106104074

K.S.R. COLLEGE OF ENGINEERING, TIRUCHENGODE – 637215
DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING
CO-PO MAPPING

Regulation: R 2020

Course Code: 20CS142 **Course Name: PROBLEM SOLVING TECHNIQUES**

CO	Course Outcomes	Programme Outcomes													
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	*Identify the basic concepts of computer and internet.*	3	3	3	2	1	-	-	-	1	-	-	1	-	-
CO2	*Recognize the problem solving strategies.*	3	3	2	1	2	-	-	-	1	-	-	1	-	-
CO3	*Design the fundamental algorithm.*	3	3	2	2	1	-	-	-	1	-	-	1	-	-
CO4	*Factorize the numbers using methods.*	3	3	3	1	2	-	-	-	1	-	-	1	-	-
CO5	*Process the array for different operations.*	3	3	3	2	1	-	-	-	1	-	-	1	-	-
	Average	**3**	**3**	**2**	**2**	**1**	**-**	**-**	**-**	**1**	**-**	**-**	**1**	**-**	**-**

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

K.S.R. COLLEGE OF ENGINEERING (Autonomous) **R 2020**

SEMESTER - I

		L	T	P	C
20AU127	**ENGINEERING GRAPHICS LABORATORY** (Common To CE,CS,EC,EE, & IT)	0	0	3	1

Prerequisite: -

Course Outcomes: On Completion of this course , the student will be able to		***Cognitive level***
CO1	*Create and modify two-dimensional drawings using AutoCAD software*	*Understand*
CO2	*Construct various planes and do orthographic projection of lines and plane surfaces.*	*Remember*
CO3	*Draw projections of solids and development of surfaces.*	*Understand*
CO4	*Create the sections of solids and surfaces.*	*Understand*
CO5	*Sketch two dimensional isometric projections of simple solids.*	*Understand*

List of Experiments:

1. Study of basic tools, commands and coordinate system (absolute, relative, polar, etc.) used in 2D software.
2. Draw the conic curves and special curves by using AutoCAD.
3. Draw the front view, top view, side view of objects from the given pictorial view.
4. Draw the projections of straight lines.
5. Draw the projections of polygonal surface.
6. Draw the projections of simple solid objects.
7. Draw the sectional view and the true shape of the given section.
8. Draw the development of surfaces like prism, pyramids, cylinders and cone.
9. Draw the isometric projections of simple solids, truncated prism and pyramids.
10. Draw the isometric projections of cylinder and cone.

Total : 45 Periods

K.S.R. COLLEGE OF ENGINEERING, TIRUCHENGODE – 637215
DEPARTMENT OF AUTOMOBILE ENGINEERING
CO-PO MAPPING

Regulation : R 2020

Course Code: 20AU127 **Course Name : Engineering Graphics Laboratory**

CO	Course Outcomes	Programme Outcomes													
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	*Create and modify two-dimensional drawings using AutoCAD software*	3	3	3	2	2	-	-	-	-	-	-	-	-	-
CO2	*Construct various planes and do orthographic projection of lines and plane surfaces.*	3	3	3	2	2	-	-	-	-	-	-	-	-	-
CO3	*Draw projections of solids and development of surfaces.*	3	3	3	2	2	-	-	-	-	-	-	-	-	-
CO4	*Create the sections of solids and surfaces.*	3	3	3	2	2	-	-	-	-	-	-	-	-	-
CO5	*Sketch two dimensional isometric projections of simple solids.*	3	3	3	2	2	-	-	-	-	-	-	-	-	-
	Average	**3**	**3**	**3**	2	2	**-**	**-**	**-**	**-**	-	**-**	**-**	**-**	**-**

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

K.S.R. COLLEGE OF ENGINEERING (Autonomous) **R 2020**

SEMESTER – I

		L	T	P	C
20PH028	**PHYSICS LABORATORY** (Common to All Branches)	0	0	3	1

Prerequisite: *NIL*

	Course Outcomes: On Completion of this course , the student will be able to	***Cognitive level***
CO1	*Comprehend the different physical parameters of optics.*	*Analyze*
CO2	*Perceive the production of ultrasonic waves through inverse piezoelectric effect and to determine the velocity of sound waves in the given liquid.*	*Remember*
CO3	*Explore the principle of thermal conductivity thereby to calculate the thermal conductivity of various bad conductors like cardboard, mica, etc.*	*Apply*
CO4	*Confer the experimental counterparts of materials properties such as modulus, solar cell, and energy gap.*	*Understand*
CO5	*Imbibe the concept of capillary action in fluid dynamics and to compare the coefficient of viscosity of the given liquid.*	*Analyze*

List of Experiments in Physics Laboratory

1. Determination of wavelength of Laser using grating and the Size of the Particles.
2. Determination of thickness of the given material by Air – wedge method.
3. Determination of velocity of Ultrasonic waves and compressibility using Ultrasonic interferometer.
4. Spectrometer grating - Determination of wavelength of mercury spectrum.
5. Determination of thermal conductivity of a bad conductor by Lee's disc method.
6. Determination of Young's modulus of the material of a uniform bar by Non – Uniform bending method.
7. Determination of Band gap energy of a semiconductor.
8. Determination of Viscosity of a given liquid by Poiseuille's method.
9. Torsional pendulum - Determination of rigidity modulus of a given wire.
10. V-I Characteristics of Solar Cell .

Total : 30 Periods

Text Book :

1. Faculty Members of Physics, Physics Lab manual, Department of Physics, K.S.R. College of Engineering, Namakkal, seventeenth Edition, 2018.
2. Dr. P. Mani, Physics Lab Manual & Observation Book, Dhanam Publications, tweleth Edition Chennai 2017.

References :

1. Dr. G. Senthilkumar, Physics Lab manual, VRB Publications Pvt. Ltd., Chennai, tenth Edition, 2006.
2. R Suresh & Dr. C. Kalyanasundaram, Physics Laboratory, Sri Krishna Hitech Publishing Company Pvt. Ltd., Chennai, fifth Edition, 2017.

K.S.R. COLLEGE OF ENGINEERING, TIRUCHENGODE – 637215
DEPARTMENT OF SCIENCE AND HUMANITIES
CO-PO MAPPING

Regulation : R 2020

Course Code: 20PH028 **Course Name : Physics Laboratory**

CO	Course Outcomes	Programme Outcomes													
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	*Comprehend the different physical parameters of optics.*	3	3	-	-	2	-	-	1	-	2	-	2	-	-
CO2	*Perceive the production of ultrasonic waves through inverse piezoelectric effect and to determine the velocity of sound waves in the given liquid*	3	3	-	-	2	-	-	1	-	2	-	2	-	-
CO3	*Explore the principle of thermal conductivity thereby to calculate the thermal conductivity of various bad conductors like cardboard, mica, etc.*	3	3	-	-	2	-	-	1	-	2	-	2	-	-
CO4	*Confer the experimental counterparts of materials properties such as modulus, solar cell, and energy gap.*	3	3	-	-	2	-	-	1	-	2	-	2	-	-
CO5	*Imbibe the concept of capillary action in fluid dynamics and to compare the coefficient of viscosity of the given liquid.*	3	3	-	-	2	-	-	1	-	2	-	2	-	-
	Average	**3**	**3**	**-**	**-**	**2**	**-**	**-**	**1**	**-**	**2**	**-**	**2**	**-**	**-**

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

K.S.R. COLLEGE OF ENGINEERING (Autonomous) **R 2020**

SEMESTER – I

		L	T	P	C
20CS171	**PROBLEM SOLVING TECHNIQUES LABORATORY** (Common To CS & EC)	0	0	3	1

Prerequisite: *No prerequisites are needed for enrolling into the course*

Course Outcomes: On Completion of this course, the student will be able to		***Cognitive level***
CO1:	*Illustrate the basic concepts of MS Office.*	*Understand*
CO2:	*Build the knowledge of flowchart.*	*Apply*
CO3:	*Create the fundamentals of algorithm.*	*Create*
CO4:	*Demonstrate the simple problems using factorizing concepts.*	*Understand*
CO5:	*Analyze the simple problems using array and string operations.*	*Analyze*

LIST OF EXPERIMENTS:

1. Prepare a Bio-data using MS Word with appropriate page, text and table formatting options and send the same too many recipients using mail merge.
2. Prepare a mark sheet with five subjects for five students in MS Excel File using Formulas, Functions and Charts.
3. i) Prepare a Power Point presentation for your organization with varying animation effects using timer.
   ii) Prepare a Student Database in MS Access, manipulate the data and generate report.
4. Design an algorithm and execute the flowchart for implement the concept of exchange of values.
5. Design an algorithm and execute the flowchart for count the digits and character of the input.
6. Design an algorithm to execute the flowchart for implement the factorization of given number.
7. Design an algorithm to execute the flowchart for produce various sequence of numbers like Fibonacci.
8. Design an algorithm to execute the flowchart for base conversion of numbers.
9. Design an algorithm to execute the flowchart for evaluates any one mathematical expression.
10. Design an algorithm to execute the flowchart for finding the LCM and GCD of the given input.
11. Design an algorithm to execute the flowchart for processing of Prime number.
12. Design an algorithm to execute the flowchart for array processing of set numbers.

Total : 45 Periods

K.S.R. COLLEGE OF ENGINEERING, TIRUCHENGODE – 637215
DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING
CO-PO MAPPING

Regulation: R 2020

Course Code: 20CS171 **Course Name: PROBLEM SOLVING TECHNIQUES LABORATORY**

CO	Course Outcomes	Programme Outcomes													
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	*Illustrate the basic concepts of MS Office.*	3	3	2	1	1	-	-	-	1	-	-	1	-	-
CO2	*Build the knowledge of flowchart.*	3	3	3	2	1	-	-	-	1	-	-	1	-	-
CO3	*Create the fundamentals of algorithm.*	3	3	2	2	1	-	-	-	1	-	-	1	-	-
CO4	*Demonstrate the simple problems using factorizing concepts.*	3	3	2	1	2	-	-	-	1	-	-	1	-	-
CO5	*Analyze the simple problems using array and string operations.*	3	3	2	2	1	-	-	-	1	-	-	1	-	-
	Average	**3**	**3**	**2**	**2**	**1**	**-**	**-**	**-**	**1**	**-**	**-**	**1**	**-**	**-**

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

K.S.R. COLLEGE OF ENGINEERING (Autonomous) **R 2020**

SEMESTER- I

		L	T	P	C
20MC151	**INDUCTION PROGRAMME** **(COMMON TO ALL BRANCHES)**	3	0	0	0

Course outcomes: On Completion of this course, the student will be able to		***Cognitive Level***
CO1	*Involve in physical activity, creative arts and culture and feel comfortable in the new environment.*	*Understand*
CO2	*Build relationship between teachers and students and make familiarizing with departments.*	*Understand*
CO3	*Concentrate on literary activities.*	*Apply*
CO4	*Develop the required skills through lectures and workshops.*	*Remember*
CO5	*Acquire skills in extracurricular activities.*	*Analyze*

List of activities during the three weeks Students Induction Programme (SIP): **3 weeks**

MODULE I : PHYSICAL ACTIVITY

- This would involve a daily routine of physical activity with games and sports. There would be games in the evening. These would help develop team work besides health.

MODULE II : CREATIVE ARTS & CULTURE

- Every student would chose one skill related to the arts whether visual arts or performing arts such as painting, music, dance, pottery, sculpture etc. The student would pursue it every day for the duration of the program.
- These would allow for creative expression. It would develop a sense of aesthetics and also enhance creativity which would help in engineering design later.

MODULE III : MENTORING AND CONNECTING THE STUDENTS WITH FACULTY

- Mentoring takes place in the context and setting of *Universal Human Values*. It gets the student to explore oneself and experience the joy of learning, prepares one to stand up to peer and take decisions with courage, be aware of relationships and be sensitive to others.
- Discussions would be conducted in small groups of about 20 students with a faculty mentor each. It is to open thinking towards the self. Universal Human Values discussions could even continue for rest of the semester as a normal course, and not stop with the induction program.

MODULE IV: FAMILIRIZATION WITH COLLEGE/DEPARTMENTS & BRANCHES

- They should be shown their department, and told what it means to get into the branch or department. Describe what role the technology related to their department plays in society and after graduation what role the student would play in society as an engineer in that branch. A lecture by an alumnus of the Dept. would be very helpful in this regard. They should also be shown the laboratories, workshops and other facilities.

MODULE V: LITERARY ACTIVITIES

- Literary activity would encompass reading a book, writing a summary, debating, enacting a play etc.

MODULE VI: PROFICIENCY MODULES:

- The induction program period can be used to overcome some critical lacunas that students might have difficulties in communication skills. These should run like crash courses, so that when normal courses start after the induction program, the student has overcome the lacunas substantially.

MODULE VII: LECTURES & WORKSHOPS

- Lectures by eminent people to be organized, say, once a week. It would give the students exposure to people who are eminent, in industry or engineering, in social service, or in public life. Alumni could be invited as well.

- Motivational lectures about life, meditation, etc. by Ramakrishna Mission, Art of Living, Vivekanand Kendras, S-VYASA, etc. may be organized. (3 sessions, 9 hours).

MODULE VIII: EXTRA CURRICULAR ACTIVITIES

- The new students should be introduced to the extra-curricular activities at the college.
- They should be shown the facilities and informed about activities related to different clubs etc. This is when selected senior students involved in or leading these activities can give presentations, under faculty supervision.

MODULE IX: FEED BACK & REPORT ON THE PROGRAMMES:

- Students should be asked to give their mid-program feedback. They should be asked to write their opinions about the program at the end of the first week.
- Finally, at the end of the program, each group (of 20 students) should be asked to prepare a single report on their experiences of the program. On the second last day, each group should present their report in front of other groups. Immediately after their presentation, they should submit their written report. This will also serve as a *closure* to the program.
- Finally, a formal written or online anonymous feedback should be collected at the end of the program.

K.S.R. COLLEGE OF ENGINEERING, TIRUCHENGODE – 637215
DEPARTMENT OF SCIENCE AND HUMANITIES
CO-PO MAPPING

Regulation : R 2020

Course Code: 20MC151 **Course Name : Induction Programme**

CO	Course Outcomes	Programme Outcomes													
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	*Involve in physical activity, creative arts and culture and feel comfortable in the new environment.*	3					3	3	2	3	2		3		
CO2	*Build relationship between teachers and students and make familiarizing with departments.*	3					3	3	3	1	3		3		
CO3	*Concentrate on literary activities.*	3					2	3	3	3	3		3		
CO4	*Develop the required skills through lectures and workshops*	3					3	3	3	2	3		3		
CO5	*Acquire skills in extracurricular activities.*	3					3	3	3	3	3		3		
	Average	**3**					**3**	**3**	**3**	**2**	**3**		**3**		

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

K.S.R. COLLEGE OF ENGINEERING (Autonomous) **R 2020**

SEMESTER – I

20MC052	**ENVIRONMENTAL SCIENCE AND ENGINEERING** (Common to All Branches)	L	T	P	C
		3	0	0	0

Prerequisite: NIL

Course Outcomes: On Completion of this course , the student will be able to		***Cognitive level***
CO1	*Interpret the importance in conservation of resources for future generation.*	*Understand*
CO2	*Relate the importance of ecosystem and biodiversity.*	*Remember*
CO3	*Analyze the impact of pollution and hazardous waste in a global and societal context.*	*Understand*
CO4	*Identify the contemporary issues that result in environmental degradation that would attempt to provide solutions to overcome the problems.*	*Understand*
CO5	*Predict the concept of Sustainability and Green Chemistry.*	*Understand*

UNIT – I INTRODUCTION TO ENVIRONMENTAL STUDIES AND NATURAL RESOURCES [9]

Environment – definition – scope and importance – need for public awareness; Forest resources – use – over exploitation – deforestation; Water resources – over–utilization of surface and ground water; Mineral resources –environmental effects of extracting and using mineral resources; Food resources – overgrazing – effects of modern agriculture – fertilizer–pesticide problems – water logging – salinity; Role of an individual in conservation of natural resources. **Activity:** Slogan making event on conserving natural resources or plantation of trees.

UNIT – II ECOSYSTEM AND BIODIVERSITY [9]

Concept of an ecosystem – structure and function of an ecosystem – producers – consumers and decomposers – Food chain – food web – energy flow in the ecosystem – ecological pyramids – Ecological succession; Forest ecosystem and Aquatic ecosystems (Estuary and marine ecosystem); Biodiversity – introduction – definition – Values of biodiversity; Hot-spots of biodiversity; Endangered and Endemic Species of India. **Activity:** Arrange a trip to visit different varieties of plants.

UNIT– III ENVIRONMENTAL POLLUTION [9]

Pollution – introduction and different types of pollution; Causes – effects and control measures of air pollution and water pollution – water quality parameters – hardness – definition – types; Alkalinity – definition – types; BOD and COD (definition and significance); Noise pollution – solid waste management – hazardous waste – medical and e-wastes; Role of an individual in prevention of pollution. **Activity:** Drive for segregation of waste or cleanliness drive.

UNIT– IV SOCIAL ISSUES AND ENVIRONMENT [9]

Water conservation – rain water harvesting and watershed management; Environmental ethics – Issues and possible solutions; Climate change – global warming and its effects on flora and fauna – acid rain – ozone layer depletion; Disaster Management – earth quake – cyclone – tsunami – disaster preparedness – response and recovery from disaster. **Activity:** Poster making event on water management or Climate change.

UNIT– V SUSTAINABILITY AND GREEN CHEMISTRY [9]

Sustainable development – from unsustainable to sustainable development – Environmental Impact Assessment (EIA); Human rights; Value education; HIV/AIDS; Role of information technology in environment and human health; 12 Principles of Green Chemistry. **Activity:** Group discussion on Sustainability or Lecture from an expert on Green chemistry.

Total = 45 Periods

Text Book :

1 Dr. T. Arun Luiz, Environmental Science and Engineering, S. Chand & Company Private Limited, New Delhi, First Edition, 2016.

2 Anubha Kaushik and C. P. Kaushik, Environmental Science and Engineering, New Age International Publishers, Chennai, Fifth Edition, 2016.

Reference Books :

1 G. Tyler Miller and Scott E. Spoolman, Environmental Science, Cengage Learning India Private Limited, New Delhi, Fourteenth Edition, 2014.
2 Dr. A. Ravikrishnan, Environmental Science and Engineering, Sri Krishna Hi-tech Publishing Company Private Limited, Chennai, Tenth Edition, 2014.
3 Raman Sivakumar, Introduction to Environmental Science and Engineering, Tata McGraw Hill Education Private Limited, Fourth Edition, 2012.
4 S S. Dara, A Text book of Environmental Chemistry and pollution control, S. Chand & Company Limited, New Delhi, Tenth Edition, 2005.

K.S.R. COLLEGE OF ENGINEERING, TIRUCHENGODE – 637215
DEPARTMENT OF SCIENCE AND HUMANITIES
CO-PO MAPPING

Regulation : R 2020

Course Code: 20MC052 **Course Name : Environmental Science and Engineering**

CO	Course Outcomes	Programme Outcomes												
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	*Interpret the importance in conservation of resources for future generation.*	3	2	2			3	3	2				1		
CO2	*Relate the importance of ecosystem and biodiversity.*	3	2	2			3	3	2				1		
CO3	*Analyze the impact of pollution and hazardous waste in a global and societal context.*	3	2	2			3	3	2				1		
CO4	*Identify the contemporary issues that result in environmental degradation that would attempt to provide solutions to overcome the problems.*	3	2	2			3	3	2				1		
CO5	*Predict the concept of Sustainability and Green Chemistry.*	3	2	2			3	3	2				1		
	Average	**3**	**2**	**2**			**3**	**3**	**2**				**1**		

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

K.S.R. COLLEGE OF ENGINEERING (Autonomous) **R 2020**

SEMESTER - I

		L	T	P	C
20GE051	**HERITAGE OF TAMILS** (common to all branches)	1	0	0	1

Prerequisite(s): *No prerequisites are needed for enrolling into the course*

Course Outcomes : On successful completion of the course, the student will be able to		***Cognitive Level***
CO1:	*Recognize the extensive literature of Tamil and its classical nature.*	Understand
CO2:	*Apprehend the heritage of sculpture, painting and musical instruments of ancient people.*	Understand
CO3:	*Review on folk and martial arts of Tamil people.*	Understand
CO4:	*Insight thinai concepts, trade and victory of Chozha dynasty.*	Understand
CO5:	*Realize the contribution of Tamil in Indian freedom struggle, self-esteem movement and siddha medicine.*	Understand

UNIT - I LANGUAGE AND LITERATURE [03]

Language Families in India - Dravidian Languages – Tamil as a Classical Language - Classical Literature in Tamil – Secular Nature of Sangam Literature – Distributive Justice in Sangam Literature - Management Principles in Thirukural - Tamil Epics and Impact of Buddhism & Jainism in Tamil Land - Bakthi Literature Azhwars and Nayanmars - Forms of minor Poetry - Development of Modern literature in Tamil - Contribution of Bharathiyar and Bharathidhasan.

UNIT - II HERITAGE - ROCK ART PAINTINGS TO MODERN ART – SCULPTURE [03]

Hero stone to modern sculpture - Bronze icons - Tribes and their handicrafts - Art of temple car making - Massive Terracotta sculptures, Village deities, Thiruvalluvar Statue at Kanyakumari, Making of musical instruments - Mridhangam, Parai, Veenai, Yazh and Nadhaswaram - Role of Temples in Social and Economic Life of Tamils.

UNIT - III FOLK AND MARTIAL ARTS [03]

Therukoothu, Karagattam, Villu Pattu, Kaniyan Koothu, Oyillattam, Leather puppetry, Silambattam, Valari, Tiger dance - Sports and Games of Tamils.

UNIT - IV THINAI CONCEPT OF TAMILS [03]

Flora and Fauna of Tamils & Aham and Puram Concept from Tholkappiyam and Sangam Literature - Aram Concept of Tamils - Education and Literacy during Sangam Age - Ancient Cities and Ports of Sangam Age - Export and Import during Sangam Age - Overseas Conquest of Cholas.

UNIT - V CONTRIBUTION OF TAMILS TO INDIAN NATIONAL MOVEMENT AND INDIAN CULTURE [03]

Contribution of Tamils to Indian Freedom Struggle - The Cultural Influence of Tamils over the other parts of India – Self-Respect Movement - Role of Siddha Medicine in Indigenous Systems of Medicine – Inscriptions & Manuscripts – Print History of Tamil Books.

Total (L= 15, T = 0) = 15 Periods

Text Books :

1. Social Life of Tamils (Dr.K.K.Pillay) A joint Publication of TNTB & ESC and RMRL – (in print)
2. Historical Heritage of the Tamils (Dr.S.V.Subatamanian, Dr.K.D. Thirunavukarasu) (Published by : International Institute of Tamil Studies)

Reference Books :

1. Social Life of the Tamils – The Classical Period (Dr.S.Sigaravelu) (Published by: International Institute of Tamil Studies).
2. The Contribution of the Tamil to Indian Culture (Dr.M.Valarmathi) (Puplished by International Institute of Tamil Studies).
3. Keeladi – 'Sangam City Civilzation on the banks of river Vaigai; (Jointly Published by: Department of Archaeology & Tamilnadu Text Book and Educational Services Corporation, Tamilnadu)
4. Studies in the History of India with Special Reference to Tamilnadu (Dr.K.K.Pillay) (Published by: The Author)

K.S.R. COLLEGE OF ENGINEERING, TIRUCHENGODE – 637215

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

CO-PO MAPPING

Semester : I **Regulation : R 2020**

Course Code : 20GE051 **Course Name : Heritage of Tamils**

CO	Course Outcomes	Programme Outcomes													
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1:	*Recognize the extensive literature of Tamil and its classical nature.*	-	-	-	-	-	-	3	3	-	2	-	3	-	-
CO2:	*Apprehend the heritage of sculpture, painting and musical instruments of ancient people.*	-	-	-	-	-	-	3	3	-	2	-	3	-	-
CO3:	*Review on folk and martial arts of Tamil people.*	-	-	-	-	-	-	3	3	-	2	-	3	-	-
CO4:	*Insightthinai concepts, trade and victory of Chozha dynasty.*	-	-	-	-	-	-	3	3	-	2	-	3	-	-
CO5:	*Realize the contribution of Tamil in Indian freedom struggle, self-esteem movement and siddha medicine.*	-	-	-	-	-	-	3	3	-	2	-	3	-	-
	Average	-	-	-	-	-	-	**3**	**3**	**-**	**2**	**-**	**3**	-	**-**

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

K.S.R. COLLEGE OF ENGINEERING (Autonomous) **R 2020**

SEMESTER - I

		L	T	P	C
20GE051	**தமிழர்மரபு**				
	(**அனைத்து துறைகளுக்கும் பொதுவானது**)	1	0	0	1

முன்கூட்டிய துறைசார் அறிவு : தேவை இல்லை

	பாடம் கற்றத்தின் விளைவுகள் :பாடத்தை வெற்றிகரகமாக கற்று முடித்த பின்பு, மாணவர்களால் முடியும் விளைவுகள்	அறிவாற்றல் நிலை
CO1:	*தமிழ்மொழியின் செந்ததன்மை மற்றும் இலக்கியம் குறித்த தெரிதல்*	*புரிதல்*
CO2:	*தமிழர்களின் சிற்பக்கலை , ஓவியக்கலை மற்றும் இசைக் கருவிகள் குறித்த தெளிவு*	*புரிதல்*
CO3:	*தமிழர்களின் நாட்டுப் புரைக் கலைகள் மற்றும் வீரவிளையாட்டுகள் குறித்த தெளிவு*	*புரிதல்*
CO4:	*தமிழர்களின் திணைக் கோட்பாடுகள், சங்ககாலவணிகம் மற்றும் சோழர்களின் வெற்றிகள் குறித்த தகவல்கள் .*	*புரிதல்*
CO5:	*இந்திய தேசிய இயக்கம், சுயமரியாதை இயக்கம் மற்றும் சித்த ருத்தவம் பற்றிய புரிதல்.*	*புரிதல்*

அலகு – I **மொழி மற்றும் இலக்கியம்** **[03]**

இந்திய மொழிக் குடும்பங்கள் – திராவிட மொழிகள் – தமிழ் ஒரு செம்மொழி – தமிழ் செவ்விலயக்கிகியங்கள் – சங்க இலக்கியத்தின் சமயச்சார்பற்ற தன்மை – சங்க இலக்கியத்தில் பகிர்தல் அறம் – திருக்குறளில் மேலாண்மைக் கருத்துக்கள் – தமிழ் காப்பியங்கள், தமிழகத்தில் சமணபௌத்த சமயங்களின் தாக்கம் – பக்தி இலக்கியம், ஆழ்வார்கள் மற்றும் நாயன்மார்கள் – சிற்றிலகியங்கள் தமிழில் நவீன இலக்கியத்தின் வளர்ச்சி – தமிழ் இலக்கியவளர்ச்சியில் பாரதியார் மற்றும் பாரதிதாசன் ஆகியோரின் பங்களிப்பு.

அலகு – II **மரபு – பாறை ஓவியங்கள் முதல் நவீன ஓவியங்கள் வரை – சிற்பக் கலை** **[03]**

நடுகல் முதல் நவீன சிற்பங்கள் வரை – ஐம்பொன் சிலைகள் – பழங்குடியினர் மற்றும் அவர்கள் தயாரிக்கும் கைவினைப் பொருட்கள், பொம்மைகள் – தேர் செய்யும் கலை – சுடுமண் சிற்பங்கள் – நாட்டுப்புறத் தெய்வங்கள் – குமரிமுனியில் திருவள்ளுவர் சிலை – இசை கருவிகள் – மிருதங்கம், பறை. வீணை. யாழ். நாதஸ்வரம் – தமிழர்களின் சமூகபொருளாதார வாழ்வில் கோவில்களின் பங்கு.

அலகு – III **நாட்டுப் புறக் கலைகள் மற்றும் வீர விளையாட்டுக்கள்** **[03]**

தெருக்கூத்து, கரகாட்டம், வில்லுப்பாட்டு, கணியான் கூத்து, ஒயிலாட்டம், தோல்பாவை**க்** கூத்து, சிலம்பாட்டம், வளரி, புலியாட்டம், தமிழர்களின் விளையாட்டுகள்.

அலகு – IV **தமிழர்களின் திணைக் கோட்பாடுகள்** **[03]**

தமிழகத்தின் தாவரங்களும், விலங்குகளும் – தொல்காப்பியம் மற்றும் சங்க இலக்கியத்தில் அகம் மற்றும் புறக் கோட்பாடுகள் – தமிழர்கள் போற்றிய அறக்கோட்பாடு - சங்கக்காலத்தில் தமிழகத்தில் எழுத்தறிவும் கல்வியும் – சங்ககால நகரங்களும் துறை முகங்களும் – சங்ககாலத்தில் ஏற்றுமதி மற்றும் இறக்குமதி – கடல் கடந்த நாடுகளில் சோழர்களின் வெற்றி.

அலகு – V **இந்திய தேசிய இயக்கம் மற்றும் இந்திய பண்பாட்டிற்குத் தமிழர்களின் பங்களிப்பு** **[03]**

இந்திய விடுதலைப்போரில் தமிழர்களின் பங்கு – இந்தியாவின் பிறபகுதிகளில் தமிழ் பண்பாட்டின் தாக்கம் – சுயமரியாதை இயக்கம் – இந்திய மருத்துவத்தில் சித்தமருத்துவத்தின் பங்கு கல்வெட்டுகள் கையெழுத்துப்படிகள் - தமிழ்ப் புத்தகங்கள்களின் அச்சு வரலாறு.

Total (L= 15, T = 0) = 15 Periods

Text Books :

1 தமிழகவரலாறு-மக்களும்பண்பாடும்-கேகேபிள்ளை (வெளியீடு தமிழ்நாடு பாடநூல் மற்றும் கல்வியில் பணிகள் கழகம்) ,உலகத் தமிழாராய்ச்சி நிறுவனம், சென்னை, **2002**

2 கணினித்தமிழ்முனைவர் இல. சுந்தரம், விகடன் பிரசுரம், 2016

Reference Books :

1 கீழடி-வைகை நதிக்கரையில் சங்ககால நகரநாகரிகம்.(தொல்லியல்துறைவெளியீடு)

2 பொருநை – ஆற்றங்கரை நாகரிகம் (தொல்லியல் துறை வெளியீடு)

3 Social Life of Tamils (Dr.K.K.Pillay) A joint Publication of TNTB & ESC and RMRL – (in print)

4 Social Life of the Tamils – The Classical Period (Dr.S.Sigaravelu) (Published by: International Institute of Tamil Studies).

K.S.R. COLLEGE OF ENGINEERING, TIRUCHENGODE – 637215

CO-PO MAPPING

Semester : I **Regulation : R 2020**

Course Code: 20GE051 **Course Name: Heritage of Tamils**

CO	Course Outcomes	Programme Outcomes													
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1:	*தமிழ் மொழியின் செந்ததன்மை மற்றும் இலக்கியம் குறித்ததெரிதல்*	-	-	-	-	-	-	3	3	-	2	-	3	-	-
CO2:	*தமிழர்களின் சிற்பக்கலை , ஓவியக்கலை மற்றும் இசைக் கருவிகள் குறித்த தெளிவு*	-	-	-	-	-	-	3	3	-	2	-	3	-	-
CO3:	*தமிழர்களின் நாட்டுப்புரைக் கலைகள் மற்றும் வீரவிளையாட்டுகள் குறித்த தெளிவு*	-	-	-	-	-	-	3	3	-	2	-	3	-	-
CO4:	*தமிழர்களின் திணைக் கோட்பாடுகள், சங்ககால வணிகம் மற்றும் சோழர்களின் வெற்றிகள் குறித்த தகவல்கள்.*	-	-	-	-	-	-	3	3	-	2	-	3	-	-
CO5:	*இந்திய தேசிய இயக்கம், சுயமரியாதை இயக்கம் மற்றும் சித்த மருத்தவம் பற்றிய புரிதல்.*	-	-	-	-	-	-	3	3	-	2	-	3	-	-
	Average	-	-	-	-	-	-	3	3	-	2	-	3	-	-

1. சிறிது (குறைந்த) 2. மிதமான (நடுத்தர) 3. கணிசமான (உயர்)

K.S.R. COLLEGE OF ENGINEERING (Autonomous) **R 2020**

SEMESTER - II

		L	T	P	C
20EN251	**TECHNICAL ENGLISH – II (Common to all branches)**	3	0	0	3

Prerequisite: *No prerequisites are needed for enrolling into the course*

Course Objectives : On successful completion of the course, the student will be able to		***Cognitive Level***
CO1:	*Infer and apply the enriched vocabulary, by knowing the basic grammatical structure, in academic and professional contexts.*	*Understand*
CO2:	*Identify and use Standard English in diverse situations.*	*Apply*
CO3:	*Interpret by reading a text and comprehend a given text.*	*Create*
CO4:	*Organize and compose business letters.*	*Evaluate*
CO5:	*Prioritize the listening skill for academic and personal development purposes.*	*Apply*

UNIT - I **[09]**

Technical Vocabulary – Changing words from one form to another - Articles – Compound Nouns - Introducing Oneself – Biased Listening- Critical reading - Need based Correspondence (In plant training & Industrial Visit) - Context based meaning - Writing short Essays.

UNIT - II **[09]**

Prefixes & Suffixes - Numerical Adjectives – If Conditionals – Making Requests – Seeking Information - Listening for main ideas –Intensive Reading - E-mail Writing– Describing Likes & Dislikes - Report Writing.

UNIT - III **[09]**

Types of Collocations - Framing Questions – 'Wh' Question – Yes / No Question –Cause and Effect Expression - Greetings and Introductions — Inviting People - Listening and Note taking - Critical reading- Making inference - Transcoding (Interpretation of Charts).

UNIT - IV **[09]**

Common English idioms and phrases - Expression of Purpose – Editing text for Spelling and Punctuation - Oral Presentation – Extensive Listening - Short Comprehension Passages - Business Correspondence – Calling for Quotations, Seeking Clarification, placing order and Complaint .

UNIT - V **[09]**

Confused and misused words - Discourse markers – Redundancies - Instructions – Describing – Listening to fill up forms and gapped texts - Reading Short texts from Journals and Newspapers - Telephone Etiquette - Check list – Essay Writing.

Total (L= 40, T = 5) = 45 Periods

Text Books :

1 Dr.S.Sumant,Technical English II, Tata McGraw Hill, New Delhi, Second Edition, 2016

2 M Ashra Rizvi, Effective Technical Communication, Tata McGraw HILL, New Delhi, First Edition, 2004.

Reference Books :

1 Michael Swan, Practical English Usage, Oxford University Press, New Delhi, First Edition, 2015.

2 Dept. of Humanities and social sciences, Anna University, Chennai, English for Engineers and Technologists, Orient Longman, First Edition, 2014

3 Hory Sankar Mukerjee, Business Communication, Oxford University Press, New Delhi, First Edition, 2013.

4 Department of English, English for Technologists and Engineers, Orient Black Swan, Chennai, First Edition, 2016

K.S.R. COLLEGE OF ENGINEERING, TIRUCHENGODE – 637215
DEPARTMENT OF SCIENCE AND HUMANITIES

CO-PO MAPPING

Regulation : R 2020

Course Code: 20EN251 **Course Name : Technical English – II**

CO	Course Outcomes	Programme Outcomes													
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	*Infer and apply the enriched vocabulary, by knowing the basic grammatical structure, in academic and professional contexts.*	-	-	-	-	-	-	-	-	2	3	-	1	-	-
CO2	*Identify and use Standard English in diverse situations.*	-	-	-	-	-	-	-	-	2	3	-	1	-	-
CO3	*Interpret by reading a text and comprehend a given text.*	-	-	-	-	-	-	-	-	2	3	-	1	-	-
CO4	*Organize and compose business letters.*	-	-	-	-	-	-	-	-	2	3	-	1	-	-
CO5	*Prioritize the listening skill for academic and personal development purposes.*	-	-	-	-	-	-	-	-	2	3	-	1	-	-
	Average	**-**	**-**	**-**	**-**	**-**		**-**	**-**	**2**	**3**	**-**	**1**	-	**-**

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

`

K.S.R. COLLEGE OF ENGINEERING (Autonomous) **R 2020**

SEMESTER – II

		L	T	P	C
20MA242	**APPLIED MATHEMATICS** (Common to EC and EE)	3	1	0	4

Prerequisite: No prerequisites are needed for enrolling into the course

Course Outcomes : On Completion of this course, the student will be able to		**Cognitive Level**
CO1	*Solving the Laplace and inverse Laplace transform problems*	*Solve*
CO2	*Apply the ideas of analytic functions, conformal mapping and bilinear transformations.*	*Apply*
CO3	*Develop their skills in double and triple integrals*	*Remember*
CO4	*Solving the Fourier series problems.*	*Solve*
CO5	*Interpret the concepts of Fourier Transforms.*	*Understand*

UNIT– I LAPLACE TRANSFORMATION [12]

Laplace transform: Conditions for existence – Transform of elementary functions – Basic Properties – Transform of derivatives and integrals – Transform of periodic functions. Inverse Laplace transform: Partial Fraction Method - Convolution theorem (excluding proof) – Solution of linear ordinary differential equations of second order with constant coefficients.

UNIT – II COMPLEX VARIABLES [12]

Functions of a complex variable – Analytic functions – Necessary conditions, Cauchy – Riemann equation and Sufficient conditions (excluding proof) – Harmonic functions – Harmonic conjugate – Conformal mapping : w = cz, c+z, 1/z and bilinear transformations - Complex integration - Residues – Cauchy's residue theorem.

UNIT – III MULTIPLE INTEGRALS [12]

Double integration – Cartesian coordinates – Triple integration in Cartesian co-ordinates – Area as double integral – Volume as triple integral.

UNIT – IV FOURIER SERIES [12]

Dirichlet's conditions – General Fourier series - Odd and even functions – Half range sine and cosine series parseval's theorem – Harmonic analysis.

UNIT – V FOURIER TRANSFORMS [12]

Fourier integral theorem (without proof) - Fourier Transform pair – Sine and cosine transforms - Properties – Transforms of simple functions – Parseval's identity.

Total (L: 45 T:15) = 60 Periods

Text Books :

1 Veerarajan.T , Engineering Mathematics III, Tata McGraw Hill Publications, New Delhi, Fourth edition, 2016.

2 Dr.Grewal B.S, Higher Engineering Mathematics, Tata McGraw Hill Pub. Co, New Delhi , Forty fourth edition, 2018.

Reference Books :

1 Ravish R Singh and Mukul Bhatt, Engineering Mathematics II", McGraw Hill Publications, New Delhi, Third edition 2016.

2 Dr.P.Kandasamy, Dr.Thilagavathy and Dr.K.Gunavathy, Engineering Mathematics , S.Chand publication, New Delhi , 2006.

3 E.Kreyszig Advanced Engineering Mathematics , Wiley Publishers, Tenth edition, Reprint 2017.

4 Veerarajan. T , Engineering Mathematics For semester I and II, Tata McGraw Hill Publications, New Delhi, 2015

K.S.R. COLLEGE OF ENGINEERING, TIRUCHENGODE – 637215
DEPARTMENT OF SCIENCE AND HUMANITIES
CO-PO MAPPING

Regulation : R 2020

Course Code: 20MA242 **Course Name : Applied Mathematics**

CO	Course Outcomes	Programme Outcomes													
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	*Solving the Laplace and inverse Laplace transform problems*	3	3	3	3	-	-	-	-	-	-	-	-	-	-
CO2	*Apply the ideas of analytic functions, conformal mapping and bilinear transformations.*	3	3	3	3	-	-	-	-	-	-	-	-	-	-
CO3	*Develop their skills in double and triple integrals*	3	3	2	3	-	-	-	-	-	-	-	-	-	-
CO4	*Solving the Fourier series problems.*	3	3	3	3	-	-	-	-	-	-	-	-	-	-
CO5	*Interpret the concepts of Fourier Transforms.*	3	3	3	3	-	-	-	-	-	-	-	-	-	-
	Average	3	3	3	3	-	-	-	-	-	-	-	-	-	-

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

K.S.R. COLLEGE OF ENGINEERING (Autonomous) **R 2020**

SEMESTER – I

		L	T	P	C
20CH051	**ENGINEERING CHEMISTRY** (Common to All Branches)	3	0	0	3

Prerequisite: *NIL*

Course Outcomes : On Completion of this course, the student will be able to		***Cognitive Level***
CO1	*Make use of the manufacture, properties and uses of advanced engineering materials.*	*Understand*
CO2	*Explain the concept of corrosion and its control.*	*Understand*
CO3	*Use the concept of thermodynamics in engineering applications.*	*Understand*
CO4	*Recall the periodic properties such as ionization energy, electron affinity and electro negativity.*	*Remember*
CO5	*Analyze the usage of various spectroscopic techniques.*	*Understand*

UNIT– I ADVANCED ENGINEERING MATERIALS [9]

Abrasives – Moh's scale of hardness – types – natural [Diamond] – synthetic [SiC]; Refractories – characteristics – classifications [Acidic, basic and neutral refractories] – properties – refractoriness – RUL – porosity – thermal spalling; Lubricants – definition – function – characteristics – properties – viscosity index, flash and fire points, cloud and pour points, oiliness; Solid lubricants – graphite and MoS_2; Nano materials – CNT– synthesis [CVD, laser evaporation, pyrolysis] – applications – medicine, electronics, biomaterials and environment.

UNIT– II ELECTROCHEMISTRY AND CORROSION [9]

Introduction – electrode potential – Nernst equation – EMF series and its significance – types of cells (Electrolytic & electrochemical); Corrosion – causes, consequences – classification – chemical corrosion – electro chemical corrosion – mechanism; Galvanic & differential aeration corrosion – factors influencing corrosion – corrosion control – corrosion inhibitors.

UNIT– III CHEMICAL THERMODYNAMICS [9]

Terminology of thermodynamics – second law; Entropy – entropy change for an ideal gas – reversible and irreversible processes – entropy of phase transition – Clausius inequality; Free energy and work function – Helmholtz and Gibb's free energy functions – criteria of spontaneity; Gibb's – Helmholtz equation (Problems); Maxwell's relations – Van't Hoff isotherm and isochore.

UNIT– IV ATOMIC STRUCTURE AND CHEMICAL BONDING [9]

Effective nuclear charge – orbitals – variations of s, p, d and f orbital – electronic configurations – ionization energy – electron affinity and electro negativity; Types of bonding – ionic, covalent and coordination bonding – hydrogen bonding and its types; Crystal field theory – the energy level diagram for transition metal complexes ($[Fe(CN)_6]^{3-}$, $[Ni(CN)_4]^{2-}$ and $[CoCl_4]^{2-}$ only); Role of transition metal ions in biological system; Band theory of solids.

UNIT – V PHOTOCHEMISTRY AND SPECTROSCOPIC TECHNIQUES [9]

Laws of photochemistry – Grotthuss Draper law – Stark-Einstein law – Beer-Lambert law – phosphorescence – fluorescence and it's applications in medicine – chemiluminescence; Colorimetry – principle – instrumentation (block diagram only) – estimation of iron by colorimetry; principles of spectroscopy – selection rules – vibrational and rotational spectroscopy – applications; Flame photometry – principle – instrumentation (block diagram only) – estimation of sodium; Atomic absorption spectroscopy – principle – instrumentation (block diagram only) – estimation of nickel.

Total = 45 Periods

Text Books :

1 Dr. A. Ravikrishnan, Engineering Chemistry, Srikrishna Hi-tech Publishing Company Private Limited, Chennai, Seventeenth Edition, 2016.

2 P.C. Jain and Monica Jain, Engineering Chemistry, Dhanpat Rai Publishing company, New Delhi, Seventeenth Edition, 2015.

Reference Books :

1 S S. Dara and S. S. Umare, A Text book of Engineering Chemistry, S. Chand & Company Limited, New Delhi, Fifth Edition, 2015.

2 N. Krishnamurthy, P. Vallinayagam and D. Madhavan, Engineering Chemistry, PHI Learning Private Limited, New Delhi, Third Edition, 2014.

3 S. Vairam, P. Kalyani and Suba Ramesh, Engineering Chemistry, Wiley India Private Limited, New Delhi, First Edition, 2013.

4 B. Sivasankar, Engineering Chemistry, Tata McGraw – Hill Education Private Limited, New Delhi, First Edition, 2008.

K.S.R. COLLEGE OF ENGINEERING, TIRUCHENGODE – 637215
DEPARTMENT OF SCIENCE AND HUMANITIES
CO-PO MAPPING

Regulation : R 2020

Course Code: 20CH051 **Course Name : Engineering Chemistry**

CO	Course Outcomes	Programme Outcomes													
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	*Make use of the manufacture, properties and uses of advanced engineering materials.*	3	3	2	-	-	-	2	-	-	-	-	1	-	-
CO2	*Explain the concept of corrosion and its control.*	3	3	2	-	-	-	3	-	-	-	-	2	-	-
CO3	*Use the concept of thermodynamics in engineering applications.*	3	3	2	-	-	-	2	-	-	-	-	2	-	-
CO4	*Recall the periodic properties such as ionization energy, electron affinity and electro negativity.*	3	3	2	-	-	-	2	-	-	-	-	1	-	-
CO5	*Analyze the usage of various spectroscopic techniques.*	3	3	2	-	-	-	3	-	-	-	-	1	-	-
	Average	**3**	**3**	**2**		**-**	**-**	**3**	**-**	**-**	**-**	**-**	**1**	**-**	**-**

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

K.S.R. COLLEGE OF ENGINEERING (Autonomous) **R 2020**

SEMESTER – II

		L	T	P	C
20CS241	**PYTHON PROGRAMMING** (Common to AU, CE, EE, EC, ME & SF)	3	0	0	3

Prerequisite: *Basic knowledge of C programming.*

Course Outcomes : On successful completion of the course, the student will be able to		***Cognitive Level***
CO1:	*Illustrate basic concepts of python programming.*	*Understand*
CO2:	*Apply the necessary data structures includes list, tuple and dictionary in the required fields.*	*Apply*
CO3:	*Analyze, design and implement the problems using OOPs technology*	*Analyze*
CO4:	*Demonstrate the simple file operations*	*Evaluate*
CO5:	*Design web site using GUI.*	*Create*

UNIT – I FUNDAMENTALS OF PYTHON [9]

Introduction to Python – Advantages of Python programming – Variables and Data types – Comments – I/O function – Operators – Selection control structures – Looping control structures – Functions: Declaration – Types of arguments – Anonymous functions: Lambda.

UNIT – II DATA STRUCTURES AND PACKAGES [9]

Strings – List – Tuples – Dictionaries – Sets – Exception Handling: Built-in Exceptions – User-defined exception– Modules and Packages.

UNIT – III OBJECT ORIENTED PROGRAMMING [9]

Object Oriented Programming basics – Inheritance and Polymorphism – Operator Overloading and Overriding – Get and Set Attribute Values – Name Mangling – Duck Typing – Relationships.

UNIT – IV FILES AND DATA BASES [9]

File I/O operations – Directory Operations – Reading and Writing in Structured Files: CSV and JSON – Data manipulation using Oracle, MySQL and SQLite.

UNIT – V GUI AND WEB [9]

UI design: Tkinter – Events – Socket Programming – Sending email – CGI: Introduction to CGI Programming, GET and POST Methods, File Upload.

Total = 45 Periods

Text Books :

1 Mark Lutz, “Learning Python”, O'Reilly Media, Fifth Edition, 2013

2 Wesley J.Chun, “Core Python Programming”, Pearson Education, Second Edition, 2017

References :

1 Bill Lubanovic, "Introducing Python Modern Computing in Simple Packages", O'Reilly Media, First Edition, 2014.

2 David Beazley, Brian K. Jones, "Python Cookbook", O'Reilly Media, Third Edition, 2013

3 Mark Lutz, “Python Pocket Reference”, O'Reilly Media, Fifth Edition, 2014

4 www.python.org and www.diveintopython3.net

5 To practice: www.codeacademy.com and https://codingbat.com/python

K.S.R. COLLEGE OF ENGINEERING, TIRUCHENGODE – 637215
DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING
CO-PO MAPPING

Regulation : R 2020

Course Code: 20CS241 **Course Name : Python Programming**

CO	Course Outcomes	Programme Outcomes													
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	*Illustrate basic concepts of python programming.*	3	3	2	2	1	-	-	-	-	-	-	-	3	2
CO2	*Apply the necessary data structures includes list, tuple and dictionary in the required fields.*	3	3	3	2	2	-	-	-	-	-	-	-	3	2
CO3	*Analyze, design and implement the problems using OOPs technology*	3	3	3	2	2	-	-	-	-	-	-	-	3	2
CO4	*Demonstrate the simple file operations*	3	3	3	3	2	-	-	-	-	-	-	-	3	3
CO5	*Design web site using GUI.*	3	3	3	3	2	-	-	-	-	-	-	-	3	3
	Average	**3**	**3**	**3**	**2**	**2**	-	-	-	-	-	-	-	**3**	**2**

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

K.S.R. COLLEGE OF ENGINEERING (Autonomous) **R 2020**

SEMESTER - II

		L	T	P	C
20EC215	**ELECTRIC CIRCUITS**	3	0	0	3

Prerequisite: *Engineering Mathematics-I, Engineering Physics*

Course Outcomes: On Completion of this course, the student will be able to ***Cognitive level***

CO1	*Apply KCL, KVL to solve the electric circuits and to find current and voltage at particular node or branch.*	*Apply*
CO2	*Apply network theorems to convert complex circuits into simple circuits to find voltage, current and power for DC circuits.*	*Apply*
CO3	*Interpret the circuit response for RL, RC, and RLC for AC circuits with its phasor diagram.*	*Apply*
CO4	*Apply the transient behavior for RL, RC, and RLC for DC and Sinusoidal inputs.*	*Apply*
CO5	*Identify the phase response for three phase circuits employing balanced and unbalanced loads.*	*Apply*

UNIT - I DC NETWORK ANALYSIS [9]

Basic components and electric networks, charge, current, voltage and power, voltage and current sources, Ohms law, Kirchhoff's laws, analysis of series and parallel networks, voltage and current division, networks reduction, nodal and mesh analysis for linear resistive networks, an introduction to network topology.

UNIT - II NETWORK THEOREMS AND DUALITY [9]

Linearity and Non-Linearity, Superposition Theorem, Thevenin's Theorem, Norton's Theorem, Maximum Power Transfer Theorem, Reciprocity Theorem, Star - Delta Transformation. Duals, Dual Networks.

UNIT - III SINUSOIDAL STEADY STATE ANALYSIS [9]

Sinusoidal Steady State analysis, Characteristics of Sinusoids, AC Network Power Analysis, Instantaneous Power, Average Power, Apparent Power and Power Factor. Phase Relationship for R, L, and C, Analysis of Simple Series and Parallel AC Networks with Phasor Diagram.

UNIT - IV TRANSIENTS AND RESONANCE IN RLC NETWORKS [9]

Transient Response of RL, RC and RLC Networks for DC Input and Sinusoidal Inputs, Series and Parallel Resonance, Frequency Response, Quality Factor, Bandwidth, Half Power Frequencies.

UNIT - V COUPLED NETWORKS AND THREE PHASE SYSTEMS [9]

Magnetically Coupled Networks: Self-Inductance, Mutual Inductance, Co-efficient of Coupling, Single and Double Tuned Networks, Analysis and Applications, Analysis of 3 Phase 3 Wire and 4 Wire Systems with Star and Delta Connected Loads (balanced & Unbalanced), 3 Phase Power Measurement by Two-Watt Meter Method.

Total (L: 45) = 45 Periods

Text Books :

1 Joseph A.Edminister, Mahmood Nahri, Electric Circuits, Schaum's Series, Tata McGraw-Hill, New Delhi, 2001.

2 David A. Bell, Fundamentals of Electric Circuits, Oxford University press, Seventh edition 2009.

Reference Books :

1 W.H.Hayt, J.E.Kemmarly, S.M.Durbin, Engineering Circuit Analysis, McGraw- Hill, New Delhi, Eighth Edition 2013.

2 Charles K. Alexander & Mathew N.O.Sadiku, Fundamentals of Electric Networks, McGraw- Hill New Delhi, Fifth edition, 2013.

3 A.Sudhakar and S.P.Shyam Mohan, Circuits and Network Analysis and Synthesis, Tata McGraw Hill, Fifth edition 2017.

4 Chakrabati A, Circuits Theory Analysis and synthesis, Dhanpath Rai & Sons, New Delhi, Sixth edition 2018.

5 NPTEL Course Link : http://nptel.ac.in/courses/108102042/

K.S.R. COLLEGE OF ENGINEERING, TIRUCHENGODE – 637215
DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING
CO-PO MAPPING

Regulation : R 2020

Course Code: 20EC215 **Course Name : Electric Circuits**

CO	Course Outcomes	Programme Outcomes													
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	*Apply KCL, KVL to solve the electric circuits and to find current and voltage at particular node or branch.*	3	3	3	-		2	-	-	-	-	-	2	1	-
CO2	*Apply network theorems to convert complex circuits into simple circuits to find voltage, current and power for DC circuits.*	3	3	3	-	-	2	-	-	-	-	-	**2**	**1**	-
CO3	*Interpret the circuit response for RL, RC, and RLC for AC circuits with its phasor diagram.*	3	3	3	-	-	2	-	-	-	-	-	**2**	**1**	-
CO4	*Apply the transient behavior for RL, RC, and RLC for DC and Sinusoidal inputs.*	3	3	3	-	-	2	-	-	-	-	-	**2**	**1**	-
CO5	*Identify the phase response for three phase circuits employing balanced and unbalanced loads.*	3	3	3	-	-	2	-	-	-	-	-	2	1	-
	Average	**3**	**3**	**3**	**-**	**-**	**2**	**-**	**-**	**-**	**-**	**-**	**2**	**1**	**-**

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

K.S.R. COLLEGE OF ENGINEERING (Autonomous) **R 2020**

SEMESTER – II

		L	T	P	C
20CH028	**CHEMISTRY LABORATORY** (Common To All Branches)	0	0	3	1

Prerequisite: *NIL*

Course Outcomes: On Completion of this course, the student will be able to

		Cognitive level
CO1	*Apply the principle of conductometric titration.*	*Understand*
CO2	*Relate the role of pH in quantitative analysis of a solution.*	*Understand*
CO3	*Perceive the knowledge of the concentration of Iron by electrochemical methods.*	*Understand*
CO4	*Analyze the application of water in various fields.*	*Understand*
CO5	*Recall the nature of corrosion process.*	*Remember*

LIST OF EXPERIMENTS:

1. Conductometric Titration – Strong Acid Vs. Strong Base.
2. Conductometric Titration – Mixture of Weak and Strong Acids Vs. Strong Base.
3. Conductometric Titration – Precipitation, $BaCl_2$ Vs. Na_2SO_4.
4. Estimation of Ferrous ion by Potentiometry – Fe^{2+} Vs $K_2Cr_2O_7$.
5. Estimation of Hydrochloric Acid by pH metry.
6. Estimation of Iron by Spectrophotometry.
7. Estimation of hardness in water by EDTA method.
8. Estimation of chloride in water sample by Argentometry.
9. Estimation of dissolved oxygen (DO) in water by Winkler's method.
10. Determination of rate of corrosion of mild steel by weight loss method.

Total : 30 Periods

Text Book :

1 Department of Chemistry Staff members, Chemistry Laboratory Manual, K.S.R. College of Engineering, Tiruchengode, Fourth Edition, 2020.

2 I. Vogel, Vogel's Textbook of Quantitative Chemical Analysis, John Wiley & sons, Newyork, Eighth Edition, 2014.

Reference Books :

1 S. K. Bhasin and Sudha Rani, Laboratory Manual of Engineering Chemistry, Dhanpat Rai Publishing Company Private Limited, New Delhi, Third Edition, 2012.

2 I. Vogel and J. Mendham, Vogel's Textbook of Quantitative Chemical Analysis, Harlow, Prentice Hall, Sixth Edition, 2000.

3 G.H. Jeffery, J. Bassett, J. Mendham and R.C. Denny, Vogel's Text book of quantitative analysis chemical analysis, Longman, Singapore publishers, Singapore, ELBS Fifth Edition, 1996.

4 B.S. Furniss, A.J, Hannaford, P.W.G. Smith and A.R. Tatchel, Vogels Textbook of practical organic chemistry, John Wiley & sons, Newyork, Fifth Edition, 1989.

K.S.R. COLLEGE OF ENGINEERING, TIRUCHENGODE – 637215
DEPARTMENT OF SCIENCE AND HUMANITIES
CO-PO MAPPING

Regulation : R 2020

Course Code: 20CH028 **Course Name : Chemistry Laboratory**

CO	Course Outcomes	Programme Outcomes													
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	*Apply the principle of conductometric titration.*	3	3	3	-	-	2	-	1	2	-	-	1	-	-
CO2	*Relate the role of pH in quantitative analysis of a solution.*	3	2	3	-	-	1	-	1	2	-	-	1	-	-
CO3	*Perceive the knowledge of the concentration of Iron by electrochemical methods.*	3	1	3	-	-	1	-	1	2	-	-	1	-	-
CO4	*Analyze the application of water in various fields.*	3	2	2	-	-	1	-	1	2	-	-	1	-	-
CO5	*Recall the nature of corrosion process.*	3	2	3	-	-	1	-	1	2	-	-	1	-	-
	Average	**3**	**2**	**3**	**-**	**-**	**1**	**-**	**1**	**2**	**-**	**-**	**1**	**-**	**-**

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

K.S.R. COLLEGE OF ENGINEERING (Autonomous) **R 2020**

SEMESTER – II

		L	T	P	C
20CS227	**PYTHON PROGRAMMING LABORATORY** (Common to AU, CE, EE, EC, ME & SF)	0	0	3	1

Prerequisite: *Basic knowledge of C programming.*

Course Outcomes : On successful completion of the course, the student will be able to		***Cognitive Level***
CO1:	*Design simple programs using conditionals and loops.*	*Apply*
CO2:	*Write functions to solve mathematical problems.*	*Understand*
CO3:	*Demonstrate the use of files in python.*	*Analyze*
CO4:	*Develop simple applications using python.*	*Create*
CO5:	*Construct GUI applications using python programming.*	*Create*

List of Experiments

1. Write a program to display the largest number among three numbers.
2. Write a program to check the prime number and to display the twin prime numbers.
3. Write a program to display the Fibonacci series and multiplication table by using looping constructs.
4. Write a program for converting decimal to octal, hexadecimals and vice versa by using functions.
5. Write a function to compute the GCD of two numbers.
6. Write a function to perform sorting list of numbers.
7. With the help of string array or list, display a simple calendar in python program without using the calendar module.
8. Demonstrate class and inheritance in python.
9. Create a text file using python file I/O. Read the content of the file and change them from lower to upper case characters. Write the updated content in another file and display it.
10. Write a program to demonstrate the user-defined exception handling mechanism in Python.
11. Design and implement a graphical user interface to perform any arithmetic operation.
12. Write a python program to insert and retrieve data using MySQL.

Total : 45 Periods

K.S.R. COLLEGE OF ENGINEERING, TIRUCHENGODE – 637215
DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING
CO-PO MAPPING

Regulation : R 2020

Course Code: 20CS227 **Course Name : Python Programming Laboratory**

CO	Course Outcomes	Programme Outcomes													
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	*Design simple programs using conditionals and loops.*	2	3	3	2	2	-	-	-	-	-	-	-	3	1
CO2	*Write functions to solve mathematical problems.*	3	3	3	2	2	-	-	-	-	-	-	-	**3**	**1**
CO3	*Demonstrate the use of files in python.*	3	3	3	2	2	-	-	-	-	-	-	-	**3**	**1**
CO4	*Develop simple applications using python.*	3	3	3	1	3	-	-	-	-	-	-	-	**3**	**1**
CO5	*Construct GUI applications using python programming.*	3	3	3	1	3	-	-	-	-	-	-	-	3	1
	Average	**3**	**3**	**3**	**2**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**3**	**1**

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

K.S.R. COLLEGE OF ENGINEERING (Autonomous) **R 2020**

SEMESTER - II

		L	T	P	C
20GE028	**MANUFACTURING PRACTICES LABORATORY** (Common to All Branches)	0	0	3	1

Prerequisite: *No Prerequisites are needed for enrolling into the course.*

Course Outcomes : On successful completion of the course, the student will be able to		***Cognitive Level***
CO1:	*Prepare green sand mould for simple patterns and carpentry components with simple joints.*	*Create*
CO2:	*Perform welding practice to join simple structures.*	*Apply*
CO3:	*Practice simple operations in lathe and drilling machine.*	*Understand*

GROUP A (CIVIL & MECHANICAL)

LIST OF EXPERIMENTS

1. Study of fitting, smithy, plastic moulding and glass cutting.
2. Prepare a mould using solid/split patterns in Foundry.
3. Make Lap joint / Butt joint / T joint from the given wooden pieces using carpentry tools.
4. Make a Butt joint / Lap joint / Tee joints using arc / gas welding equipment.
5. Perform simple Facing and Turning operation using Centre Lathe.
6. Make holes as per the given dimensions using drilling machine.

LIST OF EQUIPMENT

1. Fitting tools and its accessories - 15 Sets
2. Smithy tools and Open hearth furnace setup - 2 Sets
3. Foundry tools and its accessories - 5 Sets
4. Carpentry tools and its accessories - 15 Sets
5. Arc Welding equipments and its accessories - 5 Sets
6. Oxy Acetylene welding setup and its accessories - 1 Set
7. Centre Lathe with its accessories - 2 Nos.
8. Pillar type drilling machine - 1 No.

K.S.R. COLLEGE OF ENGINEERING, TIRUCHENGODE – 637215
DEPARTMENT OF AUTOMOBILE ENGINEERING
CO-PO MAPPING

Regulation : R 2020

Course Name : Manufacturing Practices Laboratory Group A (Civil & Mechanical)

Course Code: 20GE028

CO	Course Outcomes	Programme Outcomes													
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1:	*Prepare green sand mould for simple patterns and carpentry components with simple joints.*	2	-	-	3	-	-	-	3	1	-	-	3	3	1
CO2:	*Perform welding practice to join simple structures.*	2	-	-	3	-	-	-	3	1	-	-	3	3	1
CO3:	*Practice simple operations in lathe and drilling machine.*	2	-	-	3	-	-	-	3	1	-	-	3	3	1
	Average	**2**	**-**	**-**	**3**	**-**	**-**	**-**	**3**	**1**			**3**	**3**	**1**

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

K.S.R. COLLEGE OF ENGINEERING (Autonomous) **R 2020**

SEMESTER – II

		L	T	P	C
20GE028	**GROUP B (ELECTRICAL & ELECTRONICS)** (Common to all Branches)	0	0	3	1

Prerequisite: *No prerequisites are needed for enrolling into the course*

Course Outcomes: On Completion of this course , the student will be able to		***Cognitive level***
CO1	*Construct different types of wiring used in house.*	*Understand*
CO2	*Calibrate single phase Energy meter.*	*Understand*
CO3	*Demonstrate different electronic components, logic gates and CRO.*	*Understand*

List of Experiments:

ELECTRICAL ENGINEERING

1. Fluorescent lamp wiring & Stair-case wiring.
2. Residential house wiring using switches, fuse, indicator, lamp and fan.
3. Calibration of Single phase Energy meter

ELECTRONICS ENGINEERING

1. Study of Electronic components and Soldering practice.
2. Study of logic gates AND, OR, EX-OR, NOT, Half and Full Adder.
3. Study of CRO

Total : 45 Periods

K.S.R. COLLEGE OF ENGINEERING, TIRUCHENGODE – 637215
DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING
CO-PO MAPPING

Regulation : R 2020

Course Name : Manufacturing Practices Laboratory

Course Code: 20GE028

Group B (Electrical & Electronics)

CO	**Course Outcomes**	**Programme Outcomes**													
		PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	*Construct different types of wiring used in house*	3	2	3	-	-	-	-	1	1	-	-	3	-	-
CO2	*Calibrate single phase Energy meter*	3	1	2	-	-	-	-	1	1	-	-	3	-	-
CO3	*Demonstrate different electronic components, logic gates and CRO*	3	2	3	-	-	-	-	1	1	-	-	3	-	-
	Average	**3**	**2**	**3**	**-**	**-**	**-**	**-**	**1**	**1**	**-**	**-**	**3**	**-**	**-**

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

K.S.R. COLLEGE OF ENGINEERING (Autonomous) **R 2020**

SEMESTER – II

		L	T	P	C
20EC221	**ELECTRIC CIRCUITS LABORATORY**	0	0	3	1

Prerequisites: *Engineering Mathematics-I, Engineering Physics*

Course Outcomes: On Completion of this course , the student will be able to		***Cognitive level***
CO1:	*Apply KCL, KVL to solve electric circuits and verify with theoretical value.*	*Apply*
CO2:	*Translate the complex circuit into simple circuit to find voltage, current and power for DC circuits using network theorems and verify with theoretical value*	*Apply*
CO3:	*Construct a series and parallel resonant circuit and plot its frequency response.*	*Apply*
CO4:	*Analyze the transient behavior for RL, RC with DC and sinusoidal input.*	*Analyze*
CO5:	*Analyze single phase AC circuits to measure voltage, current, power and power factor.*	*Analyze*

List of Experiments:

1. Verification of ohm's laws and Kirchhoff's laws
2. Verification of mesh and nodal analysis.
3. Verification of Thevenin's and Norton's theorems
4. Verification of Superposition theorem
5. Verification of Maximum power transfer theorem
6. Verification of Reciprocity theorem.
7. Transient response of RL and RC circuits for DC and AC inputs
8. Frequency response of series and parallel resonance circuits
9. Measurement of self-inductance of a coil
10. Measurement of voltage, current power and power factor in single phase AC circuits
11. Measurement of energy using single phase energy meter.
12. Study of frequency response of single tuned coupled circuits.

Total = 45 Periods

K.S.R. COLLEGE OF ENGINEERING, TIRUCHENGODE – 637215
DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING
CO-PO MAPPING

Regulation : R 2020

Course Code: 20EC221 **Course Name : Electric Circuits Laboratory**

CO	Course Outcomes	Programme Outcomes													
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	*Apply KCL, KVL to solve electric circuits and verify with theoretical value.*	3	3	3	-	-	-	-	-	3	-	-	2	1	-
CO2	*Translate the complex circuit into simple circuit to find voltage, current and power for DC circuits using network theorems and verify with theoretical value.*	3	3	3	-	-	-	-	-	3	-	-	2	1	-
CO3	*Construct a series and parallel resonant circuit and plot its frequency response.*	3	3	3	-	-	-	-	-	3	-	-	2	1	-
CO4	*Analyze the transient behavior for RC, RL with DC and AC input.*	3	3	3	-	-	-	-	-	3	-	-	2	1	-
CO5	*Analyze single phase AC circuits to measure voltage, current, power and power factor.*	3	3	3	-	-	-	-	-	3	-	-	2	1	-
	Average	**3**	**3**	**3**	**-**	**-**	**-**	**-**	**-**	**3**	**-**	**-**	**2**	**1**	**-**

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

K.S.R. COLLEGE OF ENGINEERING (Autonomous) **R 2020**

SEMESTER - II

		L	T	P	C
20GE052	**TAMILS AND TECHNOLOGY** (Common to All Branches)	1	0	0	1

Prerequisite(s): *No prerequisites are needed for enrolling into the course*

Course Outcomes : On successful completion of the course, the student will be able to		***Cognitive Level***
CO1:	*Understand the weaving and ceramic technology of ancient Tamil People nature.*	*Understand*
CO2:	*Comprehend the construction technology, building materials in sangam Period and case studies.*	*Understand*
CO3:	*Infer the metal process, coin and beads manufacturing with relevant archeological evidence*	*Understand*
CO4:	*Realize the agriculture methods, irrigation technology and pearl diving.*	*Understand*
CO5:	*Apply the knowledge of scientific Tamil and Tamil computing.*	*Apply*

UNIT - I WEAVING AND CERAMIC TECHNOLOGY [03]

Weaving Industry during Sangam Age – Ceramic technology – Black and Red Ware Potteries (BRW) – Graffiti on Potteries.

UNIT - II DESIGN AND CONSTRUCTION TECHNOLOGY [03]

Designing and Structural construction House & Designs in household materials during Sangam Age – Building materials and Hero stones of Sangam age – Details of Stage Constructions in Silappathikaram– Sculptures and Temples of Mamallapuram– Great Temples of Cholas and other worship places – Temples of Nayaka Period – Type study (Madurai Meenakshi Temple) –ThirumalaiNayakar Mahal –Chetti Nadu Houses, Indo –Saracenic architecture at Madras during British Period.

UNIT - III MANUFACTURING TECHNOLOGY [03]

Art of Ship Building – Metallurgical studies – Iron industry – Iron smelting, steel – Copper and gold – Coins as source of history – Minting of Coins – Beads making – industries Stone beads – Glass beads –Terracotta beads –Shell beads/ bone beats – Archeological evidences – Gem stone types described in Silappathikaram.

UNIT - IV AGRICULTURE AND IRRIGATION TECHNOLOGY [03]

Dam, Tank, ponds, Sluice, Significance of KumizhiThoompu of Chola Period, Animal Husbandry – Wells designed for cattle use – Agriculture and Agro Processing – Knowledge of Sea – Fisheries – Pearl – Conche diving – Ancient Knowledge of Ocean – Knowledge Specific Society.

UNIT - V SCIENTIFIC TAMIL & TAMIL COMPUTING [03]

Development of Scientific Tamil – Tamil computing – Digitalization of Tamil Books – Development of Tamil Software – Tamil Virtual Academy – Tamil Digital Library – Online Tamil Dictionaries – Sorkuvai Project.

Total (L= 15, T = 0) = 15 Periods

Text Books :

1 Social Life of Tamils (Dr.K.K.Pillay) A joint Publication of TNTB & ESC and RMRL – (in print)
2 Social Life of the Tamils – The Classical Period (Dr.S.Sigaravelu) (Published by: International Institute of Tamil Studies).

Reference Books :

1 Historical Heritage of the Tamils (Dr.S.V.Subatamanian, Dr.K.D. Thirunavukarasu) (Published by : International Institute of Tamil Studies)
2 The Contribution of the Tamils to Indian Culture (Dr.M.Valarmathi)(Puplished by International Institute of Tamil Studies).
3 Keeladi – 'Sangam City Civilzation on the banks of river Vaigai; (Jointly Published by: Department of Archaeology &Tamilnadu Text Book and Educational Services Corporation, Tamilnadu)
4 Studies in the History of India with Special Reference to Tamilnadu (dr.K.K.Pillay) (Published by : The Author)

K.S.R. COLLEGE OF ENGINEERING, TIRUCHENGODE – 637215
DEPARTMENT OF SCIENCE AND HUMANITIES
CO-PO MAPPING

Regulation : R 2020

Course Code: 20GE052 **Course Name : Tamils and Technology**

CO	Course Outcomes	Programme Outcomes													
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1:	*Understand the weaving and ceramic technology of ancient Tamil People nature.*	-	-	-	-	-	-	3	3	-	2	-	3	-	-
CO2:	*Comprehend the construction technology, building materials in sangam Period and case studies.*	-	-	-	-	-	-	3	3	-	2	-	3	-	-
CO3:	*Infer the metal process, coin and beads manufacturing with relevant archeological evidence*	-	-	-	-	-	-	3	3	-	2	-	3	-	-
CO4:	*Realize the agriculture methods, irrigation technology and pearl diving.*	-	-	-	-	-	-	3	3	-	2	-	3	-	-
CO5:	*Apply the knowledge of scientific Tamil and Tamil computing.*	-	-	-	-	-	-	3	3	-	2	-	3	-	-
	Average	**-**	**-**	**-**	**-**	**-**	**-**	**3**	**3**	**-**	**2**	**-**	**3**	**-**	**-**

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

K.S.R. COLLEGE OF ENGINEERING (Autonomous) **R 2020**

SEMESTER - II

		L	T	P	C
20GE052	**தமிழரும் தொழில் நுட்பமும்** (**அனைத்து துறைகளுக்கும் பொதுவானது**)	1	0	0	1

முன் கூட்டிய துறைசார் அறிவு : தேவை இல்லை

	பாடம் கற்றத்தின் விளைவுகள் : பாடத்தை வெற்றிகரகமாக கற்று முடித்த பின்பு, மாணவர்களால் முடியும் விளைவுகள்	அறிவாற்றல் நிலை
CO1:	*சங்ககாலத் தமிழிர்களின் நெசவு மற்றும் பானைவனைதல் தொழில் நுட்பம் குறித்து கற்றுணர்தல்*	*புரிதல்*
CO2:	*சங்ககாலத் தமிழிர்களின் கட்டிட தொழில் நுட்பம் கட்டுமான பொருட்கள் மற்றும் அவற்றை விளகும் தளங்கள் குறித்து அறிவு*	*புரிதல்*
CO3:	*சங்ககாலத் தமிழிர்களின் உலோகத் தொழில், நாணயங்கள் மற்றும் மணிகள் சார்ந்த தொல்லியல் சான்றுகள் பற்றிய அறிவு*	*புரிதல்*
CO4:	*சங்ககாலத் தமிழிர்களின் வேளாண்மை, நீர்ப்பாசன முறைகள் மற்றும் முத்து குளித்தல் குறித்த தெளிவு*	*புரிதல்*
CO5:	*நவீன அறிவியல் தமிழ் மற்றும் கன்னி தமிழ் குறித்த புரிந்துகொள்ளலும் மற்றும் பயன்படுத்தலும்*	*பகுப்பாய்வு*

அலகு – I நெசவு மற்றும் பானைத் தொழில்நுட்பம் **[03]**

சங்ககாலத்தில் நெசவுத் தொழில் – பானைத் தொழில்நுட்பம் கருப்பு சிவப்பு பாண்டங்கள்– பாண்டகளில் கீறல் குறியீடுகள்

அலகு – II வடிவமைப்பு மற்றும் கட்டிடத் தொழில்நுட்பம் **[03]**

சங்ககாலத்தில் வடிவமைப்பு ற்றும் கட்டுமானங்கள் & சங்க காலத்தில் வீட்டுப் பொருட்களில் வடிவமைப்பு – சங்க காலத்தில் கட்டுமானப் பொருட்களும் நடுகல்லும்–சிலப்பதிகாரத்தில் மேடை அமைப்பு பற்றிய விவரங்கள்–மாமல்லபுரச் சிற்பங்களும், கோவில்களும்–சோழர்காலத்துப் பெருங்கோயில்கள் மற்றும் பிற வழிபாட்டுத் தலங்கள்–நாயக்கர் காலக்கோயில்கள்–மாதிரி கட்டமைப்புகள் பற்றி அறிதல், மதுரை மீனாட்சி அம்மன்ஆலய ் ற்றும் திருமலைநாயக்கர்மஹால் – செட்டிநாட்டுவீடுகள்–பிரிட்டிஷ்காலத்தில் சென்னை இந்தோ-சாரோசெனிக் கட்டிடக் கலை.

அலகு – III உற்பத்தித் தொழில்நுட்பம் **[03]**

கப்பல் கட்டும் கலை–உலோகவியல்–இரும்புத்தொழிற்சாலை–இரும்பை உருக்குதல், எஃகு–வரலாற்றுச்சான்றுகளாக செம்பு மற்றும் தங்கநாணயங்கள்–நாணயங்கள் அச்சடித்தல்–மணி உருவாக்கு ் தொழிற்சாலைகள்–கல் மணிகள்–கண்ணாடி மணிகள்–சுடு ண்மணிகள்–சங்குமணிகள்–எலும்புத்துண்டுகள்–தொல்லியல் சான்றுகள்–சிலப்பதிகாரத்தில் மணிகளின் வகைகள்.

அலகு – IV வேளாண்மை மற்றும் நீர்ப் பாசனத் தொழில்நுட்பம் **[03]**

அணை,ஏரி,குளங்கள்,மதகு–சோழர்காலகுமிழித்தூம்பின் முக்கியத்துவம்–கால்நடை பராமரிப்பு–கால்நடைகளுக்காக வடிவமைக்கப்பட்ட கிணறுகள்–வேளாண்மை மற்றும் வேளாண்மை சார்ந்த செயல்பாடுகள்–கடல்சார் அறிவு – மீன் வளம்–முத்து ற்றும் முத்துக் குளித்தல்–பெருங்கடல் குறித்த பண்டைய அறிவு–அறிவுசார் சமூகம்.

அலகு – V அறிவியல் தமிழ் மற்றும் கணினித்தமிழ் **[03]**

அறிவியல் தமிழின் வளர்ச்சி– கணினித்தமிழ் வளர்ச்சி–தமிழ் நூல்களை மின்பதிப்பு செய்தல்–தமிழ் மென் பொருட்கள் உருவாக்கம்–தமிழ் இணையக்கல்விக் கழகம்–தமிழ் மின்நூலகம்–இணையத்தில் தமிழ் அகராதிகள் சொற்குவைத் திட்டம்.

Total (L= 15, T = 0) = 15 Periods

Text Books :

1 தமிழகவரலாறு- க்களும் பண்பாடும்- கேகேபிள்ளை (வெளியீடு தமிழ்நாடு பாடநூல் மற்றும் கல்வியில் பணிகள் கழகம்)

2 கணினித்தமிழ் - முனைவர் இல. சுந்தரம் (விகடன் பிரசுரம்)

Reference Books :

1 கீழடி- வைகை நதிக்கரையில் சங்ககால நகரநாகரிகம்.(தொல்லியல் துறை வெளியீடு)

2 பொருநை – ஆற்றங்கரை நாகரிகம் (தொல்லியல் துறை வெளியீடு)

3 Studies in the History of India with Special Reference to Tamilnadu (Dr.K.K.Pillay) (Published by : The Author)

4 Porunai Civilization (Jointly Published by: Department of Archaeology &Tamilnadu Textbook and Educational Services Corporation, Tamilnadu)

K.S.R. COLLEGE OF ENGINEERING, TIRUCHENGODE – 637215
DEPARTMENT OF SCIENCE AND HUMANITIES
CO-PO MAPPING

Regulation : R 2020

Course Code: 20GE052 **Course Name : Tamils and Technology**

CO	Course Outcomes	Programme Outcomes													
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1:	சங்ககாலத் தமிழிர்களின் நெசவு மற்றும் பானைவனைதல் தொழில்நுட்பம் குறித்து கற்றுணர்தல்	-	-	-	-	-	-	3	3	-	2	-	3	-	-
CO2:	சங்ககாலத் தமிழிர்களின் கட்டிட தொழில்நுட்பம் கட்டுமான பொருட்கள் மற்றும் அவற்றை விளகும் தளங்கள் குறித்து அறிவு	-	-	-	-	-	-	3	3	-	2	-	3	-	-
CO3:	சங்ககாலத் தமிழிர்களின் உலோகத் தொழில், நாணயங்கள் மற்றும் மணிகள் சார்ந்த தொல்லியல் சான்றுகள் பற்றிய அறிவு	-	-	-	-	-	-	3	3	-	2	-	3	-	-
CO4:	சங்ககாலத் தமிழிர்களின் வேளாண்மை, நீர்ப்பாசன முறைகள் மற்றும் முத்து குளித்தல் குறித்த தெளிவு	-	-	-	-	-	-	3	3	-	2	-	3	-	-
CO5:	நவீன அறிவியல் தமிழ் மற்றும் கன்னி தமிழ் குறித்த புரிந்து கொள்ளலும் மற்றும் பயன்படுத்தலும்	-	-	-	-	-	-	3	3	-	2	-	3	-	-
	Average	**-**	**-**	**-**	**-**	**-**	**-**	**3**	**3**	**-**	**2**	**-**	**3**	**-**	**-**

1. சிறிது (குறைந்த) 2. மிதமான (நடுத்தர) 3. கணிசமான (உயர்)

K.S.R. COLLEGE OF ENGINEERING (Autonomous) **R 2020**

SEMESTER – III

		L	T	P	C
20MA342	**DIFFERENTIAL EQUATIONS AND NUMERICAL METHODS (Common to EE & EC)**	3	1	0	4

Prerequisite: *No prerequisites are needed for enrolling into the course.*

Course Outcomes: On Completion of this course , the student will be able to		***Cognitive level***
CO1	*Apply the concepts of partial differential equations.*	*Apply*
CO2	*Solving polynomial, transcendental equations, simultaneous linear equations numerically*	*Understand*
CO3	*Apply the Interpolation techniques.*	*Apply*
CO4	*Developing their skills in numerical differentiation and integration.*	*Apply*
CO5	*Determine the numerical solutions to boundary value problems.*	*Remember*

UNIT – I PARTIAL DIFFERENTIAL EQUATIONS [12]

Formation of partial differential equations – Lagrange's linear equation - Homogeneous Linear Partial Differential Equations of second and higher order with constant coefficients.

UNIT – II SOLUTION OF EQUATIONS AND INITIAL VALUE PROBLEMS FOR ORDINARY DIFFERENTIAL EQUATIONS [12]

Solutions to polynomials and transcendental equations – Newton's method - Solutions to simultaneous linear equations - Gauss Elimination - Gauss-Seidel method. Solving first order Ordinary Differential Equations (Single step) by Taylor series method **-** Euler method and Modified Euler Method for first order equation - Fourth order Runge-Kutta for solving first order equations.

UNIT – III INTERPOLATION AND APPROXIMATION [12]

Lagrange's interpolation, Inverse Lagrange's interpolation and Divided difference – Newton's forward and backward difference interpolation techniques (equal intervals) - Cubic Splines.

UNIT – IV NUMERICAL DIFFERENTIATION AND INTEGRATION [12]

Numerical differentiation using Newton's forward and backward interpolation methods - Numerical integration by trapezoidal and Simpson's $1/3^{rd}$and $3/8^{th}$rules – double integrals

UNIT – V BOUNDARY VALUE PROBLEMS IN ORDINARY AND PARTIAL DIFFERENTIAL EQUATIONS [12]

Finite difference solution of one dimensional heat equation by Crank Nicholson and Bender Schmidt method - One dimensional wave equation and two dimensional Laplace and Poisson equations

Total (L: 45 T: 15) = 60 Periods

Text Books :

1 Dr. B.S. Grewal, Numerical Methods in Engineering and Science, Khanna Publishers, New Delhi, Nineth Edition, 2016.
2 Veerarajan.T, Engineering Mathematics, Tata McGraw Hill Publications, New Delhi, Third edition, 2009.

Reference Books :

1 Dr. M.K. Venkataraman, Numerical Methods in Science and Engineering, National Publishing Co, Fifteenth Edition, 2016
2. Ramana.B.V, Higher Engineering Mathematics, Tata McGraw Hill Publishing Company Limited, New Delhi, Fourth Edition, 2016.
3 Dr.P.Kandasamy, Dr.Thilagavathy and Dr.K.Gunavathy, Numerical Methods , S.Chand & company Ltd, Third edition, New Delhi, 2003
4 C.F.Gerald & P.O.Wheatley, Applied Numerical Analysis, Pearson Education (Asia), Seventh Edition, 2007.

K.S.R. COLLEGE OF ENGINEERING, TIRUCHENGODE – 637215
DEPARTMENT OF SCIENCE AND HUMANITIES
CO-PO MAPPING

Regulation : R 2020

Course Code: 20MA342 **Course Name : Differential Equations and Numerical Methods**

CO	Course Outcomes	Programme Outcomes													
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	*Apply the concepts of partial differential equations.*	3	3	3	3	-	-	-	-	-	-	-	-	-	-
CO2	*Solving polynomial, transcendental equations, simultaneous linear equations numerically*	3	3	3	3	-	-	-	-	-	-	-	-	-	-
CO3	*Apply the Interpolation techniques.*	3	3	3	3	-	-	-	-	-	-	-	-	-	-
CO4	*Developing their skills in numerical differentiation and integration.*	3	3	3	3	-	-	-	-	-	-	-	-	-	-
CO5	*Determine the numerical solutions to boundary value problems.*	3	3	3	3	-	-	-	-	-	-	-	-	-	-
	Average	**3**	**3**	**3**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

K.S.R. COLLEGE OF ENGINEERING (Autonomous) **R 2020**

SEMESTER – III

		L	T	P	C
20CS332	**C++ AND DATA STRUCTURES**	3	0	0	3

Prerequisite: *Basic Knowledge of C programming*

Course Outcomes: On Completion of this course , the student will be able to		***Cognitive level***
CO1:	*Outline the concepts of object oriented programming.*	*Remember*
CO2:	*Demonstrate the ideas of constructors, inheritance and operator overloading*	*Understand*
CO3:	*Analyze the concept of list ADT and its implementation.*	*Analyze*
CO4:	*Summarize the knowledge in trees and graphs.*	*Understand*
CO5:	*Evaluate various sorting, Hashing and searching techniques.*	*Evaluate*

UNIT– I FUNDAMENTALS OF C++ [9]

Object Oriented Programming Concepts – Difference between object oriented and Procedure oriented – Benefits – Applications – Introduction to C++ – Tokens – Data types – Operators – Classes – Objects – Default arguments – Static member functions – Static data members – Friend Functions

UNIT– II CONSTRUCTORS AND INHERITANE [9]

Constructors – Destructors – Operator Overloading: Unary Operator Overloading – Binary operator Overloading – Inheritance – Virtual Functions – Pure Virtual Functions – Exception Handling.

UNIT – III LINEAR DATA STRUCTURES [9]

Abstract Data Types (ADT) – List ADT – Array Based Implementation – Linked List Implementation – Singly Linked Lists – Doubly Linked Lists – Stack ADT – Implementation of Stack using Array and Linked List. Queue ADT – Implementation of Queue using Array and Linked List.

UNIT – IV NON LINEAR DATA STRUCTURES [9]

Tree ADT – Binary Tree ADT – Binary Tree Traversal – Binary Search Tree – AVL Trees – Binary Heaps – Graphs and its Types – Breadth First Traversal – Depth First Traversal – Topological Sort – Minimum Spanning Tree: Prim's and Kruskal's algorithms –- Shortest Path Algorithms : Dijkstra's Algorithm.

UNIT – V SEARCHING,HASHING AND SORTING [9]

Searching: Linear and Binary Search – Hashing: Hash function – Separate Chaining – Open Addressing – Linear Probing – Sorting: Bubble Sort – Selection Sort – Insertion Sort – Merge Sort – Quick Sort.

Total = 45 Periods

Text Books :

1 E. Balagurusamy, Object Oriented Programming with C++, McGraw-Hill Education, New Delhi, Seventh Edition, 2018.

2 M. A. Weiss, Data Structures and Algorithm Analysis in C, Pearson Education, New Delhi, Second Edition, 2015.

References :

1 Robert Lafore, Object Oriented Programming in-C++, Galgotia Publication, New Delhi, Fourth Edition, 2014.

2 B. Trivedi, Programming with ANSI C++, Oxford University Press, England, Second Edition, 2007.

3 A.K. Sharma, Data Structures using C, Pearson Education, New Delhi, First Edition 2011.

4 Rhttp://www.nptelvideos.in/2012/11/data-structures-and-algorithms.html.

K.S.R. COLLEGE OF ENGINEERING, TIRUCHENGODE – 637215
DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING
CO-PO MAPPING

Regulation : R 2020

Course Code: 20CS332 **Course Name : C++ and Data Structures**

CO	Course Outcomes	Programme Outcomes													
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	*Outline the concepts of object oriented programming.*	3	2	3	2	2	-	-	-	1	-	2	1	-	-
CO2	*Demonstrate the ideas of constructors, inheritance and operator overloading*	3	2	3	2	2	-	-	-	1	-	3	1	-	-
CO3	*Analyze the concept of list ADT and its implementation.*	3	3	2	2	2	-	-	-	1	-	2	1	-	-
CO4	*Summarize the knowledge in trees and graphs.*	3	2	2	2	2	-	-	-	1	-	3	1	-	-
CO5	*Evaluate various sorting, Hashing and searching techniques.*	3	2	2	2	2	-	-	-	1	-	2	1	-	-
	Average	**3**	**3**	**2**	**2**	**2**	**-**	**-**	**-**	**1**	**-**	**2**	**1**	**-**	**-**

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

K.S.R. COLLEGE OF ENGINEERING (Autonomous) **R 2020**

SEMESTER - III

20EC311	**ELECTRONIC DEVICES**	L	T	P	C
		3	0	0	3

Prerequisite: *Electric Circuits*

Course Outcomes : On successful completion of the course, the student will be able to		***Cognitive Level***
CO1:	*Understand the operation and characteristics of PN diode*	*Understand*
CO2:	*Analyze the Bipolar Junction Transistor characteristics and the biasing techniques*	*Analyze*
CO3:	*Analyze the characteristics of Field Effect Transistor.*	*Analyze*
CO4:	*Examine the characteristics of rectifier, filter and regulator circuits.*	*Analyze*
CO5:	*Illustrate the relationship between voltage and current for various special semiconductor devices*	*Understand*

UNIT - I SEMICONDUCTOR DIODES [09]

Types of semiconductor: Intrinsic, extrinsic semiconductor, P-type and N- type semiconductos: Carrier concentration, Fermi energy level, variation of fermi level with temperature, electrical conductivity – Drift & diffusion current – PN Junction: forward bias, reverse bias – Diode current equation – Capacitance.

UNIT - II TRANSISTORS [09]

NPN and PNP Operations – Configurations – Biasing methods – Bias compensation techniques – Hybrid parameter for CE amplifier – Miller's theorem – Darlington amplifier and bootstrapping emitter follower – Hybrid π equivalent model – Low and high frequency response of CE amplifier.

UNIT - III FET [09]

JFET types and operation of N-Channel and P-channel – MOSFET types and operation – CMOS operation, inverter voltage transfer curve and threshold voltage - Latch up problem and prevention.

UNIT - IV RECTIFIERS AND POWER SUPPLIES [09]

Analysis of half wave, full wave and bridge rectifiers with resistive load – Analysis of ripple voltage with C, L, LC and CLC filters – Voltage regulators: Zener diode regulator, transistor series and shunt regulator - Current limiting and over voltage protection circuit –SMPS

UNIT - V SPECIAL SEMICONDUCTOR DEVICES [09]

Zener diode, Tunnel diode, PIN diode, Varactor diode, LED, LCD, LASER, Photodiode, Phototransistor, Photoconductive and Photovoltaic cells. SCR, DIAC, TRIAC and UJT.

Total (L: 45) = 45 Periods

Text Books :

1 Sedra / Smith, "Micro Electronic Circuits" Oxford University Press, Seventh edition united kingdom 2017.

2 Anil K Maini, Varsha Agarwal, "Electronic Devices & Circuits", John Wiley United States, Reprint 2012.

Reference Books :

1 Robert L. Boylestad and Louis Nasheresky, "Electronic Devices and Circuit Theory", Eleventh edition, PHI, Delhi 2015.

2 David A. Bell, "Solid State Pulse Circuits", Fourth edition PHI, Delhi 2012.

3 Donald .A. Neamen, "Electronic Circuit Analysis and Design", Second edition, Tata McGraw Hill,Delhi 2009.

4 Millman.J. and Halkias C.C, "Integrated Electronics", Tata McGraw Hill, Forty eight Reprint Delhi 2008.

5 NPTEL Course Link: http://nptel.ac.in/courses/117101106/7

K.S.R. COLLEGE OF ENGINEERING, TIRUCHENGODE – 637215
DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING
CO-PO MAPPING

Regulation : R 2020

Course Code: 20EC311 **Course Name : Electronic Devices**

CO	Course Outcomes	Programme Outcomes													
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	*Understand the operation and characteristics of PN diode*	3	3	3	3	3	-	-	-	-	-	-	3	3	2
CO2	*Analyze the Bipolar Junction Transistor characteristics and the biasing techniques*	3	3	3	3	3	-	-	-	-	-	-	3	3	2
CO3	*Analyze the characteristics of Field Effect Transistor.*	3	3	3	3	3	-	-	-	-	-	-	3	3	2
CO4	*Examine the characteristics of rectifier, filter and regulator circuits.*	3	3	3	3	3	-	-	-	-	-	-	3	3	2
CO5	*Illustrate the relationship between voltage and current for various special semiconductor devices*	2	3	3	2	3	-	-	-	-	-	-	3	3	2
	Average	**3**	**3**	**3**	**3**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**3**	**3**	**2**

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

K.S.R. COLLEGE OF ENGINEERING (Autonomous) **R 2020**

SEMESTER - III

20EC312 **DIGITAL ELECTRONICS**

L	T	P	C
3	0	0	3

Prerequisite: *Nil*

Course Outcomes : On successful completion of the course, the student will be able to		***Cognitive Level***
CO1:	*Analyze different methods used for simplification of boolean expressions.*	*Analyze*
CO2:	*Construct the different types of combinational circuits.*	*Apply*
CO3:	*Explain the nomenclature and technology in memory devices: ROM, RAM and PLD.*	*Apply*
CO4:	*Analyze sequential circuits like flip-flops, registers and counters.*	*Analyze*
CO5:	*Describe types of sequential circuits and develop HDL models for digital circuits.*	*Apply*

UNIT - I MINIMIZATION TECHNIQUES AND LOGIC GATES [09]

Minimization Techniques: Boolean postulates and laws - De-Morgan‟s theorem - Principle of duality - Boolean expression: Minterm, maxterm, Sum of Products, Product of Sums - Minimization of boolean expression: Algebraic method, Karnaugh map method, Don‟t care conditions, Quine – McCluskey method.

Logic gates: AND, OR, NOT, NAND, NOR, Exclusive-OR and Exclusive-NOR - Implementation of logic functions using basic gates, NAND-NOR implementations - TTL and CMOS digital logic families – Tristate gates.

UNIT - II COMBINATIONAL CIRCUITS [09]

Introduction - Design procedure - Half adder - Full adder - Half subtractor - Full subtractor - Parallel binary adder, Parallel binary subtractor - Fast adder: Carry look ahead adder - Serial adder/subtractor - BCD adder Binary multiplier - Binary divider – Magnitude Comparator-Code converters - Parity generator - Parity checker - Decoders - Encoders - Multiplexers –Demultiplexers.

UNIT - III MEMORY AND PROGRAMMABLE LOGIC DEVICES [09]

Classification of memories – ROM: ROM organization, PROM, EPROM, EEPROM, EAPROM, RAM: RAM organization - Memory expansion - Static RAM cell - Bipolar RAM cell - MOSFET RAM cell - Dynamic RAM cell - Programmable Logic Devices: Programmable Logic Array - Programmable Array Logic - Field Programmable Gate Arrays - Implementation of combinational logic circuits using ROM, PLA and PAL

UNIT - IV SEQUENTIAL CIRCUITS [09]

Latches and Flip-flops: SR, JK, D, T, and Master-Slave - Characteristic table and equation - Application Table – Edge triggering - Level Triggering - Realization of one flip flop using other flip-flops.

Counters: Asynchronous and synchronous counter: Up, Down and Up/Down counter - Design of synchronous counter - Modulo–n counter - Registers: Shift registers, universal shift register - Shift register counters: Ring counter, Johnson counter – Sequence generator.

UNIT - V SYNCHRONOUS AND ASYNCHRONOUS SEQUENTIAL CIRCUITS [09]

Synchronous Sequential Circuits: General model, classification, analysis and design of synchronous sequential circuit - Use of algorithmic state machine. **Asynchronous Sequential Circuits:** Analysis and design of fundamental mode and pulse mode circuits Incompletely specified state machines - Problems in asynchronous sequential circuit - Hazards: Types of hazard, design of hazard free switching circuits. **Hardware Description Language**: Introduction to VHDL, VHDL model for combinational and sequential circuits.

Total (L= 45) = 45 Periods

Text Books :

1 Soumitra Kumar Mandal, “Digital Electronics Principles and Applications”, McGraw Hill, Seventh Reprint, 2014.

2 M.Morris Mano, “Digital Design”, Prentice Hall of India Pvt.Ltd, Fourth edition, 2012.

Reference Books :

1 Donald P.Leach, Albert Paul Malvino and Goutam Saha," Digital Principles and Applications", McGraw Hill Education, Eight edition, 2015.

2 John.M Yarbrough, "Digital Logic Applications and Design", Thomson Learning, Ninth Edition Reprint, 2012.

3 Donald D.Givone,"digital Principles and Design", Tata McGraw, Twenty first Reprint 2012.

4 John F. Wakerly, "Digital Design Principles and Practices", Pearson Education, Ninth Impression, 2013.

5 Stephen Brown, ZvonkoVranesic, "Fundamentals of Digital Logic with VHDL Design", TMH, Third edition 2012

K.S.R. COLLEGE OF ENGINEERING, TIRUCHENGODE – 637215
DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING
CO-PO MAPPING

Regulation : R 2020

Course Code: 20EC312 **Course Name : Digital Electronics**

CO	Course Outcomes	Programme Outcomes													
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	*Analyze different methods used for simplification of boolean expressions.*	3	3	3	2	-	-	-	-	-	-	-	2	3	-
CO2	*Construct the different types of combinational circuits.*	3	3	3	2	3	-	-	-	-	-	-	2	3	2
CO3	*Explain the nomenclature and technology in memory devices: ROM, RAM and PLD.*	3	3	3	2	-	-	-	-	-	-	-	2	3	2
CO4	*Analyze sequential circuits like flip-flops, registers and counters.*	3	3	3	2	3	-	-	-	-	-	-	2	3	-
CO5	*Describe types of sequential circuits and develop HDL models for digital circuits.*	3	3	3	2	3	-	-	-	-	-	-	2	3	2
	Average	**3**	**3**	**3**	**2**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**2**	**3**	**2**

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

K.S.R. COLLEGE OF ENGINEERING (Autonomous) **R 2020**

SEMESTER - III

20EC313 **ELECTROMAGNETIC THEORY**

L	T	P	C
3	1	0	4

Prerequisite: *Nil*

Course Outcomes : On successful completion of the course, the student will be able to		***Cognitive Level***
CO1:	*Solve static electric field for various types of static charges and their potentials.*	*Apply*
CO2:	*Apply basic static magnetic field laws to find magnetic field intensity for various types of magnetic charges*	*Apply*
CO3:	*Describe the interaction of electric/magnetic fields with materials and solve simple electrostatic and magneto static boundary value problems*	*Apply*
CO4:	*Analyze the behavior of time varying field using Maxwell's equation and derive Maxwell's equation from fundamental laws and poynting vector*	*Analyze*
CO5:	*Apply the evaluation of wave equation from Maxwell's equation for different mediums with different boundaries.*	*Apply*

UNIT - I STATIC ELECTRIC FIELD [12]

Rectangular, cylindrical and spherical coordinate systems – Line, surface and volume integrals –Gradient, divergence and curl – Stokes and Divergence theorem – Coulomb's law – Electric field intensity – Principle of superposition –Electric field due to discrete and continuous charges –Charges distributed uniformly on an finite and infinite line, axis of a uniformly charged circular disc – Electric scalar potential – Relationship between potential and electric field – Potential due to infinite uniformly charged line and electric dipole –Electric flux density–Proof of Gauss's law.

UNIT - II STATIC MAGNETIC FIELD [12]

The Biot-Savart's law–Magnetic field intensity due to a finite and infinite wire, the axis of a circular and rectangular loop– Ampere's circuital law and its applications – Magnetic flux density – The Lorentz force equation for a moving charge and its applications – Force on a current carrying wire placed in a magnetic field – Torque on a loop carrying a current – Magnetic moment – Magnetic vector potential.

UNIT - III ELECTRIC AND MAGNETIC FIELDS IN MATERIALS [12]

Poisson's and Laplace's equation – Nature of dielectric materials – Definition of capacitance – Capacitance of various geometrics using Laplace's equation – Electrostatic energy and energy density – Boundary conditions for electric fields– Electric current – Current density – Point form of Ohm's law – Continuity equation for current – Definition of inductance –Inductance of loops and solenoids – Energy density in magnetic fields – Nature of magnetic materials – Magnetization and Permeability – Magnetic boundary conditions.

UNIT - IV TIME VARYING ELECTRIC AND MAGNETIC FIELDS [12]

Ampere's circuital law – Maxwell"s first equation from Ampere's circuital law – Equation expressed in point form - Faraday's law – Maxwell's second equation from Faraday's law – Equation expressed in point form – Maxwell's four equations in integral form and differential form – Poynting vector and Poynting theorem – Power flow in a co-axial cable - Instantaneous average and complex Poynting vector.

UNIT - V ELECTROMAGNETIC WAVES [12]

Wave equation – Uniform plane waves – Wave equation in phasor form – Plane waves in free space – Wave equation for a conducting medium – Plane waves in lossy dielectrics – Propagation in good conductors – Skin effect – Linear, Elliptical and Circular polarization – Reflection of plane wave from a conductor – Normal incidence – Reflection of plane waves by a perfect dielectric – Normal incidence – Brewster's angle.

Total (L= 45, T = 15) = 60 Periods

Text Books :

1 W H.Hayt & J A Buck, "Engineering Electromagnetics", TATA McGraw-Hill, New Delhi, Ninth edition, 2020.

2 E.C. Jordan & K.G. Balmain, "Electromagnetic Waves and Radiating Systems", Pearson Education/PHI, India, Fourth edition, 2015.

Reference Books :

1 Matthew N.O.Sadiku, "Elements of Engineering Electromagnetics" ,Oxford University Press, New York, Fourth edition, 2009.

2 Narayana Rao, N "Elements of Engineering Electromagnetics", Pearson Education, USA, Sixth edition, 2017.

3 Ramo, Whinnery and Van Duzer, "Fields and Waves in Communications Electronics", John Wiley & Sons, New York, Third edition, 2003.

4 David K.Cheng, "Field and Wave Electromagnetics", Pearson Edition, Hong Kong, Second edition, 2013.

5 G.S.N. Raju, "Electromagnetic Field Theory &Transmission Lines", Pearson Edition, New Delhi, First edition, 2013.

K.S.R. COLLEGE OF ENGINEERING, TIRUCHENGODE – 637215
DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING
CO-PO MAPPING

Regulation : R 2020

Course Code: 20EC313 **Course Name : Electromagnetic Theory**

CO	Course Outcomes	Programme Outcomes													
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	*Solve static electric field for various types of static charges and their potentials.*	3	3	3	-	-	-	-	-	-	-	-	-	-	3
CO2	*Apply basic static magnetic field laws to find magnetic field intensity for various types of magnetic charges*	3	3	3	-	-	-	-	-	-	-	-	-	-	3
CO3	*Describe the interaction of electric/magnetic fields with materials and solve simple electrostatic and magneto static boundary value problems*	3	3	3	-	-	-	-	-	-	-	-	-	-	3
CO4	*Analyze the behavior of time varying field using Maxwell's equation and derive Maxwell's equation from fundamental laws and poynting vector*	3	3	3	-	-	-	-	-	-	-	-	-	-	3
CO5	*Apply the evaluation of wave equation from Maxwell's equation for different mediums with different boundaries.*	3	3	3	-	-	-	-	-	-	-	-	-	-	3
	Average	**3**	**3**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**3**

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

K.S.R. COLLEGE OF ENGINEERING (Autonomous) **R 2020**

SEMESTER – III

20EE331	**ELECTRICAL MACHINES**	L	T	P	C
		3	0	0	3

Prerequisite: *Nil*

Course Outcomes: On completion of this course, the student will be able to		***Cognitive Level***
CO1:	*Explain the construction, operating principle, performance, starting and speed control of DC machines.*	*Remember*
CO2:	*Describe the construction, working principle and performance of transformers.*	*Remember*
CO3:	*Explain the constructional details, characteristics and starting methods of induction motor.*	*Remember*
CO4:	*Describe the constructional details, regulation characteristics and starting methods of synchronous machines.*	*Remember*
CO5:	*Explain the working principle of special electrical machines.*	*Remember*

UNIT – I D.C. MACHINES [09]

Laws of Electromagnetism – Construction of DC machines – DC generator: EMF equation – Methods of excitation – Types – Armature reaction – Characteristics – DC Motor: Principle of operation, types – Back EMF – Torque equation – Characteristics – Starting and speed control of D.C series and shunt motors.

UNIT – II TRANSFORMERS [09]

Constructional details – Principle of operation – EMF equation – Transformation ratio – Transformer on no load and load – Equivalent circuit – Load test, open circuit and short circuit test – Voltage regulation – Auto transformer.

UNIT – III INDUCTION MOTORS [09]

Three phase induction motor: Construction, principle of operation, types, torque equation, torque slip characteristic, starting and speed control - Single phase induction motor: Split phase motor, capacitor start capacitor run motor, shaded pole motor.

UNIT– IV SYNCHRONOUS MACHINES [09]

Construction of Synchronous Machines – Alternator: Working principle, types, EMF equation, OC and SC characteristics – Voltage regulation – EMF methods – Brushless alternators – Synchronous motor: Working principle – Starting methods – Effect of change of excitation.

UNIT – V SPECIAL MACHNIES [09]

Stepper motor – Hysteresis motor – Reluctance Motor – AC series motor – Universal motor – Linear induction motor – Brushless DC motor.

Total = 45 Periods

Text Books:

1 Nagrath, I.J., Kothari, D. P., Electric Machines, Tata McGraw Hill Publishing Company Ltd, Fifth Reprint, 2012.

2 Theraja, B.L., Theraja, A.K., A Text Book of Electrical Technology, S.Chand Publishing, First Multicolor Edition, 2015.

Reference Books:

1 Fitzgerald, A.E., Charles Kingsely Jr and Stephen D. Umans, Electric Machinery, McGraw Hill Books Company, Seventh Edition, 2013.

2 Murugesh Kumar. K., Electric Machines, Vikas publishing house Pvt Ltd, First Edition, 2003.

3 Bhimbhra, P.S., Electrical Machinery, Khanna Publishers, Seventh Edition, 2013.

4 Samarajit Ghosh, Electrical Machines, Pearson Education, Second Edition, 2012.

5 NPTEL Course Link: http://nptel.ac.in/courses/108106071/

K.S.R. COLLEGE OF ENGINEERING, TIRUCHENGODE – 637215
DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING
CO-PO MAPPING

Regulation : R 2020

Course Code: 20EE331 **Course Name : Electrical Machines**

CO	Course Outcomes	Programme Outcomes													
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	*Explain the construction, operating principle, performance, starting and speed control of DC machines.*	3	2	-	-	-	1	2	-	-	-	-	1	-	-
CO2	*Describe the construction, working principle and performance of transformers.*	3	2	-	-	-	1	2	-	-	-	-	1	-	-
CO3	*Explain the constructional details, characteristics & starting methods of induction motor.*	3	2	-	-	-	1	2	-	-	-	-	1	-	-
CO4	*Describe the constructional details, regulation characteristics and starting methods of synchronous machines.*	3	2	-	-	-	1	2	-	-	-	-	1	-	-
CO5	*Explain the working principle of special electrical machines.*	3	2	-	-	-	1	2	-	-	-	-	1	-	-
	Average	**3**	**2**	**-**	**-**	**-**	**1**	**2**	**-**	**-**	-	-	**1**	**-**	-

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

K.S.R. COLLEGE OF ENGINEERING (Autonomous) **R 2020**

SEMESTER – III

		L	T	P	C
20CS326	**C++ AND DATA STRUCTURES LABORATORY**	0	0	3	1

Prerequisite: *Basic knowledge of C programming*

Course Outcomes: On Completion of this course , the student will be able to		***Cognitive level***
CO1:	*Apply the concepts of classes and objects.*	*Understand*
CO2:	*Apply the concept of singly and doubly linked list.*	*Apply*
CO3:	*Design the balanced tree concepts.*	*Create*
CO4:	*Construct the minimum spanning tree.*	*Create*
CO5:	*Demonstrate the sorting algorithm techniques.*	*Understand*

List of Experiments:

1. Implementation of classes and objects.
2. Implementation of static member functions
3. Implementation of friend function.
4. Implementation of single and multiple inheritance
5. Implementation of virtual function.
6. Implementation of Singly Linked List.
7. Implementation of Doubly linked list
8. Array implementation of Stack and Queue
9. Implementation of Binary Search Tree.
10. Implementation of AVL Tree.
11. Implementation of graph traversal and MST algorithms: a) DFS Algorithm b) Prims Algorithm.
12. Implementation of sorting methods to arrange a list of integers in ascending order:

    a) Insertion sort b) Merge sort

Total : 45 Periods

K.S.R. COLLEGE OF ENGINEERING, TIRUCHENGODE – 637215
DEPARTMENT OF Computer Science and Engineering
CO-PO MAPPING

Regulation : R 2020

Course Code: 20CS326 **Course Name : C++ and Data Structures Laboratory**

CO	Course Outcomes	Programme Outcomes													
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	*Apply the concepts of classes and objects.*	2	3	3	2	2	-	-	-	1	-	2	2	-	-
CO2	*Apply the concept of singly and doubly linked list.*	2	3	3	2	2	-	-	-	1	-	2	2	-	-
CO3	*Design the balanced tree concepts.*	2	3	3	2	2	-	-	-	1	-	2	2	-	-
CO4	*Construct the minimum spanning tree.*	2	3	3	2	2	-	-	-	1	-	2	2	-	-
CO5	*Demonstrate the sorting algorithm techniques.*	2	2	3	2	2	-	-	-	1	-	2	2	-	-
	Average	**2**	**3**	**3**	**2**	**2**	**-**	**-**	**-**	**1**	**-**	**2**	**2**	**-**	**-**

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

K.S.R. COLLEGE OF ENGINEERING (Autonomous) **R 2020**

SEMESTER - III

		L	T	P	C
20EC321	**ELECTRONIC DEVICES LABORATORY**	0	0	3	1

Prerequisite: *Electric Circuits laboratory*

Course Outcomes : On successful completion of the course, the students will be able to		***Cognitive Level***
CO1:	*Demonstrate the characteristics of diode , transistor and FET.*	*Understand*
CO2:	*Demonstrate the characteristics of triggering devices.*	*Understand*
CO3:	*Construct various amplifier circuits and plot their frequency response characteristics.*	*Applying*
CO4:	*Examine the characteristics of various rectifier, filter and regulator circuits.*	*Analyzing*
CO5:	*Interpret the characteristics of diode and transistor using SPICE tool.*	*Understand*

List of Experiments:

Design and verification of

1. Characteristics of PN and Zener diode
2. Characteristics of CE, CB and CC configuration
3. Characteristics of JFET
4. Characteristics of UJT and SCR
5. Design and construct CE amplifier using voltage divider bias with and without bypass emitter capacitance
6. Design and construct CC amplifier using voltage divider bias
7. Design and construct CS Amplifier
8. Power supply circuit – Half, Full wave rectifier with simple capacitor filter and shunt regulator
9. Simulation using SPICE tool for any four device characteristics.

Total = 45 Periods

K.S.R. COLLEGE OF ENGINEERING, TIRUCHENGODE – 637215
DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING
CO-PO MAPPING

Regulation : R 2020

Course Code: 20EC321 **Course Name : Electronic Devices Laboratory**

CO	Course Outcomes	Programme Outcomes													
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	*Demonstrate the characteristics of diode , transistor and FET.*	3	3	3	3	3	-	-	-	1	-	-	2	3	2
CO2	*Demonstrate the characteristics of triggering devices.*	3	3	3	3	3	-	-	-	1	-	-	2	3	2
CO3	*Construct various amplifier circuits and plot their frequency response characteristics.*	3	3	3	3	3	-	-	-	1	-	-	2	3	2
CO4	*Examine the characteristics of various rectifier, filter and regulator circuits.*	3	3	3	3	3	-	-	-	1	-	-	2	3	2
CO5	*Interpret the characteristics of diode and transistor using SPICE tool.*	3	3	3	3	3	-	-	-	1	-	-	2	3	2
	Average	**3**	**3**	**3**	**3**	**3**	**-**	**-**	**-**	**1**	**-**	**-**	**2**	**2**	**2**

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

K.S.R. COLLEGE OF ENGINEERING (Autonomous) **R 2020**

SEMESTER – III

		L	T	P	C
20EC322	**DIGITAL ELECTRONICS LABORATORY**	0	0	3	1

Course Outcomes: On completion of this course, the student will be able to		***Cognitive Level***
CO1:	*Analyze the concept of universal logic gates.*	Analyze
CO2:	*Construct simple* arithmetic circuits.	*Apply*
CO3:	*Construct basic combinational circuits and verify their functionalities.*	*Apply*
CO4:	*Apply the design procedure to design basic sequential circuits such as counters and shift registers.*	*Apply*
CO5:	*Develop HDL models for combinational and sequential circuits.*	*Apply*

Prerequisites: *NIL*

Objective:

- Implement basic gates using Universal gates
- Design and Implement combinational circuits using logic gates.
- Construct and study the functionality of multiplexer, demultiplexer, encoder and decoder
- Analyze and verify the performance of synchronous counter, asynchronous counter and shift registers.
- Understand how Hardware Description Language is used to simulate the combinational and sequential logic circuits.

List of Experiments:

1.Realization of gates using universal gates.

2.Construction of simple arithmetic circuits- adder and subtractor.

3.Construction of Code converters using logic gates

i). BCD to Excess-3 code and vice versa

ii). Binary to Gray code and vice-versa

4.Construction of parity checker, generator and magnitude comparator circuits.

5.Construction of Multiplexer, Demultiplexer, Encoder and Decoder using logic gates.

6.Construct and verify the functionality of 4-bit Ripple counter and Modulo N counter.

7.Design and implementation of 3-bit synchronous up / down counter.

8.Implementation of SISO, SIPO, PISO and PIPO shift registers using flip-flops.

9.Simulation of combinational logic circuits and sequential logic circuits using HDL.

10.Design a Digital System.(Any Hardware/ Simulation circuit).

Total = 45 Periods

K.S.R. COLLEGE OF ENGINEERING, TIRUCHENGODE – 637215
DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING
CO-PO MAPPING

Regulation : R 2020

Course Code: 20EC322 **Course Name : Digital Electronics Laboratory**

CO	Course Outcomes	Programme Outcomes													
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	*Analyze the concept of universal logic gates.*	2	3	3	3	3	-	-	-	-	-	-	2	3	
CO2	*Construct simple* arithmetic circuits.	2	3	3	3	2	-	-	-	-	-	-	**2**	**3**	2
CO3	*Construct basic combinational circuits and verify their functionalities.*	2	3	2	3	2	-	-	-	-	-	-	**2**	**3**	2
CO4	*Apply the design procedure to design basic sequential circuits such as counters and shift registers.*	2	3	3	3	3	-	-	-	-	-	-	**2**	**3**	
CO5	*Develop HDL models for combinational and sequential circuits.*	2	3	3	3	3	-	-	-	-	-	-	2	3	2
	Average	**2**	**3**	**3**	**3**	**3**		-	-	-	-	-	**2**	**3**	**2**

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

K.S.R. COLLEGE OF ENGINEERING (Autonomous) **R 2020**

SEMESTER - III

		L	T	P	C
20HR351	**CAREER DEVELOPMENT SKILLS - I**	0	2	0	0

***Prerequisite*:** *No prerequisites are needed for enrolling into the course*

Course Outcomes : On successful completion of the course, the student will be able to		***Cognitive Level***
CO1:	*Have competent knowledge on grammar with an understanding of its basic rules.*	*Understand*
CO2:	*Communicate effectively and enhance interpersonal skills with renewed self – confidence*	*Apply*
CO3:	*Construct sentence in English and make correction*	*Apply*
CO4:	*Perform oral communication in any formal situation*	*Create*
CO5:	*Develop their LSRW skills.*	*Understand*

UNIT - I **EFFECTIVE ENGLISH – SPOKEN ENGLISH** **[06]**

Basic Rules of Grammar – Parts of Speech – Tenses – Verbs – Sentences construction - Vocabulary – idioms & phrases – Synonyms – Antonyms – Dialogues and conversation – Exercise(Speaking).

UNIT - II **ESSENTIAL COMMUNICATION** **[06]**

Verbal communication – Effective communication – Active Listening – Paraphrasing – Feedback, Non Verbal Communication – Body language of self and Others, Important of feelings in communication – Dealing with feelings in communication practice – Exercise.

UNIT - III **WRITTEN COMMUNICATION – PART 1** **[06]**

Usage of noun, pronoun, adjective (Comparative Forms), Verb, Adjectives, Adverb, Tenses, Articles and Preposition – Change of Voice – Change of Speech – One word Substitution – Using the same word as different parts of speech – Odd Man Out – Spelling & Punctuation (Editing).

UNIT - IV **WRITTEN COMMUNICATION – PART – 2** **[06]**

Analogies – Sentences Formation – Sentence Completion – Sentence Correction – idioms & Phrases – Jumbled Sentences, Letter Drafting (Formal Letters) – Reading Comprehension (Level 1) – Contextual Usage – Foreign Languages Words used in English – Exercise.

UNIT - V **ORAL COMMUNICATION – PART – 1** **[06]**

Self-introduction – Situational Dialogues / Role Play (Telephonic Skills) – Oral Presentations – Prepared –'Just A Minute' Sessions (JAM) – Presentation Skills – Exercise.

Total (L= 0, T = 30) = 30 Periods

Text Books :

1 Anne Laws, Writing Skills, Orient Black Swan., Hyderabad, 2011.

2 Sarah Freeman, Written Communication in English, Orient Black Swan, Hyderabad, First Edition, 2015

Reference Books :

1 Raj N Bakshmi, English Grammar Practice, Orient Black Swan, Hyderabad, First Edition, 2009.

2 M Ashra Rizvi, Effective Technical Communication, Tata McGraw HILL, New Delhi, First Edition, 2005.

3 Thakur K B Sinha, Enrich Your English, Vijay Nicole, Chennai, First Edition, 2005.

4 Norman Lewis. W.R., "Word Power Made Easy", Goyal Publications

K.S.R. COLLEGE OF ENGINEERING, TIRUCHENGODE – 637215
DEPARTMENT OF SCIENCE AND HUMANITIES
CO-PO MAPPING

Regulation : R 2020

Course Code: 20HR351 **Course Name : Career Development Skills - I**

CO	Course Outcomes	Programme Outcomes													
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	*Have competent knowledge on grammar with an understanding of its basic rules.*	-	-	-	-	1	-	-	-	3	3	-	3	-	-
CO2	*Communicate effectively and enhance interpersonal skills with renewed self – confidence*	-	-	-	-	1	-	-	-	3	3	-	3	-	-
CO3	*Construct sentence in English and make correction*	-	-	-	-	1	-	-	-	3	3	-	3	-	-
CO4	*Perform oral communication in any formal situation*	-	-	-	-	1	-	-	-	3	3	-	3	-	-
CO5	*Develop their LSRW skills.*	-	-	-	-	1	-	-	-	3	3	-	3	-	-
	Average	-	-	-	-	1	-	-	-	**3**	**3**	**-**	**3**	**-**	**-**

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

K.S.R. COLLEGE OF ENGINEERING (Autonomous) **R 2020**

SEMESTER - IV

20MA433	**PROBABILITY AND STOCHASTIC PROCESSES (B.E – EC)**	**L**	**T**	**P**	**C**
		3	**0**	**0**	**3**

Prerequisite: No prerequisites are needed for enrolling into the course.

Course Outcomes : On successful completion of the course , the student will be able to		**Cognitive Level**
CO1:	*Apply one dimensional discrete and continuous random variables for Engineering Applications*	*Apply*
CO2:	*Analyze the importance of two-dimensional random variables.*	*Analyze*
CO3:	*Identify the knowledge of Stationary, Markov, Poisson, Sine wave processes*	*Apply*
CO4:	*Interpreting the ideas of various power spectrums.*	*Understand*
CO5:	*Design and implement the concept of linear system and white noise*	*Create*

UNIT - I RANDOM VARIABLES [9]

Discrete and continuous random variables – Moments - Moment generating functions and their properties. Binomial, Poisson, Uniform and Normal distributions.

UNIT - II TWO DIMENSIONAL RANDOM VARIBLES [9]

Joint distributions - Marginal and conditional distributions – Covariance - Correlation and Regression - Central limit theorem (for two dimensional random variables).

UNIT - III CLASSIFICATION OF RANDOM PROCESSES [9]

Definition and examples - first order, second order, strictly stationary, wide-sense stationary and ergodic processes - Markov process - Binomial, Poisson and Normal processes.

UNIT - IV CORRELATION AND SPECTRAL DENSITIES [9]

Auto correlation - Cross correlation - Properties – Power spectral density – Cross spectral density - Properties – Wiener-Khintchine relation – Relationship between cross power spectrum and cross correlation function.

UNIT - V LINEAR SYSTEMS WITH RANDOM INPUTS [9]

Linear time invariant system - System transfer function – Linear systems with random inputs – Auto correlation and cross correlation functions of input and output – white noise.

Total (L:45 T:0) = 45 Periods

Text Books :

1 Oliver C. Ibe, Fundamentals of Applied probability and Random processes, Elsevier, Second edition , 2014.

2 J.Ravichandran, Probability and Random Processes for Engineers, WILEY India Publications, Fifth edition, 2014.

Reference Books :

1 Miller,S.L and Childers, S.L, Probability and Random Processes with applications to Signal Processing and Communications, Elsevier , Second edition, 2012.

2 Leon-Garcia,A, Probability and Random Processes for Electrical Engineering, Pearson Education Asia, Third edition, 2012.

3 Yates and D.J. Goodman, Probability and Stochastic Processes, John Wiley and Sons, Second edition, 2011.

4 www.probabilitycourse.com

K.S.R. COLLEGE OF ENGINEERING, TIRUCHENGODE – 637215
DEPARTMENT OF SCIENCE AND HUMANITIES
CO-PO MAPPING

Regulation : R 2020

Course Code: 20MA433 **Course Name : Probability and Stochastic Processes**

CO	Course Outcomes	Programme Outcomes													
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	*Apply one dimensional discrete and continuous random variables for Engineering Applications*	3	3	3	3	-	-	-	-	-	-	-	-	-	-
CO2	*Analyze the importance of two-dimensional random variables.*	3	3	3	3	-	-	-	-	-	-	-	-	-	-
CO3	*Identify the knowledge of Stationary, Markov, Poisson, Sine wave processes*	3	3	3	3	-	-	-	-	-	-	-	-	-	-
CO4	*Interpreting the ideas of various power spectrums.*	3	3	3	3	-	-	-	-	-	-	-	-	-	-
CO5	*Design and implement the concept of linear system and white noise*	3	3	3	3	-	-	-	-	-	-	-	-	-	-
	Average	**3**	**3**	**3**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**		**-**

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

K.S.R. COLLEGE OF ENGINEERING (Autonomous) **R 2020**

SEMESTER - IV

		L	T	P	C
20EC411	**SIGNALS AND SYSTEMS**	3	1	0	4

Prerequisites: *No prerequisites are needed for enrolling into the course.*

Course Outcomes: On successful completion of the course, students will be able to		***Cognitive Level***
CO1	*Demonstrate the basic concept of classification of signals and systems.*	*Understand*
CO2	*Analyze continuous time signals using Fourier and Laplace Transforms.*	*Analyze*
CO3	*Apply Fourier and Laplace Transform techniques to find the response of CT systems.*	*Apply*
CO4	*Analyze discrete time signals using DTFT and Z-Transforms.*	*Analyze*
CO5	*Analyze system using DTFT and Z-Transforms and realize the structure for DT systems.*	*Analyze*

UNIT - I CLASSIFICATION OF SIGNALS AND SYSTEMS [12]

Continuous and Discrete time signals: Step, ramp, pulse, impulse, exponential - Classification of CT and DT signals and systems - Linear time invariant systems and its properties.

UNIT - II ANALYSIS OF CONTINUOUS TIME SIGNALS [12]

Fourier series analysis - Spectrum of CT Signals - Fourier transform and its properties - Laplace transform: ROC and properties.

UNIT - III LINEAR TIME INVARIANT – CONTINUOUS TIME SYSTEMS [12]

Differential equations: Frequency response, impulse response, Fourier and Laplace transform in analysis of CT systems - Block diagram representation - Convolution integral - State variable equations and matrix representation of CT systems.

UNIT - IV ANALYSIS OF DISCRETE TIME SIGNALS [12]

Sampling of continuous time signals - Aliasing - DTFT and its properties - Z Transform: ROC and properties, Inverse Z Transform.

UNIT - V LINEAR TIME INVARIANT - DISCRETE TIME SYSTEMS [12]

Difference equations: Impulse response, LTI systems analysis using DTFT and Z Transform - Block diagram representation - Convolution sum - State variable equations and matrix representation of DT systems.

Total (L= 45, T=15) = 60 Periods

Text Books:

1 Allan V.Oppenheim, S.Wilsky and S.H.Nawab, “Signals and Systems”, Pearson Education, Second edition, 2017.

2 Edward W Kamen and Bonnie’s Heck, “Fundamentals of Signals and Systems”, Pearson Education, Third edition, 2014.

Reference Books:

1 H P Hsu, RakeshRanjan “Signals and Systems”, Schaums Outlines, Tata McGraw Hill, Indian Reprint 2013.

2 P.RameshBabu, R.Anandanatarajan, “Signals and Systems”, Scitech Publications, Fourth edition, Reprint 2015.

3 Simon Haykins and Barry Van Veen, “Signals and Systems”, John Wiley & Sons, Second edition, 2012.

4 Robert A. Gabel and Richard A.Roberts, “Signals & Linear Systems”, John Wiley, Third edition, 2014.

5 NPTEL course Link: http://nptel.ac.in/courses/117104074

K.S.R. COLLEGE OF ENGINEERING, TIRUCHENGODE – 637215
DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING
CO-PO MAPPING

Regulation : R 2020

Course Code: 20EC411 **Course Name : Signals and systems**

CO	Course Outcomes	Programme Outcomes													
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	Demonstrate the basic concept of classification of signals and systems.	3	3	3	3	-	-	-	-	-	-	-	2	2	2
CO2	Analyze continuous time signals using Fourier and Laplace Transforms.	3	3	3	3	3	-	-	-	-	-	2	2	-	2
CO3	Apply Fourier and Laplace Transform techniques to find the response of CT systems.	3	3	3	3	3	1	-	-	-	-	2	2	2	2
CO4	Analyze discrete time signals using DTFT and Z-Transforms.	3	3	3	3	3	-	-	-	-	-	2	2	-	2
CO5	Analyze system using DTFT and Z-Transforms and realize the structure for DT systems.	3	3	3	3	3	1	-	-	-	-	2	2	2	2
Average		**3**	**3**	**3**	**3**	**3**	**1**	**-**	**-**	**-**	**-**	**2**	**2**	**2**	**2**

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

K.S.R. COLLEGE OF ENGINEERING (Autonomous) **R 2020**

SEMESTER - IV

		L	T	P	C
20EC412	**ELECTRONIC CIRCUITS**	3	0	0	3

Prerequisite: Electronic Devices

Course Outcomes : On successful completion of the course, the student will be able to		***Cognitive Level***
CO1:	Classify a power amplifier based on the Q point and calculate its efficiency.	*Understand*
CO2:	Compare the various types of negative feedback amplifiers.	*Understand*
CO3:	Construct various types of tuned amplifier.	*Applying*
CO4:	Build oscillator circuits for different frequencies.	*Applying*
CO5:	Develop various wave shaping circuits and multivibrators for different applications.	*Applying*

UNIT - I LARGE SIGNAL AMPLIFIERS [09]

Classification of amplifiers – RC coupled Class A amplifier – Transformer coupled class A amplifier, efficiency – Second and higher order harmonic distortions – Class B amplifier, push–pull amplifier and efficiency, complementary symmetry and efficiency – Distortion in amplifiers – Class C, Class D and Class E amplifiers – Thermal stability and heat sink.

UNIT - II FEEDBACK AMPLIFIERS [09]

Introduction – Classification – Block diagram – Loop gain – Gain with feedback – Effects of negative feedback: Sensitivity, desensitivity of gain, Cut–off frequencies, Distortion, Noise, Input impedance and output impedance with feedback – Negative feedback topologies – Method of identifying feedback topology and feedback factor – Nyquist criterion for stability of feedback amplifiers

UNIT - III TUNED AMPLIFIERS [09]

Coil losses – Loaded and unloaded Q of tank circuit – Small signal tuned amplifier – Analysis of capacitor coupled single tuned and double tuned amplifiers – Effect of cascading single tuned and double tuned amplifiers on bandwidth – Stagger tuned amplifier – Large signal tuned amplifier: Class C tuned amplifier, efficiency and applications – Stability of tuned amplifier: Neutralization, Hazeltine neutralization method.

UNIT - IV OSCILLATORS [09]

Barkhausen criterion – Mechanism for start of oscillation and stabilization of amplitude – Classification – General form of an LC oscillator – LC oscillators: Hartley, Colpitts and Clapp oscillators – RC oscillators: Phase shift, Wien bridge and Twin-T oscillators – Frequency range of RC and LC oscillators – Quartz crystal – Miller and Pierce crystal oscillators – Frequency stability of oscillators.

Blocking Oscillators: Free running blocking oscillator – Monostable blocking oscillator with base timing and emitter timing.

UNIT - V MULTIVIBRATORS AND TIME BASE CIRCUITS [09]

RC, RL Integrator and Differentiator circuits – Diode: Clippers and Clampers – Astable, monostable and Bistable multivibrators – Triggering methods for bistable multivibrator – Schmitt trigger circuit – UJT saw tooth waveform generator –Time base circuits.

Total (L= 45, T = 0) = 45 Periods

Text Books :

1 Sedra / Smith," Micro Electronic Circuits" Oxford University Press, Eighth edition 2019.

2 Anil K Maini, VarshaAgarwal, "Electronic Devices & Circuits", John Wiley India, Reprint 2012

Reference Books :

1 Robert L. Boylestad and Louis Nasheresky," Electronic Devices and Circuit Theory", Eleventh edition, PE / PHI, 2015.

2 David A. Bell, "Electronic Devices and Circuits", Fifth edition, Oxford University Press, 2008.

3 Millman.J. and Halkias C.C, "Integrated Electronics", McGraw Hill, Forty eighth Reprint 2017.

4 Schilling.D.L and Belove.C "Electronic Circuits", Third edition, McGraw Hill 2012

5 NPTEL Course Link:http://nptel.ac.in/courses/117108107/32

K.S.R. COLLEGE OF ENGINEERING, TIRUCHENGODE – 637215
DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING
CO-PO MAPPING

Regulation : R 2020

Course Code: 20EC412 **Course Name : Electronic Circuits**

CO	Course Outcomes	Programme Outcomes													
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	Classify a power amplifier based on the Q point and calculate its efficiency.	3	3	3	3	3	-	-	-	-	-	-	2	3	2
CO2	Compare the various types of negative feedback amplifiers.	3	3	3	3	3	-	-	-	-	-	-	2	**3**	2
CO3	Construct various types of tuned amplifier.	3	3	3	3	3	-	-	-	-	-	-	2	3	2
CO4	Build oscillator circuits for different frequencies.	3	3	3	3	3	-	-	-	-	-	-	2	**3**	2
CO5	Develop various wave shaping circuits and multivibrators for different applications.	3	3	3	3	3	-	-	-	-	-	-	2	3	2
	Average	**3**	**3**	**3**	**3**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**2**	**3**	**2**

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

K.S.R. COLLEGE OF ENGINEERING (Autonomous) **R 2020**

SEMESTER - IV

		L	T	P	C
20EC413	**LINEAR INTEGRATED CIRCUITS**	3	0	0	3

Prerequisite: Electronic devices

Course Outcomes : On successful completion of the course, the student will be able to		***Cognitive Level***
CO1:	*Interpret the different steps involved in fabrication of IC's and analyze the DC and AC characteristics of OP-AMP.*	*Remember*
CO2:	*Construct various operational amplifier circuits.*	*Analyze*
CO3:	*Understand the analog multiplier and PLL circuits.*	*Understand*
CO4:	*Classify and comprehend the working principle of ADC and DAC.*	*Understand*
CO5:	*Identify the special function ICs.*	*Remember*

UNIT - I **MONOLITHIC IC** **[09]**

Advantages of ICs over discrete components – Manufacturing process of monolithic ICs – Construction of monolithic bipolar transistor – Monolithic diodes – Integrated resistors – Monolithic capacitors – Inductors – Current mirror and current sources – BJT Differential amplifier with active loads – General operational amplifier stages – DC and AC characteristics – Open and closed loop configurations.

UNIT - II **APPLICATIONS OF OPERATIONAL AMPLIFIERS** **[09]**

Sign changer – Scale changer – Phase shift circuits – Voltage follower – V-to-I and I-to-V converters – Adder – Subtractor – Instrumentation amplifier – Integrator – Differentiator – Logarithmic amplifier – Antilogarithmic amplifier – Comparators, schmitt trigger – Precision rectifier, peak detector, clipper and clamper – First order low-pass, high-pass filters – Phase shift and wein bridge oscillator – Astable and monostable multivibrator.

UNIT - III **ANALOG MULTIPLIER AND PLL** **[09]**

Analog multiplier using emitter coupled transistor pair – Gilbert multiplier cell – Variable transconductance technique – Analog multiplier IC and their applications – PLL: Closed loop analysis, voltage controlled oscillator, monolithic PLL IC 565 - Applications of PLL: AM/FM detection, FSK modulation/demodulation and frequency synthesizing.

UNIT - IV **DAC AND ADC** **[09]**

Analog and digital data conversions - D/A converter: Specifications, Types: Weighted resistor type, R-2R ladder type, voltage and current mode R - 2R ladder types – Switches for D/A converters – A/D Converters: Specifications, Types: Flash, successive approximation, single slope, dual slope

UNIT - V **SPECIAL FUNCTION ICs** **[09]**

Timer IC 555 - IC voltage regulators – Three terminal fixed and adjustable voltage regulators – IC 723 general purpose regulator – Monolithic switching regulator – Switched capacitor filter IC MF10 - ICL8038 function generator - Audio power amplifier – Video amplifier – Isolation amplifier – Opto-couplers and fibre optic IC.

Total (L= 45, T = 0) = 45 Periods

Text Books :

1 Sergio Franco, "Design with Operational Amplifiers and Analog Integrated Circuits", TMH, Fourth edition, 2017.

2 D. Roy Choudhry and Shail Jain, "Linear Integrated Circuits", New Age International Pvt. Ltd , Fifth edition,2018.

Reference Books :

1 S. Salivahanan & V.S. Kanchana Bhaskaran, "Linear Integrated Circuits", TMH, Third edition, 2018.

2 Ramakant A. Gayakwad, "OP- AMP and Linear ICs", Prentice Hall, Fourth edition, 2009.

3 Gray and Meyer, "Analysis and Design of Analog Integrated Circuits", Wiley International, Fifth edition, 2009.

4 B.S. Sonde, "Introduction to System Design using Integrated Circuits", New Age Pub, Second edition, 2013.

5 NPTEL Course Link:http://nptel.ac.in/video.php?subjectId=108106068.

K.S.R. COLLEGE OF ENGINEERING, TIRUCHENGODE – 637215
DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING
CO-PO MAPPING

Regulation : R 2020

Course Code: 20EC413 **Course Name : Linear Integrated Circuits**

CO	Course Outcomes	Programme Outcomes													
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	*Interpret the different steps involved in fabrication of IC's and analyze the DC and AC characteristics of OP-AMP.*	3	3	3	3	2	-	-	-	1	1	2	1	3	2
CO2	*Construct various operational amplifier circuits.*	3	3	3	3	2	-	-	-	1	1	2	1	**3**	**2**
CO3	*Understand the analog multiplier and PLL circuits.*	3	3	3	3	2	-	-	-	1	1	2	1	**3**	**2**
CO4	*Classify and comprehend the working principle of ADC and DAC.*	3	3	3	3	2	-	-	-	1	1	2	1	**3**	**2**
CO5	*Identify the special function ICs.*	3	3	3	3	2	-	-	-	1	1	2	1	3	2
	Average	**3**	**3**	**3**	**3**	**2**	**-**	**-**	**-**	**1**	**1**	**2**	**1**	**3**	**2**

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

K.S.R. COLLEGE OF ENGINEERING (Autonomous) **R 2020**

SEMESTER - IV

		L	T	P	C
20EC414	**MICROPROCESSORS AND MICROCONTROLLERS**	3	0	0	3

Prerequisite: Digital Electronics

Course Outcomes : On successful completion of the course, the student will be able to		***Cognitive Level***
CO1:	*Describe the architecture of 8085 microprocessor and know the assembly language programming skill using 8085 microprocessor.*	*Understand*
CO2:	*Explain the architecture of 8086 microprocessor and know the assembly language programming skill using 8086 microprocessor.*	*Understand*
CO3:	*Describe the microprocessor peripheral interfacing.*	*Understand*
CO4:	*Explain the architecture of 8051 microcontroller and know the assembly language programming skill using 8051 microcontroller.*	*Understand*
CO5:	*Design a microcontroller based system.*	*Apply*

UNIT – I 8 BIT MICROPROCESSOR ARCHITECTURE AND PROGRAMMING [09]

Evolution – Introduction: Address, data and control bus, Clock generation – 8085: Hardware architecture, addressing modes, instruction set, timing diagrams, interrupts, assembly language programming.

UNIT - II 16 BIT MICROPROCESSOR ARCHITECTURE AND PROGRAMMING [09]

8086: Hardware architecture, signals, addressing modes, maximum and minimum mode configurations, assembler directives, instruction set, timing diagram, interrupts, assembly language programming.

UNIT - III MICROPROCESSOR PERIPHERAL INTERFACING [09]

Introduction - Programmable peripheral interface (Intel 8255) – Serial communication interface (8251) - Keyboard and display controller (8279) – Programmable interval timers (Intel 8253, 8254) – Programmable interrupt controller (8259) - Analog to digital converter, Digital to analog converter - Printer interface.

UNIT - IV 8 BIT MICROCONTROLLER ARCHITECTURE AND PROGRAMMING [09]

8051 Microcontroller: Hardware architecture, special function register, I/O ports and circuits, external memory, timers and counters, serial data input/output, interrupts, addressing modes, instruction set, assembly language programming.

UNIT - V MICROCONTROLLER PERIPHERAL INTERFACING [09]

8051 Interfacing: DC motor, stepper motor, sensors, relay, keyboard, switches, seven segment display, RTC and LCD. Case study: Traffic light control.

Total (L= 45, T = 0) = 45 Periods

Text Books :

1 Krishna Kant, “Microprocessors and microcontrollers architecture, programming and system design using 8085, 8086, 8051 and 8096”, PHI, Second edition, 2014.

2 Douglas V Hall, “Microprocessors and interfacing, Programming and Hardware” TMH, Third edition, 2012.

Reference Books :

1 Muhammad Ali Mazidi, Janice Gillispie Mazidi, Rolin D.MCKinlay “The 8051 Microcontroller and Embedded systems”, Pearson Education, Second edition, 2011.

2 Ramesh S Gaonkar, “Microprocessor architecture programming and application with 8085” – Penram publications pvt., Sixth edition, 2013.

3 Kenneth J. Ayala, “The 8086 Microprocessor: programming & interfacing the PC”, Delmar Publishers, 2007.

4 A K Ray, K M Bhurchandi, “Advanced Microprocessors and Peripherals”, TMH, Third edition, 2012.

K.S.R. COLLEGE OF ENGINEERING, TIRUCHENGODE – 637215
DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING
CO-PO MAPPING

Regulation : R 2020

Course Code: 20EC414 **Course Name : Microprocessors And Microcontrollers**

CO	Course Outcomes	Programme Outcomes													
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	*Describe the architecture of 8085 microprocessor and know the assembly language programming skill using 8085 microprocessor.*	3	3	3	2	-	-	-	-	-	-	-	1	3	2
CO2	*Explain the architecture of 8086 microprocessor and know the assembly language programming skill using 8086 microprocessor.*	3	3	3	2	-	-	-	-	-	-	-	1	3	2
CO3	*Describe the microprocessor peripheral interfacing.*	3	3	3	2	-	-	-	-	-	-	-	1	3	2
CO4	*Explain the architecture of 8051 microcontroller and know the assembly language programming skill using 8051 microcontroller.*	3	3	3	2	-	-	-	-	-	-	-	1	3	2
CO5	*Design a microcontroller based system.*	3	3	3	2	-	-	-	-	-	-	-	1	3	2
	Average	**3**	**3**	**3**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**1**	**3**	**2**

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

K.S.R. COLLEGE OF ENGINEERING (Autonomous) **R 2020**

SEMESTER - IV

		L	T	P	C
20EC415	**TRANSMISSION LINES AND WAVE GUIDES**	3	0	0	3

Prerequisite: *Engineering Electromagnetics*

Course Outcomes : On successful completion of the course, the student will be able to		***Cognitive Level***
CO1:	*Develop a transmission line from filter concepts.*	*Remember*
CO2:	*Discuss the propagation of signals through transmission lines.*	*Understand*
CO3:	*Analyze signal propagation at radio frequencies.*	*Analyze*
CO4:	*Explain radio propagation in parallel planes and waveguides.*	*Understand*
CO5:	*Design and analyze cavity resonators.*	*Analyze*

UNIT - I FUNDAMENTALS OF TRANSMISSION LINES [09]

The neper - The decibel - Characteristic impedance of symmetrical networks - Current and voltage ratios - Propagation constant - Properties of symmetrical networks - A line of cascaded T sections - Equivalent circuit - General solution of the transmission line - Physical significance of the equations - The infinite line.

UNIT - II TRANSMISSION LINE THEORY [09]

Wavelength - Velocity of propagation - Distortion line - Distortion less line condition - Loading - The telephone cable - Loaded telephone cable – Campbel's formula - Open and short circuited lines - Input impedance of open and short circuited lines - Reflection on a line not terminated in Z_0 - Reflection coefficient - Reflection factor and reflection loss - Insertion loss - Standing waves - Nodes - Standing wave ratio.

UNIT - III THE LINE AT RADIO FREQUENCY [09]

Parameters of open wire line and coaxial cable at RF - Line constants for dissipation - Voltages and currents on the dissipation less line - Power and impedance measurement on lines - Section of transmission line: λ/2, λ/4, λ/8 line - Impedance matching - Single and double stub matching - Circle diagram - Smith chart and its applications - Stub matching problems using smith chart.

UNIT - IV GUIDED WAVES BETWEEN PARALLEL PLANES [09]

Waves between parallel planes of perfect conductors - Field components of TM, TE & TEM waves between parallel planes - Manner of wave travel - Characteristics of TM, TE & TEM waves - Wave impedance - Attenuation factor of TM, TE & TEM waves.

UNIT - V WAVEGUIDES AND RESONANT CAVITIES [09]

Waves between rectangular waveguide - TM and TE waves in rectangular guide - Bessel functions - Waves between circular waveguide - TM and TE waves in circular waveguide - Characteristics of TM and TE waves in rectangular and circular wave guides - Excitation of wave guides - Resonant cavities - Rectangular resonant cavity - Q factor of a rectangular cavity resonator for TE_{101} mode.

Total (L= 45, T = 0) = 45 Periods

Text Books :

1 John D. Ryder, "Networks, Lines and Fields", Prentice Hall of India, Second edition, 2015.

2 E.C.Jordan, K.G. Balmain: "EM Waves and Radiating Systems", Prentice Hall of India, Second edition, 2011.

Reference Books :

1 G S N Raju, "Electromagnetic Field Theory and Transmission Lines", Pearson Education, First edition, 2013.

2 S.F.Mahmoud, "Electromagnetic Waveguides Theory and Applications," Peter Peregrinus ltd, First edition 1991.

3 B.Somanathan Nair, "Transmission Lines and wave guides", Pearson Education, First edition, 2011.

4 P.Baskaran, "Transmission Lines and wave guides", Scitech Publications, First edition, 2013.

5 NPTEL Course Link: http://nptel.ac.in/courses/115101005/

K.S.R. COLLEGE OF ENGINEERING, TIRUCHENGODE – 637215
DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING
CO-PO MAPPING

Regulation : R 2020

Course Code: 20EC415 **Course Name : Transmission Lines And Wave Guides**

CO	Course Outcomes	Programme Outcomes													
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	*Develop a transmission line from filter concepts.*	3	3	3	-	-	-	-	-	-	-	-	2	2	3
CO2	*Discuss the propagation of signals through transmission lines.*	3	3	3	-	-	-	-	-	-	-	-	**2**	**2**	3
CO3	*Analyze signal propagation at radio frequencies.*	3	3	3	-	-	-	-	-	-	-	-	**2**	**2**	3
CO4	*Explain radio propagation in parallel planes and waveguides.*	3	3	3	-	-	-	-	-	-	-	-	**2**	**2**	3
CO5	*Design and analyze cavity resonators.*	3	3	3	-	-	-	-	-	-	-	-	2	2	3
	Average	**3**	**3**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2**	**2**	**3**

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

K.S.R. COLLEGE OF ENGINEERING (Autonomous) **R 2020**

SEMESTER - IV

		L	T	P	C
20EC421	**ELECTRONIC CIRCUITS AND SIMULATION LABORATORY**	0	0	3	1

Prerequisite: Electronic Devices Laboratory

Course Outcomes : On successful completion of the course, the student will be able to		***Cognitive Level***
CO1:	Construct a Class B Push Pull amplifier with and without distortion.	*Apply*
CO2:	Construct a negative feedback amplifier and plot its frequency response	*Analyze*
CO3:	Build an oscillator circuit and observe its output waveform	*Analyze*
CO4:	Develop a narrow band amplifier and different wave shaping circuits for various applications.	*Apply*
CO5:	Simulate the given electronic circuits using SPICE tool	*Apply*

List of Experiments:

Design and Analysis of the following circuits:

1. Class B complementary symmetry power amplifier.
2. Series feedback amplifier (voltage and current).
3. RC phase shift and Hartley oscillators.
4. Tuned class C amplifier.
5. Integrator, Differentiator, Clipper & Clampers.
6. Astable and Monostable Multivibrators.

Simulation using SPICE Tool:

7. Shunt feedback amplifier (voltage and current).
8. Wein Bridge and Colpitts oscillators.
9. Bistable Multivibrator and Schmitt trigger circuit.
10. Time base circuits.

Total = 45 Periods

K.S.R. COLLEGE OF ENGINEERING, TIRUCHENGODE – 637215
DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING
CO-PO MAPPING

Regulation : R 2020

Course Code: 20EC421 **Course Name : Electronic Circuits And Simulation Laboratory**

CO	Course Outcomes	Programme Outcomes													
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	Construct a Class B Push Pull amplifier with and without distortion.	3	3	3	3	3	-	-	-	1	-	-	2	3	2
CO2	Construct a negative feedback amplifier and plot its frequency response	3	3	3	3	3	-	-	-	1	=	-	2	**3**	**2**
CO3	Build an oscillator circuit and observe its output waveform	3	3	3	3	3	-	-	-	1	-	-	2	3	**2**
CO4	Develop a narrow band amplifier and different wave shaping circuits for various applications.	3	3	3	3	3	-	-	-	1	-	-	2	**3**	**2**
CO5	Simulate the given electronics circuits using SPICE tool	3	3	3-	3	3	-	-	-	1	-	-	2	3	2
	Average	**3**	**3**	**3**	**3**	**3**	**-**	**-**	**-**	**1**	**-**	**-**	**2**	**3**	**2**

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

K.S.R. COLLEGE OF ENGINEERING (Autonomous) **R 2020**

SEMESTER - IV

		L	T	P	C
20EC422	**LINEAR INTEGRATED CIRCUITS LABORATORY**	0	0	3	1

Prerequisite: Electronic devices

Course Outcomes : On successful completion of the course, the student will be able to		***Cognitive Level***
CO1:	*Design op-amp circuits for different applications.*	*Analyze*
CO2:	*Experiment with frequency response characteristic of various filters using op-amp.*	*Understand*
CO3:	*Develop waveform generators using timer.*	*Analyze*
CO4:	*Construct voltage regulator using LM723.*	*Analyze*
CO5:	*Simulate various applications of operational amplifiers using PSpice.*	*Understand*

List of Experiments:

Design and verification of

1. Inverting, non-inverting and differential amplifiers using op-amp
2. Integrator and differentiator using op-amp
3. Instrumentation amplifier using op-amp
4. Active low pass, high pass filters using op-amp
5. Astable & monostable multivibrators and schmitt trigger using op-amp
6. Phase shift and wien bridge oscillators using op-amp
7. Astable and monostable multivibrators using IC 555timer.
8. Frequency multiplier using PLL.
9. Voltage regulator using LM723.
10. Simulation of any above three experiments using PSpice

Total (L= 45, T = 0) = 45 Periods

K.S.R. COLLEGE OF ENGINEERING, TIRUCHENGODE – 637215
DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING
CO-PO MAPPING

Regulation : R 2020

Course Code: 20EC422 **Course Name : Linear Integrated Circuits Laboratory**

CO	Course Outcomes	Programme Outcomes													
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	*Design op-amp circuits for different applications.*	3	3	3	3	3	-	-	-	-	-	-	-	3	2
CO2	*Experiment with frequency response characteristic of various filters using op-amp.*	3	3	3	3	3	-	-	-	-	-	-	-	**3**	**2**
CO3	*Develop waveform generators using timer.*	3	3	3	3	3	-	-	-	-	-	-	-	**3**	**2**
CO4	*Construct voltage regulator using LM723.*	3	3	3	3	3	-	-	-	-	-	-	-	**3**	**2**
CO5	*Simulate various applications of operational amplifiers using PSpice.*	3	3	3	3	3	-	-	-	-	-	-	-	3	2
	Average	**3**	**3**	**3**	**3**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**3**	**2**

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

K.S.R. COLLEGE OF ENGINEERING (Autonomous) **R 2020**

SEMESTER – IV

		L	T	P	C
20EC423	**MICROPROCESSORS AND MICROCONTROLLERS LABORATORY**	0	0	3	1

Prerequisite: Digital Electronics Laboratory

Course Outcomes : On successful completion of the course, the student will be able to		***Cognitive Level***
CO1:	*Write assembly language programming for 8085 microprocessor.*	*Apply*
CO2:	*Write assembly language programming for 8086 microprocessor.*	*Apply*
CO3:	*Write assembly language programming for 8051 microprocessors.*	*Apply*
CO4:	*Interface different I/Os with processor.*	*Apply*
CO5:	*Write assembly language programming using simulation software.*	*Apply*

List of Experiments:

1. 8085 Microprocessor
- (i) Arithmetic Operations
- (ii) Array Processing

2. 8086 Microprocessor
- (i) Arithmetic Operations
- (ii) Sorting and Searching
- (iii) String Manipulation

3. 8051 Microcontroller
- (i) Arithmetic Operations
- (ii) Logical and Bit Manipulation

4. Peripheral Interfacing
- (i) Programmable peripheral interface (8255) using 8085.
- (ii) Programmable interval timer (8253) using 8085.
- (iii) ADC and DAC using 8085.
- (iv) Keyboard and display controller (8279) using 8086.
- (v) Programmable interrupt controller (8259) using 8086.
- (vi) Stepper motor using 8051.

5. Simple 8051 programming using KEIL and Proteus Software.

Total (P= 45, T = 0) = 45 Periods

K.S.R. COLLEGE OF ENGINEERING, TIRUCHENGODE – 637215
DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING
CO-PO MAPPING

Regulation : R 2020

Course Code: 20EC423 **Course Name : Microprocessors and Microcontrollers Laboratory**

CO	Course Outcomes	Programme Outcomes													
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	*Write assembly language programming for 8085 microprocessor.*	3	3	3	3	1	-	1	-	-	-	-	2	3	2
CO2	*Write assembly language programming for 8086 microprocessor.*	3	3	3	3	1	-	1	-	-	-	-	2	3	2
CO3	*Write assembly language programming for 8051 microprocessor.*	3	3	3	3	1	-	1	-	-	-	-	2	3	2
CO4	*Interface different I/Os with processor.*	3	3	3	3	1	-	1	-	-	-	-	2	3	2
CO5	*Write assembly language programming using simulation software.*	3	3	3	3	3	-	1	-	-	-	-	2	3	2
	Average	**3**	**3**	**3**	**3**	**1**	**-**	**1**	**-**	**-**	**-**	**-**	**2**	**3**	**2**

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

K.S.R. COLLEGE OF ENGINEERING (Autonomous) **R 2020**

SEMESTER - IV

		L	T	P	C
20HR442	**CAREER DEVELOPMENT SKILLS - II**	0	2	0	0

Prerequisite: *No prerequisites are needed for enrolling into the course*

Course Outcomes: On successful completion of the course, the student will be able to		***Cognitive Level***
CO1:	*Speak and write appropriately by understanding verbal and logical reasoning*	*Apply*
CO2:	*Demonstrate various principles involved in solving mathematical problems and thereby reducing the time taken for performing job functions*	*Apply*
CO3:	*Enhance their skills on quantitative aptitude*	*Understand*
CO4:	*Speak and write appropriately by understanding and applying the basic grammatical rules*	*Create*
CO5:	*Critically evaluate problems related to quantitative aptitude*	*Apply*

UNIT - I VERBAL AND LOGICAL REASONING – PART 1 [06]

Alphabet Test – Synonyms & Antonyms – Idioms & Phrases – Analogies - Theme Detection – Odd Words – Statement & Conclusions - Family Tree – Blood Relations – Coding & Decoding – Syllogism – Odd Man Out.

UNIT - II QUANTITATIVE APTITUDE – PART 1 [06]

Numbers: Number system - Squaring of Numbers – Square Roots – Cube Roots – Divisibility – HCF, LCM – Decimals.

UNIT - III QUANTITATIVE APTITUDE – PART 2 [06]

Percentages – Averages – Ratio & Proportion – Mixtures and Allegations – logarithms.

UNIT - IV READING COMPREHENSION&WRITTEN COMMUNICATION –PART 3 [06]

READING SKILLS : Importance of Reading – Definition of Reading – Levels of Reading – Requirements of Reading – Types of Reading – Techniques of Reading - Academic Reading Tips.

UNIT - V QUANTITATIVE APTITUDE – PART 3 [06]

Profit and Loss – Simple Interest & Compound Interest – Problem on Ages – Calendar.

Total (L= 0, T = 30) = 30 Periods

Text Books :

1 Anne Laws, Writing Skills, Orient Black Swan., Hyderabad, 2011.

2 Abhijit Guha, Quantitative Aptitude, TMH, New Delhi, Third edition,2009

Reference Books :

1 Agarwal. R.S ,A.Modern Approach to Verbal and Non- verbal Reasoning, Revised edition 2008, Reprint 2009, S.Chand & Co Ltd., New Delhi.

2 M Ashra Rizvi, Effective Technical Communication, Tata McGraw HILL, New Delhi, First edition, 2005.

3 M.B. Lal & Goswami, Objective Instant Arithmetic, Upkar Publications, New Delhi, Second edition,2012.

4 Norman Lewis. W.R., “Word Power Made Easy”, Goyal Publications

K.S.R. COLLEGE OF ENGINEERING, TIRUCHENGODE – 637215
DEPARTMENT OF SCIENCE AND HUMANITIES
CO-PO MAPPING

Regulation : R 2020

Course Code: 20HR442 **Course Name : Career Development Skills - II**

CO	Course Outcomes	Programme Outcomes													
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	*Speak and write appropriately by understanding verbal and logical reasoning*	-	-	-	-	-	-	-	-	2	3	-	3	2	2
CO2	*Demonstrate various principles involved in solving mathematical problems and thereby reducing the time taken for performing job functions*	-	-	-	-	-	-	-	-	2	3	-	3	2	2
CO3	*Enhance their skills on quantitative aptitude*	-	-	-	-	-	-	-	-	2	3	-	3	2	2
CO4	*Speak and write appropriately by understanding and applying the basic grammatical rules*	-	-	-	-	-	-	-	-	2	3	-	3	2	2
CO5	*Critically evaluate problems related to quantitative aptitude*	-	-	-	-	-	-	-	-	2	3	-	3	2	2
	Average	-	-	-	-	-	-	-	-	**2**	**3**	**-**	**3**	**2**	**2**

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

K.S.R. COLLEGE OF ENGINEERING (Autonomous) **R 2020**

SEMESTER - V

		L	T	P	C
20EC511	**ANALOG COMMUNICATION SYSTEMS**	3	0	0	3

Prerequisites: *Engineering Mathematics, Electronic Devices and Circuits.*

Course Outcomes: On successful completion of the course, students will be able to		***Cognitive Level***
CO1	*Describe the concepts of Amplitude Modulation and its types.*	*Remember*
CO2	*Describe the concepts of Angle Modulation, Pulse Modulation and its types.*	*Remember*
CO3	*Discuss the AM Transmitters and Receivers.*	*Understand*
CO4	*Discuss the FM Transmitters and Receivers.*	*Understand*
CO5	*Infer the concepts of noise in communication systems.*	*Understand*

UNIT - I AMPLITUDE MODULATION [09]

Basic representation of communication system - Baseband and band pass signal - Transmission media - Electromagnetic spectrum - Need for modulation - Amplitude modulation: Single tone and multi tone modulation, Phasor representation, Power relations, Representation of DSBSC and SSBSC- Principles of VSB Signals - Frequency translation - FDM-Non-linear distortion.

UNIT - II ANGLE MODULATION AND PULSE MODULATION [09]

Frequency modulation: Single tone and multi tone modulation, Representation, Frequency spectrum, Phasor representation, Narrow band and Wide band FM, Average power, Bandwidth requirements - Phase modulation - Comparison of AM, FM & PM - Pulse modulation: PAM, PWM, PPM.

UNIT - III AM TRANSMITTERS AND RECEIVERS [09]

Generation of AM: Low level and high level, Modulated transistor amplifier - Generation of SSB: Suppression of carrier and unwanted sideband - Extensions of SSB - Receiver parameters - Tuned radio frequency receiver – Super heterodyne receiver - RF section and characteristics - Frequency changing and tracking - Intermediate frequencies and IF amplifiers - Detection and automatic gain control -Single and independent side band receivers.

UNIT - IV FM TRANSMITTERS AND RECEIVERS [09]

Generation of FM: Direct method, Stabilized reactance modulator - AFC - Indirect method - FM receiver: Comparison with AM receiver, Amplitude limiting, Basic FM demodulators, Ratio Detector, FM demodulator comparison, Stereo FM multiplex reception.

UNIT - V NOISE THEORY [09]

External noise - Internal noise - Noise figure: Calculation, Equivalent noise resistance, measurement - Noise temperature - Noise bandwidth- Noise triangle - Pre-emphasis and de-emphasis - Noise in DSBSC, SSB, AM and FM receivers.

Total = 45 Periods

Text Books:

1. George Kennedy, Bernard Davis & SRM Prasanna, Electronic Communication Systems, Tata McGraw-Hill Education, New Delhi, Sixth edition, 2017.
2. Simon Haykin & Michael Moher, Communication Systems, Wiley India Pvt. Ltd., New Delhi, Fifth edition, 2011.

Reference Books:

1. Wayne Tomasi, Electronic Communications Systems – Fundamentals Through Advanced, Pearson Education, New York, Fifth edition, 2008.
2. A.Bruce Carlson & Paul B. Crilly, Communication Systems, Tata McGraw-Hill Education, New Delhi, Fifth edition, 2011.
3. H Taub, D Schilling & G Saha, Principles of Communication Systems, Tata McGraw-Hill Education, New Delhi, Fourth edition, 2013.
4. P.Ramkrishna Rao, Analog Communication, Tata McGraw-Hill, New Delhi, First edition, 2011.
5. NPTEL Course Link:http://nptel.ac.in/courses/117102059/

K.S.R. COLLEGE OF ENGINEERING, TIRUCHENGODE – 637215
DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING
CO-PO MAPPING

Regulation : R 2020

Course Code: 20EC511 **Course Name : Analog Communication Systems**

CO	Course Outcomes	Programme Outcomes													
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	*Describe the concepts of Amplitude Modulation and its types.*	2	2	3	2	-	2	-	-	-	-	1	1	2	2
CO2	*Describe the concepts of Angle Modulation, Pulse Modulation and its types.*	2	2	3	1	-	2	-	-	-	-	1	1	2	2
CO3	*Discuss the AM Transmitters and Receivers.*	3	2	2	1	-	1	-	-	-	-	2	1	2	2
CO4	*Discuss the FM Transmitters and Receivers.*	3	2	2	1	-	1	-	-	-	-	2	1	2	2
CO5	*Infer the concepts of noise in communication systems.*	3	3	3	2	-	1	-	-	-	-	1	1	2	2
	Average	**3**	**2**	**3**	**1**	**-**	**1**	**-**	**-**	**-**	**-**	**1**	**1**	**2**	**2**

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

K.S.R. COLLEGE OF ENGINEERING (Autonomous) **R 2020**

SEMESTER – V

20EC512	**DIGITAL SIGNAL PROCESSING**	L	T	P	C
		3	1	0	4

Prerequisite: *Differential Equations and Numerical Methods, Signals and Systems*

Course Outcomes: On completion of this course, the student will be able to		***Cognitive Level***
CO1:	*Describe the concepts of DFT, FFT and convolution process*	*Understand*
CO2:	*Design appropriate type of FIR filter and implement digital filters in different FIR filter structures*	*Analyze*
CO3:	*Design digital IIR filter using appropriate type and implement digital filters in various realization structures*	*Analyze*
CO4:	*Characterize the effects of finite precision representation on digital filters*	*Understand*
CO5:	*Describe digital signal processors and the programming concepts*	*Understand*

UNIT – I DISCRETE FOURIER TRANSFORM AND FAST FOURIER TRANSFORM [12]

Introduction to Discrete Fourier Transform pairs and its properties – Relation between z transform and DTFT with DFT – Fast Fourier Transform: Introduction, computations using Decimation in Time and Decimation in Frequency algorithms – Sectional convolution: Overlap add and overlap save methods.

UNIT – II DESIGN OF FINITE IMPULSE RESPONSE DIGITAL FILTERS [12]

Design of FIR filters - symmetric and Anti-symmetric FIR filters - design of linear phase FIR filters using Fourier series method - FIR filter design using windows (Rectangular, Hamming and Hanning window), Frequency sampling method. FIR filter structures - linear phase structure, direct form realizations.

UNIT – III DESIGN OF INFINITE IMPULSE RESPONSE DIGITAL FILTERS [12]

Characteristics of practical frequency selective filters. Characteristics of commonly used analog filters - Butterworth filters, Chebyshev filters. Design of IIR filters from analog filters (LPF, HPF) - Impulse invariance method, Bilinear transformation. Frequency transformation in the analog domain. Structure of IIR filter - direct form I, direct form II, Cascade, parallel realizations.

UNIT– IV FINITE WORD LENGTH EFFECTS AND MULTIRATE SIGNAL PROCESSING [12]

Quantization noise – Derivation for quantization noise power – Binary fixed point and floating point number representations – Truncation and rounding error – Input quantization error – Coefficient quantization error – Product quantization error – Limit cycle oscillations : Zero limit cycle oscillation, overflow limit cycle oscillation and signal scaling – Introduction to multirate signal processing: Up sampling, down sampling and effects of spectrum.

UNIT – V DIGITAL SIGNAL PROCESSORS [12]

Introduction to DSP architecture: Multiplier and multiplier accumulator, bus architectures and memory access scheme, multiported memory, pipelining, special addressing modes – Architecture of TMS320C6747 – Introduction to C programing for DSP applications with code composer studio and simple programs using C.

Total (L: 45 T:15) = 60 Periods

Text Books:

1 John G Proakis and Dimtris G Manolakis, Digital Signal Processing Principles, Algorithms and Application, Pearson Education, USA, Fourth edition, 2014.

2 Venkataramani B and Bhaskar M, Digital Signal Processor Architecture, Programming and Application, Tata McGraw Hill, New Delhi, Second edition, 2013.

Reference Books:

1 Mitra S K, Digital Signal Processing, A Computer based approach, Tata McGraw Hill, Fourth edition, New Delhi, 2013.

2 EsakkirajanS, VeerakumarT, Digital Signal Processing, Tata McGraw Hill, First edition, New Delhi, 2021.

3 Sen M Kuo and Bob H Lee, Real-Time Digital Signal Processing: Implementations, Application and Experiments with the TMS320C55X, John Wiley & Sons Ltd, England, 2003.

4 Texas Instruments, TMS320C6747 DSP data sheet and User's Manual.

5 Online reference: http://nptel.ac.in/courses/117102060/

K.S.R. COLLEGE OF ENGINEERING, TIRUCHENGODE – 637215
DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING
CO-PO MAPPING

Regulation : R 2020

Course Code: 20EC512 **Course Name : Digital Signal Processing**

CO	Course Outcomes	Programme Outcomes													
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	*Describe the concepts of DFT, FFT and convolution process*	3	3	2	2	3	1	-	-	-	-	2	1	3	1
CO2	*Design appropriate type of FIR filter and implement digital filters in different FIR filter structures*	3	3	3	3	3	1	-	-	-	-	1	1	3	2
CO3	*Design digital IIR filter using appropriate type and implement digital filters in various realization structures*	3	3	3	3	3	1	-	-	-	-	1	1	3	2
CO4	*Characterize the effects of finite precision representation on digital filters*	3	3	2	2	2	1	-	-	-	-	1	1	3	1
CO5	*Describe digital signal processors and the programming concepts*	3	3	3	3	2	1	1	-	-	1	2	2	3	1
	Average	**3**	**2**	**3**	**3**	**3**	**3**	**1**	**-**	**-**	**1**	**1**	**1**	**3**	**2**

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

K.S.R. COLLEGE OF ENGINEERING (Autonomous) **R 2020**

SEMESTER - V

		L	T	P	C
20EC513	**COMPUTER NETWORKS**	3	0	0	3

Prerequisite: *No prerequisites needed for enrolling into the course.*

Course Outcomes : On successful completion of the course, the student will be able to		***Cognitive Level***
CO1:	*Understand the concepts of data communication, Network models and transmission media in networks.*	*Understand*
CO2:	*Describe the concepts of data link layer services and protocols, multiple access protocols, Ethernet protocol and various connecting devices.*	*Understand*
CO3:	*Apply various routing protocols and algorithms for a given network along with IP addresses.*	*Apply*
CO4:	*Demonstrate the flow of information from one process to another process in the network.*	*Understand*
CO5:	*Enumerate the application layer protocols and the need for network security.*	*Understand*

UNIT - I **PHYSICAL LAYER** **[09]**

Data communications - Networks: Network criteria, connection types, network topology, network types - Network models: OSI model - TCP/IP model - Addressing - Guided and unguided transmission media - Switching: Circuit switched networks, Datagram networks, Virtual circuit networks.

UNIT - II **DATA LINK LAYER** **[09]**

Data link control: Framing, flow control and error control - Protocols: Simple protocol, stop and wait, sliding window, Go Back N, selective repeat - HDLC - Multiple access: Random access, controlled access - IEEE 802.3: Standard Ethernet, changes in the standard, fast Ethernet, gigabit Ethernet - IEEE 802.11 - Connecting devices: Hub, repeater, switch, bridge, router, gateway.

UNIT - III **NETWORK LAYER** **[09]**

Logical addressing: IPv4, IPv6 addresses - Internet Protocol: Internetworking, IPv4, IPv6, transition from IPv4 to IPv6 - Address mapping - Delivery - Forwarding - Routing protocols: Intra and inter domain routing, distance vector routing, link state routing, path vector routing.

UNIT - IV **TRANSPORT LAYER** **[09]**

Transport layer services - Multiplexing and demultiplexing - User datagram protocol - Transmission control protocol - Congestion control - Quality of Service - Techniques to improve QoS.

UNIT - V **APPLICATION LAYER AND NETWORK SECURITY** **[09]**

Domain Name System (DNS) - E-mail - FTP - WWW - HTTP - Network security: Cryptography, symmetric key and public key algorithms, digital signature, communication security, authentication protocols.

Total (L= 45, T = 0) = 45 Periods

Text Books :

1 Behrouz A. Forouzan, “Data Communication and Networking”, Tata McGraw-Hill, Fifth edition, 2013.

2 Andrew S. Tannenbaum and David J. Wetherall, “Computer Networks”, Prentice Hall, Fifth edition, 2011.

Reference Books :

1 Wayne Tomasi, “Introduction to Data Communication and Networking”, Pearson Education, First edition, 2007.

2 William Stallings, “Data and Computer Communications”, Pearson Education, Eight edition, 2014.

3 James F. Kurouse & Keith W. Ross, “Computer Networking: A Top down Approach”, Pearson Education, Fifth edition, 2012.

4 Greg Tomsho, “Guide to Networking Essentials”, Cengage Learning, Seventh edition, 2016.

K.S.R. COLLEGE OF ENGINEERING, TIRUCHENGODE – 637215
DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING
CO-PO MAPPING

Regulation : R 2020

Course Code: 20EC513 **Course Name : Computer Networks**

CO	Course Outcomes	Programme Outcomes													
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	*Understand the concepts of data communication, Network models and transmission media in networks.*	1	1	-	2	-	-	-	-	-	-	-	-	-	-
CO2	*Describe the concepts of data link layer services and protocols, multiple access protocols, Ethernet protocol and various connecting devices.*	1	1	-	2	-	-	-	-	-	-	-	-	-	-
CO3	*Apply various routing protocols and algorithms for a given network along with IP addresses.*	2	2	-	2	-	-	-	-	-	-	-	2	2	-
CO4	*Demonstrate the flow of information from one process to another process in the network.*	1	1	-	2	-	-	-	-	-	-	-	2	-	-
CO5	*Enumerate the application layer protocols and the need for network security.*	1	1	-	2	-	-	-	-	-	-	-	2	2	-
	Average	**1**	**1**	**-**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2**	**2**	**-**

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

K.S.R. COLLEGE OF ENGINEERING (Autonomous) **R 2018**

SEMESTER – V

20EC514	**EMBEDDED SYSTEMS**	L	T	P	C
		3	0	0	3

Prerequisite: *Microprocessors and Microcontrollers*

Course Outcomes *: On the successful completion of the course, students will be able to*		***Cognitive Level***
CO1	*Interpret the basic concepts of embedded system and its application.*	*Understand*
CO2	*Outline the concepts of various I/O interface devices and buses.*	*Understand*
CO3	*Apply the programming concepts in Embedded system design*	*Apply*
CO4	*Explain the architecture of AVR Microcontroller*	*Understand*
CO5	*Develop the Programming with Arduino and AVR Microcontrollers*	*Apply*

UNIT - I INTRODUCTION TO EMBEDDED SYSTEMS [09]

Embedded system: Definition - Classification - Categories - Recent trends - Design considerations and requirements - Overview of architecture - Purpose - Major application area - Design life cycle.

UNIT - II EMBEDDED DEVICES AND BUSES [09]

IO types and examples - Serial communication devices - Parallel device ports - Sophisticated interfacing features in device ports - Wireless devices - Timer and counting devices - Watchdog timer - Real time clock - Networked embedded systems - Serial bus communication protocols - Parallel bus device protocols - Internet enabled systems - Wireless and mobile system protocols - ISR concept - Interrupt sources - Interrupt service handling mechanism.

UNIT - III EMBEDDED PROGRAMMING [09]

Software programming in assembly and high level language - Program elements: Macros and functions, data types, data structures, modifiers, statements, loops and pointers - Object oriented programming - Embedded programming in C++ - Embedded programming in JAVA - Program models - DFG models - State machine programming models for event controlled program flow - Modeling of multiprocessor systems - UML modeling.

UNIT - IV AVR MICROCONTROLLER [09]

Internal Architecture – internal Memory - Peripheral Functions - Analog Comparator - Analog-to-Digital Converter - Serial I/O - Interrupts - Watchdog Timer - Electrical Characteristics – Arduino - Specific AVR Microcontrollers - **ATmega168/328 - ATmega1280 / ATmega 2560 :** Memory, Features, Packages, Ports, Pin Functions, Analog Inputs, Serial Interfaces, Timer/Clock I/O, External Interrupts, Arduino Pin Assignments, Basic Electrical Characteristics.

UNIT - V Programming the Arduino and AVR Microcontrollers [09]

Cross Compilers - Boot loaders - The Arduino IDE Environment : Installing the Arduino IDE, Configuring the Arduino IDE-Cross-Compiling with the Arduino: IDE The Arduino Executable Image, The Arduino Software Build Process, Sketch Tabs, Arduino Software Architecture, Runtime Support: The main() Function, Global variables - Libraries

Total (L: 45) = 45 Periods

Text Books :

1. Raj Kamal Embedded Systems Architecture, Programming and Design, McGraw-Hill Education, New Delhi, Second edition, 2011.
2. J.M.Hughes, "Arduino: A Technical Reference A Handbook for Technicians, Engineers, and Makers", USA, O' Reilly Media, First edition 2016.

Reference Books :

1. David E. Simon, An Embedded Software Primer, Addison-Wesley Professional, United States, First edition, 2007.
2. Daniel .W Lewis, Fundamentals of Embedded Software, Prentice Hall India Learning, New Delhi, 2003.
3. Simon Monk, "Programming Aurdino, getting started with sketches" McGraw Hill, New York, First edition 2012.
4. http://nptel.ac.in/courses/108102045.

K.S.R. COLLEGE OF ENGINEERING, TIRUCHENGODE – 637215
DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING
CO-PO MAPPING

Regulation : R 2020

Course Code: 20EC514 **Course Name : Embedded Systems**

CO	Course Outcomes	Programme Outcomes													
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	*Interpret the basic concepts of embedded system and its application.*	2	2	3	-	-	-	-	-	-	-	-	1	3	2
CO2	*Outline the concepts of various I/O interface devices and buses.*	2	2	3	-	-	-	-	-	-	-	-	1	3	2
CO3	*Apply the programming concepts in Embedded system design*	2	2	3	-	-	-	-	-	-	-	-	1	3	2
CO4	*Explain the architecture of AVR Microcontroller*	2	2	3	-	-	-	-	-	-	-	-	1	3	2
CO5	*Develop the Programming with Arduino and AVR Microcontrollers*	2	2	3	-	-	-	-	-	-	-	-	1	3	2
	Average	**2**	**2**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**1**	**3**	**2**

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

K.S.R. COLLEGE OF ENGINEERING (Autonomous) **R 2020**

SEMESTER – V

		L	T	P	C
20EC521	**DIGITAL SIGNAL PROCESSING LABORATORY**	0	0	3	1

Prerequisite: *Programming for Problem Solving & Signals and Systems*

	Course Outcomes: On Completion of this course, the student will be able to	***Cognitive level***
CO1	*Carryout basic signal processing operations using MATLAB.*	*Understand*
CO2	*Solve time and frequency domain representation of signals.*	*Apply*
CO3	*Design and simulate IIR filters and their responses.*	*Create*
CO4	*Design and simulate FIR filters and their responses.*	*Create*
CO5	*Implement the basic Digital signal Processing algorithms using Processors.*	*Understand*

List of Experiments:

Using MATLAB / Equivalent open source

1. Basic signal generation and processing
2. a) Generation of Continuous and Discrete Elementary signals using Mathematical expression.
   b) Operations on signals and sequences such as addition, multiplication, scaling, shifting, folding.
   c) Locating the zeros and poles and plotting the pole zero maps in s-plane and z-plane for the given transfer function.
3. Discrete Fourier Transform using FFT and IFT.
4. Convolution and correlation of discrete signals.
5. Sampling and effect of aliasing.
6. Design of FIR filters and IIR filters.

Using TMS 320C50 Processor

7. Study of various addressing modes of Digital signal processors using simple programming examples.
8. Calculation of DFT using FFT.
9. Implementation of FIR filter and IIR filter.

Using TMS 320C6747 Processor

10. Sampling of input signal and display.
11. Convolution and correlation of discrete signals.

Total : 45 Periods

K.S.R. COLLEGE OF ENGINEERING, TIRUCHENGODE – 637215
DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING
CO-PO MAPPING

Regulation : R 2020

Course Code: 20EC521 **Course Name : Digital Signal Processing Laboratory**

CO	Course Outcomes	Programme Outcomes													
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	*Carryout basic signal processing operations using MATLAB.*	3	3	3	2	3	-	-	-	1	-	2	1	3	3
CO2	*Solve time and frequency domain representation of signals.*	3	3	3	2	3	-	-	-	1	-	1	1	3	3
CO3	*Design and simulate IIR filters and their responses.*	3	3	3	2	3	-	-	-	1	-	1	1	3	3
CO4	*Design and simulate FIR filters and their responses.*	3	3	3	2	3	-	-	-	1	-	1	1	3	3
CO5	*Implement the basic Digital signal Processing algorithms using Processors.*	3	3	3	2	3	-	-	-	1	-	2	1	3	3
	Average	**3**	**3**	**3**	**2**	**3**	**-**	**-**	**-**	**1**	**-**	**1**	**1**	**3**	**3**

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

K.S.R. COLLEGE OF ENGINEERING (Autonomous) **R 2020**

SEMESTER - V

20EC522	**COMPUTER NETWORKS LABORATORY**	L	T	P	C
		0	0	3	1

Prerequisite: Nil

Course Outcomes : On successful completion of the course, the student will be able to		***Cognitive Level***
CO1	*Design and analyze the performance of parallel and serial communication.*	*Apply*
CO2	*Compare and contrast the performance of token bus and token ring protocols.*	*Apply*
CO3	*Implement and understand the concept of data link layer protocols, routing algorithms and cable crimping*	*Analyze*
CO4	*Infer about network security and file transfer concepts.*	*Apply*
CO5	*Simulate and evaluate the performance of LAN using NS2.*	*Analyze*

List of Experiments:

1. PC to PC communication:
   Parallel communication using 8 bit parallel cable.
   Serial communication using RS 232 cable.
2. Ethernet LAN protocol:
   Create scenario and verify the performance of Ethernet LAN protocol.
3. Token bus and token ring protocols:
   Create scenario and verify the performance of token bus and token ring protocols.
4. Implementation of stop and wait protocol.
5. Implementation of Go Back N and selective repeat protocols.
6. Implementation of distance vector routing algorithm.
7. Implementation of link state routing algorithm.
8. Implementation of data encryption and decryption.
9. Transfer of files from PC to PC using windows socket processing.
10. Simulation and performance analysis of LAN using NS-2.
11. Crimping of Ethernet cable.

Total = 45 Periods

K.S.R. COLLEGE OF ENGINEERING, TIRUCHENGODE – 637215
DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING
CO-PO MAPPING

Regulation : R 2020

Course Code: 20EC522 **Course Name : Computer Networks Laboratory**

CO	Course Outcomes	Programme Outcomes													
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	*Design and analyze the performance of serial and parallel communication.*	1	1	-	2	1	-	-	-	-	-	-	1	2	2
CO2	*Compare and contrast the performance of token bus and token ring protocols.*	1	1	-	2	1	-	-	-	-	-	-	1	-	-
CO3	*Implement and understand the concept of data link layer protocols, routing algorithms and cable crimping*	2	2	-	2	1	-	-	-	-	-	-	2	2	2
CO4	*Infer about network security and file transfer concepts.*	1	1	-	2	1	-	-	-	-	-	-	2	2	2
CO5	*Simulate and evaluate the performance of LAN using NS2.*	1	1	-	2	1	-	-	-	-	-	-	1	-	-
	Average	**1**	**1**	**-**	**2**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**1**	**2**	**2**

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

K.S.R. COLLEGE OF ENGINEERING (Autonomous) **R 2018**

SEMESTER – V

		L	T	P	C
20EC523	**EMBEDDED SYSTEM DESIGN LABORATORY**	0	0	3	1

Prerequisites: *Programming for problem solving*

Course Outcomes *: On the successful completion of the course, students will be able to*		***Cognitive Level***
CO1	*Develop embedded C coding for Buzzer Beep and I/O interfacing*	*Apply*
CO2	*Analyze the* Analog-to-Digital conversion *and LCD interfacing.*	*Apply*
CO3	*Develop embedded C programming for* DC motor control and PWM generation for velocity, *motion and position control*	*Apply*
CO4	*Develop embedded C programming for white line follower and sensor switching using Firebird V Robot.*	*Apply*
CO5	*Develop embedded C programming for serial communication using Zig Bee*	*Apply*

List of Experiments:

ATMEGA processor programming using Fire Bird V Robot

a. Buzzer Beep
b. I/O Interfacing
c. Analog-to-Digital conversion
d. Interfacing LCD for debugging
e. DC motor control and PWM generation for velocity control
f. Motion Control
g. Position Control
h. Sensor Switching
i. White line follower
j. Serial communication using Zig Bee

Total : 45 Periods

K.S.R. COLLEGE OF ENGINEERING, TIRUCHENGODE – 637215
DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING
CO-PO MAPPING

Regulation : R 2020

Course Code: 20EC523 **Course Name : Embedded System Design Laboratory**

CO	Course Outcomes	Programme Outcomes													
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	*Develop embedded C coding for Buzzer Beep and I/O interfacing*	2	2	3	3	3	-	-	-	-	-	-	1	3	2
CO2	*Analyze the* Analog-to-Digital conversion *and LCD interfacing.*	2	2	3	3	3	-	-	-	-	-	-	1	3	2
CO3	*Develop embedded C programming for* DC motor control and PWM generation for velocity, *motion and position control*	2	2	3	3	3	-	-	-	-	-	-	1	3	2
CO4	*Develop embedded C programming for white line follower and sensor switching using Firebird V Robot.*	2	2	3	3	3	-	-	-	-	-	-	1	3	2
CO5	*Develop embedded C programming for serial communication using Zig Bee*	2	2	3	3	3	-	-	-	-	-	-	1	3	2
	Average	**2**	**2**	**3**	**3**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**1**	**3**	**2**

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

K.S.R. COLLEGE OF ENGINEERING (Autonomous) **R 2020**

SEMESTER - V

		L	T	P	C
20HR543	**CAREER DEVELOPMENT SKILLS - III**	0	2	0	0

Prerequisite: No prerequisites are needed for enrolling into the course

Course Outcomes : On successful completion of the course, the student will be able to		***Cognitive Level***
CO1:	*Understand the nearness of leading various texts.*	*Apply*
CO2:	*Perform well in verbal and logical reasoning.*	*Apply*
CO3:	*Understand and develop the etiquette necessary to present oneself in a professional setting.*	*Understand*
CO4:	*Demonstrate various principles involved in solving mathematical problems and thereby reducing the time taken for performing job functions.*	*Create*
CO5:	*Enhance the comprehension Skills in core subjects.*	*Apply*

UNIT - I **WRITTEN AND ORAL COMMUNICATION – PART 1** **[06]**

Reading Comprehension Level 3 - Self Introduction - News Paper Review - Self Marketing - Debate- Structured and Unstructured GDs Psychometric Assessment – Types & Strategies to answer the questions Practices: Sentence Completion - Sentence Correction - Jumbled Sentences - Synonyms & Antonyms - Using the Same Word as Different Parts of Speech - Interpretation of Pictorial Representations – Editing.

UNIT - II **VERBAL & LOGICAL REASONING – PART 2** **[06]**

Syllogism - Assertion and Reasons - Statements and Assumptions - Identifying Valid Inferences - identifying Strong Arguments and Weak Arguments - Statements and Conclusions- Cause and Effect - Deriving Conclusions from Passages - Seating Arrangements Practices: Analogies - Blood Relations - Statement & Conclusions.

UNIT - III **QUANTITATIVE APTITUDE – PART 3** **[06]**

Probability - Calendar- Clocks - Logarithms - Permutations and Combinations.

UNIT - IV **QUANTITATIVE APTITUDE – PART 4** **[06]**

Algebra - Linear Equations - Quadratic Equations – Polynomials – Problem on Numbers – Ages – Train – Time and Work – Sudoku – Puzzles.

UNIT - V **DEPARTMENT TECHNICAL TOPICS** **[06]**

Networks – Solution Methods, Network Theorems, Time and frequency domain analysis of circuits.

Electronic Devices–Diode, BJT, JFET, MOS capacitor, MOSFET, LED, p-i-n and avalanche photo diode, Basics of LASERs & IC fabrication.

Analog Circuits - Simple diode circuits, clippers, Clampers, Biasing of transistors, Small Signal Equivalent circuits of diodes, BJTs, MOSFETs, amplifiers, filters, differential amplifiers, oscillators, simple opamp & 555 circuits and Power supplies.

Total (L= 0, T = 30) = 30 Periods

Text Books :

1 Anne Laws, Writing Skills, Orient Black Swan, Hyderabad, 2011.

2 Abhijit Guha, Quantitative Aptitude, TMH, New Delhi, Third edition,2009

Reference Books :

1 Agarwal. R.S ,A.Modern Approach to Verbal and Non- verbal Reasoning, Revised Edition 2008, Reprint 2009, S.Chand & Co Ltd., New Delhi.

2 M Ashra Rizvi, Effective Technical Communication, Tata McGraw HILL, New Delhi, First edition, 2005.

3 M.B. Lal & Goswami, Objective Instant Arithmetic, Upkar Publications, New Delhi, Second edition,2012.

4 Norman Lewis. W.R., "Word Power Made Easy", Goyal Publications

K.S.R. COLLEGE OF ENGINEERING, TIRUCHENGODE – 637215
DEPARTMENT OF SCIENCE AND HUMANITIES
CO-PO MAPPING

Regulation : R 2020

Course Code: 20HR543 **Course Name : Career Development Skills - III**

CO	Course Outcomes	Programme Outcomes													
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	*Understand the nearness of leading various texts.*	-	-	-	-	-	-	-	1	3	3	-	-	1	1
CO2	*Perform well in verbal and logical reasoning.*	-	-	-	-	-	-	-	1	3	3	-	2	1	1
CO3	*Understand and develop the etiquette necessary to present oneself in a professional setting.*	-	-	-	-	-	-	-	1	3	3	-	1	1	1
CO4	*Demonstrate various principles involved in solving mathematical problems and thereby reducing the time taken for performing job functions.*	-	-	-	-	-	-	-	1	3	3	-	2	1	1
CO5	*Enhance the comprehension Skills in core subjects.*	-	-	-	-	-	-	-	1	3	3	-	-	1	1
	Average	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**1**	**3**	**3**	**-**	**2**	**1**	**1**

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

K.S.R. COLLEGE OF ENGINEERING (Autonomous) **R 2020**

SEMESTER - VI

		L	T	P	C
20HS051	**UNIVERSAL HUMAN VALUES AND UNDERSTANDING HARMONY**	3	0	0	3

Prerequisite:

Course Outcomes : On successful completion of the course, the student will be able to		***Cognitive Level***
CO1:	*Explain the Basic Concepts of Value Education*	*Understand*
CO2:	*Distinguish between the Self and the Body, understand the meaning of Harmony in the Self the Co– existence of Self and Body.*	*Understand*
CO3:	*Explain the value of harmonious relationship based on trust, respect and other naturally acceptable feelings in human–human relationships*	*Understand*
CO4:	*Describe the harmony in nature and existence, and work out their mutually fulfilling participation in the nature.*	*Understand*
CO5:	*Explain ethical and unethical practices in work environment*	*Understand*

UNIT - I INTRODUCTION TO VALUE EDUCATION [09]

Need and Basic Guidelines of Value Education – Content and Process of Value Education – Self Exploration – purpose of self Exploration – Content and Process of Self exploration – Natural Acceptance – Realization and Understanding – Basic Human Aspirations – Continuous Happiness and Prosperity – Exploring Happiness and Prosperity – Basic Requirement for Fulfilment of Human Aspirations – Relationships – Physical Facilities – Right Understanding.

UNIT - II HARMONY IN THE HUMAN BEING [09]

Human Begin and Body – Understanding Myself as Co–existence of Self ('I') and Body, Needs of the Self and Body, Activities in the Self and Body, Self ('I') as the Conscious Entity, the Body as the Material Entity – Exercise – Body as an Instrument– Harmony in the Self ('I) – Understanding Myself – Harmony with Body.

UNIT - III HARMONY IN THE FAMILY AND SOCIETY [09]

Harmony in the Family – Justice – Feelings (Values) in Human Relationships – Relationship from Family to Society – Identification of Human Goal – Five dimensions of Human Endeavour.

UNIT - IV HARMONY IN NATURE AND EXISTENCE [09]

Order of Nature – Interconnectedness – Understanding the Four order – Innateness – Natural Characteristic – Basic Activity – Conformance – Introduction to Space – Co–existence of units of Space – Limited and unlimited – Active and No–activity – Existence is Co–existence.

UNIT - V PROFESSIONAL ETHICS [09]

Values in different dimensions of Human Living – Definitiveness of Ethical Human Conduct –Implications of Value based Living – Identification of Comprehensive Human Goal – Humanistic Education – Universal Human Order – Competence and Issues in Professional Ethics.

Total (L= 45, T = 0) = 45 Periods

Text Books :

1 Gaur R.R., Sangal, R., Bagaria, G.P., A Foundation Course in Human Values and Professional Ethics, Excell Books Pvt. Ltd., New Delhi, First Edition, 2016.

2 Tripaty, A.N., Human Values, New Age International Publishers, 2003

Reference Books :

1 Ivan Illich, "Energy & Equity", The Trinity Press, USA, 1974.

2 Schumacher E.F., "Small is Beautiful: a study of economics as if people mattered", Britain, 1973.

3 Seebauer, E.G., Robert L. Berry, Fundamentals of Ethics for Scientists & Engineers, Oxford University Press, 2000.

4 B P Banerjee, 2005, Foundations of Ethics and Management, Excel Books.

K.S.R. COLLEGE OF ENGINEERING, TIRUCHENGODE – 637215

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

CO PO MAPPING

Regulation: R 2020

Course Code: 20HS051 **Course Name: Universal Human values and Understanding Harmony**

CO	Course Outcomes	Programme Outcomes													
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	*Explain the basic concepts of value education.*	-	-	-	-	-	1	1	3	3	-	1	3	-	-
CO2	*Distinguish between the self and the body, implement the meaning of Harmony in the Co– existence of Self and the Body.*	-	-	-	-	-	1	1	3	3	-	1	3	-	-
CO3	*Explain the value of harmonious relationship based on trust, respect and other naturally acceptable feelings in human–human relationships.*	-	-	-	-	-	1	1	3	3	-	1	3	-	-
CO4	*Describe the harmony in nature and existence, and work out their mutually fulfilling participation in the nature.*	-	-	-	-	-	1	1	3	3	-	1	3	-	-
CO5	*Explain the ethical and unethical practices in work environment.*	-	-	-	-	-	1	1	3	3	-	1	3	-	-
	Average	**-**	**-**	**-**	**-**	**-**	**1**	**1**	**3**	**3**	**-**	**1**	**3**	**-**	**-**

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

K.S.R. COLLEGE OF ENGINEERING (Autonomous) **R 2020**

SEMESTER - VI

		L	T	P	C
20EC611	**DIGITAL COMMUNICATION SYSTEMS**	3	0	0	3

Prerequisite: Nil

Course Outcomes : On successful completion of the course, the student will be able to		**Cognitive Level**
CO1:	*Illustrate the basics of digital communication systems and signal representation*	Understand
CO2:	*Describe the baseband formatting techniques.*	Understand
CO3:	*Apply various baseband coding methods.*	Apply
CO4:	*Describe the baseband reception techniques.*	Understand
CO5:	*Infer band pass signal processing systems.*	Understand

UNIT - I **FUNDAMENTALS OF DIGITAL COMMUNICATION** [09]

Elements of digital communication systems: Model of digital communication systems – Channel classification – Performance measure – Geometric representation of signals; Gram Schmidt orthogonalisation procedure – Bandwidth – Mathematical models of communication channel.

UNIT - II **BASEBAND FORMATTING TECHNIQUES** [09]

Sampling: Impulse sampling, natural sampling, sampler implementation – Quantization: Uniform and non-uniform – Encoding techniques for analog sources: PCM, DPCM, Delta modulation, Adaptive delta modulation, spectral waveform encoding, model-based encoding.

UNIT - III **BASEBAND CODING TECHNIQUES** [09]

Block codes, convolutional codes – Concept of error free communication – Classification of line codes, desirable characteristics and power spectra of line codes.

UNIT - IV **BASEBAND RECEPTION TECHNIQUES** [09]

Noise in communication systems – Receiving filter – Correlator type – Matched filter type – Equalizing filter – Signal and system design for ISI elimination, Implementation – Eye pattern analysis – Synchronization – Detector, Maximum likelihood detector, error probability, figure of merit for digital detection.

UNIT - V **BANDPASS SIGNAL TRANSMISSION AND RECEPTION** [09]

Memory less modulation methods – Transmitter, receiver signal space diagram and BER; ASK, FSK, PSK, QAM, QPSK – Band pass receiving filter, error performance.

Total = 45 Periods

Text Books :

1 Amitabha Bhattacharya, Digital Communications, McGraw Hill, New Delhi, First Edition, 2017.

2 Simon Haykin, Digital Communications, John Wiley, United States, Fourth Edition (Indian Adaptation Edition), 2021.

3 Bernard Sklar, Digital Communication, Pearson Education, New York, Second Edition, 2014.

Reference Books :

1 John.G. Proakis, Fundamentals of Communication Systems, Pearson Education, New York, Second Edition, 2014.

2 Michael. B. Purrsley, Introduction to Digital Communication, Pearson Education, New York, First Edition, 2006.

3 Herbert Taub & Donald L Schilling, Principles of Communication Systems, TMH, New Delhi, Third Edition, 2008.

4 Leon W. Couch, Digital and Analog Communication Systems, Pearson Education, New York, Seventh Edition, 2008.

K.S.R. COLLEGE OF ENGINEERING, TIRUCHENGODE – 637215
DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING
CO-PO MAPPING

Regulation : R 2020

Course Code: 20EC611 **Course Name : Digital Communication Systems**

CO	Course Outcomes	Programme Outcomes													
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	*Illustrate the basics of digital communication systems and signal representation*	3	3	2	-	-	-	-	-	-	-	-	-	3	-
CO2	*Describe the baseband formatting techniques.*	3	3	3	-	-	-	-	-	-	-	-	-	3	-
CO3	*Apply various baseband coding methods.*	3	3	3	-	-	-	-	-	-	-	-	-	3	-
CO4	*Describe the baseband reception techniques.*	3	3	3	-	-	-	-	-	-	-	-	-	3	-
CO5	*Infer band pass signal processing systems.*	3	3	3	-	-	-	-	-	-	-	-	-	3	-
	Average	**3**	**3**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**3**	**-**

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

K.S.R. COLLEGE OF ENGINEERING (Autonomous) **R 2020**

SEMESTER - VI

		L	T	P	C
20EC612	**DIGITAL IMAGE PROCESSING**	3	0	0	3

Prerequisite: ***Digital Signal Processing***

Course Outcomes : On successful completion of the course, the student will be able to		**Cognitive Level**
CO1:	*Describe the fundamentals in digital imaging.*	*Understand*
CO2:	*Apply various image transformation techniques.*	*Apply*
CO3:	*Apply different techniques for image enhancement and image restoration.*	*Apply*
CO4:	*Infer image segmentation and representation techniques.*	*Understand*
CO5:	*Compare various compression techniques.*	*Apply*

UNIT - I DIGITAL IMAGE FUNDAMENTALS [09]

Elements of digital image processing systems - Elements of visual perception - Basic relationship between pixels: Connectivity, Distance measure - Brightness - Contrast - Hue - Saturation - Mach band effect - Color image fundamentals: RGB - HSI models - Conversion from RGB to HSI - Image sampling - Quantization - Dither

UNIT - II IMAGE TRANSFORMS [09]

2D transforms - Discrete fourier transform - Discrete cosine transform - Discrete Sine Transform - Walsh - Hadamard - Slant - Haar transform - DWT: Haar wavelet, Daubechies wavelet .

UNIT - III IMAGE ENHANCEMENT AND RESTORATION [09]

Spatial domain enhancement: Gray level transformations - Histogram Equalization - Smoothing spatial filters, Median filter, Sharpening spatial filters - Homomorphic filtering - Image restoration: Degradation model – Order Statistics filtering - Inverse filtering - Wiener filtering.

UNIT - IV IMAGE SEGMENTATION AND REPRESENTATION [09]

Line and point detection, Edge detection, Edge linking via Hough transform - Morphological operations - Thresholding - Region based segmentation: Region growing - Region splitting and merging - Representation: Chain codes, Signatures, Boundary segments, Skeletons.

UNIT-V IMAGE COMPRESSION & IMAGE PROCESSING APPLICATIONS [09]

Need for data compression - Lossless compression: Huffman coding, Run length coding, Bit plane coding, LZW coding. Lossy compression:, Block truncation coding - Applications: Satellite image processing and face recognition.

Total (L: 45) = 45 Periods

Text Books :

1 Jayaraman .S, Esakkirajan.S, Veerakumar T, Digital Image Processing, Tata McGraw Hill, New Delhi, Second Edition, 2020

2 Rafael C Gonzalez, Richard E Woods, Digital Image Processing, Pearson Education, New Delhi, Fourth Edition, 2019.

Reference Books :

1 Anil K- Jain, Fundamentals of Digital Image Processing, Pearson Education, New Delhi, First Edition, 2015.

2 Kenneth R.Castleman, Digital Image Processing, Pearson, New Delhi, Second reprint, , 2008.

3 David Salomon, Data Compression: The Complete Reference, Springer - Verlag, Third Edition, New York, 2011.

4 http://nptel.ac.in/courses/117105079/

K.S.R. COLLEGE OF ENGINEERING, TIRUCHENGODE – 637215
DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING
CO-PO MAPPING

Regulation : R 2020

Course Code: 20EC612 **Course Name : Digital Image Processing**

CO	Course Outcomes	Programme Outcomes													
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	Describe the fundamentals in digital imaging.	3	3	2	-	-	-	1	-	-	-	-	2	3	-
CO2	Apply various image transformation techniques.	3	3	2	-	-	-	1	-	-	-	-	2	3	-
CO3	Apply different techniques for image enhancement and image restoration.	3	3	3	-	-	-	2	-	-	-	-	3	3	-
CO4	Infer image segmentation and representation techniques.	3	3	3	-	-	-	2	-	-	-	-	3	3	-
CO5	Compare various compression techniques.	3	3	3	-	-	-	2	-	-	-	-	3	3	-
	Average	**3**	**3**	**3**	**-**	**-**	**-**	**2**	**-**	**-**	**-**	**-**	**3**	**3**	-

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

K.S.R. COLLEGE OF ENGINEERING (Autonomous) **R 2020**

SEMESTER - VI

20EC613 **VLSI DESIGN**

L	T	P	C
3	0	0	3

Prerequisite: Digital Electronics

Course Outcomes : On successful completion of the course, the student will be able to **Cognitive Level**

CO1:	*Design the digital circuits and CMOS structures using Verilog HDL.*	*Apply*
CO2:	*Describe the VLSI fabrication process and design rules.*	*Understand*
CO3:	*Develop the CMOS structure and layout.*	*Apply*
CO4:	*Discuss the types of storage elements and dynamic logic circuits.*	*Understand*
CO5:	*Discuss the types of Test and testability for VLSI circuits.*	*Understand*

UNIT - I **VERILOG HDL** [09]

Basic concepts - Modules and ports - Operators - Structural modeling - Data flow modeling - Behavioral modeling – Switch level modeling - Test benches - Verilog code for: adders, subtractors, multiplexer, demultiplexer, encoder, decoder, priority encoder, comparator, D-Latch, D flip flop, shift register and counter.

UNIT - II **VLSI FABRICATION TECHNIQUES** [09]

Chip design hierarchy - IC layers - Photolithography and pattern transfers - CMOS fabrication processes: nWell - pWell - - Submicron CMOS process - Masks and layout - CMOS design rules: SCMOS design rule set - Lambda based layout.

UNIT - III **CMOS LOGIC GATE DESIGN AND LAYOUT** [09]

CMOS inverter voltage transfer curve - NAND and NOR gates - Complex logic gates - Stick diagram - CMOS Layout - Tri state circuits - Large FETs – Transmission gate and pass transistor logic - Standard cell design: Cell hierarchies - Cell libraries.

UNIT - IV **STORAGE ELEMENTS AND DYNAMIC LOGIC CIRCUITS** [09]

SR latch - Bit level register - D flip flop - Dynamic D flip flop - Static RAM cell - Clocked CMOS - Dynamic logic – Domino logic - SR logic - Dynamic memories.

UNIT - V **TEST AND TESTABILITY** [09]

Need for Testing, Testers, Test fixtures and test programs - Silicon debug principles - Manufacturing test principles Modeling, Design for Testability, Boundary Scan.

Total = 45 Periods

Text Books :

1 John P. Uyemura, Chip Design for Submicron VLSI: CMOS layout and simulation, Cengage Learning India Private Ltd, 11th Indian Reprint 2016.
2 Samir Palnitkar, Verilog HDL A Guide to Digital Design and Synthesis, Pearson Education, Second Edition, 2014.

Reference Books :

1 Kamran Eshraghian, Douglas A. Pucknell and Sholeh Eshraghian, Essentials of VLSI Circuits and Systems, Prentice Hall of India Pvt Ltd, 2013.
2 J.Bhasker, Verilog HDL Primer, BS publication, Third Edition, Reprint 2012.
3 http://nptel.ac.in/courses/108101089/
4 http://nptel.ac.in/syllabus/syllabus.php?subjectId=117108041

K.S.R. COLLEGE OF ENGINEERING, TIRUCHENGODE – 637215
DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING
CO-PO MAPPING

Regulation : R 2020

Course Code: 20EC613 **Course Name : VLSI Design**

CO	Course Outcomes	Programme Outcomes													
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	Design the digital circuits and CMOS structures using Verilog HDL.	3	3	3	-	3	-	-	-	-	-	-	2	3	-
CO2	Describe the VLSI fabrication process and design rules.	3	3	3	-	3	-	-	-	-	-	-	2	3	-
CO3	Develop the CMOS structure and layout.	3	3	3	-	3	-	-	-	-	-	-	2	3	-
CO4	Discuss the types of storage elements and dynamic logic circuits.	3	3	3	-	3	-	-	-	-	-	-	2	3	-
CO5	Discuss the types of Test and testability for VLSI circuits.	3	3	3	-	3	-	-	-	-	-	-	2	3	-
	Average	**3**	**3**	**3**	**-**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**2**	**3**	**-**

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

K.S.R. COLLEGE OF ENGINEERING (Autonomous) **R 2020**

20EC614	**ANTENNA AND WAVE PROPAGATION (Elective)**	L	T	P	C
		3	0	0	3

Prerequisite: Engineering Electromagnetics

Course Outcomes: On Completion of this course , the student will be able to		***Cognitive level***
CO1	*Describe antenna radiation principles and its fundamental parameters.*	*Understand*
CO2	*Design different types of antenna arrays and their radiation patterns.*	*Apply*
CO3	*Design various types of low and high frequency antennas.*	*Apply*
CO4	*Discuss different types of special antennas and techniques used in antenna measurements.*	*Understand*
CO5	*Describe different types of wave propagation methods and its characteristics*	*Understand*

UNIT – I ELECTROMAGNETIC RADIATION AND ANTENNA FUNDAMENTALS [9]

Review of electromagnetic theory: Vector potential - Retarded case - Hertizian dipole - Half wave dipole - Quarter wave monopole - Antenna characteristics: Radiation pattern, beam solid angle, directivity, gain, input impedance, polarization, bandwidth, reciprocity, effective aperture, effective length, antenna temperature.

UNIT – II ANTENNA ARRAYS [9]

Expression for electric field from two and N element arrays - Linear arrays: Broad side array and end fire array - Method of pattern multiplication - Binomial array - Phased arrays - Frequency scanning arrays - Adaptive arrays.

UNIT – III LOW AND HIGH FREQUENCY ANTENNAS [9]

Loop antennas: Radiation from small loop and its radiation resistance - Helical antenna: Normal mode and axial mode operation - Yagi Uda antenna - Log periodic antenna - Rhombic antenna - Horn antenna - Reflector antennas and their feed systems - Micro strip antenna.

UNIT – IV SPECIAL ANTENNAS AND ANTENNA MEASUREMENTS [9]

Special applications: Antenna for terrestrial mobile communication systems - GPR - Embedded antennas - UWB - Plasma antenna - Smart antennas. Antenna measurements: Radiation pattern - Gain - Directivity - Polarization - Impedance -Efficiency.

UNIT – V WAVE PROPAGATION [9]

Ground wave propagation: Attenuation characteristics - Space wave propagation: Reflection from ground for vertically and horizontally polarized waves - Reflection characteristics of earth - Resultant of direct and reflected ray at the receiver - Duct propagation - Sky wave propagation: Structure of the ionosphere - Effective dielectric constant of ionized region - Mechanism of refraction - Refractive index - Critical frequency - Skip distance.

Total = 45 Periods

Text Books :

1 Prasad K. D, Antennas and Wave Propagation, Satya Prakashan Publications, New Delhi, 2020.

2 John D. Kraus, Ronald J. Marhefka, and Ahmad S. Khan, Antennas and Wave Propagation, Tata McGraw-Hill, New Delhi, Fifth Edition, 2017.

Reference Books :

1 Constantine A. Balanis, Antenna Theory: Analysis and Design, John Wiley & Sons, USA, Fourth Edition, 2016.

2 Edward C. Jordon and Keith G. Balmain, Electromagnetic Waves and Radiating Systems, Pearson Education, Second Edition, 2015.

3 Robert E.Collin, Antennas and Radio wave Propagation, McGraw-Hill Education, US, Fourth Edition, 2014

4 https://nptel.ac.in/courses/117/107/117107035/

K.S.R. COLLEGE OF ENGINEERING, TIRUCHENGODE – 637215
DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING
CO-PO MAPPING

Regulation : R 2020

Course Code:20EC614 **Course Name: ANTENNA AND WAVE PROPAGATION**

CO	Course Outcomes	Programme Outcomes													
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	*Describe antenna radiation principles and its fundamental parameters.*	3	3	3	-	-	-	-	-	-	-	-	-	-	3
CO2	*Design different types of antenna arrays and their radiation patterns.*	3	3	3	-	-	-	-	-	-	-	-	-	-	3
CO3	*Design various types of low and high frequency antennas.*	3	3	3	-	-	-	-	-	-	-	-	-	-	3
CO4	*Discuss different types of special antennas and techniques used in antenna measurements..*	3	3	2	-	-	-	-	-	-	-	-	-	-	3
CO5	*Describe different types of wave propagation methods and its characteristics.*	3	3	2	-	-	-	-	-	-	-	-	-	-	3
	Average	**3**	**3**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**3**

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

K.S.R. COLLEGE OF ENGINEERING (Autonomous) **R 2020**

SEMESTER - VI

		L	T	P	C
20EC621	**COMMUNICATION SYSTEMS LABORATORY**	0	0	3	1

Prerequisite: -

Course Outcomes : On successful completion of the course, the student will be able to		**Cognitive Level**
CO1:	*Demonstrate the concept of analog modulation techniques*	Apply
CO2:	*Demonstrate the concept of pulse modulation techniques*	Apply
CO3:	*Discuss about the coding techniques for A/D conversion*	Understand
CO4:	*Demonstrate various digital modulation techniques*	Apply
CO5:	*Measure the antenna radiation pattern and summarize the frequency response of RF filters*	Understand

List of Experiments:

To Design and observe the waveforms for

1. To Design AM modulator and demodulator circuit and determine the modulation index of various modulation types using spectrum analyzer and math mode of CRO.
2. To Design FM modulator and demodulator circuit and determine the modulation index.
3. Pulse Modulation - PAM, PWM, PPM.
4. Pulse code modulation encoder and decoder.
5. Delta modulation and demodulation.
6. Digital Modulation Techniques - ASK, FSK, PSK. Compare its bit error performance using MATLAB.
7. Sampling & TDM.
8. Radiation pattern of Yagi-Uda, Horn, Loop antennas and determine its bandwidth, gain and directivity.
9. To simulate broadside array and end fire array using MATLAB.
10. Determine the S-parameters using network analyzer. (DUT Specific)
11. Frequency response of RF filters using spectrum analyzer.

Total (P: 45) = 45 Periods

K.S.R. COLLEGE OF ENGINEERING, TIRUCHENGODE – 637215
DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING
CO-PO MAPPING

Regulation : R 2020

Course Code: 20EC621 **Course Name : Communication Systems Laboratory**

CO	Course Outcomes	Programme Outcomes													
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	*Demonstrate the concept of analog modulation techniques*	3	3	3	-	-	-	-	-	3	-	-	-	3	-
CO2	*Demonstrate the concept of pulse modulation techniques*	3	3	3	-	-	-	-	-	3	-	-	-	3	-
CO3	*Discuss about the coding techniques for A/D conversion*	3	3	3	-	-	-	-	-	3	-	-	-	3	-
CO4	*Demonstrate various digital modulation techniques*	3	3	3	-	3	-	-	-	3	-	-	-	3	3
CO5	*Measurement of antenna radiation pattern and summarize the frequency response of RF filters*	3	3	3	-	3	-	-	-	3	-	-	-	3	3
	Average	**3**	**3**	**3**	**-**	**3**	**-**	**-**	**-**	**3**	**-**	**-**	**-**	**3**	**3**

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

K.S.R. COLLEGE OF ENGINEERING (Autonomous) **R 2020**

SEMESTER - VI

		L	T	P	C
20EC622	**VLSI LABORATORY**	3	0	0	1

Prerequisite: Digital Electronics

Course Outcomes : On successful completion of the course, the student will be able to		***Cognitive Level***
CO1:	*Design and develop the combinational circuits using Verilog HDL.*	*Apply*
CO2:	*Develop the sequential circuits using Verilog HDL.*	*Apply*
CO3:	*Design CMOS logic gates using EDA tool.*	*Apply*
CO4:	*Verify the functionality of digital circuits using FPGA.*	*Apply*
CO5:	*Develop place and route of the digital circuits using FPGA.*	*Apply*

List of Experiments:

- Design and simulation of combinational logic circuit using Verilog. (CO1)
  1. Adder, subtractor, and multiplier
  2. Multiplexer and multiplexer
  3. Encoder and decoder
- Design and simulation of sequential logic circuit using Verilog.(CO2)
  4. Flip flops
  5. Counters
  6. Shift registers
- CMOS circuit design using EDA Tool. (CO3)
  7. CMOS inverter
  8. CMOS NAND and NOR gates
  9. CMOS based complex logic gates.
- FPGA implementation with functional verification. (CO4)
  10. Combinational and sequential circuits
- FPGA implementation with place and route. (CO5)
  11. Combinational and sequential circuits
  12. ALU, Counter

Total (L= 45, T = 0) = 45 Periods

K.S.R. COLLEGE OF ENGINEERING, TIRUCHENGODE – 637215
DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING
CO-PO MAPPING

Regulation : R 2020

Course Code: 20EC622 **Course Name : VLSI LABORATORY**

CO	Course Outcomes	Programme Outcomes													
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	*Design and develop the combinational circuits using Verilog HDL.*	3	3	3	-	3	-	-	-	-	-	-	2	3	-
CO2	*Develop the sequential circuits using Verilog HDL.*	3	3	3	-	3	-	-	-	-	-	-	2	3	-
CO3	*Design CMOS logic gates using EDA tool.*	3	3	3	-	3	-	-	-	-	-	-	2	3	-
CO4	*Verify the functionality of digital circuits using FPGA.*	3	3	3	-	3	-	-	-	-	-	-	2	3	-
CO5	*Develop place and route of the digital circuits using FPGA.*	3	3	3	-	3	-	-	-	-	-	-	2	3	-
	Average	**3**	**3**	**3**	**-**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**2**	**3**	**-**

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

K.S.R. COLLEGE OF ENGINEERING (Autonomous) **R 2020**

SEMESTER - VI

		L	T	P	C
20HR654	**CAREER DEVELOPMENT SKILLS – IV**	0	2	0	0

Prerequisite(s): NIL

Course Outcomes: On successful completion of the course, the student will be able to		***Cognitive Level***
CO1:	*Employ critical thinking in personal interviews type situations.*	*Apply*
CO2:	*Understand the Quantitative Aptitude problems in geometry.*	*Understand*
CO3:	*Understand the data interpretation and analysis by using various graphs.*	*Understand*
CO4:	*Enhance the skills in resume writing and presentation.*	*Create*
CO5:	*Develop the comprehension Skills in core subjects.*	*Apply*

UNIT - I WRITTEN AND ORAL COMMUNICATION [06]

Self-Introduction – GD – Personal Interview Skills Practices on Reading Comprehension Level 2 – Paragraph Writing – Newspaper and Book Review Writing – Skimming and Scanning – Interpretation of Pictorial Representations – Sentence Completion – Sentence Correction – Jumbled Sentences – Synonyms& Antonyms – Using the Same Word as Different Parts of Speech – Editing.

UNIT - II QUANTITATIVE APTITUDE [06]

Geometry – Straight Line – Triangles – Quadrilaterals – Circles – Co-ordinate Geometry – Cube – Cone – Sphere.

UNIT - III DATA INTERPRETATION AND ANALYSIS [06]

Data Interpretation based on Text – Data Interpretation based on Graphs and Tables. Graphs Column Graphs, Bar Graphs, Line Charts, Pie Chart, Graphs representing Area, Venn Diagram & Flow Charts.

UNIT - IV RESUME WRITING & PRESENTATION SKILLS [06]

An Introduction to the Resume – Types of Resumes – Common Resume Errors – Anatomy of a Resume – What is a Cover Letter? – Types of Cover Letters – Enhancing the Language and Style of Your Resume and Cover Letter – Assessment.

Presentation Skills: Oral presentation and public speaking skills; business presentations. – Understand the Situation – Know Your Tools – Know Yourself – Organize it, Write the Script – Practice – Delivering a Presentation.

UNIT - V DOMAIN PROFICIENCY [06]

Digital circuits - Boolean algebra, logic gates, Combinatorial circuits, Sequential circuits, Sample and hold circuits, ADCs, DACs, Microprocessor (8085).

Analog Communication - Random signals and noise, Analog communication systems, AM, FM modulation and Demodulation, Spectral Analysis, super heterodyne receivers, signal-to-noise ratio.

Digital Communication - Sample and Hold Circuits, PCM & DPCM, Digital modulation techniques ASK, FSK, PSK, bandwidth consideration and probability of error calculations, Basics of TDMA, FDMA and CDMA and GSM.

Total (L= 45, T = 0) = 45 Periods

Text Books :

1 Dr.R.S.Aggarwal, Quantitative Aptitude, S. Chand & Company Limited, New Delhi, Sixteenth Edition, 2018.

2 Dr.R.S.Aggarwal, A Modern Approach to Verbal & Non -Verbal Reasoning, S. Chand & Company Limited, New Delhi, Fourth Edition,2015.

Reference Books :

1 M Ashra Rizvi, Effective Technical Communication, Tata McGraw HILL, New Delhi, First Edition, 2005.

2 Abhijit Guha, Quantitative Aptitude, TMH, New Delhi, Third Edition,2016.

3 M.B. Lal, Goswami Objective Instant Arithmetic, Upkar Publications, Delhi, Second Edition,2012.

4 ECE for Gate by Kishore Kashyap, McGraw-Hill Education – Europe, 2020.

K.S.R. COLLEGE OF ENGINEERING, TIRUCHENGODE – 637215
DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING
CO-PO MAPPING

Semester	**VI**	**Regulation:**	**R 2020**
Course Code:	**20HR654**	**Course Name:**	**CAREER DEVELOPMENT SKILLS – IV**

CO	Course Outcomes	Programme Outcomes													
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1:	*Develop the basic grammatical rules for written and oral communication.*	-	-	-	-	-	-	-	-	2	3	-	3	-	-
CO2:	*Enhance their skills on quantitative aptitude.*	1	-	-	-	-	-	-	-	2	3	-	3	-	-
CO3:	*Understand the data interpretation and analysis by using various graphs.*	-	-	-	-	-	-	-	-	2	3	-	3	-	-
CO4:	*Enhance the skills in resume writing and presentation.*	-	-	-	-	-	-	-	-	2	3	-	3	-	-
CO5:	*Develop the comprehension Skills in core subjects.*	-	-	-	-	-	-	-	-	2	3	-	3	2	-
	Average	**1**	**-**		**-**	**-**	**-**	**-**	**-**	**2**	**3**	**-**	**3**	**2**	**-**

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

K.S.R. COLLEGE OF ENGINEERING (Autonomous) **R 2020**

SEMESTER - VII

		L	T	P	C
20EC711	**WIRELESS AND CELLULAR COMMUNICATION**	**3**	**0**	**0**	**3**

Prerequisite: *Digital Communication Systems*

Course Outcomes : On successful completion of the course, the student will be able to		***Cognitive Level***
CO1:	*Summarize the evolution of wireless systems.*	*Understand*
CO2:	*Describe the fundamentals of cellular concepts.*	*Understand*
CO3:	*Explain the types of accessing techniques.*	*Understand*
CO4:	*Identify the various diversity schemes and spread spectrum.*	*Understand*
CO5:	*Discuss the architecture and services of Wireless LAN.*	*Understand*

UNIT - I WIRELESS COMMUNICATION SYSTEMS [09]

Generation of wireless communication systems: 2G, 3G, 4G and 5G - Examples of wireless systems: Cordless, Paging system and Cellular telephone system - Comparison of wireless system - Personal communication system.

UNIT - II CELLULAR FUNDAMENTALS [09]

Frequency reuse - Handoff - Channel assignment - Interference - Improving coverage and capacity in cellular systems - Radio propagation mechanisms: Free space propagation and two ray ground reflection model.

UNIT - III WIRELESS ACCESS SYSTEMS [09]

Access methods: TDMA, FDMA, CDMA and CSMA - Capacity of CDMA and SDMA - OFDM - MIMO - Future wireless systems: Introduction to Front Haul and Back Haul.

UNIT - IV ANTENNA DIVERSITY AND SPREAD SPECTRUM [09]

Diversity: Space, Time, Polarization and Frequency - Selection diversity improvement - Combining techniques: Selective diversity combining, maximal ratio, equal gain combining, feed forward and feedback combining - Spread spectrum: Basic principles, direct sequence spread spectrum, frequency hopping spread spectrum.

UNIT - V WIRELESS LAN [09]

Fundamentals of WLAN - IEEE 802.11n WLAN standard, architecture and services, physical layer - MAC sub layer - MAC management sub layer - IEEE standards - HIPER LAN - Bluetooth - Overview of WIFI - WIMAX - LTE.

Total (L:45) = 45 Periods

Text Books :

1 Rappaport.T.S, Wireless communications, Pearson Education, Bengalore, Second edition, 2014.

2 David TSE and Pramod Viswanath, Fundamentals of Wireless Communication, Cambridge University Press, First edition 2005.

Reference Books :

1 Jochen Schiller, Mobile Communications, Pearson Education, Bengaluru, Second edition, 2017.

2 KavethPahlavan and Prashant Krishnamurthy, Principles of Wireless Networks, John Wiley & Sons Ltd, Atrium southern gate chichester, Second edition, 2013.

3 Simon Haykin and Michael Moher, Modern Wireless Communication, Pearson Education, Bengaluru, First edition, 2011.

4 Kazi Mohammed Saidul Hug and Jonathan Rodriguez, Back hauling/Front hauling for future wireless systems, John Wiley & Sons Ltd, Atrium southern gate chichester, First edition, 2017.

K.S.R. COLLEGE OF ENGINEERING, TIRUCHENGODE – 637215
DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING
CO-PO MAPPING

Regulation: **R 2020**

Course Code:20EC711 **Course Name:** **WIRELESS AND CELLULAR COMMUNICATION**

CO PO MAPPING

CO	Course Outcomes	Programme Outcomes													
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	*Summarize the evolution of wireless systems.*	3	3	3	-	-	3	2	-	-	-	-	-	-	3
2	*Describe the fundamentals of cellular concepts.*	3	3	3	-	-	3	2	-	-	-	-	-	-	3
3	*Explain the types of accessing techniques.*	3	3	3	-	-	3	2	-	-	-	-	-	-	3
4	*Identify the various diversity schemes and spread spectrum.*	3	3	3	-	-	3	2	-	-	-	-	-	-	3
5	*Discuss the architecture and services of Wireless LAN.*	3	3	3	-	-	3	2	-	-	-	-	-	-	3
	Average	**3**	**3**	**3**	**-**	**-**	**3**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**3**

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

K.S.R. COLLEGE OF ENGINEERING (Autonomous) **R 2020**

SEMESTER - VII

		L	T	P	C
20EC712	**RF AND MICROWAVE ENGINEERING**	**3**	**0**	**0**	**3**

Prerequisite: *Electronic Devices and Circuits*

Course Outcomes : On completion of this course, the student will be able to	***Cognitive Level***
CO1: Describe the Z, Y, h, ABCD and S parameters for two port network.	*Understand*
CO2: Elaborate the process of microwave signal generation using Reflex klystron, TWTA and Magnetron.	*Understand*
CO3: Describe the characteristics of passive and active microwave devices.	*Understand*
CO4: Compute the stability for microwave amplifier and design of matching networks.	*Apply*
CO5: Measure the power, impedance, VSWR and S-parameters using microwave measuring instruments.	*Understand*

UNIT - I TWO PORT NETWORK PARAMETERS [09]

Review of low frequency parameters: Impedance, Admittance, Hybrid and ABCD parameters - Different types of interconnections in two port network - High frequency parameters: Formulation of S parameter for two port network and multiport network - Properties of S parameters - Reciprocal and lossless networks - Transmission matrix - RF behavior of resistors, capacitors and inductors.

UNIT - II MICROWAVE TUBES [09]

Two cavity klystron: Transit time effect, velocity modulation, current modulation and bunching - Reflex klystron - Slow wave structures - Helix traveling wave tube, its analysis and gain considerations - Magnetron: Operation of Cylindrical magnetron, Hull cutoff magnetic and Hull cutoff voltage Equation.

UNIT - III MICROWAVE COMPONENTS AND DEVICES [09]

Terminations, Attenuators, Phase shifters, Power dividers, Circulator, Isolators - S matrix of power dividers and directional coupler- Rat race coupler - Impedance matching devices: Crystal diode, Schottkey diode, PIN diode, Gunn diode, READ diode and IMPATT diode.

UNIT - IV RF AMPLIFIER AND MATCHING NETWORKS [09]

Characteristics of amplifiers - Amplifier power relations - Stability considerations - Stabilization methods - Constant VSWR circles - Constant Noise figure circles - Broadband, high power and multistage amplifiers - Matching Networks: Impedance matching using discrete components - Two component matching networks - Frequency response and quality factor - T and Pi matching networks - Micro strip line matching networks - Single stub and Double stub matching networks.

UNIT - V MICROWAVE MEASUREMENTS [09]

Measuring instruments: VSWR meter, Power meter, Spectrum analyzer, Network analyzer - Measurement of impedance, frequency, Power, VSWR, Q-factor, dielectric constant, scattering coefficients, attenuation, S-parameters.

Total (L:45) = 45 Periods

Text Books:

1 Samuel Y.Liao, Microwave Devices and Circuits, Pearson Education Inc., New Delhi, Third edition, 2012.

2 Reinhold Ludwig and Gene Bogdanov, RF Circuit Design: Theory and Applications, Pearson Education Inc., New Delhi, Second edition, 2012.

Reference Books:

1 David M.Pozar, Microwave Engineering, Wiley India (P) Ltd, New Delhi, Fourth edition, 2011.

2 S.Vasuki, D.Margaret Helena and R.Rajeswari, Microwave Engineering, McGraw Hill Education, New York, First edition, 2015.

3 Annapurna Das and Sisir K Das, Microwave Engineering, Tata McGraw Hill, New Delhi, Second edition, 2012.

4 Thomas H Lee, Planar Microwave Engineering: A Practical Guide to Theory, Measurements and Circuits, Cambridge University Press, United Kingdom, First edition, 2010.

K.S.R. COLLEGE OF ENGINEERING, TIRUCHENGODE – 637215
DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING
CO-PO MAPPING

Regulation: R 2020

Course Code:20EC712 **Course Name: RF AND MICROWAVE ENGINEERING**

CO	Course Outcomes	Programme Outcomes													
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	*Describe the Z, Y, h, ABCD and S parameters for two port network.*	3	3	2	2	-	-	-	-	-	-	-	2	3	3
2	*Elaborate the process of microwave signal generation using Reflex klystron, TWTA and Magnetron.*	3	3	2	2	-	-	-	-	-	-	-	2	3	3
3	*Describe the characteristics of passive and active microwave devices.*	3	3	2	2	-	-	-	-	-	-	-	2	3	3
4	*Compute the stability for microwave amplifier and design of matching networks.*	3	3	3	2	-	-	-	-	-	-	-	2	3	3
5	*Measure the power, impedance, VSWR and S-parameters using microwave measuring instruments.*	3	3	2	2	-	-	-	-	-	-	-	2	3	3
	Average	**3**	**3**	**2**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2**	**3**	**3**

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

K.S.R. COLLEGE OF ENGINEERING (Autonomous) **R 2020**

SEMESTER - VII

		L	T	P	C
20EC713	**FIBER OPTIC COMMUNICATION**	**3**	**0**	**0**	**3**

Prerequisite: Nil

Course Outcomes: On successful completion of the course, the student will be able to		***Cognitive Level***
CO1:	*Elaborate the concepts of optical fiber waveguide modes, configurations, structures and the measurement of attenuation, numerical aperture and fiber diameter.*	*Understand*
CO2:	*Compute the losses due to scattering, absorption, fiber bend and nonlinear effects in optical fibers.*	*Apply*
CO3:	*Interpret the characteristics of LEDs and Laser sources and explain about power launching and lensing.*	*Understand*
CO4:	*Interpret the characteristics of optical detectors and describe the receiver operation.*	*Understand*
CO5:	*Describe the principles of coherent and phase modulated optical fiber systems.*	*Understand*

UNIT - I OPTICAL FIBER WAVEGUIDES [09]

Ray theory transmission: Total internal reflection, acceptance angle, numerical aperture, skew rays - Electromagnetic mode theory of optical propagation: EM wave, modes in planar guide, phase and group velocity - Cylindrical fibers - SM fibers - Fiber attenuation measurements - Fiber numerical aperture measurements - Fiber diameter measurements.

UNIT - II SIGNAL DEGRADATION IN OPTICAL FIBERS [09]

Attenuation - Material absorption losses in silica glass fibers - Linear and nonlinear scattering losses - Fiber bend loss - Mid-band and far-band infrared transmission - Intra and intermodal dispersion - Overall fiber dispersion - Polarization - Nonlinear effects - Optical fiber connections: Fiber alignment and joint losses, fiber splices, fiber connectors, fiber couplers.

UNIT - III OPTICAL SOURCES [09]

LEDs - LASER diodes: Semiconductor laser diode, fabry - perot laser, distributed feedback lasers, modulation of laser diodes, temperature effects - Power launching and coupling: Source to fiber power launching, lensing scheme for coupling improvement, LED coupling to single mode fibers.

UNIT - IV OPTICAL RECEIVER [09]

Optical detectors: PIN photo detector, avalanche photodiodes, construction, characteristics and properties - Photo detector noise: Noise sources, signal to noise ratio, detector response time, comparison of photo detector - Fundamental receiver operation: Digital signal transmission, error sources - Front end amplifier - Probability of error - Quantum limit.

UNIT - V COHERENT AND PHASE MODULATED OPTICAL FIBER SYSTEMS [09]

Basic Coherent Systems – coherent principles – Practical constraints of coherent transmission – Modulation Formats – Demodulation schemes – DPSK – Receiver sensitivities – Multicarrier systems.

Total (L: 45) = 45 Periods

Text Books:

1 Gerd Keiser, Optical Fiber Communication, McGraw Hill, New York, Fifth edition, 2017.

2 John M. Senior, Optical Fiber Communication, Pearson Education, Noida, Third edition, 2009.

Reference Books:

1 Govind P.Agrawal, Fiber-optic communication systems, Wiley & sons, New Jersey, Fourth edition, 2010.

2 Harry J.R Dutton, Understanding Optical Communications, IBM Corporation, International Technical Support Organization, New York, First edition, 1998.

3 J.Gower, Optical Communication System, Prentice Hall of India, New Delhi, Second edition, 2003.

4 R.P. Khare, Fiber Optics and Optoelectronics, Oxford University Press, London, First edition, 2004.

K.S.R. COLLEGE OF ENGINEERING, TIRUCHENGODE – 637215
DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING
CO-PO MAPPING

Regulation: R 2020

Course Code: 20EC713 **Course Name: FIBER OPTIC COMMUNICATION**

CO	Course Outcomes	Programme Outcomes													
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	*Elaborate the concepts of optical fiber waveguide modes, configurations, structures and the measurement of attenuation, numerical aperture and fiber diameter.*	3	3	1	-	-	-	-	-	-	-	-	-	3	-
2	*Compute the losses due to scattering, absorption, fiber bend and nonlinear effects in optical fibers.*	3	3	3	-	-	-	-	-	-	-	-	-	3	-
3	*Interpret the characteristics of LEDs and Laser sources and explain about power launching and lensing.*	3	3	1	-	-	-	-	-	-	-	-	-	3	-
4	*Interpret the characteristics of optical detectors and describe the receiver operation.*	3	3	1	-	-	-	-	-	-	-	-	-	3	-
5	*Describe the principles of coherent and phase modulated optical fiber systems.*	3	3	1	-	-	-	-	-	-	-	-	-	3	-
	Average	**3**	**3**	**1**	**-**		**-**	**-**	**-**	**-**	**-**	**-**	**-**	**3**	**-**

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

K.S.R. COLLEGE OF ENGINEERING (Autonomous) **R 2020**

SEMESTER - VII

		L	T	P	C
20EC721	**RF, MICROWAVE AND OPTIC LABORATORY**	**0**	**0**	**3**	**1**

Prerequisite: Nil

Course Outcomes : On successful completion of the course, the student will be able to		**Cognitive Level**
CO1:	Measure the characteristics of RF Amplifiers, mixers and band pass filters using spectrum analyzer and network analyzer.	Apply
CO2:	Measure the mode characteristics, VSWR, Wavelength and frequency of Reflex Klystron and Gunn diode.	Apply
CO3:	Compute the coupling coefficient of directional coupler and measure the radiation pattern of Horn antenna.	Apply
CO4:	Perform the data transmission in analog and digital form through optical fiber also measure the numerical aperture and bending losses.	Apply
CO5:	Obtain the characteristics of optical sources like LASER, LED and measure the BER and eye pattern for fiber cable.	Apply

List of Experiments:

RF Experiments:

1. Characteristics of RF circuits using spectrum analyzer
2. Study of frequency response of band pass filter
3. Design of Micro Strip Patch Antenna using HFSS - Study Experiments

Microwave Experiments:

1. Characteristics of Reflex klystron and Gunn diode oscillator
2. VSWR Measurements and determination of terminated impedance
3. Guide wavelength and frequency
4. Directivity and Coupling coefficient of Directional coupler
5. Radiation pattern and Gain measurement of Horn antenna

Optical Experiments:

1. Analog and digital link using Fiber optical cable
2. Numerical aperture of fiber cables
3. Bending losses
4. DC characteristics of LED and VI characteristics of LASER diode
5. BER and Eye pattern

Total (P:45) = 45 Periods

K.S.R. COLLEGE OF ENGINEERING, TIRUCHENGODE – 637215
DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING
CO-PO MAPPING

Regulation: R 2020

Course Code: 20EC721 **Course Name: RF, MICROWAVE AND OPTIC LABORATORY**

CO	Course Outcomes	Programme Outcomes													
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	Measure the characteristics of RF Amplifiers, mixers and band pass filters using spectrum analyzer and network analyzer.	3	3	2	-	-	-	-	-	3	-	-	1	3	1
2	Measure the mode characteristics, VSWR, Wavelength and frequency of Reflex Klystron and Gunn diode.	3	3	2	-	-	-	-	-	3	-	-	1	3	1
3	Compute the coupling coefficient of directional coupler and measure the radiation pattern of Horn antenna.	3	3	2	-	-	-	-	-	3	-	-	1	3	1
4	Perform the data transmission in analog and digital form through optical fiber also measure the numerical aperture and bending losses.	3	3	2	-	-	-	-	-	3	-	-	1	3	1
5	Obtain the characteristics of optical sources like LASER, LED and measure the BER and eye pattern for fiber cable.	3	3	2	-	-	-	-	-	3	-	-	1	3	1
	Average	**3**	**3**	**2**	**-**	**-**	**-**	**-**	**-**	**3**	**-**	**-**	**1**	**3**	**1**

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

K.S.R. COLLEGE OF ENGINEERING (Autonomous) **R 2020**

SEMESTER - VII

		L	T	P	C
20EC722	**PROJECT WORK PHASE I**	**0**	**0**	**6**	**3**

Prerequisite: All the core and elective courses of the programme.

Course Outcomes : On successful completion of the course, the student will be able to		**Cognitive Level**
CO1:	Identify, analyze, interpret and formulate the problem and conceptualize the methodology of the project in research areas of the department interests or of Industrial importance.	Apply
CO2:	*Solve a specific problem right from its identification and literature review till the successful solution of the same.*	Apply
CO3:	*Apply the theoretical concepts to solve real time problems with teamwork and multi-disciplinary approach.*	Apply
CO4:	*Design /develop/conduct experiment and document the results by using modern tools/methods.*	Apply
CO5:	*Prepare a good project report and be able to present the ideas with clarity.*	Apply

The students should adhere the following Guidelines:

1. To start with literature review about the proposed idea of the project and executing the same in consultation with the project guide/project coordinator/Industry experts.

2. A detailed analysis/modeling/simulation/design/problem solving/experiment is must to complete and an effort leading to paper publication or patenting is desired.

3. The progress of the project work phase I is evaluated based on a minimum of three reviews and the review committee may be constituted by the Head of the Department.

4. A project work phase I report is required to be submitted at the end of the semester in the prescribed format.

The project work phase I is evaluated based on oral presentation and the project report jointly by external and internal examiners constituted by the Head of the Department.

Total (P:45) = 45 Periods

K.S.R. COLLEGE OF ENGINEERING, TIRUCHENGODE – 637215
DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING
CO-PO MAPPING

Regulation: R 2020

Course Code: 20EC722 **Course Name: PROJECT WORK PHASE I**

CO	Course Outcomes	Programme Outcomes													
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	Identify, analyze, interpret and formulate the problem and conceptualize the methodology of the project in research areas of the department interests or of Industrial importance.	3	3	3	3	3	3	3	3	3	3	3	3	3	3
2	*Solve a specific problem right from its identification and literature review till the successful solution of the same.*	3	3	3	3	3	3	3	3	3	3	3	3	3	3
3	*Apply the theoretical concepts to solve real time problems with teamwork and multi-disciplinary approach.*	3	3	3	3	3	3	3	3	3	3	3	3	3	3
4	*Design /develop/conduct experiment and document the results by using modern tools/methods.*	3	3	3	3	3	3	3	3	3	3	3	3	3	3
5	*Prepare a good project report and be able to present the ideas with clarity.*	3	3	3	3	3	3	3	3	3	3	3	3	3	3
	Average	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

K.S.R. COLLEGE OF ENGINEERING (Autonomous) **R 2020**

SEMESTER - VIII

		L	T	P	C
20EC821	**PROJECT WORK PHASE II**	**0**	**0**	**12**	**6**

Prerequisites: *All the core and elective courses of the programme.*

Course Outcomes: On successful completion of the course, the student will be able to		***Cognitive Level***
CO1:	*Identify a real world problem and develop the design solutions.*	*Apply*
CO2:	*Select the proper components as per requirements of the design/system.*	*Apply*
CO3:	*Apply the new tools, algorithms, methodologies that contribute to obtain the solution of the project.*	*Analyze*
CO4:	*Analyze the findings and execute the project with developed prototype as a team.*	*Analyze*
CO5:	*Defend the findings and conclude with oral/written reports.*	*Evaluate*

The students should adhere the following guidelines:

1. Start with literature review about the proposed idea of the project and executing the same in consultation with the project guide/project coordinator/Industry experts.
2. A detailed analysis/modeling/simulation/design/problem solving/experiment to be completed and an effort should be made to publish a paper in journals and filing a patent.
3. A working model or prototype is to be submitted at the end semester for evaluation.
4. Project work done at Industry should be supported by duly signed certificate by the Industry. The students should provide a copy of certificate at the end of the project report.
5. The review committee constituted by the Head of the Department will conduct at least three consecutive reviews to access the progress of the project.
6. A project report should be submitted at the end of the semester in the prescribed format.
7. The project work will be evaluated by the oral presentation and the project report by examiners.

Total = 180 Periods

K.S.R. COLLEGE OF ENGINEERING, TIRUCHENGODE – 637215
DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING
CO-PO MAPPING

Regulation: R 2020

Course Code: 20EC821 **Course Name: PROJECT WORK PHASE II**

CO	Course Outcomes	Programme Outcomes													
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1:	*Identify a real world problem and develop the design solutions.*	3	3	3	3	3	3	2	3	3	-	2	3	3	2
CO2:	*Select the proper components as per requirements of the design/system.*	3	3	3	3	3	3	2	3	3	-	2	3	3	2
CO3:	*Apply the new tools, algorithms, methodologies that contribute to obtain the solution of the project.*	3	3	2	3	3	2	1	2	3	2	3	3	3	1
CO4:	*Analyze the findings and execute the project with developed prototype as a team.*	3	3	2	3	3	1	1	2	3	2	3	3	3	1
CO5:	*Defend the findings and conclude with oral/written reports.*	1	3	1	3	3	-	-	3	3	3	3	3	3	2
	Average	**3**	**3**	**2**	**3**	**3**	**2**	**2**	**3**	**3**	**2**	**3**	**3**	**3**	**2**

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

K.S.R. COLLEGE OF ENGINEERING: TIRUCHENGODE - 637 215

(Autonomous)

(REGULATIONS 2020)

PROFESSIONAL ELECTIVE COURSES

K.S.R. COLLEGE OF ENGINEERING (Autonomous) **R 2020**

SEMESTER – V

		L	T	P	C
20IE591	**AUGMENTED INTELLIGENCE LED MANAGED SERVICES (AIMS) – I** **(Common To CS, EC, EE & IT)** **(PROFESSIONAL ELECTIVE - I)**	3	0	0	3

Prerequisite: *No prerequisites are needed for enrolling into the course*

Course Outcomes : *On successful completion of the course, the student will be able to*		***Cognitive Level***
CO1:	*Identify the operation policies and procedures based on how the organization*	*Understand*
CO2:	*Analysing the procedures to achieve a safe working environment in line with health and safety regulation.*	*Analyze*
CO3:	*Apprehend the Key Concepts of Service Management of IT-enabled services*	*Create*
CO4:	*Recognize an IT Infrastructure and Information Security*	*Analyze*
CO5:	*Implement the policies in Microsoft 365.*	*Understand*

UNIT – I **IT OPERATIONS** **[9]**

Evolution of Technologies – IT Operations Introduction – Policies – Roles –Support – Procedures for Managing Problems and Incidents

UNIT– II **SECURE WORKING ENVIRONMENT AND ETIQUETTE** **[9]**

Introduction – Safety Enforcement – National Standards – Safety Compliance – Health and Safety Awareness – Components of Etiquette – Professionalism and Ethics – Etiquette Standards – Email Communication – Business Meetings, Grooming and Personal Attire – Dining Etiquette

UNIT– III **ITIL** **[9]**

Introduction – Understanding ITIL Guiding Principles in an Organization – Optimize and Automate – Four Dimensions of Service Management – Key Activities of the Service Value Chain

UNIT – IV **IT INFRASTRUCTURE AND INFORMATION SECURITY** **[9]**

IT Infrastructure – Hardware, Software, Network – IT Infrastructure Types – Designing, Maintenance – Risks faced by Computer Systems and Networks – Analyzing Security Problems – Standard Security Mechanism

UNIT – V **AMS AND TOOLS** **[9]**

Introduction – Support Models – Activities Type – Audits – Microsoft 365 – Domain Management – Licensing – Managing Teams – Meeting Policies – Messaging Policies

Total = 45 Periods

Text Books :

1 Eric N. Smith, Workplace Security Essentials. A Guide for Helping Organizations Create Safe Work Environments, Butterworth Heinemann, Elsevier, United States of America,2014

2. AXELOS, ITIL Foundation ITIL 4 Edition, AXELO Limited, London, Second Edition, 2019

Reference Books :

1 John R. Vacca, Cyber Security and IT Infrastructure Protection, Syngress, ELSEVIER, United States of America ,First Edition, 2014

2 https://docs.microsoft.com/en-us/learn/m365/

K.S.R. COLLEGE OF ENGINEERING, TIRUCHENGODE – 637215
DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING
CO-PO MAPPING

Regulation: **R 2020**

Course Code: **20IE591** **Course Name:** **AUGMENTED INTELLIGENCE LED MANAGED SERVICES (AIMS) – I**

CO	Course Outcomes	Programme Outcomes													
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1:	*Identify the operation policies and procedures based on how the organization works.*	3	2	2	-	2	-	-	2	1	-	-	2	-	-
CO2:	*Apply the procedures to achieve a safe working environment in line with health and safety regulation.*	3	3	3	-	3	-	-	2	1	-	-	2	-	-
CO3:	*Outline the Key Concepts of Service Management of IT-enabled services*	3	2	2	-	3	-	-	2	1	-	-	2	-	-
CO4:	*Recognize an IT Infrastructure and Security mechanism*	3	2	3	-	2	-	-	2	1	-	-	2	-	-
CO5:	*Implement the policies in Microsoft 365.*	3	2	3	-	3	-	-	1	1	-	-	3	-	-
	Average	**3**	**2**	**3**	**-**	**3**	**-**	**-**	**2**	**1**	**-**	**-**	**2**	**-**	**-**

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

K.S.R. COLLEGE OF ENGINEERING (Autonomous) **R 2020**

SEMESTER – V

		L	T	P	C
20HS001	**PRINCIPLES OF MANAGEMENT (Common to All Branches)**	3	0	0	3

Course Outcomes: On Completion of this course, the student will be able to		***Cognitive Level***
CO1	*Explain the fundamentals of Management thoughts and the conceptual frame work of Management*	*Understand*
CO2	*Discuss the various concepts of planning, MBO and Strategy to help solving managerial problems*	*Understand*
CO3	*Explain the concepts of organizing, Delegation and Decision-making.*	*Understand*
CO4	*Describe the management concepts and styles in Leading.*	*Understand*
CO5	*Illustrate the various controlling and emerging concepts in management thought and philosophy*	*Understand*

UNIT - I OVERVIEW OF MANAGEMENT **[09]**

Definition of Management – Importance of management – Management functions – Levels of management – Role of managers – Management a science or an art – Evolution of Management thought: Scientific management and Administrative Principles of management – Ethical issues in Management.

UNIT - II PLANNING **[09]**

Planning: Meaning, purpose, Steps and Types of Plans - Management by objectives (MBO) – Decision Making: Types of Decisions, Steps in Rational Decision making, Common difficulties in Management Decision Making.

UNIT – III ORGANISING **[09]**

Nature and purpose of organizing : Organization structure, Process and Principles of organizing – Line & Staff authority – Departmentation – Span of Control – Centralization and Decentralization – Delegation of authority – Staffing : Sources of Recruitment, Selection process – Training methods – Performance appraisal methods.

UNIT - IV DIRECTING **[09]**

Creativity and Innovation – Motivation and Satisfaction: Motivation Theories – Leadership: Leadership theories and Styles – Communication: Barriers to communication, Principles of effective Communication

UNIT - V CONTROLLING **[09]**

Steps in a control Process: Need for control system, Budgetary and Non-Budgetary control techniques, Problems of the control system, Essentials of effective control system, and Benefits of control.

Total (L: 45 T: 0) = 45 Periods

Text Books :

1. L.M.Prasad, Principles and Practices of Management, Sultan Chand & Sons, New Delhi, Eleventh edition, 2015.
2. P.C.Tripathi and Reddy Principles of Management, McGraw Hill, New Delhi, Eighth edition, 2015.

Reference Books :

1. Hellriegel, Slocum & Jackson, Management A Competency Based Approach, Thomson South Western, London, Fifteenth edition, 2017.
2. Harold Koontz, Heinz Weihrich and mark V Cannice, Management – A Global Entrepreneurial Perspective, Tata McGraw Hill, New Delhi, Twelveth edition, 2014.
3. Andrew J. Dubrin, Essentials of Management, Thomson Southwestern, London, Tenth edition, 2014.
4. Robbins S.P., Fundamentals of Management, Pearson, New Delhi, Second edition, 2003

K.S.R. COLLEGE OF ENGINEERING, TIRUCHENGODE – 637215
DEPARTMENT OF MANAGEMENT STUDIES
CO-PO MAPPING

Regulation : R 2020

Course Code: 20HS001 **Course Name : Principles of Management**

CO	Course Outcomes	Programme Outcomes													
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	*Explain the fundamentals of Management thoughts and the conceptual frame work of Management*	-	-	-	-	-	1	1	3	1	2	3	2	-	-
CO2	*Discuss the various concepts of planning, MBO and Strategy to help solving managerial problems*	-	-	-	-	-	1	1	3	1	2	3	2	-	-
CO3	*Explain the concepts of organizing, Delegation and Decision-making.*	-	-	-	-	-	1	1	3	1	2	3	2	-	-
CO4	*Describe the management concepts and styles in Leading.*	-	-	-	-	-	1	1	3	1	2	3	2	-	-
CO5	*Illustrate the various controlling and emerging concepts in management thought and philosophy*	-	-	-	-	-	1	1	3	1	2	3	2	-	-
Round off Average		-	-	-	-	-	1	1	3	1	2	3	2	-	-

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

K.S.R. COLLEGE OF ENGINEERING (Autonomous) **R 2020**

SEMESTER – V

		L	T	P	C
20EC561	**ADVANCED DIGITAL SYSTEMS DESIGN (PROFESSIONAL ELECTIVE – I)**	3	0	0	3

***Prerequisite**: Digital Electronics*

Course Outcomes: On Completion of this course , the student will be able to		***Cognitive level***
CO1	*Analyze and design synchronous sequential circuits.*	*Analyze*
CO2	*Analyze and design asynchronous sequential circuits*	*Analyze*
CO3	*Describe the architecture of programmable logic devices and design digital circuits using programmable devices.*	*Apply*
CO4	*Demonstrate and use programming tools for implementing digital circuits of industry standards.*	*Apply*
CO5	*Illustrate about different fault models and fault diagnosis.*	*Apply*

UNIT – I SEQUENTIAL CIRCUIT DESIGN [9]

Analysis and modeling of Clocked Synchronous Sequential Network (CSSN): State diagram, state table, state table assignment and reduction - Design of synchronous sequential circuit - Design of iterative circuit - ASM chart and realization using ASM.

UNIT – II ASYNCHRONOUS SEQUENTIAL CIRCUIT DESIGN [9]

Analysis of Asynchronous Sequential Circuit (ASC) - Flow table reduction - Races in ASC - State assignment and transition table - Design of ASC - Static, dynamic and essential hazards - Data synchronizers - Mixed operating mode asynchronous circuits - Design of vending machine controller.

UNIT – III SYNCHRONOUS DESIGN USING PROGRAMMABLE DEVICES [9]

Programmable logic device families - Designing a synchronous sequential circuit using PLA/PAL - Realization of finite state machine using PLD - FPGA - Xilinx FPGA - Xilinx 4000.

UNIT – IV SYSTEM DESIGN USING VERILOG HDL [9]

Hardware modeling with Verilog HDL - Data types and operators for modeling in Verilog HDL - Behavioural descriptions in Verilog HDL - HDL based synthesis - Synthesis of finite state machines - Structural modeling - Compilation and simulation of Verilog code - Test bench - Realization of combinational and sequential circuit using Verilog.

UNIT – V FAULT DIAGNOSIS AND TESTABILITY ALGORITHMS [9]

Fault table method - Path sensitization method - Boolean difference method - Kohavi algorithm - Tolerance techniques - The Compact Algorithm - Fault in PLA - Test generation - Masking cycle - DFT schemes - Built in self-test.

Total = 45 Periods

Text Books :

1 Charles H. Roth Jr., Larry L Kinney, Fundamentals of Logic design, Cengage Learning, Enhanced Edition, 2020.
2 Nripendra N Biswas, Logic Design Theory, Prentice Hall of India, 2010.

Reference Books :

1 Donald G. Givone, Digital principles and Design, Tata McGraw Hill, 21st Reprint, 2012
2 Stephen Brown and Zvonk Vranesic, Fundamentals of Digital Logic with VHDL Design, TMH, 2004.
3 S. Palnitkar, Verilog HDL – A Guide to Digital Design and Synthesis, Pearson, 2003.
4 Parag K Lala, Digital System design using PLD, BS Publications, 2003.
5 John M Yarbrough, Digital Logic applications and Design, Thomson Learning, 9th Reprint, 2012.
6 https://www.ee.usyd.edu/
7 https://www.cse.iitb.ac.in/

K.S.R. COLLEGE OF ENGINEERING, TIRUCHENGODE – 637215
DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING
CO-PO MAPPING

Regulation : R 2020

Course Code: 20EC561 **Course Name : ADVANCED DIGITAL SYSTEMS DESIGN**

CO	Course Outcomes	Programme Outcomes													
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	*Analyze and design synchronous sequential circuits.*	3	3	2	2	2	-	-	-	-	-	-	2	3	2
CO2	*Analyze and design asynchronous sequential circuits*	3	3	2	2	2	-	-	-	-	-	-	2	3	2
CO3	*Describe the architecture of programmable logic devices and design digital circuits using programmable devices.*	3	3	2	2	2	-	-	-	-	-	-	2	3	2
CO4	*Demonstrate and use programming tools for implementing digital circuits of industry standards.*	3	3	2	2	2	-	-	-	-	-	-	2	3	2
CO5	*Illustrate about different fault models and fault diagnosis.*	3	3	2	2	2	-	-	-	-	-	-	2	3	2
	Average	**3**	**3**	**2**	**2**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**2**	**3**	**2**

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

K.S.R. COLLEGE OF ENGINEERING (Autonomous) **R 2020**

SEMESTER V

		L	T	P	C
20EC562	**ELECTRONIC INSTRUMENTATION** (Elective)	2	0	1	3

Prerequisite: *NIL*

Course Outcomes: On Completion of this course , the student will be able to		***Cognitive level***
CO1	*Explain different types of electronic meters and their applications.*	*Understand*
CO2	*Describe various Digital instruments and its applications.*	*Understand*
CO3	*Explain the working of various types of cathode ray oscilloscopes and signal analyzers.*	*Understand*
CO4	*Discuss the functional operation of different types of waveform generators.*	*Understand*
CO5	*Outline the principle of telemetry, modulation techniques and multiplexing.*	*Understand*

UNIT – I ELECTRONIC INSTRUMENTS **[9]**

Introduction – Functional elements of a measurement system – Electronic Voltmeter and their advantages – Types: Differential amplifier, rectifier, multirange – True RMS voltmeter – Ohmmeter – Electronic multimeter – Current measurement – Power measurement – Microprocessor based DMM with auto ranging and self-diagnostic features.

UNIT – II DIGITAL INSTRUMENTS **[9]**

Digital Voltmeter, Types: Ramp, Integrating and Dual slope – Digital Multimeter – Digital Frequency meter – Digital Time Measurement – Digital Tachometer and pH meter – Automation in digital instruments – Microprocessor based instruments.

UNIT – III CATHODE RAY OSCILLOSCOPE & SIGNAL ANALYZERS **[9]**

General purpose cathode ray oscilloscope – Dual trace, dual beam and sampling oscilloscopes– Analog and digital storage oscilloscope - frequency selective and heterodyne wave analyzer – Harmonic distortion analyzer – Spectrum analyzer.

UNIT – IV WAVEFORM GENERATORS **[9]**

Wien's bridge and phase shift oscillators – Hartley and crystal oscillators – Square wave and pulse generators – Triangular wave-shape generator – Signal and function generators – Q meter – Electronic Counters.

UNIT – V TELEMETRY **[9]**

General telemetry system – voltage, current and position telemetry systems – Radio frequency telemetry – Frequency modulation, pulse-amplitude modulation and pulse-code modulation telemetry – Frequency and time multiplexing.

Total = 45 Periods

Text Books :

1 Kalsi, H.S., Electronic Instrumentation, Tata McGraw-Hill, New Delhi, Third Edition, 2017.

2 Helfrick, A.D. and Cooper,W.D., Modern Electronic Instrumentation and Measurement Techniques, Pearson India Education , New Delhi, First Edition, 2016.

Reference Books :

1 David A Bell, Electronic Instrumentation and Measurements, Oxford University Press, London, Third Edition, 2013.

2 Prithiwiraj Prukait, Budhaditya Biswas, Santanu Das and Chiranjib Koley, Electrical and Electronics Measurement and Instrumentation, Tata McGraw Hill, New Delhi, First Edition, 2013.

3 J.J. Carr, Elements of Electronic Instrumentation and Measurement, Pearson Education India, New Delhi, Third Edition, 2011.

4 Sawhney, A.K., Electrical, Electronic measurement & Instrumentation, Dhanpat Rai & sons, New Delhi, Eighteenth edition, 2012.

K.S.R. COLLEGE OF ENGINEERING, TIRUCHENGODE – 637215
DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING
CO-PO MAPPING

Regulation : R 2020

Course Code: 20EC562 **Course Name : Electronic Instrumentation**

CO	Course Outcomes	Programme Outcomes													
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	*Explain different types of electronic meters and their applications.*	3	3	2	2	-	-	-	-	-	-	-	-	3	2
CO2	*Describe various Digital instruments and its applications.*	3	3	2	2	-	-	-	-	-	-	-	-	3	2
CO3	*Explain the working of various types of cathode ray oscilloscopes and signal analyzers.*	3	3	2	2	-	-	-	-	-	-	-	-	3	2
CO4	*Discuss the functional operation of different types of waveform generators.*	3	3	2	2	-	-	-	-	-	-	-	-	3	2
CO5	*Outline the principle of telemetry, modulation techniques and multiplexing.*	3	3	2	2	-	-	-	-	-	-	-	-	3	2
	Average	**3**	**3**	**2**	**2**	**-**	**-**	**-**	**-**	**-**		**-**	**-**	**3**	**2**

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

K.S.R. COLLEGE OF ENGINEERING (Autonomous) **R 2020**

SEMESTER – V

ARTIFICIAL INTELLIGENCE

20CS501 **(Common To EC & EE)**

L	T	P	C
3	0	0	3

Prerequisite: *-*

Course Outcomes : On successful completion of the course, the student will be able to		***Cognitive Level***
CO1:	*Describe agents structure and predict appropriate uninformed search algorithms for any AI problem*	*Understand*
CO2:	*Illustrate appropriate AI methods to solve a given problem.*	*Apply*
CO3:	*Explain a problem using first order and predicate logic.*	*Analyze*
CO4:	*Use planning algorithms and illustrate about learning*	*Apply*
CO5:	*Describe about expert systems.*	*Understand*

UNIT – I **BASICS OF ARTIFICIAL INTELLIGENCE** **[9]**

Intelligent Agents – Agents and environments – Good behavior– Nature of environments – Structure of agents – Problem Solving: Problem solving agents – Example problems – Searching for solutions – Un-informed search strategies.

UNIT – II **PROBLEM SOLVING** **[9]**

Informed search and exploration – Informed search strategies – Heuristic function – Local search algorithms and optimistic problems – Constraint Satisfaction Problems – Backtracking search – Structure of problems – Adversarial Search – Games – Optimal decisions in games – Alpha-Beta Pruning.

UNIT – III **PROBABILISTIC REASONING** **[9]**

First order logic – Representation revisited – Syntax and semantics for first order logic – Using first order logic – Knowledge engineering in first order logic – Inference in First order logic – Prepositional versus first order logic – Unification and lifting – Forward chaining – Backward chaining – Resolution.

UNIT– IV **PLANNING AND LEARNING** **[9]**

Planning Problem – Planning with state – space search – Partial-order planning – Planning graphs – Learning from observation – Inductive learning – Decision trees – Explanation based learning.

UNIT – V **EXPERT SYSTEMS** **[9]**

Expert Systems – Architecture of Expert Systems – Roles of Expert Systems – Knowledge Acquisition – Typical Expert Systems – MYCIN – Expert Systems Shells.

Total = 45 Periods

Text Books :

1 Stuart Russell and Peter Norvig, Artificial Intelligence – A Modern Approach, Pearson Education, New Delhi, Third Edition, 2016

2 Kevin Night and Elaine Rich, Nair B., Artificial Intelligence (SIE), McGraw Hill, New York, Third Edition, 2008

Reference Books :

1 Dan W. Patterson, Introduction to AI and ES, Pearson Education, New Delhi, Third Edition, 2007.

2 Peter Jackson, Introduction to Expert Systems, Pearson Education, New Delhi, Third Edition, 2007.

3 Deepak Khemani, Artificial Intelligence, Tata McGraw Hill Education, New York, First Edition, 2013.

4 David L. Poole and Alan K. Mackworth, Artificial Intelligence: Foundations of Computational Agents, Cambridge University Press, Second Edition, 2010.

K.S.R. COLLEGE OF ENGINEERING, TIRUCHENGODE – 637215

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING
CO-PO MAPPING

Regulation: R 2020

Course Code: 20CS501 **Course Name: ARTIFICIAL INTELLIGENCE**

CO	Course Outcomes	Programme Outcomes													
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	*Describe agents structure and predict appropriate uninformed search algorithms for any AI problem*	3	3	3	3	3	2	-	-	-	2	-	3	-	-
CO2	*Illustrate appropriate AI methods to solve a given problem.*	3	3	3	3	3	2	-	-	-	2	-	3	-	-
CO3	*Explain a problem using first order and predicate logic.*	3	3	3	3	3	2	-	-	-	2	-	3	-	-
CO4	*Use planning algorithms and illustrate about learning*	3	3	3	3	3	2	-	-	-	2	-	3	-	-
CO5	*Describe about expert systems.*	3	3	3	3	3	2	-	-	-	2	-	3	-	-
	Average	**3**	**3**	**3**	**3**	**3**	**2**	**-**	**-**	**-**	**2**	**-**	**3**	**-**	-

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

K.S.R. COLLEGE OF ENGINEERING (Autonomous) **R 2020**

20EC661	**ELECTRONIC SYSTEM DESIGN (ELECTIVE)**	L	T	P	C
		3	0	0	3

Prerequisite: *NIL*

Course Outcomes: On Completion of this course , the student will be able to		***Cognitive level***
CO1	*Design of simple power supplies and amplifiers.*	*Apply*
CO2	*Illustrate data acquisition systems.*	*Understand*
CO3	*Describe the concept of PCB design methods.*	*Understand*
CO4	*Apply RF design methodologies to construct PCB boards.*	*Apply*
CO5	*Describe the PCB technology trends*	*Understand*

UNIT – I DESIGN OF POWER SUPPLIES AND AMPLIFIERS [9]

Voltage regulations: Introduction - O/P resistance and load regulation - Types of regulators - Voltage converters. Power amplifiers: Basic consideration - Class A, class B and class AB Power amplifier –SMPS - Power MOSFET.

UNIT – II DATA ACQUISITION SYSTEMS [9]

Digital to analog converters: Introduction, R-2R resistor ladder networks, CMOS current switches,16-bit monolithic DAC,DAC speed and settling time, Analog to digital converters: ADC transfer characteristic and quantization error, parallel comparator ADC, successive approximation ADC

UNIT – III PRINTED CIRCUIT BOARD [9]

Layout planning: General considerations - PCB sizes - Layout approaches - Layout, General rules and parameters: Resistance, capacitance, inductance, conductor spacing, cooling requirements and package density, layout check.

UNIT – IV DESIGN RULES FOR DIGITAL & ANALOG CIRCUIT PCB's [9]

Digital circuit PCB: Introduction – Reflection - Cross talk - Around and supply line noise - Electromagnetic interference from pulse type EM fields. Analog circuit PCB: Component placing - Signal conductor - Supply and ground conductors.

UNIT – V PCB TECHNOLOGY TRENDS [9]

Introduction - Fine line conductors with ultra-thin copper foil - Multilayer board - Multi wire board - Subtractive additive process - Semi additive process - Additive process - Flexible PCB - Metal core circuit boards - Mechanical milling of PCB

Total (L: 45) = 45 Periods

Text Books :

1 Reinhold Luduig and Pavel Bretchko, "RF Circuit Design – Theory and Applications", Pearson Education, USA Second Edition, 2012.

2 Walter C.Bosshart, "Printed circuit Boards – Design and Technology", Tata McGraw-Hill, New Delhi, Second Edition, 2012.

Reference Books :

1 Keith H.Billings, "Handbook of Switched Mode Power Supplies" McGraw-Hill Publishing Co., New Delhi, Third Edition 2011.

2 Michael Jaacob, "Applications and Design with Analog Integrated Circuits", PHI, New Delhi, Second Edition, 1999.

3 F.H.Mitchell, "Introduction to Electronic Design", Prentice Hall of India, New Delhi, Second Edition, 1992.

4 Sydney Soclof, "Applications of Analog Integrated Circuits", Prentice Hall of India, New Delhi, Second Edition 1997.

K.S.R. COLLEGE OF ENGINEERING, TIRUCHENGODE – 637215
DEPARTMENT OF ELCETRONICS AND COMMUNICATION ENGINEERING
CO-PO MAPPING

Regulation : R 2020

Course Code: 20EC661 **Course Name : ELECTRONIC SYSTEM DESIGN**

CO	Course Outcomes	Programme Outcomes													
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	*Design of simple power supplies and amplifiers.*	3	3	3	-	-	-	-	-	-	-	-	-	3	-
CO2	*Illustrate data acquisition systems.*	3	3	3	-	-	-	-	-	-	-	-	-	3	-
CO3	*Describe the concept of PCB design methods.*	3	3	3	-	-	-	-	-	-	-	-	-	3	-
CO4	*Apply RF design methodologies to construct PCB boards.*	3	3	3	-	-	-	-	-	-	-	-	-	3	-
CO5	*Describe the PCB technology trends*	3	3	3	-	-	-	-	-	-	-	-	-	3	-
	Average	**3**	**3**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**3**	**-**

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

K.S.R. COLLEGE OF ENGINEERING (Autonomous) **R 2020**

20EC662	**MEDICAL ELECTRONICS** (Elective)	L	T	P	C
		3	0	0	3

Prerequisite: *Measurement and Instrumentation*

Course Outcomes: On Completion of this course , the student will be able to		***Cognitive level***
CO1	*Explain the electrophysiological activity of nerves and cardiopulmonary system of the human body.*	*Understand*
CO2	*Illustrate different types of electrodes and transducers used for the bio signal measurement.*	*Understand*
CO3	*Outline the procedure used for the measurement of electrical and non-electrical parameters of the human body.*	*Understand*
CO4	*Explain the working principle and applications of medical imaging systems.*	*Understand*
CO5	*Demonstrate the usage of therapeutic and assisting equipment's in medical applications.*	*Understand*

UNIT – I ELECTROPHYSIOLOGY [9]

Cell & its structure – Electrical and chemical activities – Action and resting potential – Neurons – Axons – Synapse -CNS – PNS - Propagation of electrical impulses along the nerve – Sodium pump – Cardiopulmonary system – Physiology of heart and lung.

UNIT – II BIO POTENTIAL ELECTRODES AND TRANSDUCERS [9]

Components of biomedical instrument system – Electrodes: Micro electrodes, Needle electrodes, Surface electrodes – Transducers: Piezoelectric, Ultrasonic – Passive transducers: Resistive, Capacitive, Inductive – Isolation amplifier– Pre-amplifier – Current amplifier – Chopper amplifier.

UNIT – III INSTRUMENTS USED FOR DIAGNOSIS [9]

ECG – Einthoven triangle – Leads – Electrodes – Measurement of cardiac output, heart rate and heart beat – EEG – EMG EOG– Blood flow measurements – Holter monitor– Respiratory rate measurement – Oximeter–Blood gas analyzer: pH– pCo2 – pO2 of blood – Glucometer.

UNIT – IV MEDICAL IMAGING [9]

Radiographic and fluoroscopic techniques – Computer tomography – MRI – Ultrasonography – Endoscopy – Thermography – Different types of bio telemetry systems – Patient monitoring – Sources of electric hazards and safety techniques.

UNIT – V ASSISTING AND THERAPEUTIC EQUIPMENTS [9]

Pacemaker – Defibrillators – Automated External Defibrillator – Ventilators – Nerve and muscle stimulators – Diathermy – Heart lung machine – Audio meters – Dialysers – Lithotripsy.

Total = 45 Periods

Text Books :

1 R.S.Khandpur, Handbook of Biomedical Instrumentation, Tata McGraw Hill, Noida, Third Edition, 2014.

2 Mandeep Singh, Introduction to Biomedical Instrumentation, PHI Learning Private Ltd, New Delhi, Second Edition, 2014.

Reference Books :

1 R. Anandanatarajan, Biomedical Instrumentation and Measurements, PHI Learning Private Ltd, New Delhi, Second Edition, 2013

2 M.Arumugam, Biomedical Instrumentation, Anuradha Agencies, Tamilnadu, Second Edition, 2002.

3 Joseph J. Carr and John M. Brown, Introduction to Biomedical Equipment Technology, Pearson Education, New Delhi, Fourth Edition, 2013.

4 Leslie Cromwell, Fred J.Weibell, Erich A.Pfeiffer, Biomedical Instrumentation and Measurements, PHI Learning Private Ltd, New Delhi, Second Edition, 2014.

K.S.R. COLLEGE OF ENGINEERING, TIRUCHENGODE – 637215
DEPARTMENT OF ELCETRONICS AND COMMUNICATION ENGINEERING
CO-PO MAPPING

Regulation : R 2020

Course Code: 20EC662 **Course Name : Medical Electronics**

CO	Course Outcomes	Programme Outcomes													
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	*Explain the electrophysiological activity of nerves and cardiopulmonary system of the human body.*	3	-	-	-	-	-	-	-	-	-	-	1	-	2
CO2	*Illustrate different types of electrodes and transducers used for the bio signal measurement.*	3	-	-	-	2	-	-	-	-	-	-	1	-	2
CO3	*Outline the procedure used for the measurement of electrical and non-electrical parameters of the human body.*	3	3	-	-	3	3	2	3	-	-	-	2	-	2
CO4	*Explain the working principle and applications of medical imaging systems.*	3	3	-	-	3	3	2	3	-	-	-	2	-	2
CO5	*Demonstrate the usage of therapeutic and assisting equipment's in medical applications.*	3	3	-	-	3	1	3	3	-	-	-	2	-	2
	Average	3	3	-	-	2	2	2	3	-	-	-	2	-	2

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

K.S.R. COLLEGE OF ENGINEERING (Autonomous) **R 2020**

SEMESTER - VI

		L	T	P	C
20EC663	**ADVANCED MICROPROCESSORS AND MICROCONTROLLERS (ELECTIVE)**	3	0	0	3

Prerequisite: Microprocessors and Microcontrollers

Course Outcomes : On successful completion of the course, the student will be able to		**Cognitive Level**
CO1:	*Illustrate the concepts of CISC architecture.*	Understand
CO2:	*Illustrate the concepts of RISC architecture.*	Understand
CO3:	*Describe the architectural features and the family of MSP430.*	Understand
CO4:	*Identify the functions of various peripherals which are interfaced with MSP430.*	Understand
CO5:	*Develop programs using various instructions of MSP430 for different applications.*	Apply

UNIT - I **HIGH PERFORMANCE CISC ARCHITECTURE – PENTIUM** [09]

CPU Architecture- Bus operations – Pipelining – Brach predication – Floating point unit- Operating modes –Paging – Multitasking – Exception and Interrupts – Instruction set – Addressing modes – Programming the Pentium processor.

UNIT - II **HIGH PERFORMANCE RISC ARCHITECTURE – ARM** [09]

Arcon RISC machine – Architectural inheritance – Core & Architectures - Registers – Pipeline - Interrupts – ARM organization - ARM processor family – Co-processors - ARM instruction set- Thumb instruction set - Instruction cycle timings - The ARM Programmer's model –ARM Development tools –ARM Assembly language programming - C programming – Optimizing ARM Assembly Code – Optimized primitives.

UNIT - III **MSP430 ARCHITECTURE** [09]

Introduction – Application areas,The outside view, The inside view - Functional block diagram, Memory, Central Processing Unit, Memory mapped input and output, Clock generator, Exceptions: Interrupts and Resets, MSP430 family.

UNIT - IV **ON CHIP PERIPHERALS, INTERFACING AND APPLICATIONS OF MSP430** [09]

Watchdog Timer, Timers, Real Time Clock, DAC: Digital-to-Analog Conversion, Direct Memory Access (DMA), LCD Controller, Case studies of applications of MSP 430 data acquisition system

UNIT - V **PROGRAMMING THE MSP430** [09]

Addressing modes, Instruction set of MSP430, Double operand core instructions, Single operand core instructions (Format II), Program flow control, Emulated instructions, Movement instructions, Implementation of decimal arithmetic, Shift and rotate instructions.

Total = 45 Periods

Text Books :

1 Andrew N.Sloss, Dominic Symes and Chris Wright, " ARM System Developer's Guide : Designing and Optimizing System Software", Morgan Kaufmann Publishers, First edition, 2004.

2 K.Uma Rao, Andhe Pallavi, "The 8051 and MSP430 Microcontrollers: Architecture Programming and Applications", Wiley Publications, 2019

Reference Books :

1 Daniel Tabak, "Advanced Microprocessors", McGraw Hill. Inc., Second edition, 2007

2 B.B.Brey, "The Intel Microprocessor 8086/8088 /80186/80188, 80286, 80386, 80486 PENTIUM, PENTIUM Pro, PII, PIII IV Archietecture, Programming Interfacing", Pearson Education, Seventh edition, 2010.

3 John H Davies, MSP430 Microcontroller Basics, Newnes Publications, Elsevier, 2008.

4 Chris Nagy, Embedded Systems Design using TI MSP430 Series, Newnes Publications, Elsevier, 2003.

5 User Guide from Texas Instruments

K.S.R. COLLEGE OF ENGINEERING, TIRUCHENGODE – 637215
DEPARTMENT OF ELCETRONICS AND COMMUNICATION ENGINEERING
CO-PO MAPPING

Regulation : R 2020

Course Code: 20EC663 **Course Name : ADVANCED MICROPROCESSORS AND MICROCONTROLLERS**

CO	Course Outcomes	Programme Outcomes													
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	*Illustrate the concepts of CISC architecture.*	3	3	3	-	2	-	-	-	-	-	-	1	3	2
CO2	*Illustrate the concepts of RISC architecture.*	3	3	3	-	2	-	-	-	-	-	-	1	3	2
CO3	*Describe the architectural features and the family of MSP430.*	3	3	3	-	2	-	-	-	-	-	-	1	3	2
CO4	*Identify the functions of various peripherals which are interfaced with MSP430.*	3	3	3	-	2	-	-	-	-	-	-	1	3	2
CO5	*Develop programs using various instructions of MSP430 for different applications.*	3	3	3	-	2	-	-	-	-	-	-	1	3	2
	Average	**3**	**3**	**3**	**-**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**1**	**3**	**2**

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

K.S.R. COLLEGE OF ENGINEERING (Autonomous) **R 2020**

SEMESTER - VI

		L	T	P	C
20EC664	**INFORMATION THEORY AND CODING (ELECTIVE)**	**3**	**0**	**0**	**3**

Prerequisite: Nil

Course Outcomes : On successful completion of the course, the student will be able to **Cognitive Level**

CO1:	*Illustrate the concepts of information theory.*	Apply
CO2:	*Discuss the source coding methods used in image and video broadcasting.*	Apply
CO3:	*Infer the methodology of channel coding.*	Apply
CO4:	*Describe the various block codes for error correcting and detecting process.*	Analyze
CO5	*Describe the various convolutional codes for error correcting and detecting process.*	Apply

UNIT - I INFORMATION THEORY **[9]**

Information – Information rate - Entropy – Classification of codes – K-raft McMillan inequality –source coding theorem- Shannon Fano coding - Huffman coding - Extended Huffman coding – joint and conditional entropies- Mutual Information- Discrete memory less channels: BSC, BEC and channel capacity - Shannon limit.

UNIT - II SOURCE CODING **[9]**

Text: Adaptive Huffman coding, arithmetic coding and latex format - Audio: Perceptual coding, masking techniques, psychoacoustic model, MPEG audio layers - I,II & III - Dolby AC3 – Image and video formats: GIF, TI F, BMP, PNG , SIF, CIF & QCIF – Image compression: JPEG – Video compression: Principles-I,B,P frame s and motion estimation.

UNIT - III CHANNEL CODING **[9]**

Characteristics of speech signals - Quantization techniques – Channel vocoder - Linear predictive coding –Information capacity theorem – Implication of the information capacity theorem- Information capacity of colored noise channel – Rate distortion theory - Data compression.

UNIT - IV BLOCK CODES **[9]**

Hamming codes: Hamming weight, hamming distance, minimum distance decoding – Single parity Codes- Repetition codes: Linear block codes, cyclic codes – Syndrome calculation, encoder and decoder - CRC.

UNIT - V CONVOLUTIONAL CODES **[9]**

Convolutional codes – Code tree, trellis, state diagram - Encoding - Decoding: Sequential search and Viterbi algorithm - Principle of turbo coding – Other codes: RS code, Gola y code and Burst error correcting code.

Total (L: 45) = 45Periods

Text Books :

1 R. Bose, Information Theory, Coding and Cryptography, Tata McGraw Hill, New Delhi, Third Edition, 2016

2 Fred Halsall, Multimedia Communications: Applications, Networks, Protocols and Standards, Pearson Education Asia, Fourth Edition, 2009.

Reference Books :

1 K.Sayood, Introduction to Data Compression, Elsevier, Netherlands, Fifth Edition, 2017.

2 S.Gravano, Introduction to Error Control Codes, Oxford University Press, England, First Edition, 2007.

3 Amitabha Bhattacharya, Digital Communications, Tata McGraw Hill, New Delhi, First Edition, 2013.

4 Theodore Rappaport, Wireless Communications - Principles and Practice, Pearson Education, Bengaluru, Second Edition, 2012.

5 https://nptel.ac.in/courses/117/101/117101053/.

K.S.R. COLLEGE OF ENGINEERING, TIRUCHENGODE – 637215
DEPARTMENT OF ELCETRONICS AND COMMUNICATION ENGINEERING
CO - PO MAPPING

Regulation : R 2020

Course Code: 20EC664 **Course Name : Information Theory and Coding**

CO	Course Outcomes	Programme Outcomes													
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	*Illustrate the concepts of information theory*	3	3	3	-	-	-	-	-	-	-	-	-	3	-
CO2	*Discuss the source coding methods used in image and video broadcasting*	3	3	3	-	-	-	-	-	-	-	-	-	3	-
CO3	*Infer the methodology of channel coding*	3	3	3	-	-	-	-	-	-	-	-	-	3	-
CO4	*Describe the various block codes for error correcting and detecting process*	3	3	3	-	-	-	-	-	-	-	-	-	3	-
CO5	*Describe the various convolutional codes for error correcting and detecting process.*	3	3	3	-	-	-	-	-	-	-	-	-	3	-
	Average	**3**	**3**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**3**	**-**

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

K.S.R. COLLEGE OF ENGINEERING (Autonomous) **R 2020**

SEMESTER - VI

		L	T	P	C
20IE691	**AUGMENTED INTELLIGENCE LED MANAGED SERVICES (AIMS) – II**				
	(Common to CS, EC, EE and IT)	3	0	0	3

Prerequisite: Basic Knowledge of Augmented Intelligence Led Managed Services (AIMS) – I.

Course Outcomes : On Completion of this course, the student will be able to		***Cognitive Level***
CO1:	*Recognize the essentials of Cloud Computing*	*Understand*
CO2:	*Identify with the Big Data Platform and create a Hadoop Environment and Generate a Map-Reduce Programming*	*Apply*
CO3:	*Infer the ML and other AI technologies to implement the application.*	*Understand*
CO4:	*Apply RPA technologies to automate the identification and resolution of common IT issues.*	*Apply*
CO5:	Inspect the life cycle of help desk tickets and fulfilment requests in Service Now.	*Apply*

UNIT – I CLOUD COMPUTING **[9]**

Introduction – Characteristics of Cloud computing – Architecture – Types – Service Models – SaaS, IaaS, PaaS – Regions – Cloud Security.

UNIT– II BIG DATA AND DATA SCIENCE **[9]**

Introduction – Data Science and Challenges – HDFS and Hadoop – Structured and Unstructured data – Processing Big Data – Supervised and Unsupervised Learning – Text Analysis – Data visualization.

UNIT– III AI/ML AND AIOPS **[9]**

Introduction – Structure of Intelligent Agents – Knowledge and Reasoning – Machine Learning – Deep Learning – Applications of AI – AIOps Technologies – AIOps Benefits – Implementation.

UNIT – IV ROBOT PROCESS AUTOMATION **[9]**

Introduction – Variables – Control flow – Data Tables and Excel Automation – UI Automation – Selectors – Email Automation.

UNIT – V SITE RELIABILITY ENGINEERING AND SERVICENOW **[9]**

Introduction – Adopting a DevOps and SRE Model – SRE Vs DevOps – Architecture and Lifecycle – Practices – Error Budgets – Toil Management – DevOps Tools – Introduction to Service Now – Reporting and Managing Issue – Benefits.

Total = 45 Periods

TEXT BOOKS :

1 Daniel Kirsch, Judith Hurwitz, Cloud Computing for Dummies, John Wiley & Sons, Second Edition, 2020

2 EMC Education Services, Data Science and Big Data Analytics: Discovering, Analyzing, Visualizing and Presenting Data, Wiley, First Edition, 2015.

REFERENCE BOOKS :

1 Ui Path, RPA Design and Development, UiPath Academic Alliance Resource

2 Shamayel Mohammed Farooqui, Vishnu Vardhan Chikoti, Hands-on Site Reliability Engineering, PBP, First Edition, 2021

3 Tim Woodruff, Learning Service Now, Packt Publishing Limited, Second Edition, 2018., Learning Service Now, Packt Publishing Limited, Second Edition, 2018.

K.S.R. COLLEGE OF ENGINEERING, TIRUCHENGODE – 637215
DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING
CO-PO MAPPING

Regulation: **R 2020**

Course Code: **20IE691** **Course Name:** **AUGMENTED INTELLIGENCE LED MANAGED SERVICES (AIMS) – II**

CO	Course Outcomes	Programme Outcomes													
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	Recognize the essentials of Cloud Computing	3	3	2	-	2	-	-	-	2	-	-	2	-	-
CO2	Identify with the Big Data Platform and create a Hadoop Environment and Generate a Map-Reduce Programming	3	3	3	-	3	-	-	-	1	-	-	3	-	-
CO3	Infer the ML and other AI technologies to implement the application	2	2	3	-	2	-	-	-	1	-	-	2	-	-
CO4	Apply RPA technologies to automate the identification and resolution of common IT issues.	2	2	2	-	3	-	-	-	1	-	-	3	-	-
CO5	Inspect the life cycle of help desk tickets and fulfilment requests in Service Now.	3	2	3	-	3	-	-	-	3	-	-	2	-	-
	Average	**3**	**2**	**3**	**-**	**3**	**-**	**-**	**-**	**2**	**-**	**-**	**2**	**-**	**-**

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

K.S.R. COLLEGE OF ENGINEERING (Autonomous) **R 2020**

SEMESTER – V

		L	T	P	C
20CS601	**C# AND .NET FRAMEWORK** (Common To CS & EC)	3	0	0	3

Prerequisite: *Basic Knowledge of object oriented programming*

Course Outcomes : On successful completion of the course, the student will be able to		***Cognitive Level***
CO1:	*Solve the basic problems using object and classes in C#.*	*Understand*
CO2:	*Explain the concepts of OOPs.*	*Understand*
CO3:	*Design application programs using .Net Components.*	*Apply*
CO4:	*Design website using ASP .Net.*	*Apply*
CO5:	*Build a server and client with an interface.*	*Apply*

UNIT - I **.NET FRAMEWORK** **[9]**

.NET Overview – The Common Language Runtime – .NET Programming – Working with .NET Components – Data and XML – Web Services – Web Forms.

UNIT – II **BASICS OF C#** **[9]**

Overview of C# – Literals, Variables and Data types – Operators and Expressions – Decision Making and Branching – Decision Making and Looping – Methods in C# – Handling Arrays – Manipulating Strings – Structures and Enumerations

UNIT - III **OOPs in C#** **[9]**

Classes and Objects – Inheritance and Polymorphism – Interface: Multiple Inheritance – Operator Overloading – Delegates and Events – Managing Console I/O Operations – Managing Errors and Exceptions

UNIT - IV **WEB BASED APPLICATION DEVELOPMENT ON .NET** **[9]**

Introducing ASP.NET and the .NET Platform – ASP.NET Basics – Constructing ASP.NET Web Pages – Building Web Applications – Using the Validation Controls

UNIT - V **.NET WITH DATABASE CONNECTIVITY** **[9]**

Database Design and Development – Speaking SQL – ADO.NET – Displaying Content Using Data Lists – Managing Content Using Grid view and Details View – Advanced Data Access – Security and User Authentication

Total = 45 Periods

Text Books :

1 Thuan L. Thai and Hoang Lam, .NET Framework Essentials, O'Reilly Media, USA, Third Edition, 2003
2 E. Balagurusamy, Programming in C#, Tata McGraw Hill, New Delhi, Third Edition, 2010.

Reference Books :

1 Cristian Darie, wyatt Barnett and Tim Posey, Build your own ASP.Net 4 website, Site Point Pvt Ltd, Australia, Fourth Edition, 2011.
2 Andrew Troelsen, Pro C# 5.0 and the .net 4.5 frameworks, A press, India, Sixth Edition, 2010.
3 Herbert Schildt, The complete reference C# 4.0, Tata McGraw Hill, New Delhi, First Edition, 2010.
4 Art Gittleman, Computing with C# & .Net Framework, Jones & Bartlett Publishers, US, Second Edition, 2011.
5 nptel.ac.in/courses/105108081/module9/lecture39/lecture.pdf

K.S.R. COLLEGE OF ENGINEERING, TIRUCHENGODE – 637215
DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING
CO-PO MAPPING

Regulation: R 2020

Course Code: 20CS601 **Course Name: C# AND .NET FRAMEWORK**

CO	Course Outcomes	Programme Outcomes													
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	*Solve the basic problems using object and classes in C#.*	3	3	3	2	2	-	-	-	2	-	1	1	-	-
CO2	*Explain the concepts of OOPs.*	3	3	2	1	2	-	-	-	1	-	1	1	-	-
CO3	*Design application programs using .Net Components.*	3	3	2	2	1	-	-	-	2	-	1	1	-	-
CO4	*Design website using ASP .Net.*	3	3	3	1	2	-	-	-	2	-	1	1	-	-
CO5	*Build a server and client with an interface.*	3	3	3	2	1	-	-	-	2	-	1	1	-	-
	Average	**3**	**3**	**2**	**2**	**2**	**-**	**-**	**-**	**2**	**-**	**1**	**1**	**-**	**-**

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

K.S.R. COLLEGE OF ENGINEERING (Autonomous) **R 2020**

SEMESTER - VI

		L	T	P	C
20CS602	**MACHINE LEARNING (Common To EC & EE)**	3	0	0	3

Prerequisite: *-*

Course Outcomes : On successful completion of the course, the student will be able to		***Cognitive Level***
CO1:	*Distinguish between supervised, unsupervised and semi-supervised learning.*	*Understand*
CO2:	*Design a neural network for an application of your choice.*	*Understand*
CO3:	*Apply Dimensionality Reduction and Evolutionary Models for real world problems.*	*Understand*
CO4:	*Outline existing machine learning algorithms to improve classification efficiency.*	*Understand*
CO5:	*Design systems that uses the appropriate graph models of machine learning.*	*Apply*

UNIT – I FUNDAMENTALS OF MACHINE LEARNING AND SUPERVISED LEARNING [9]

Introduction to Machine Learning – Examples of machine learning applications – Types of Machine Learning: Supervised Learning – Machine Learning Process – The Curse of Dimensionality, Overfitting – Training, Testing, and Validation Sets.

UNIT– II NEURAL NETWORKS AND MULTI-LAYER PERCEPTRON [9]

Brain and The Neuron - Neural Networks – Perceptron – Linear Separability – Linear Regression – Multi-layer Perceptron: Going Forwards – Going Backwards – Multi-Layer Perceptron in Practice – Examples of Using the MLP – Deriving Back-Propagation.

UNIT – III DIMENSIONALITY REDUCTION AND EVOLUTIONARY MODELS [9]

Linear Discriminant Analysis (LDA) – Principal Component Analysis (PCA) – Factor Analysis – Independent Component Analysis – Gaussian Mixture Models: EM Algorithm – Nearest Neighbour Methods – Support Vector Machines.

UNIT– IV INSTANCE BASED LEARNING [9]

Evolutionary Learning – The Genetic Algorithm (GA) – Reinforcement Learning – Decision Trees – Classification and Regression Trees (CART) – Ensemble Learning: Boosting – Bagging – Random Forests – Unsupervised Learning: K-Means Algorithm.

UNIT– V GRAPHICAL MODELS [9]

Graphical model: Bayesian Networks – Markov Random Fields – Hidden Markov Model (HMMS) – Tracking Methods – Deep Belief Networks (DBN).

Total = 45 Periods

Text Books :

1 Stephen Marsland, Machine Learning: An Algorithmic Perspective, Chapman and Hall / CRC Machine Learning and Pattern Recognition Series, United States, Second Edition, 2015.

2 Ethem Alpaydin, Introduction to Machine Learning (Adaptive Computation and Machine Learning), The MIT Press, Cambridge, United States, Third Edition, 2014.

Reference Books :

1 Tom M Mitchell, Machine Learning, McGraw-Hill Education Private Limited, India, First Edition, 2017.

2 Kevin Murphy, Machine Learning: An Probabilistic Perspective, MIT Press, Cambridge, United States, First Edition, 2012.

3 Peter Flach,, Machine Learning: The Art and Science Algorithms That Makes Sense of Data, First Edition, Cambridge University Press, 2012.

4 https://nptel.ac.in/courses/106105152 & https://nptel.ac.in/courses/106106139

K.S.R. COLLEGE OF ENGINEERING, TIRUCHENGODE – 637215
DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING
CO-PO MAPPING

Regulation: R 2020

Course Code: 20CS602 **Course Name: MACHINE LEARNING**

CO	Course Outcomes	Programme Outcomes													
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	*Distinguish between supervised, unsupervised and semi-supervised learning.*	3	2	2	2	1	2	-	-	-	-	-	1	-	-
CO2	*Design a neural network for an application of your choice.*	3	3	2	2	2	2	-	-	-	-	-	1	-	-
CO3	*Apply Dimensionality Reduction and Evolutionary Models for real world problems.*	3	2	2	3	2	2	-	-	-	-	-	1	-	-
CO4	*Outline existing machine learning algorithms to improve classification efficiency.*	3	2	3	2	2	1	-	-	-	-	-	1	-	-
CO5	*Design systems that uses the appropriate graph models of machine learning.*	3	2	2	2	3	2	-	-	-	-	-	1	-	-
	Average	**3**	**2**	**2**	**3**	**2**	**2**		**-**	**-**	**-**	**-**	**1**	**-**	**-**

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

K.S.R. COLLEGE OF ENGINEERING (Autonomous) **R 2020**

SEMESTER - VII

20EC761	**COMMUNICATION AND SWITCHING NETWORKS (PROFESSIONAL ELECTIVE – III)**	**L**	**T**	**P**	**C**
		3	**0**	**0**	**3**

Prerequisite: Analog communication systems

Course Outcomes: On successful completion of the course, the student will be able to		**Cognitive Level**
CO1:	*Summarize the different types of switching systems.*	*Understand*
CO2:	*Differentiate the types digital switching.*	*Understand*
CO3:	*Describe the network synchronization control and management.*	*Understand*
CO4:	*Classify the types of telephone operations.*	*Understand*
CO5:	*Identify the traffic characterization and analysis.*	*Apply*

UNIT - I OVERVIEW OF TELECOMMUNICATION [09]

Introduction: Evolution of telecommunication, basics of switching system, manual switching system – Telecommunication networks - Strowger switching systems: Signaling tones, strowger switching components, step-by-step switching, design parameters - Cross bar switching: Touch tone dial telephone, principles of cross bar switching and cross bar switch configurations, Centralized and distributed stored program control, software architecture, application software, enhanced services offered by stored program control.

UNIT - II DIGITAL SWITCHING [09]

Introduction to switching functions: Space division switching - Time division switching - Two dimensional switching: STS switching, TST switching, No-4 ESS Toll switch - Digital cross-connect systems - Digital switching in an analog environment.

UNIT - III NETWORK SYNCHRONIZATION CONTROL AND MANAGEMENT [09]

Timing: Timing recovery, phase locked loop, clock instability, jitter measurements, systematic jitter - Timing inaccuracies: Slips, asynchronous multiplexing - Network synchronization - Network control - Network management.

UNIT - IV TELEPHONE OPERATIONS [09]

Introduction: Subscriber loop system, switching hierarchy and routing, transmission plan, transmission systems, numbering plan, charging plan, signaling techniques - Digital subscriber access: Digital loop carrier systems, universal digital loop carrier systems, integrated digital loop carrier systems, next-generation digital loop carrier systems - Local microwave distribution service - Digital satellite services.

UNIT - V TRAFFIC ANALYSIS [09]

Traffic characterization: Arrival distributions, holding time distributions - Loss systems - Network blocking probabilities: End to End blocking probabilities overflow traffic - Delay systems: Exponential service times, constant service times, finite queues.

Total (L: 45) = 45 Periods

Text Books:

1 John C Bellamy, Digital Telephony, John Wily & Sons, USA, Third Edition, 2009.

2 Thiagarajan Visvanathan, Telecommunication Switching Systems and Networks, PHI, New Delhi, Second Edition, 2015.

Reference Books:

1 J.E.Flood, Telecommunication Switching, Traffic and Networks, Pearson Education Ltd, USA, First Edition, 2016.

2 Syed R Ali, Digital Switching Systems, McGraw-Hill, First Edition, Europe, 2017.

3 William Stallings, Data and Computer Communications, Prentice Hall, New Delhi, Ninth Edition, 2011.

4 John G Van Bose and Fabrizio devetak, Signaling in telecommunication networks, Wiley Inter Science, USA, Second edition, 2007.

K.S.R. COLLEGE OF ENGINEERING, TIRUCHENGODE – 637215

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

CO-PO MAPPING

Regulation: R 2020

Course Code:20EC761 **Course Name: COMMUNICATION AND SWITCHING NETWORKS**

CO	Course Outcomes	Programme Outcomes													
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	Summarize the different types of switching systems.	3	3	2	-	-	-	-	-	-	-	-	-	2	3
CO2	Differentiate the types digital switching	3	3	2	-	-	-	-	-	-	-	-	-	2	3
CO3	Describe the network synchronization control and management.	3	3	2	-	-	-	-	-	-	-	-	-	2	3
CO4	Classify the types of telephone operations.	3	3	2	-	-	-	-	-	-	-	-	-	2	3
CO5	Identify the traffic characterization and analysis.	3	3	2	-	-	-	-	-	-	-	-	-	2	3
	Average	**3**	**3**	**2**	**-**		**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2**	**3**

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

K.S.R. COLLEGE OF ENGINEERING (Autonomous) **R 2020**

SEMESTER - VII

		L	T	P	C
20EC762	**DIGITAL COMMUNICATION SYSTEMS II (PROFESSIONAL ELECTIVE – III)**	**3**	**0**	**0**	**3**

Prerequisite: Nil

Course Outcomes: On successful completion of the course, the student will be able to		**Cognitive Level**
CO1:	*Compute bandwidth and power requirement for BFSK, M-ary PSK and GMSK modulation schemes.*	*Apply*
CO2:	*Describe OFDM concepts and applications.*	*Understand*
CO3:	*Elaborate equalization technique algorithms to control ISI in communication systems.*	*Understand*
CO4:	*Describe the concepts for spread spectrum signals for digital communication.*	*Understand*
CO5:	*Elaborate the performances of Multi path Fading channels.*	*Understand*

UNIT - I DIGITAL MODULATION TECHNIQUES [09]

Advantages of constant envelope modulation – Binary frequency shift keying - Coherent and non-coherent detection of BFSK - Minimum shift keying - Gaussian minimum shift keying - M-ary phase shift keying - M-ary quadrature amplitude modulation - M-ary frequency shift keying.

UNIT - II OFDM [09]

Generation of subcarriers uses the IFFT - Guard time and cyclic extension - Windowing - OFDM signal processing - Peak power problem - PAP reduction schemes: Clipping - Filtering - Coding and scrambling.

UNIT - III EQUALIZATION TECHNIQUES [09]

Band limited channels - ISI - Nyquist criterion - Controlled ISI - Partial response signals - Equalization algorithms - Viterbi algorithm - Linear equalizer - Decision feedback equalization - Adaptive equalization algorithms.

UNIT - IV SPREAD SPECTRUM SIGNALS FOR DIGITAL COMMUNICATION [09]

Model of spread spectrum digital communication system, Direct sequence spread spectrum signals, Frequency hopped spread spectrum signals, CDMA, Time hopping SS, Synchronization of SS systems.

UNIT - V DIGITAL COMMUNICATION THROUGH FADING MULTIPATH CHANNELS [09]

Characterization of fading multipath channels, The effect of signal characteristics on the choice of a channel model, Frequency nonselective, Slowly fading channel, Diversity techniques for fading multipath channels, Digital signals over a frequency selective, Slowly fading channel.

Total (L: 45) = 45 Periods

Text Books:

1 M.K.Simon, S.M. Hinedi and W.C.Lindsey, Digital Communication Techniques: Signaling and detection, Prentice Hall India, New Delhi, Reprint edition 2003.

2 Richard Van Nee & Ramjee Prasad, OFDM for Multimedia Communications, Artech House Publication, London Reprint edition, 2001.

Reference Books:

1 Simon Haykin, Digital Communications, John Wiley and sons, New Jersey, Fifth edition, 2014,

2 John G. Proakis, Digital Communication, McGraw Hill Publication, New Delhi, Second edition, 2001.

3 Theodore S.Rappaport, Wireless Communications, Pearson Education, New Delhi, Second edition, 2002.

4 Stephen G.Wilson, Digital Modulation and Coding, Pearson Education, New Delhi, First Indian Reprint, 2003.

K.S.R. COLLEGE OF ENGINEERING, TIRUCHENGODE – 637215

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

CO-PO MAPPING

Regulation: R 2020

Course Code:20EC762 **Course Name: DIGITAL COMMUNICATION SYSTEMS II**

CO	Course Outcomes	Programme Outcomes													
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	*Compute bandwidth and power requirement for BFSK, M-ary PSK and GMSK modulation schemes.*	3	3	3	-	-	-	-	-	-	-	-	-	2	3
CO2	*Describe OFDM concepts and applications.*	3	3	1	-	-	-	-	-	-	-	-	-	2	3
CO3	*Elaborate equalization technique algorithms to control ISI in communication systems.*	3	3	3	-	-	-	-	-	-	-	-	-	2	3
CO4	*Describe the concepts for spread spectrum signals for digital communication.*	3	3	3	-	-	-	-	-	-	-	-	-	2	3
CO5	*Elaborate the performances of Multi path Fading channels.*	3	3	1	-	-	-	-	-	-	-	-	-	2	3
	Average	**3**	**3**	**2**		**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2**	**3**

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

K.S.R. COLLEGE OF ENGINEERING (Autonomous) **R 2020**

SEMESTER - VII

		L	T	P	C
20EC763	**PC HARDWARE, INSTALLATION, TROUBLESHOOTING AND SERVICING (PROFESSIONAL ELECTIVE – III)**	**3**	**0**	**0**	**3**

Prerequisite: Nil

Course Outcomes: On successful completion of the course, the student will be able to		***Cognitive Level***
CO1:	*Elaborate the concepts of computer hardware and motherboards.*	*Understand*
CO2:	*Interpret the concepts of processors and memory.*	*Understand*
CO3:	*Describe the features, working and installation concepts of various storage devices.*	*Understand*
CO4:	*Illustrate the type, features, specification, working of various input and output devices.*	*Understand*
CO5:	*Identify the steps to assemble and configure computers hardware.*	*Apply*

UNIT - I HARDWARE AND MOTHERBOARDS [09]

Computer through generations – Basic computer hardware structure - Hardware and software - Different type of computers - Features of computer systems: Features of desktop system, Features of server computer, Features of laptops, Features of tablets - Motherboards: Features, components, form factor, processor support, controller, memory support, graphics support, BIOS - Connectors: Power Supply, IDE and SATA – External devices interfaces – Selection of motherboards – Trouble shooting and maintenance of motherboards.

UNIT - II PROCESSING UNIT AND MEMORY [09]

Processor features - Developmental stages of CPU - Towards multiple core processors - Processor architectural details - Processor specifications – Installing and uninstalling CPU – CPU overheating issues – Common problems and solutions - Memory: Features, types, working, memory map, installing and uninstalling memory modules, troubleshooting and maintenance of memory.

UNIT - III STORAGE DEVICES [09]

Storage Devices, Hard Disks: Details, working, feature, installation, selection, specifications, partitioning and formatting, maintenance and troubleshooting – Solid State Drives: Installation, optical storage devices features, working of optical storage drives, installing optical drives, specification for multi drives, disc burning software, troubleshooting and maintenance.

UNIT - IV INPUT AND OUTPUT DEVICES [09]

Features of monitor – CRT monitors: Working, specification, troubleshooting and maintenance – LCD monitors: Installing, specification, specification for TFT monitors, maintenance and troubleshooting of LCD monitors – LED monitors and touch screens – Keyboard: Types and features, interfaces, installing, usage guidelines, maintenance and troubleshooting – Mouse: types, working, features, interfaces, maintenance and troubleshooting – Printers: Types – Dot matrix printers: Specifications, installing, maintenance and troubleshooting – Laser printer: Features, working, specifications, installing printer on networks, managing laser printers, maintenance and troubleshooting.

UNIT - V ASSEMBLING AND CONFIGURING COMPUTERS [09]

Assembling and configuring: Caution and safety, Setting up the cabinet - Installing power supply unit - Installing CPU - Installing heat sink and cooling fan – Installing memory module - Mounting motherboard – Installing hard disk – Installing optical drive – Connecting motherboard - Power supply cables – Connecting to front panel – Connecting mouse, keyboard and monitor – Switching on the computer – Configuring – BIOS Installing operating system – Installing device drivers – Installing add-on cards – common problems and solutions.

Total (L: 45) = 45 Periods

Text Books:

1 K. L. James, Computer Hardware: Installation, Interfacing, Troubleshooting and Maintenance, PHI Learning, Delhi, First edition, 2013.

2 B. Govindarajalu, IBM PC and Clones – Hardware, Troubleshooting and Maintenance, Tata McGraw-Hill, New Delhi, First edition, 2002.

Reference Books:

1 Jean Andrews, Guide to Hardware Managing, Maintaining and Troubleshooting, Cengage Learning (Course Technology), Noida, Ninth Edition, 2016.

2 Craig Zacker and John Rourke, PC Hardware: The Complete Reference, McGraw-Hill, New Delhi, First edition 2017.

3 Michael W. Graves, A+ Guide to PC Hardware Maintenance and Repair, Cengage Learning, Noida, First edition, 2004.

4 Scott M. Mueller, Upgrading and Repairing PCs, Que Publishing, Ahmedabad, Twenty second Edition, 2015.

K.S.R. COLLEGE OF ENGINEERING, TIRUCHENGODE – 637215
DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING
CO-PO MAPPING

Regulation: **R 2020**

Course Code:20EC763 **Course Name:** **PC HARDWARE, INSTALLATION, TROUBLESHOOTING AND SERVICING**

CO	Course Outcomes	Programme Outcomes													
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	*Elaborate the concepts of computer hardware and motherboards .*	3	3	2	-	2	-	-	-	-	-	-	-	3	-
CO2	*Interpret the concepts of processors and memory.*	3	3	2	-	2	-	-	-	-	-	-	-	3	-
CO3	*Describe the features, working and installation concepts of various storage devices.*	3	3	2	-	2	-	-	-	-	-	-	-	3	-
CO4	*Illustrate the type, features, specification, working of various input and output devices.*	3	3	2	-	2	-	-	-	-	-	-	-	3	-
CO5	*Identify the steps to assemble and configure computers hardware.*	3	3	2	-	2	-	-	-	-	-	-	-	3	-
	Average	**3**	**3**	**2**	**-**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**3**	**-**

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

K.S.R. COLLEGE OF ENGINEERING (Autonomous) **R 2020**

SEMESTER - VII

		L	T	P	C
20EC764	**EMBEDDED SYSTEM DESIGN (PROFESSIONAL ELECTIVE – III)**	**3**	**0**	**0**	**3**

Prerequisite: Microprocessors and Microcontrollers

Course Outcomes: On successful completion of the course, the student will be able to		***Cognitive Level***
CO1:	*Illustrate the concepts of embedded system design and its accessories.*	*Understand*
CO2:	*Interpret the components of embedded programming, optimization, validation and testing of programming.*	*Understand*
CO3:	*Explain various processes and interpret the performance of operating system.*	*Understand*
CO4:	*Familiarize various architectures and basics of embedded networks.*	*Understand*
CO5:	*Identify various system design techniques with examples.*	*Apply*

UNIT - I INTRODUCTION TO EMBEDDED ARCHITECTURE [09]

Complex systems and microprocessors - Embedded system design process - Formalisms for system design - Design example: Model train controller - Instruction sets: preliminaries - ARM processor - CPU: Programming input and output - Supervisor mode, exception and traps - Coprocessors - Memory system mechanism - CPU performance - CPU power consumption.

UNIT - II COMPUTING PLATFORM AND DESIGN ANALYSIS [09]

CPU buses - Memory devices - I/O devices - Component interfacing - Design with microprocessors - Development and debugging - Components for embedded programs - Model of programs - Assembly, linking and loading - Basic compilation techniques - Program optimization - Program validation and testing.

UNIT - III PROCESSES AND OPERATING SYSTEMS [09]

Multiple tasks and multi processes - Preemptive real time operating systems - Priority based scheduling - Inter process communication mechanisms - Evaluating operating system performance - Power management and optimization for processes.

UNIT - IV HARDWARE ACCELERATORS & NETWORKS [09]

CPUs and accelerators - Multiprocessor performance analysis - Consumer electronics architecture - Distributed embedded architecture - Networks for embedded systems - Network based design - Internet enabled systems - Vehicles as networks - Sensor networks.

UNIT - V SYSTEM DESIGN TECHNIQUES [09]

Design methodologies - Requirement analysis - Specifications - System analysis and architecture design - Quality assurance - Software tools for embedded system development - Design example: Alarm clock, software modem, elevator controller.

Total (L: 45) = 45 Periods

Text Books:

1 Wayne Wolf, Computers as Components - Principles of Embedded Computing System Design, Morgan Kaufmann Publisher, USA, Fifth edition, 2022.

2 David E Simon, An Embedded Software Primer, Pearson Education, New Delhi, Twelfth Indian reprint, 2007.

Reference Books:

1 K.V.K.K.Prasad, Embedded Real-Time Systems: Concepts, Design & Programming, Dreamtech Press, India, First edition, 2009

2 Sriram V Iyer, Pankaj Gupta, Embedded Real Time Systems Programming, Tata McGraw Hill, New Delhi, First edition, 2017.

3 Tammy Noergaard, Embedded Systems Architecture, Elsevier, Chennai, Second edition, 2013.

4 Raj Kamal, Embedded Systems Architecture, Programming and Design, Tata McGraw Hill, New Delhi, Third edition, 2017.

K.S.R. COLLEGE OF ENGINEERING, TIRUCHENGODE – 637215
DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING
CO-PO MAPPING

Regulation: R 2020

Course Code:20EC764 **Course Name: EMBEDDED SYSTEM DESIGN**

CO	Course Outcomes	Programme Outcomes													
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	*Illustrate the concepts of embedded system design and its accessories.*	3	3	3	-	2	3	-	-	-	-	-	3	3	-
CO2	*Interpret the components of embedded programming, optimization, validation and testing of programming.*	3	3	3	-	2	3	-	-	-	-	-	3	3	-
CO3	*Explain various processes and interpret the performance of operating system.*	3	3	3	-	2	3	-	-	-	-	-	3	3	-
CO4	*Familiarize various architectures and basics of embedded networks.*	3	3	3	-	2	3	-	-	-	-	-	3	3	-
CO5	*Identify various system design techniques with examples.*	3	3	3	-	2	3	-	-	-	-	-	3	3	-
	Average	**3**	**3**	**3**	**-**	**2**	**3**	**-**	**-**	**-**	**-**	**-**	**3**	**3**	**-**

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

K.S.R. COLLEGE OF ENGINEERING (Autonomous) **R 2020**

SEMESTER - VII

		L	T	P	C
20EC765	**WIRELESS NETWORKS (PROFESSIONAL ELECTIVE – III)**	**3**	**0**	**0**	**3**

Prerequisite: *Computer Networks*

Course Outcomes : On successful completion of the course, the student will be able to		***Cognitive Level***
CO1:	*Describe the wireless network protocols.*	*Understand*
CO2:	*Interpret mobile network layer and routing*	*Understand*
CO3:	*Explain the overview and architecture of 3G networks*	*Understand*
CO4:	*Compare various schemes used for internetworking between WLANS and WMANS.*	*Understand*
CO5:	*Illustrate the 4G Networks and its architecture*	*Understand*

UNIT - I WIRELESS LAN [09]

Introduction - WLAN technologies: IEEE802.11: System architecture, protocol architecture, 802.11b, 802.11a – Hiper LAN: WATM, BRAN, HiperLAN2 – Bluetooth: Architecture, WPAN – IEEE 802.15.4, Wireless USB, Zigbee, 6LoWPAN, Wireless HART.

UNIT - II MOBILE NETWORK LAYER [09]

Introduction - Mobile IP: IP packet delivery, Agent discovery, tunneling and encapsulation, IPV6 - Network layer in the internet - Mobile IP session initiation protocol - mobile ad - hoc network: Routing: Destination Sequence distance vector, IoT: CoAP

UNIT - III INTERNETWORKING BETWEEN WLANS AND WWANS [09]

Internetworking objectives and requirements, Schemes to connect WLANS and 3G Networks, Session Mobility, Internetworking Architecture for WLAN and GPRS, System Description, Local Multipoint Distribution Service, Multichannel Multipoint Distribution System.

UNIT - IV 3G OVERVIEW [09]

Overview of UTMS Terrestrial Radio access network - UMTS Core network Architecture: 3GPP Architecture, User equipment, CDMA2000 overview - Radio and Network components, Network structure, Radio Network, TD - CDMA, TD – SCDMA.

UNIT - V 4G & 5G NETWORKS [09]

Introduction – 4G vision – 4G features and challenges - Applications of 4G – 4G Technologies: Multicarrier Modulation, Smart antenna techniques, IMS Architecture, LTE, Advanced Broadband Wireless Access and Services, MVNO.

Total (L: 45) = 45 Periods

Text Books :

1 Jochen Schiller, Mobile Communications, Pearson Education, Bengaluru, Second Edition, 2012.

2 Vijay Garg, Wireless Communications and networking, Elsevier, First Edition, 2007.

Reference Books :

1 Erik Dahlman, Stefan Parkvall, Johan Skold and Per Beming, 3G Evolution HSPA and LTE for Mobile Broadband, Academic Press, Second Edition, 2008.

2 Anurag Kumar, D.Manjunath, Joy kuri, Wireless Networking, Elsevier, Brazil, First Edition, 2011.

3 Simon Haykin , Michael Moher, David Koilpillai, Modern Wireless Communications, Pearson Education, Bengaluru, First edition, 2013.

4 Dharma PrakashAgarwal and Qing An Zeng, Introduction to Wireless and Mobile Systems, Thomson Learning, United states, Second edition, 2007.

K.S.R. COLLEGE OF ENGINEERING, TIRUCHENGODE – 637215

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

CO-PO MAPPING

Regulation: R 2020

Course Code:20EC765 **Course Name: WIRELESS NETWORKS**

CO PO MAPPING

CO	Course Outcomes	Programme Outcomes													
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	*Describe the wireless network protocols.*	3	3	3	-	-	-	-	-	-	-	-	-	-	3
CO2	*Interpret mobile network layer and routing*	3	3	3	-	-	-	-	-	-	-	-	-	-	3
CO3	*Explain the overview and architecture of 3G networks*	3	3	3	-	-	-	-	-	-	-	-	-	-	3
CO4	*Compare various schemes used for internetworking between WLANS and WMANS.*	3	3	3	-	-	-	-	-	-	-	-	-	-	3
CO5	*Illustrate the 4G Networks and its architecture*	3	3	3	-	-	-	-	-	-	-	-	-	-	3
	Average	**3**	**3**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**3**

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

K.S.R. COLLEGE OF ENGINEERING (Autonomous) **R 2020**

SEMESTER – VII

		L	T	P	C
20EC770	**PATTERN RECOGNITION (PROFESSIONAL ELECTIVE – III)**	**3**	**0**	**0**	**3**

Prerequisite:

Course Outcomes: On successful completion of the course, the student will be able to		***Cognitive Level***
CO1:	*Relate basics of pattern recognition problems and mathematical foundation for pattern recognition.*	*Understand*
CO2:	*Illustrate the statistical pattern recognition techniques and functions.*	*Understand*
CO3:	*Solve problems related to parametric estimation methods in pattern recognition.*	*Apply*
CO4:	*Describe unsupervised learning in pattern recognition.*	*Understand*
CO5:	*Elaborate the clustering problems in pattern recognition.*	*Understand*

UNIT – I INTRODUCTION [09]

Introduction: Basics of pattern recognition – Design principles of pattern recognition system - Learning and adaptation – Pattern recognition approaches. Mathematical foundations: Linear algebra – Probability theory – Expectation – Mean and Covariance – Normal distribution - Multivariate normal densities – Chi square test of hypothesis.

UNIT – II STATISTICAL PATTERN RECOGNITION [09]

Statistical Patten Recognition: Bayesian Decision Theory – Classifiers – Normal density and discriminant functions.

UNIT – III MODELS [09]

Parameter estimation methods: Maximum-Likelihood estimation – Bayesian Parameter estimation – Dimension reduction methods – Principal Component Analysis (PCA) – Fisher Linear discriminant analysis – Expectation – maximization (EM) – Hidden Markov Models (HMM) – Gaussian mixture models.

UNIT – IV NON PARAMETRIC TECHNIQUES [09]

Nonparametric Techniques: Density Estimation – Parzen Windows – K-Nearest Neighbor Estimation – Nearest Neighbor Rule – Fuzzy classification.

UNIT – V CLUSTERING TECHNIQUES [09]

Unsupervised Learning and Clustering: Criterion functions for clustering – Clustering Techniques: Iterative square – Error partitional clustering – K-Means – agglomerative hierarchical clustering – Cluster validation.

Total (L: 45) = 45 Periods

Text Books:

1 Richard O. Duda, Peter E. Hart and David G. Stork, Pattern Classification, Second edition, John Wiley, 2006.

2 Bishop, Christopher M., Pattern Recognition and Machine Learning, First edition, Springer, 2009.

Reference Books:

1 S. Theodoridis, K. Koutroumbas, Pattern Recognition, Fourth edition, Academic Press, 2009.

2 Keinosuke Fukunaga, Introduction to Statistical Pattern Recognition, Second edition, Academic Press, 2003.

3 Sergios Thedoridis, Konstantinos Koutroumbas, Pattern Recognition, Fourth edition, Academic Press, 2009.

4 C. M. Bishop, “Pattern Recognition and Machine Learning”, Springer, 2009.

K.S.R. COLLEGE OF ENGINEERING, TIRUCHENGODE – 637215

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

CO-PO MAPPING

Regulation: R2020

Course Code:20EC770 **Course Name: PATTERN RECOGNITION**

CO PO MAPPING

CO	Course Outcomes	Programme Outcomes													
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	*Relate basics of pattern recognition problems and mathematical foundation for pattern recognition.*	3	3	3	-	-	-	-	-	-	-	-	- 3		-
CO2	*Illustrate the statistical pattern recognition techniques and functions.*	3	3	3	-	-	-	-	-	-	-	-	- 3		-
CO3	*Solve problems related to parametric estimation methods in pattern recognition.*	3	3	3	-	-	-	-	-	-	-	-	- 3		-
CO4	*Describe unsupervised in learning pattern recognition.*	3	3	3	-	-	-	-	-	-	-	-	- 3		-
CO5	*Elaborate the clustering in problems pattern recognition.*	3	3	3	-	-	-	-	-	-	-	-	- 3		-
	Average	**3**	**3**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**3**	**-**

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

K.S.R. COLLEGE OF ENGINEERING (Autonomous) **R 2020**

SEMESTER – VII

		L	T	P	C
20EC766	**CMOS ANALOG CIRCUITS (PROFESSIONAL ELECTIVE – IV)**	**3**	**0**	**0**	**3**

Prerequisite: VLSI Design

Course Outcomes: On successful completion of the course, the student will be able to		***Cognitive Level***
CO1:	*Elaborate the concepts of analog Integrated Circuits with consideration of CMOS technology.*	*Understand*
CO2:	*Examine the performance of various CMOS device modeling.*	*Analyze*
CO3:	*Design a two stage CMOS operational amplifiers with its power supply rejection ratio.*	*Apply*
CO4:	*Elaborate the concepts of comparators and switched capacitor circuits in VLSI domain.*	*Understand*
CO5:	*Elaborate the concepts of Digital to Analog Converters and Analog to Digital Converters in VLSI domain.*	*Understand*

UNIT – I FUNDAMENTALS OF ANALOG ICs [09]

Analog integrated circuit design - Notation, symbology and terminology - Analog signal processing - Example of analog VLSI mixed signal circuit design - PN junction - MOS transistor - Passive components - Other considerations of CMOS technology - Integrated circuit layout.

UNIT – II CMOS DEVICE MODELING [09]

Simple MOS large signal model - Parameters - Small signal model - Computer simulation models - Sub threshold MOS model - SPICE simulation - MOS switch - Diode/Active resistor - Current sinks and sources - Current mirrors - Current and voltage references.

UNIT – III CMOS AMPLIFIERS [09]

Inverters - Differential amplifiers - Design of CMOS OPAMPs - Compensation of OPAMPs - Design of two stage OPAMPs - Power supply rejection ratio of two stage OPAMPs.

UNIT – IV COMPARATORS AND SWITCHED CAPACITOR CIRCUITS [09]

Characterization of a comparator - Two stage open-loop comparators - Other open-loop comparators - Switched capacitor circuits - Amplifiers – Integrators

UNIT – V DIGITAL TO ANALOG AND ANALOG TO DIGITAL CONVERTERS [09]

Characterization of digital to analog converters - Parallel digital to analog converters - Extending the resolution - Serial digital to analog converters - Characterization of analog to digital converters: Serial, medium and high speed.

Total (L: 45) = 45 Periods

Text Books:

1 Phillip E.Allen, Douglas R.Holberg, CMOS Analog Circuit Design, Oxford University Press, Third edition, 2011.

2 Behzad Razavi, Design of Analog CMOS Integrated Circuits, McGraw Hill Higher Education, International edition, 2009.

Reference Books:

1 Liu Kramer, Indiveri, Delbruck, Douglas, Analog VLSI: Circuits and Principles, Pearson Education, 2004.

2 Weste and Harris, CMOS VLSI Design, Pearson Education, Third edition, 2005.

3 D.A.Pucknell and K.Eshraghian, Basic VLSI Design, PHI, Third edition, 2003.

4 Kamran Eshraghian, Douglas A. Pucknell and Sholeh Eshraghian, Essentials of VLSI Circuits and Systems, PHI, 2013

K.S.R. COLLEGE OF ENGINEERING, TIRUCHENGODE – 637215
DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING
CO-PO MAPPING

Regulation: R 2020

Course Code: 20EC766 **Course Name: CMOS ANALOG CIRCUITS**

CO	Course Outcomes	Programme Outcomes													
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	*Elaborate the concepts of analog Integrated Circuits with consideration of CMOS technology.*	3	3	2	-	-	-	-	-	-	-	-	-	3	-
CO2	*Examine the performance of various CMOS device modeling.*	3	3	2	-	-	-	-	-	-	-	-	-	3	-
CO3	*Design a two stage CMOS operational amplifiers with its power supply rejection ratio.*	3	3	2	-	-	-	-	-	-	-	-	-	3	-
CO4	*Elaborate the concepts of comparators and switched capacitor circuits in VLSI domain.*	3	3	2	-	-	-	-	-	-	-	-	-	3	-
CO5	*Elaborate the concepts of Digital to Analog Converters and Analog to Digital Converters in VLSI domain.*	3	3	2	-	-	-	-	-	-	-	-	-	3	-
	Average	**3**	**3**	**2**	**-**		**-**	**-**	**-**	**-**	**-**	**-**	**-**	**3**	**-**

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

K.S.R. COLLEGE OF ENGINEERING (Autonomous) **R 2020**

SEMESTER - VII

20EC767	**FUNDAMENTALS OF NANO ELECTRONICS (PROFESSIONAL ELECTIVE – III)**	**L**	**T**	**P**	**C**
		3	**0**	**0**	**3**

Prerequisite: Engineering physics

Course Outcomes: On successful completion of the course, the student will be able to		**Cognitive Level**
CO1:	Understand the basics of Nano electronics including quantum wires, dots and wells	*Understand*
CO2:	Infer the mechanism behind quantum electronic devices	*Understand*
CO3:	Illustrate the properties of Nano capacitors, nanowire FETs, SETs.	*Understand*
CO4:	Analyze the key performance aspects of tunneling and superconducting Nano electronic devices	*Understand*
CO5:	Apply the knowledge in the development of nanotubes and nanostructure devices.	*Understand*

UNIT - I INTRODUCTION TO NANO ELECTRONICS [09]

Scaling to nano - Light as a wave and particle - Electrons as waves and particles - origin of quantum mechanics - General postulates of quantum mechanics - Time independent Schrodinger wave equation - Electron confinement - Quantum dots, wires and well-Spin and angular momentum

UNIT - II QUANTUM ELECTRONICS [09]

Quantum electronic devices - Short channel MOS transistor - Split gate transistor - Electron wave transistor - Electron wave transistor - Electron spin transistor - Quantum cellular automata - Quantum dot array, Quantum memory.

UNIT - III NANO ELECTRONIC TRANSISTORS [09]

Coulomb blockade - Coulomb blockade in Nano capacitors - Coulomb blockade in tunnel junctions - Single electron transistors, Semiconductor nanowire FETs and SETs, Molecular SETs and molecular electronics - Memory cell.

UNIT - IV NANO ELECTRONIC TUNNELING AND SUPER CONDUCTING DEVICES [09]

Tunnel effect - Tunneling element -Tunneling diode - Resonant tunneling diode - Three terminal resonant tunneling devices - Superconducting switching devices - Cryotron - Josephson tunneling device.

UNIT - V NANOTUBES AND NANOSTRUCTURE DEVICES [09]

Carbon Nanotube - Fullerenes - Types of nanotubes - Formation of nanotubes - Assemblies - Purification of carbon nanotubes - Electronic properties - Synthesis of carbon nanotubes - Carbon nanotube interconnects - Carbon nanotube FETs and SETs - Nanotube for memory applications Nano structures and Nano structured devices.

Total (L: 45) = 45 Periods

Text Books:

1 W. R. Fahrner, Nanotechnology and Nanoelectronics : materials Springer - Verlag Berlin Heidelberg, scholars porta, First edition, 2019.
2 Hanson, Fundamentals of Nanoelectronics, Pearson education, New Delhi, First edition, 2009.

Reference Books:

1 Jan Dienstuhl, Karl Goser, and Peter Glösekötter, Nanoelectronics and Nanosystems: From Transistors to Molecular and Quantum Devices, Springer-Verlag, Berlin Heideberg, First edition, 2004.
2 Mircea Dragoman and Daniela Dragoman, Nanoelectronics : Principles and Devices, Artech House, USA, Second edition, 2009.
3 Robert Puers, Livio Baldi, Marcel Van de Voorde and Sebastiaan E. Van Nooten, Nanoelectronics: Materials, Devices, Applications, Wiley, First edition, USA, 2017.
4 Brajesh Kumar Kaushik, Nanoelectronics : Devices, Circuits and Systems, Elsevier science, First edition, 2018.

K.S.R. COLLEGE OF ENGINEERING, TIRUCHENGODE – 637215
DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING
CO-PO MAPPING

Regulation: R 2020

Course Code:20EC767 **Course Name: FUNDAMENTALS OF NANO ELECTRONICS**

CO	Course Outcomes	Programme Outcomes													
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	Understand the basics of Nano electronics including quantum wires, dots and wells	3	3	2	2	3	2	-	-	-	-	-	2	3	2
CO2	Infer the mechanism behind quantum electronic devices	3	3	3	2	3	2	-	-	-	-	-	2	3	2
CO3	Illustrate the properties of Nano capacitors, nanowire FETs, SETs.	3	3	2	2	3	2	--	-	-	-	-	2	3	2
CO4	Analyze the key performance aspects of tunneling and superconducting Nano electronic devices	3	3	3	2	3	2	-	-	-	-	-	2	3	2
CO5	Apply the knowledge in the development of nanotubes and nanostructure devices.	3	3	2	2	3	3	-	-	-	-	-	2	3	2
Average		**3**	**3**	**2**	**2**	**3**	**2**	**-**	**-**	**-**	**-**	**-**	**2**	**3**	**2**

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

K.S.R. COLLEGE OF ENGINEERING (Autonomous) **R 2020**

SEMESTER - VII

20EC768	**HIGH PERFORMANCE NETWORKS**	**L**	**T**	**P**	**C**
	(PROFESSIONAL ELECTIVE – IV)	**3**	**0**	**0**	**3**

Prerequisite: *Computer networks*

Course Outcomes : On successful completion of the course, the student will be able to	***Cognitive Level***
CO1: Describe the concepts of networks.	*Understand*
CO2: Interpret the functionalities of high speed networks.	*Understand*
CO3: Illustrate the various protocols for real time operations.	*Understand*
CO4: Explain the various queuing disciplines and differentiated services.	*Understand*
CO5: Compare the connection-oriented services with reference to MPLS & VPN.	*Understand*

UNIT - I NETWORK CONCEPTS [09]

Introduction - Principles - Applications - Services: Network elements- Network mechanisms - Layered architecture: layered network - Limitations.

UNIT - II HIGH SPEED NETWORKS [09]

Frame Relay Networks – Asynchronous transfer mode – ATM Protocol Architecture, ATM logical Connection, ATM Cell – ATM Service Categories – AAL, High Speed LANs: Fast Ethernet, Gigabit Ethernet, Fiber Channel – Wireless LANs: applications, requirements – Architecture of 802.11.

UNIT - III PROTOCOLS FOR QOS SUPPORT [09]

RSVP – Goals & Characteristics, Data Flow, RSVP operations, Protocol Mechanisms – Multiprotocol Label Switching – Operations, Label Stacking, Protocol details – RTP – Protocol Architecture, Data Transfer Protocol, RTCP.

UNIT - IV INTEGRATED AND DIFFERENTIATED SERVICES [09]

Integrated services architecture: Approach, components, services - Queuing discipline: Fair queuing, processor sharing,bit-round fair queuing, generalized processor sharing, weighted fair queuing - Random early detection - Differentiated services.

UNIT - V ADVANCED NETWORK CONCEPTS [09]

VPN: Remote access, site-to-site, tunneling and point to point protocol - Security in VPN - MPLS: Operation, routing, tunneling and use of FEC, traffic engineering and MPLS based VPNs - Overlay networks: Peer to peer connection.

Total (L:45)= 45 Periods

Text Books :

1 Jean Warland, Pravin Varaiya, High Performance Communication Networks, Morgan Kaufmann Publishers, San Francisco ,Second edition, 2011.

2 Nader F. Mir, Computer and Communication Networks, Dorling Kindersley, , Noida, Third edition, 2009.

Reference Books :

1 Lenon Garcia Widjaja, Communication Networks, Tata McGraw-Hill, New Delhi, Second edition, 2007.

2 Othmarkyas, ATM Networks, International Thomson Computer Press, second edition, 1993.

3 Ranier Handel Manfred N Huber, Stefan Schroder, ATM Networks - Concepts, Protocols Applications, Addison Wesley, New York, Third edition, 2006.

4 Irvan Pepelnjk, Jim Guichard& Jeff Apcar, MPLS and VPN Architecture, Volume 1 and 2, Cisco Press, 2007.

K.S.R. COLLEGE OF ENGINEERING, TIRUCHENGODE – 637215
DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING
CO-PO MAPPING

Regulation: R 2020

Course Code:20EC768 **Course Name: HIGH PERFORMANCE NETWORKS**

CO PO MAPPING

CO	Course Outcomes	Programme Outcomes													
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	*Describe the concepts of networks.*	3	3	3	-	-	-	-	-	-	-	-	-	-	3
CO2	*Interpret the functionalities of high speed networks.*	3	3	3	-	-	-	-	-	-	-	-	-	-	3
CO3	*Illustrate the various protocols for real time operations.*	3	3	3	-	-	-	-	-	-	-	-	-	-	3
CO4	*Explain the various queuing disciplines and differentiated services.*	3	3	3	-	-	-	-	-	-	-	-	-	-	3
CO5	*Compare the connection-oriented services with reference to MPLS & VPN.*	3	3	3	-	-	-	-	-	-	-	-	-	-	3
	Average	**3**	**3**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**3**

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

K.S.R. COLLEGE OF ENGINEERING (Autonomous) **R 2020**

SEMESTER - VII

20EC769	**ROBOTICS**	L	T	P	C
	(PROFESSIONAL ELECTIVE – IV)	3	0	0	3

Prerequisite: *Digital image processing*

Course Outcomes : On successful completion of the course, the student will be able to		**Cognitive Level**
CO1:	*Comprehend the fundamentals of robotics.*	Understand
CO2:	*Describe the technologies applicable for Robotics in computer based vision.*	Understand
CO3:	*Elucidate the different sensing devices of robot.*	Understand
CO4:	*Describe the algorithms applicable for robotics.*	Understand
CO5:	*Develop 4-axis and 6-axis robot.*	Apply

UNIT - I INTRODUCTION TO ROBOTICS [09]

Motion - Potential function - Road maps - Cell decomposition sensor and sensor planning - Kinematics - Forward and inverse kinematics - Transformation matrix and DH transformation - Inverse kinematics - Geometric methods and algebraic methods - Non holonomic constraints.

UNIT - II COMPUTER VISION [09]

Projection - Optics, projection on the Image plane and radiometry - Image processing - Connectivity - Images - Gray Scale and binary images - Blob filling – Thresholding - Histogram - Convolution - Digital convolution and filtering and Masking techniques - Edge detection - Mono and stereo vision - Face detection.

UNIT - III SENSORS AND SENSING DEVICES [09]

Introduction to various types of sensor - Resistive sensors - Range sensors – LADAR - Sonar - Radar and Infra-red - Introduction to sensing - Light sensing - Heat sensing - Touch sensing and position sensing.

UNIT - IV ARTIFICIAL INTELLIGENCE FOR ROBOTICS [09]

Uniform Search strategies - Breadth first, Depth first, Iterative and deepening depth first search and bidirectional search - The A* algorithm - Planning - State-space planning - Graph plan/Sat plan and their comparison - Probabilistic reasoning - Bayesian networks - Decision trees and bayes net inference.

UNIT - V INTEGRATION TO ROBOT [09]

Building of 4 axis or 6 axis robot - Vision system for pattern detection - Sensors for obstacle detection - Decision making.

Total (L:45) = 45 Periods

Text Books :

1 Robert Schilling and Craig, Fundamentals of Robotics, Analysis and control, PHI, New Delhi, Third Edition, 2015.

2 Stuart Russell and Peter Norvig, Artificial Intelligence-A Modern Approach, Pearson Education Series in Artificial Intelligence, London, Third Edition, 2016.

Reference Books :

1 Duda. Hart. and Stork., Pattern Recognition, Wiley-Inter science,UK, Second Edition, 2000.

2 Mallot., Computational Vision Information Processing in Perception and Visual Behavior, MIT Press,Cambridge, Second Edition, 2000.

3 Forsyth. and Ponce., Computer Vision, A modern Approach, Pearson Education, London, Second Edition, 2011.

4 Fu,K.S. Gonzalez,R.C and Lee,C.S.G., Robotics control, sensing, vision and intelligence, Tata- McGraw Hill Pub. Co., New York, Second Edition, 2008.

5 https://nptel.ac.in/courses/112/108/112108093/

K.S.R. COLLEGE OF ENGINEERING, TIRUCHENGODE – 637215
DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING
CO-PO MAPPING

Regulation: R 2020

Course Code:20EC769 **Course Name: ROBOTICS**

CO	Course Outcomes	Programme Outcomes													
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	*Comprehend the fundamentals of robotics.*	3	3	3	-	-	-	-	-	-	-	-	3	3	-
CO2	*Describe the technologies applicable for Robotics in computer based vision.*	3	3	3	-	-	-	-	-	-	-	-	3	3	-
CO3	*Elucidate the different sensing devices of robot.*	3	3	3	-	-	-	-	-	-	-	-	3	3	3
CO4	*Describe the AI algorithms applicable for robotics.*	3	3	3	-	3	-	-	-	-	-	-	3	3	-
CO5	*Develop 4-axis and 6-axis robot.*	3	3	3	-	-	-	-	-	-	-	-	3	3	-
	Average	**3**	**3**	**3**	**-**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**3**	**3**	**3**

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

K.S.R. COLLEGE OF ENGINEERING (Autonomous) **R 2020**

SEMESTER – VII

		L	T	P	C
20EC771	**SOFT COMPUTING TECHNIQUES (PROFESSIONAL ELECTIVE – IV)**	**3**	**0**	**0**	**3**

Prerequisite:

Course Outcomes: On successful completion of the course, the student will be able to		***Cognitive Level***
CO1:	*Infer the concepts of artificial neural network.*	*Understand*
CO2:	*Outline the various types of neural network.*	*Understand*
CO3:	*Discuss the basic concepts of fuzzy logic system.*	*Apply*
CO4:	*Illustrate the fundamentals of different soft computing techniques.*	*Understand*
CO5:	*Apply the knowledge of neural networks and fuzzy logic controller for classical applications.*	*Understand*

UNIT – I INTRODUCTION TO SOFT COMPUTING [09]

Introduction-Artificial Intelligence-Artificial Neural Networks-Fuzzy Systems-Genetic Algorithm and Evolutionary Programming-Swarm Intelligent Systems-Classification of ANNs-McCulloch and Pitts Neuron Model-Learning Rules: Hebbian and Delta-Perceptron Network-Adaline Network-Madaline Network.

UNIT – II ARTIFICIAL NEURAL NETWORKS [09]

Back propagation Neural Networks - Kohonen Neural Network -Learning Vector Quantization -Hamming Neural Network - Hopfield Neural Network- Bi-directional Associative Memory -Adaptive Resonance Theory Neural Networks- Support Vector Machines - Spike Neuron Models.

UNIT – III FUZZY SYSTEMS [09]

Introduction to Fuzzy Logic, Classical Sets and Fuzzy Sets - Classical Relations and Fuzzy Relations -Membership Functions -Defuzzification - Fuzzy Arithmetic and Fuzzy Measures - Fuzzy Rule Base and Approximate Reasoning - Introduction to Fuzzy Decision Making.

UNIT – IV GENETIC ALGORITHMS [09]

Basic Concepts- Working Principles -Encoding- Fitness Function - Reproduction - Inheritance Operators - Cross Over - Inversion and Deletion -Mutation Operator - Bit-wise Operators -Convergence of Genetic Algorithm

UNIT – V HYBRID SYSTEMS [09]

Hybrid Systems -Neural Networks, Fuzzy Logic and Genetic - GA Based Weight Determination - LR-Type Fuzzy Numbers - Fuzzy Neuron - Fuzzy BP Architecture - Learning in Fuzzy BP - Inference by Fuzzy BP - Fuzzy ArtMap: A Brief Introduction - Soft Computing Tools - GA in Fuzzy Logic Controller Design - Fuzzy Logic Controller

Total (L: 45) = 45 Periods

Text Books:

1 Sivanandam S.N and Deepa S.N, Principles of soft computing techniques, John Wiley and Sons Ltd, United States, Third Edition, 2011.

2 N.P.Padhy, S.P.Simon, Soft Computing with MATLAB Programming, Oxford University Press, 2015.

3 S.Rajasekaran, G.A.Vijayalakshmi Pai, Neural Networks, Fuzzy Logic and Genetic Algorithm, Synthesis and Applications, PHI Learning Pvt.Ltd., 2017

Reference Books:

1 Jyh-Shing Roger Jang, Chuen-Tsai Sun, Eiji Mizutani, Neuro-Fuzzy and Soft Computingll, Prentice-Hall of India, 2002.

2 Kwang H.Lee, First course on Fuzzy Theory and Applicationsll, Springer, 2005.

3 George J. Klir and Bo Yuan, Fuzzy Sets and Fuzzy Logic-Theory and Applicationsll, Prentice Hall, 1996.

4 James A. Freeman and David M. Skapura, Neural Networks Algorithms, Applications, and Programming Techniques ll, Addison Wesley, 2003.

K.S.R. COLLEGE OF ENGINEERING, TIRUCHENGODE – 637215
DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING
CO-PO MAPPING

Regulation: R 2020

Course Code:20EC771 **Course Name: SOFT COMPUTING TECHNIQUES**

CO	Course Outcomes	Programme Outcomes													
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	*Comprehend the fundamentals of robotics.*	3	3	3	-	-	-	-	-	-	-	-	3	3	-
CO2	*Describe the technologies applicable for Robotics in computer-based vision.*	3	3	3	-	-	-	-	-	-	-	-	3	3	-
CO3	*Elucidate the different sensing devices of robot.*	3	3	3	-	-	-	-	-	-	-	-	3	3	3
CO4	*Describe the AI algorithms applicable for robotics.*	3	3	3	-	3	-	-	-	-	-	-	3	3	-
CO5	*Develop 4-axis and 6-axis robot.*	3	3	3	-	-	-	-	-	-	-	-	3	3	-
	Average	**3**	**3**	**3**	**-**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**3**	**3**	**3**

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

K.S.R. COLLEGE OF ENGINEERING (Autonomous) **R 2020**

SEMESTER - VIII

		L	T	P	C
20EC861	**SATELLITE COMMUNICATION**	3	0	0	3

Prerequisites: *Digital Communication*

Course Objectives: On successful completion of the course, the student will be able to		***Cognitive Level***
CO1:	*Describe satellite systems in relation to other terrestrial systems and its orbits.*	*Understand*
CO2:	*Discuss about the space segment and earth segment components.*	*Understand*
CO3:	*Design the satellite uplink and downlink.*	*Apply*
CO4:	*Outline the concept of satellite access by various users.*	*Understand*
CO5:	*Explain the different applications of satellite communication.*	*Understand*

UNIT - I SATELLITE ORBITS **[09]**

Introduction to satellite communications: Kepler's laws, Newton's law, orbital parameters, orbital perturbations, station keeping, geostationary and non-geostationary orbits-Look angle determination - Limits of visibility-Eclipse-Sub satellite point-Sun transit outage-Launch vehicles and propulsion : Principles of rocket propulsion, injection in to final orbit, launch vehicles for commercial satellites.

UNIT - II SPACE AND EARTH SEGMENTS **[09]**

Space segment: Structure, primary power, thermal subsystem, telemetry, tracking and command subsystem, attitude control, propulsion subsystem, transponders. Earth segment: Transmitters, receivers, tracking systems, terrestrial interface-Receive only TV systems-Master antenna TV systems - Transmit-receive earth station.

UNIT - III SATELLITE LINK DESIGN **[09]**

Link power budget equation-Satellite link: Uplink and downlink, C/N ratio – Interference analysis: Inter modulation, inter symbol, cross polarization - Terrestrial - Propagation consideration- Noise consideration.

UNIT - IV SATELLITE ACCESS **[09]**

Modulation and multiplexing: Voice, data, video, analog and digital transmission systems - Single access - Multiple access: FDMA: Pre assigned and demand assigned FDMA, TDMA: Pre assigned and demand assigned TDMA, reference bursts, CDMA: Direct sequence spread spectrum, the code signal, acquisition and tracking, spectrum spreading and de spreading.

UNIT - V SATELLITE APPLICATIONS **[09]**

INTELSAT series – INSAT – VSAT - Mobile satellite services: GSM, GPS, INMARSAT– Satellite navigational system- Direct Broadcast Satellites (DBS) - Direct to Home Broadcast (DTH) - Digital Video Broadcast (DVB) - Digital Audio Broadcast (DAB) - Business TV (BTV)- Google Earth.

Total (L: 45) = 45 Periods

Text Books :

1 Dennis Roddy, Satellite Communications, McGraw Hill International, New York, Fourth edition, Reprint 2017.

2 Wilbur L. Pritchard, Hendri G. Suyderhoud, Robert A. Nelson, O, Satellite Communications Systems Engineering, Pearson Education Limited, New Delhi, India, Second edition ,2016.

Reference Books :

1 Tri T. Ha, Digital Satellite Communication, Tata McGraw Hill, Noida India, Second edition, Reprint 2017.

2 Anil.K.Maini, Varsha Agraval, Satellite Communications, John Wiley, New Jersey, US Reprint, 2014.

3 M.Richharia, Satellite Communication Systems - Design Principles, Macmillan Education, London ,UK, Second edition ,2003.

4 Timothy Pratt, Charles Bostian & Jeremy Allnutt, Satellite Communications, John Wiley, New Jersey, US Reprint 2017.

K.S.R. COLLEGE OF ENGINEERING, TIRUCHENGODE – 637215
DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING
CO-PO MAPPING

Regulation: R 2020

Course Code: 20EC861 **Course Name: SATELLITE COMMUNICATION**

CO	Course Outcomes	Programme Outcomes													
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	*Describe satellite systems in relation to other terrestrial systems and its orbits.*	3	2	2	-	-	-	-	-	-	-	-	-	3	3
CO2	*Discuss about the space segment and earth segment components.*	3	2	2	-	-	-	-	-	-	-	-	-	3	3
CO3	*Design the satellite uplink and downlink.*	3	3	3	-	-	-	-	-	-	-	-	-	3	3
CO4	*Outline the concept of satellite access by various users.*	3	2	2	-	-	-	-	-	-	-	-	-	3	3
CO5	*Explain the different applications of satellite communication.*	3	2	2	-	-	-	-	-	-	-	-	-	3	3
	Average	**3**	**3**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**3**	**3**

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

K.S.R. COLLEGE OF ENGINEERING (Autonomous) **R 2020**

SEMESTER - VIII

		L	T	P	C
20EC862	**OPTICAL NETWORKS**	3	0	0	3

Prerequisites: *Fiber optic communication, Computer Networks*

Course Objectives: On successful completion of the course, the student will be able to		***Cognitive Level***
CO1:	*Describe the fundamental of optical network elements*	*Understand*
CO2:	*Interpret the various optical networks architectures*	*Understand*
CO3:	*Design various optical networks and calculate routing, wavelength assignment for online and offline model*	*Apply*
CO4:	*Illustrate the concept of photonic packet switching and access network*	*Understand*
CO5:	*Outline the network management functions and optical safety measures in network design*	*Understand*

UNIT - I OPTICAL SYSTEM COMPONENTS **[09]**

Introduction-Components: Couplers, isolators, circulators, multiplexers, filters, optical amplifiers, switches and wavelength converters.

UNIT - II OPTICAL NETWORK ARCHITECTURES **[09]**

SONET/SDH-Metropolitan Area Networks-Layered architecture-Broadcast and select networks: Topologies, media access control protocols - Test beds: Lambda net, NTTs, rainbow and star net.

UNIT - III WDM NETWORK DESIGN **[09]**

WDM network Elements: Optical line terminal, optical line amplifiers, optical add/drop multiplexers, optical cross connects-Wavelength routing networks: Node designs, optical layer cost tradeoffs, routing and wavelength assignment, architectural variations.

UNIT - IV PACKET SWITCHING AND ACCESS NETWORKS **[09]**

Photonic packet switching: OTDM, multiplexing and demultiplexing, synchronization, head processing, buffering, burst switching - Access network: Future access networks, optical access network architectures.

UNIT - V CONTROL AND MANAGEMENT **[09]**

Network management functions-Optical layer services and interference-Configuration management-Performance management - Fault management - Optical safety - Service interface.

Total (L: 45) = 45 Periods

Text Books :

1 Rajiv Ramaswami and Kumar N. Sivarajan, Optical Networks: A Practical Perspective, Harcourt Asia Pt Ltd., California, Third Edition, 2011.
2 C. Siva Ram Murthy and Mohan Gurusamy, WDM Optical Networks: Concept, Design and Algorithms, Prentice Hall of India, New Delhi, First Edition, 2015.

Reference Books :

1 Uyless Black, Optical Networks: Third Generation Transport Systems, Pearson Education, New York, First Edition, 2008.
2 Biswanath Mukherjee, Optical WDM Networks, Springer, Mexico, First Edition, 2006.
3 John R. Vacca, Optical networking Best practices Handbook, Wiley publications, New York, First Edition, 2008.
4 Paul E. Green, Jr., Fiber Optic Networks, Prentice Hall, New Jersy, Third Edition, 1993.

K.S.R. COLLEGE OF ENGINEERING, TIRUCHENGODE – 637215
DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING
CO-PO MAPPING

Regulation: R 2020

Course Code: 20EC862 **Course Name: OPTICAL NETWORKS**

CO PO MAPPING

CO	Course Outcomes	Programme Outcomes													
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	*Describe the fundamental of optical network elements*	3	3	2	-	-	-	-	-	-	-	-	-	3	2
CO2	*Interpret the various optical networks architectures*	3	3	2	-	-	-	-	-	-	-	-	-	3	2
CO3	*Design various optical networks and calculate routing, wavelength assignment for online and offline model*	3	3	2	-	-	-	-	-	-	-	-	-	3	2
CO4	*Illustrate the concept of photonic packet switching and access network*	3	3	2	-	-	-	-	-	-	-	-	-	3	2
CO5	*Outline the network management functions and optical safety measures in network design*	3	3	2	-	-	-	-	-	-	-	-	-	3	2
	Average	**3**	**3**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**3**	**2**

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

K.S.R. COLLEGE OF ENGINEERING (Autonomous) **R 2020**

SEMESTER –VIII

		L	T	P	C
20EC863	**MULTIMEDIA COMPRESSION AND COMMUNICATION**	3	0	0	3

Prerequisite: Digital Image Processing

Course Outcomes : On Completion of this course, the student will be able to		**Cognitive Level**
CO1:	*Infer the concept of characteristics and elements of multimedia.*	*Understand*
CO2:	*Classify the various audio and video compression techniques.*	*Understand*
CO3:	*Illustrate the various text and audio compression techniques.*	*Understand*
CO4:	*Discuss various methods used in VoIP technology.*	*Understand*
CO5:	*Describe the issues and services that arise when designing and building multimedia networking.*	*Understand*

UNIT– I MULTIMEDIA COMPONENTS [09]

Introduction - Multimedia skills - Multimedia components and their characteristics: Text, sound, images, graphics, animation, video.

UNIT – II AUDIO AND VIDEO COMPRESSION [09]

Audio compression: DPCM, Adaptive PCM, Adaptive predictive coding, Linear predictive coding, Code excited LPC, perpetual coding - Video compression: Principles - H.261, H.263, MPEG 1, 2, 4 - Eco cancellation and noise Cancellation.

UNIT – III TEXT AND IMAGE COMPRESSION [09]

Compression principles - Source encoders and destination encoders - Lossless and lossy compression - Entropy encoding - Source encoding - Text compression: Static Huffman coding, Dynamic coding - Arithmetic coding - Lempel Ziv-welsh compression - Image compression.

UNIT – IV VoIP TECHNOLOGY [09]

Basics of IP transport - VoIP challenges - H.323/ SIP - Network architecture, Protocols, Call establishment and release - VoIP and SS7 - Quality of service - CODEC methods - VoIP application.

UNIT – V MULTIMEDIA NETWORKING [09]

Streamed stored and audio - Making the best effort service - Protocols for real time interactive applications - Distributing multimedia - Beyond best effort service - Scheduling and policing mechanisms - Integrated services - Differentiated services - RSVP.

Total (L: 45) = 45 Periods

Text Books :

1. Fred Halshall, Multimedia Communication - Applications, Networks, Protocols and Standards, Pearson education, Bengaluru, First Edition, 2014.
2. Kurose and W.Ross Computer Networking A Top down approach, Pearson education, Bengaluru, Seventh Edition, 2017.

Reference Books :

1. Tay Vaughan, Multimedia: Making it Work, Tata McGraw Hill, New Delhi, Eighth Edition, 2013.
2. K.R. Rao, Zoran. S.Bojkovic, D.A. Milovanovic, Multimedia Communication Systems: Techniques, Standards and Networks, Pearson education, Bengaluru, First Edition, 2012.
3. Ranjan Parekh, Principles of Multimedia, Tata McGraw Hill, New Delhi, First Edition, 2011.
4. https://nptel.ac.in/courses/117/105/117105083/.

K.S.R. COLLEGE OF ENGINEERING, TIRUCHENGODE – 637215
DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING
CO-PO MAPPING

Regulation : R 2020

Course Code:20EC863 **Course Name : Multimedia Compression and Communication**

CO	Course Outcomes	Programme Outcomes													
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	*Infer the concept of characteristics and elements of multimedia.*	3	3	-	-	-	-	-	-	-	-	-	-	2	-
CO2	*Classify the various audio and video compression techniques.*	3	3	-	-	-	-	-	-	-	-	-	-	2	-
CO3	*Illustrate the various text and audio compression techniques.*	3	3	-	-	-	-	-	-	-	-	-	-	2	-
CO4	*Discuss various methods used in VoIP technology.*	3	3	-	-	-	-	-	-	-	-	-	-	2	2
CO5	*Describe the issues and services that arise when designing and building multimedia networking.*	3	3	-	-	-	-	-	-	-	-	-	-	2	2
	Average	**3**	**3**	**-**		**-**	**-**		**-**	**-**	**-**	**-**	**-**	**2**	**2**

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

K.S.R. COLLEGE OF ENGINEERING (Autonomous) **R 2020**

SEMESTER - VIII

		L	T	P	C
20EC864	**EMBEDDED NETWORKS (ELECTIVE)**	**3**	**0**	**0**	**3**

Prerequisite: *Computer networks*

Course Outcomes: On successful completion of the course, the student will be able to		***Cognitive Level***
CO1:	*Describe the basic concepts of Ethernet.*	*Understand*
CO2:	*Discuss the Ethernet communication protocols.*	*Understand*
CO3:	*Explain the concepts of network security.*	*Understand*
CO4:	*Interpret the Controller Area Network.*	*Understand*
CO5:	*Identify the configuration of CAN.*	*Apply*

UNIT - I ETHERNET BASICS [09]

Elements of a network - Inside Ethernet - Building a network: Hardware options - Cables, connections and network speed - Design choices: Selecting components - Ethernet controllers.

UNIT - II EMBEDDED ETHERNET [09]

Internet in local and internet communications - Inside the Internet protocol - Exchanging messages using UDP and TCP - Serving web pages with dynamic data, serving web pages that respond to user Input.

UNIT - III EMBEDDED ETHERNET PROTOCOLS AND SECURITY [09]

Sending and receiving messages - Email protocols - File Transfer Protocol (FTP): FTP clients and server - Inside the file transfer protocol- Keeping devices and network secure: Limiting access with password - Rules for securing device and local network.

UNIT - IV EMBEDDED NETWORK REQUIREMENTS [09]

Code requirements - Communication requirements - Introduction to CAN open: CAN open standard - Object directory -Electronic data sheets and device - Configuration files - Service data objectives - Network management CAN open messages - Device profile encoder.

UNIT - V CAN CONFIGURATION [09]

CAN open configuration - Evaluating system requirements, choosing devices and tools - Configuring single devices - Overall network configuration - Network simulation - Network commissioning - Advanced features and testing.

Total (L= 45) = 45 Periods

Text Books:

1 Jan Axelson, Embedded Ethernet and Internet Complete, Designing and Programming Small Devices for Networking, Penram International Publication, Mumbai, First Edition, 2007.

2 Glaf P.Feiffer, Andrew Ayre and Christian Keyold, Embedded Networking with CAN and CAN open, Embedded System Academy, United States, First Edition, 2016.

Reference Books:

1 Frank Vahid, Givargis, Embedded Systems Design: A Unified Hardware/Software Introduction, Wiley Publications, United States, Third Edition, 2011.

2 Behrouz A.Forouzan, Data Communication and Networking, Tata McGraw Hill Publications, New Delhi, Second Edition, 2008.

3 Konrad Etschberger, Controller Area Network, IXXAT Automation GmbH, Germany, First Edition, 2001.

4 http://www.can-cia.org/can.

K.S.R. COLLEGE OF ENGINEERING, TIRUCHENGODE – 637215
DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING
CO-PO MAPPING

Regulation: **R 2020**

Course Code: 20EC864 **Course Name:** **EMBEDDED NETWORKS**

CO	Course Outcomes	Programme Outcomes													
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	*Describe the basic concepts of Ethernet.*	3	2	-	-	2	2	-	-	-	-	-	2	3	2
CO2	*Describe the Ethernet communication protocols.*	3	2	-	-	2	2	-	-	-	-	-	2	3	2
CO3	*Explain the concepts of network security.*	3	2	-	-	2	2	-	-	-	-	-	2	3	2
CO4	*Interpret the Controller Area Network.*	3	2	-	-	2	2	-	-	-	-	-	2	3	2
CO5	*Identify the configuration of CAN.*	3	2	-	-	2	2	-	-	-	-	-	2	3	2
	Average	**3**	**2**	**-**	**-**	**2**	**2**	**-**	**-**	**-**	**-**	**-**	**2**	**3**	**2**

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

K.S.R. COLLEGE OF ENGINEERING (Autonomous) **R 2020**

SEMESTER –VIII

20EC865	**VLSI SIGNAL PROCESSING**	L	T	P	C
		3	0	0	3

Prerequisite: Digital signal processing and VLSI design

Course Outcomes: On Completion of this course, the student will be able to		**Cognitive Level**
CO1	Explain the basic of pipelining and parallel processing used in FIR filters	*Understand*
CO2	Describe the pipelining and parallel processing used in IIR filters	*Understand*
CO3	Relate retiming, unfolding algorithm used in filters and transforms	*Understand*
CO4	Interpret scaling and round off and numerical strength reduction used in VLSI signal processing.	*Understand*
CO5	Infer synchronous and asynchronous pipelines used in VLSI signal processing	*Understand*

UNIT– I PROCESSING OF FIR FILTERS [09]

Introduction to DSP systems: Typical DSP algorithms, dataflow and dependence graphs - Critical path - Loop bound - Iteration bound: longest path matrix algorithm - Pipelining and parallel processing of FIR filters.

UNIT – II PIPELINING AND PARALLEL PROCESSING OF IIR FILTERS [09]

Pipelined and parallel recursive filters: Look ahead pipelining in first order IIR filters, look ahead pipelining with power of 2-decomposition and clustered look ahead pipelining - Parallel processing of IIR filters: Combined pipelining and parallel processing of IIR filters.

UNIT – III RETIMING, ALGORITHMIC STRENGTH REDUCTION AND FAST CONVOLUTION [09]

Retiming: Definitions and properties - Unfolding: Algorithm, properties and applications - Algorithmic strength reduction in filters and transforms (Qualitative analysis only) Fast convolution: Cook -Toom algorithm and modified Cook - Toom Algorithm

UNIT – IV SCALING, ROUNDOFF NOISE NUMERICAL STRENGTH REDUCTION [09]

Scaling operation - Round off noise - State variable description of digital filters: Scaling and round–off noise computation - Round off noise in pipelined IIR filters, Numerical strength reduction: Sub expression elimination, multiple constant multiplications, iterative matching

UNIT – V SYNCHRONOUS, WAVE AND ASYNCHRONOUS PIPELINES [09]

Synchronous pipelining and clocking styles: Clock skew in edge triggered single phase clocking and two-phase clocking - Wave pipelining - Asynchronous pipelining: Bundled data versus dual rail protocol.

Total (L: 45) = 45 Periods

Text Books:

1. KeshabK.Parhi, VLSI Digital Signal Processing Systems, Design and implementation, John Wiley, New York, US, First Edition, 2007.
2. U.MeyerBaese, Digital Signal Processing with Field Programmable Gate Arrays, Springer Berlin Heidelberg, New - York, First Edition, 2001.

Reference Books :

1. Gary K.Yeap, Practical Low Power Digital VLSI Design, Kluwer Academic Publishers, Netherland,First Edition, 2008.
2. Mohammed Isamail and Terri Fiez, Analog VLSI Signal and Information, McGraw– Hill New Delhi, First Edition,1994.
3. ParhiKeshab K,VLSI Digital Signal Processing Systems: Design and Implementation, Wiley,New York, First Edition, 2007.
4. Jose E.France and Yannisvidis, Design of analog – Digital VLSI Circulation for Telecommunication and Signal Processing, Prentice Hall, Hoboken, New Jersey, Second Edition, 2006

K.S.R. COLLEGE OF ENGINEERING, TIRUCHENGODE – 637215
DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING
CO-PO MAPPING

Regulation : R 2020

Course Code: 20EC865 **Course Name: VLSI SIGNAL PROCESSING**

CO	Course Outcomes	Programme Outcomes													
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	Explain the basic of pipelining and parallel processing used in FIR filters	3	3	-	-	-	-	-	-	-	-	-	-	3	2
CO2	Describe the pipelining and parallel processing used in IIR filters	3	3	-	-	-	-	-	-	-	-	-	-	3	2
CO3	Relate retiming, unfolding algorithm used in filters and transforms	3	3	-	-	-	-	-	-	-	-	-	-	3	2
CO4	Interpret scaling and round off and numerical strength reduction used in VLSI signal processing.	3	3	-	-	-	-	-	-	-	-	-	-	3	2
CO5	Infer synchronous and asynchronous pipelines used in VLSI signal processing	3	3	-	-	-	-	-	-	-	-	-	-	3	2
Average		**3**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**3**	**2**

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

K.S.R. COLLEGE OF ENGINEERING (Autonomous) **R 2020**

SEMESTER –VIII

		L	T	P	C
20EC866	**CAD FOR VLSI**	3	0	0	3

Prerequisite: VLSI design

Course Outcomes: On Completion of this course, the student will be able to		**Cognitive Level**
CO1:	Describe the basic concepts of VLSI design tools.	*Understand*
CO2:	Infer the graph theory algorithms for optimization.	*Understand*
CO3:	Identify the techniques for layout compaction.	*Understand*
CO4:	Summarize the algorithms of placement, partitioning and floor planning.	*Understand*
CO5:	Discuss the algorithms on detailed and global routing.	*Understand*

UNIT– I INTRODUCTION TO VLSI DESIGN AND TOOLS [09]

VLSI Design problem - Design domains - Design action - Design methods and technologies - Algorithmic and system design - Structural and logic design - Transistor level design - Layout design - Verification methods - Design management tools

UNIT – II GRAPH THEORY AND ALGORITHMS [09]

Terminology - Data structures for the representation of graphs - Computational complexity - Examples of graph algorithms: Depth first search - Breadth first search – Dijkstra's shortest path algorithm – Prim's algorithm for minimum spanning tree - Tractable and intractable problems: Combinatorial optimization problems - Decision problems - Complexity classes - NP completeness and NP hardness - Consequences.

UNIT – III COMBINATORIAL OPTIMIZATION AND LAYOUT COMPACTION [09]

Unit size placement problem - Backtracking - Branch and bound - Dynamic programming - Integer linear programming - Design rules - Symbolic layout - Problem formulation: Applications of compaction - Informal problem formulation - Graph theoretical formulation - Maximum distance constraints - Algorithms for constraint graph compaction: Longest path algorithm for DAGs - Longest path in graphs with cycles - Liao wong algorithm - Bellman ford algorithm.

UNIT – IV PLACEMENT, PARTITIONING AND FLOOR PLANNING [09]

Circuit representation - Wire length estimation - Types of placement problems - Placement algorithms - Constructive placement - Iterative improvement - Kernighan Lin partitioning algorithm – Floor planning concepts - Terminology and floor planning representation - Optimization problems in floor planning - Shape functions and floor planning sizing.

UNIT – V ROUTING AND ALGORITHMS [09]

Types of local routing problems - Area routing - Channel routing: Channel routing models - Vertical constraint graph - Horizontal constraints and left edge algorithm - Channel routing algorithms - Global routing - Standard cell layout - Building block layout and channel ordering - Algorithms for global routing - Problem definition and discussion - Efficient rectilinear steiner tree construction - Local transformations for global routing.

Total =45 Periods

Text Books:

1 S.H. Gerez, Algorithms for VLSI Design Automation, Wiley, New York, First Edition, 2006.

2 Stephen M. Trimberger, An Introduction to CAD for VLSI, Springer; US, Software Reprint, 2014.

Reference Books:

1 N.A. Sherwani, Algorithms for VLSI Physical Design Automation, Springer, New York, Third Edition Reprint, 2002.

2 Christopher Michael and Mohammed Ismail, Statistical Modeling of Computer-Aided Design of MOS VLSI Circuits, Springer, New York, Software Reprint, 2012.

3 D.Hill, D. Shugard, J. Fishburn and K. Keutzer, Algorithms and Techniques for VLSI Layout Synthesis, Springer, US, Software Reprint, 2011.

4 Drechsler R, Evolutionary Algorithms for VLSI CAD, Springer ,Publisher, Germany UK, Second Edition, Reprint 2012

K.S.R. COLLEGE OF ENGINEERING, TIRUCHENGODE – 637215
DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING
CO-PO MAPPING

Regulation : R 2020

Course Code: 20EC866 **Course Name: CAD FOR VLSI**

CO	Course Outcomes	Programme Outcomes													
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	Describe the basic concepts of VLSI design tools.	3	3	-	-	-	-	-	-	-	-	-	-	3	-
CO2	Infer the graph theory algorithms for optimization.	3	3	-	-	-	-	-	-	-	-	-	-	3	-
CO3	Identify the techniques for layout compaction.	3	3	-	-	-	-	-	-	-	-	-	-	3	-
CO4	Summarize the algorithms of placement, partitioning and floor planning.	3	3	-	-	-	-	-	-	-	-	-	-	3	-
CO5	Discuss the algorithms on global and detailed routing.	3	3	-	-	-	-	-	-	-	-	-	-	3	-
	Average	**3**	**3**		-		-	-	-	-	-	-		3	**-**

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

K.S.R. COLLEGE OF ENGINEERING (Autonomous) **R 2020**

SEMESTER - VIII

20EC867	**ADVANCED SIGNAL PROCESSING (PROFESSIONAL ELECTIVE – IV)**	L	T	P	C
		3	0	0	3

Prerequisite: *Digital Signal Processing*

Course Outcomes: On successful completion of the course, the student will be able to		***Cognitive Level***
CO1:	*Explain the concept of discrete time random signal processing techniques*	*Understand*
CO2:	*Describe the Non-Parametric Methods and parametric methods of spectrum estimation*	*Understand*
CO3:	*Discuss the methodology of Linear Estimation and Prediction and find solution to Levinson Durbin's algorithm and Levinson recursion algorithm*	*Understand*
CO4:	*Explain the working adaptive filters and its application in signal processing fields.*	*Understand*
CO5:	*Discuss the concept multirate signal processing and Wavelet transform*	*Understand*

UNIT - I DISCRETE RANDOM SIGNAL PROCESSING [09]

Discrete Random Processing – Expectations – Variance – Co-Variance – Scalar Product – Energy of Discrete Signals – Parseval's Theorem – Wiener Khintchine Relation – Power Spectral Density – Periodogram. Autocorrelation – Sum Decomposition Theorem – Spectral Factorization Theorem – Discrete Random Signal Processing by Linear Systems – Simulation of White Noise – Low Pass Filtering of White Noise.

UNIT - II SPECTRAL ESTIMATION [09]

Estimation of spectra from finite duration signals - Non-Parametric Methods-Correlation Method - Periodogram Estimator - Performance Analysis of Estimators -Unbiased, Consistent Estimators- Modified periodogram - Bartlett and Welch methods - Blackman -Tukey method, Parametric Methods - AR, MA, ARMA model based spectral estimation.

UNIT - III LINEAR ESTIMATION AND PREDICTION [09]

Maximum likelihood criterion – Efficiency of estimator – Least Mean Squared Error Criterion – Wiener Filter – Discrete Wiener Hoff Equations – Linear prediction – Prediction error – Whitening filter – Inverse filter – Solutions using Durbin's algorithm –Levinson recursion algorithm for solving Toeplitz system of equations.

UNIT - IV ADAPTIVE FILTERS [09]

FIR adaptive filters – Newton's steepest descent method – Adaptive filter based on steepest descent method – Widrow Hoff LMS adaptive algorithm – Adaptive channel equalization – Adaptive echo chancellor – Adaptive noise cancellation – RLS Adaptive filters – Exponentially weighted RLS – Sliding window RLS – Simplified HR LMS adaptive filter.

UNIT - V MULTIRATE DIGITAL SIGNAL PROCESSING [09]

Mathematical description of change of sampling rate – Interpolation and Decimation – Continuous time model – Direct digital domain approach – Decimation by an integer factor – Interpolation by an integer factor – Single and multistage realization – Poly phase realization – Application to sub band coding – Wavelet transform and filter bank implementation of wavelet expansion of signals.

Total (L: 45) = 45 Periods

Text Books :

1 J.G.Proakis and D.G.Manolakis, Digital signal processing: Principles, Algorithm and Applications, , Prentice Hall India, New Delhi, Fourth Edition, 2007

2 Monson H. Hayes, Statistical Digital Signal Processing and Modeling, John Wiley and Sons Ltd, New Delhi, First Edition, Reprint 2008.

Reference Books :

1 Bruce W. Suter, Multirate and Wavelet Signal Processing, Academic Press, United States, First Edition, 1997.

2 N. J. Fliege, Multirate Digital Signal Processing: Multirate Systems -Filter Banks – Wavelets, John Wiley and Sons Ltd, New Delhi, First Edition, 1999.

3 S.Haykin, Adaptive Filter Theory, Prentice Hall India, New Delhi, Fourth Edition, 2001.

4 D. G. Manolakis, V. K. Ingle and S. M. Kogon, Statistical and Adaptive Signal Processing: Spectral Estimation, Signal Modeling, Adaptive Filtering and Array Processing, McGraw-Hill, New York, First Year, 2000

K.S.R. COLLEGE OF ENGINEERING, TIRUCHENGODE – 637215
DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING
CO-PO MAPPING

Regulation: R 2020

Course Code: 20EC867 **Course Name: ADVANCED SIGNAL PROCESSING**

CO	Course Outcomes	Programme Outcomes													
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1:	*Explain the concept of discrete time random signal processing techniques*	3	3	-	-	-	-	-	-	-	-	-	-	3	-
CO2:	*Describe the Non-Parametric Methods and parametric methods of spectrum estimation*	3	3	-	-	-	-	-	-	-	-	-	-	3	-
CO3:	*Discuss the methodology of Linear Estimation and Prediction and find solution to Levinson Durbin's algorithm and Levinson recursion algorithm*	3	3	-	-	-	-	-	-	-	-	-	-	3	-
CO4:	*Explain the working adaptive filters and its application in signal processing fields.*	3	3	3	-	-	-	-	-	-	-	-	-	3	-
CO5:	*Discuss the concept multirate signal processing and Wavelet transform*	3	3	-	-	-	-	-	-	-	-	-	-	3	-
	Average	**3**	**3**	**3**	**-**	**-**	**-**		**-**	**-**	**-**	**-**	**-**	**3**	**-**

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

K.S.R. COLLEGE OF ENGINEERING (Autonomous) **R 2020**

SEMESTER - VIII

		L	T	P	C
20EC879	**WIRELESS SENSOR NETWORKS**	3	0	0	3

Prerequisites: *Wireless Networks*

Course Objectives: On successful completion of the course, the student will be able to		***Cognitive Level***
CO1:	*Describe the basics of wireless sensor networks*	*Understand*
CO2:	*Explain the sensor nodes and architectures.*	*Understand*
CO3:	*Interpret the MAC protocols and routing protocols for WSN.*	*Understand*
CO4:	*Explain the concept of location discovery and sensor tasking.*	*Understand*
CO5:	*Describe the sensor network platforms and tools.*	*Understand*

UNIT - I INTRODUCTION TO WIRELESS SENSOR NETWORKS [09]

Introduction - Issues and challenges - Characteristics requirements - Advantages - Applications of sensor networks -Difference between mobile Ad-hoc and sensor networks.

UNIT - II SENSOR NODE ARCHITECTURES [09]

Single node architecture: Layered, clustered - Hardware components - Energy consumption of sensor nodes, operating systems and execution environments - Network architecture: Sensor network scenarios - Optimization goals and figure of merit - Gateway concepts.

UNIT - III NETWORKING OF SENSORS [09]

Data dissemination and gathering - MAC protocols for wireless sensor networks - Low duty cycle protocols and wakeup concepts - S-MAC - Wakeup radio concepts - Assignment of MAC addresses - Routing protocols: Energy efficient, unicast, broadcast and multicast - Low energy adaptive clustering hierarchy - Power efficient data gathering.

UNIT - IV LOCATION DISCOVERY AND SENSOR TASKING [09]

Topology control - Clustering - Time synchronization - Localization and its services: Ranging techniques, range based localization algorithms - Sensor tasking and control: Task driven sensing, roles of sensor nodes and utilities, information based sensor tasking.

UNIT - V SENSOR NETWORK PLATFORMS AND TOOLS [09]

Operating systems for wireless sensor networks - Sensor node hardware - Berkeley motes, programming challenges - Node-level software platforms - Node-level simulators - State-centric programming.

Total (L: 45) = 45 Periods

Text Books :

1 Holger Karl & Andreas Willig, Protocols and Architectures for Wireless Sensor Networks, John Wiley, New York, First Edition, 2011.

2 Feng Zhao & Leonidas J. Guibas, Wireless Sensor Networks – An Information Processing Approach, Elsevier, Netherlands, Reprint, 2012.

References :

1 C.Siva Ram Murthy, B.S.Manoj, Ad hoc Wireless Networks Architectures and Protocols, Second edition, Pearson Education, Indiana, 2012.

2 Anna Hac, Wireless Sensor Network Designs, John Wiley, New York, First Edition, 2012.

3 KazemSohraby, Daniel Minoli, &TaiebZnati, Wireless Sensor Networks-Technology, Protocols, and Applications, John Wiley, Reprint, 2012.

4 Bhaskar Krishnamachari, Networking Wireless Sensors, Cambridge Press, England, First Edition, 2005.

K.S.R. COLLEGE OF ENGINEERING, TIRUCHENGODE – 637215
DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING
CO-PO MAPPING

Regulation : R 2020

Course Code: 20EC879 **Course Name : WIRELESS SENSOR NETWORKS**

CO	Course Outcomes	Programme Outcomes													
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	*Describe the basics of wireless sensor networks*	3	2	-	-	-	-	-	-	-	-	-	-	3	2
CO2	*Explain the sensor nodes and architectures.*	3	2	-	-	-	-	-	-	-	-	-	-	3	2
CO3	*Interpret the MAC protocols and routing protocols for WSN.*	3	2	-	-	-	-	-	-	-	-	-	-	3	2
CO4	*Explain the concept of location discovery and sensor tasking.*	3	2	-	-	-	-	-	-	-	-	-	-	3	2
CO5	*Describe the sensor network platforms and tools.*	3	2	-	-	-	-	-	-	-	-	-	-	3	2
	Average	**3**	**2**		**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**3**	**2**

K.S.R. COLLEGE OF ENGINEERING (Autonomous) **R 2020**

SEMESTER - IV

		L	T	P	C
20EC880	**BIOMEDICAL SIGNAL PROCESSING**	3	0	0	3

Prerequisite: Signals and Systems

Course Outcomes : On successful completion of the course, the student will be able to		***Cognitive Level***
CO1:	*Explain various bio signals and their origin*	*Understand*
CO2:	*Illustrate different types of electrodes used for the biosignal measurement and signal conditioning techniques in practice.*	*Understand*
CO3:	*Apply mathematical tools to process biomedical signal analysis*	*Apply*
CO4:	*Discuss about various biomedical signal processing algorithms used and its applications*	*Understand*
CO5:	*Explain the principle of pattern classification and neural networks to analyze bio signals*	*Understand*

UNIT - I INTRODUCTION TO BIOMEDICAL SIGNALS [09]

Acquisition, Generation of Bio-signals, Origin of bio-signals, Types of bio-signals, Study of diagnostically significant bio-signal parameters-Bio-impedance signals-course objectives of biomedical signal analysis, difficulties in biomedical signal analysis.

UNIT - II BIO SIGNAL MEASUREMENT [09]

Electrodes for bio-physiological sensing and conditioning, Electrode-electrolyte interface, polarization, electrode skin interface and motion artefact, biomaterial used for electrode, Types of electrodes (body surface, internal, array of electrodes, microelectrodes), Practical aspects of using electrodes, Acquisition of bio-signals (signal conditioning) and Signal conversion (ADC's DAC's) Processing, Digital filtering

UNIT - III REAL TIME TRANSFORMS [09]

Biomedical signal processing by Fourier analysis, Biomedical signal processing by wavelet (time-frequency) analysis, Analysis (Computation of signal parameters that are diagnostically significant), Classification of signals and noise, Spectral analysis of deterministic, stationary random signals and non-stationary signals.

UNIT - IV ALGORITHMS FOR BIOSIGNAL PROCESSING [09]

Coherent treatment of various biomedical signal processing methods and applications. Principal component analysis, Correlation and regression, Analysis of chaotic signals Application areas of Bio–Signals analysis Multiresolution analysis (MRA) and wavelets, Principal Component Analysis (PCA), Independent Component Analysis (ICA)

UNIT - V BIOSIGNAL PROCESSING BY NEURAL NETWORKS [09]

Pattern classification–supervised and unsupervised classification, Neural networks, Support vector Machines, Hidden Markov models. Examples of biomedical signal classification examples

Total (L= 45, T = 0) = 45 Periods

Text Books:

1 W. J. Tompkins, Biomedical Digital Signal Processing, Prentice Hall India Learning Private Limited, New Delhi, First Edition, 1993.

2 Eugene N Bruce, Biomedical Signal Processing and Signal Modeling, John Wiley & Son's publication, 2001

Reference Books:

1 Myer Kutz, Biomedical Engineering and Design Handbook, Volume I, McGraw Hill, United States Second Edition, 2009.

2 Katarzyn J. Blinowska, Jaroslaw Zygierewicz, "Practical Biomedical Signal Analysis Using MATLAB", 1st Edition, CRC Press, 2011

3 D C Reddy, "Biomedical Signal Processing", McGraw Hill, 2005.

K.S.R. COLLEGE OF ENGINEERING (Autonomous)
DEPARTMENT OF ELECTRONICS AND COMMUNICATION

Course Code: 20EC880 **Regulation: R2020**

Course Name: BIOMEDICAL SIGNAL PROCESSING

CO PO MAPPING

CO	Course Outcomes	Programme Outcomes													
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	*Explain various bio signals and their origin*	3	-	-	-	-	-	2	-	-	-	-	3	3	-
CO2	*Illustrate different types of electrodes used for the biosignal measurement and signal conditioning techniques in practice.*	3	-	-	-	-	-	2	-	-	-	-	3	3	-
CO3	*Apply mathematical tools to process biomedical signal analysis*	3	3	-	-	-	-	2	-	-	-	-	3	3	-
CO4	*Discuss about various biomedical signal processing algorithms used and its applications*	3	3	-	-	-	-	2	-	-	-	-	3	3	-
CO5	*Explain the principle of pattern classification and neural networks to analyze bio signals*	3	3	-	-	-	-	2	-	-	-	-	3	3	-
	Average	**3**	**3**	**-**		**-**	**-**	**2**	**-**	**-**	**-**	**-**	**3**	3	**-**

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

K.S.R. COLLEGE OF ENGINEERING (Autonomous) **R 2020**

SEMESTER –VIII

		L	T	P	C
20EC881	**ADVANCED DIGITAL IMAGE PROCESSING**	3	0	0	3

Prerequisite: Digital Image Processing

Course Outcomes: On Completion of this course, the student will be able to		**Cognitive Level**
CO1:	Explain image formation and the role of human visual system plays in perception of gray and color image data	*Understand*
CO2:	Apply image processing techniques in both the spatial and frequency (Fourier) domains.	*Apply*
CO3:	To design image analysis techniques in the form of image segmentation and to evaluate the methodologies for segmentation.	*Apply*
CO4:	Conduct independent study and analysis of feature extraction techniques.	*Apply*
CO5:	Explain the concepts of image registration and image fusion	*Understand*

UNIT– I FUNDAMENTALS OF DIGITAL IMAGE PROCESSING [09]

Elements of visual perception, brightness, contrast, hue, saturation, mach band effect, 2D image transforms-DFT, DCT, KLT, and SVD. Image enhancement in spatial and frequency domain, Morphological image processing.

UNIT – II SEGMENTATION [09]

Edge detection, Thresholding, Region growing, Fuzzy clustering, Watershed algorithm, Active contour methods, Texture feature-based segmentation, Model based segmentation, Atlas based segmentation, Wavelet based Segmentation methods.

UNIT – III FEATURE EXTRACTION [09]

First and second order edge detection operators, Phase congruency, Localized feature extraction- detecting image curvature, shape features Hough transform, shape skeletonization, Boundary descriptors, Moments, Texture descriptors-Autocorrelation, Co-occurrence features, Run length features, Fractal model-based features, Gabor filter, wavelet features

UNIT – IV REGISTRATION AND IMAGE FUSION [09]

Registration- Pre-processing, Feature selection-points, lines, regions and templates Feature Correspondence-Point pattern matching, Line matching, region matching Template matching. Transformation functions-Similarity transformation and Affine Transformation. Resampling- Nearest Neighbour and Cubic Splines Image Fusion-Overview of image fusion, pixel fusion, Multiresolution based fusion discrete wavelet transforms, Curvelet transform. Region based fusion.

UNIT – V 3D IMAGE VISUALIZATION [09]

Sources of 3D Data sets, Slicing the Data set, Arbitrary section planes, The use of color, Volumetric display, Stereo Viewing, Ray tracing, Reflection, Surfaces, multiply connected surfaces, Image processing in 3D, Measurements on 3D images.

Total =45 Periods

Reference Books:

1 John C.Russ, The Image Processing Handbook, CRC Press, Florida, First Edition, 2007

2 Mark Nixon, Alberto Aguado, Feature Extraction and Image Processing, Academic Press, USA, First Edition, 2008.

3 Ardeshir Goshtasby, 2D and 3D Image registration for Medical, Remote Sensing and Industrial Applications, John Wiley and Sons, New Delhi, First Edition. 2005

4 Rafael C. Gonzalez, Richard E. Woods, Digital Image Processing', Pearson, Education, Inc., New Delhi, Second Edition, 2004.

K.S.R. COLLEGE OF ENGINEERING, TIRUCHENGODE – 637215
DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING
CO-PO MAPPING

Regulation : R 2020

Course Code: 20EC881 **Course Name: ADVANCED DIGITAL IMAGE PROCESSING**

CO	Course Outcomes	Programme Outcomes													
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	Explain image formation and the role of human visual system plays in perception of gray and color image data	3	3	-	-	-	-	-	-	-	-	-	-	3	-
CO2	Apply image processing techniques in both the spatial and frequency (Fourier) domains.	3	3	-	-	-	-	-	-	-	-	-	-	3	-
CO3	To design image analysis techniques in the form of image segmentation and to evaluate the methodologies for segmentation.	3	3	-	-	-	-	-	-	-	-	-	-	3	-
CO4	Conduct independent study and analysis of feature extraction techniques.	3	3	-	-	-	-	-	-	-	-	-	-	3	-
CO5	Explain the concepts of image registration and image fusion	3	3	-	-	-	-	-	-	-	-	-	-	3	-
	Average	**3**	**3**		**-**		**-**	**-**	**-**	**-**	**-**	**-**		**3**	**-**

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

K.S.R. COLLEGE OF ENGINEERING (Autonomous) **R 2020**

20EC882	**SPEECH PROCESSING**	L	T	P	C
		3	0	0	3

Prerequisite: *NIL*

Course Outcomes: On Completion of this course , the student will be able to		***Cognitive level***
CO1	*Describe the fundamentals of speech*	*Understand*
CO2	*Extract various speech features for speech related applications*	*Understand*
CO3	*Choose an appropriate speech coder for a given application*	*Apply*
CO4	*Build a speech enhancement system*	*Apply*
CO5	*Build a text-to-speech synthesis system for various applications*	*Apply*

UNIT – I FUNDAMENTALS OF SPEECH [09]

The Human speech production mechanism, Discrete-Time model of speech production, Speech perception - human auditory system, Phonetics - articulatory phonetics, acoustic phonetics, and auditory phonetics, Categorization of speech sounds, Spectrographic analysis of speech sounds, Pitch frequency, Pitch period measurement using spectral and cepstral domain, Formants, Evaluation of Formants for voiced and unvoiced speech.

UNIT – II SPEECH FEATURES AND DISTORTION MEASURES [09]

Significance of speech features in speech-based applications, Speech Features – Cepstral Coefficients, Mel Frequency Cepstral Coefficients (MFCCs), Perceptual Linear Prediction (PLP), Log Frequency Power Coefficients (LFPCs), Speech distortion measures–Simplified distance measure, LPC-based distance measure, Spectral distortion measure, Perceptual distortion measure.

UNIT – III SPEECH CODING [09]

Need for speech coding, Waveform coding of speech – PCM, Adaptive PCM, DPCM, ADPCM, Delta Modulation, Adaptive Delta Modulation, G.726 Standard for ADPCM, Parametric Speech Coding – Channel Vocoders, Linear Prediction Based Vocoders, Code Excited Linear Prediction (CELP) based Vocoders, Sinusoidal speech coding techniques, Hybrid coder, Transform domain coding of speech

UNIT – IV SPEECH ENHANCEMENT [09]

Classes of Speech Enhancement Algorithms, Spectral-Subtractive Algorithms - Multiband Spectral Subtraction, MMSE Spectral Subtraction Algorithm, Spectral Subtraction Based on Perceptual Properties, Wiener Filtering - Wiener Filters in the Time Domain, Wiener Filters in the Frequency Domain, Wiener Filters for Noise Reduction, Maximum-Likelihood Estimators, Bayesian Estimators, MMSE and Log-MMSE Estimator, Subspace Algorithms.

UNIT – V SPEECH SYNTHESIS AND APPLICATION [09]

A Text-to-Speech systems (TTS), Synthesizers technologies – Concatenative synthesis, Use of Formants for concatenative synthesis, Use of LPC for concatenative synthesis, HMM-based synthesis, Sinewave synthesis, Speech transformations, Watermarking for authentication of a speech, Emotion recognition from speech.

Total = 45 Periods

Text Books :

1 Shaila D. Apte, Speech and Audio Processing, Wiley India (P) Ltd, New Delhi, First Edition, 2012

2 Philipos C. Loizou, Speech Enhancement Theory and Practice, Second Edition, CRC Press, Inc., United States, First Edition 2013

Reference Books :

1 Rabiner L. R. and Juang B. H, Fundamentals of speech recognition, Pearson Education, Noida, First Edition 2003.

2 Thomas F. Quatieri, Discrete-time speech signal processing - Principles and practice, Pearson, First Edition 2012. Noida

K.S.R. COLLEGE OF ENGINEERING, TIRUCHENGODE – 637215
DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING
CO-PO MAPPING

Regulation : R 2020

Course Code: 20EC882 **Course Name : SPEECH PROCESSING**

CO	Course Outcomes	Programme Outcomes													
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	*Describe the fundamentals of speech*	2	2	-	-	-	-	-	-	-	-	-	-	3	-
CO2	*Extract various speech features for speech related applications*	2	2	-	-	-	-	-	-	-	-	-	-	3	-
CO3	*Choose an appropriate speech coder for a given application*	3	3	3	-	-	-	-	-	-	-	-	-	3	-
CO4	*Build a speech enhancement system*	3	3	3	-	-	-	-	-	-	-	-	-	3	-
CO5	*Build a text-to-speech synthesis system for various applications*	3	3	3	-	-	-	-	-	-	-	-	-	3	-
	Average	**3**	**3**	**3**	**-**	**-**	**-**	**-**	**-**		**-**	**-**	**-**	**3**	**-**

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

K.S.R. COLLEGE OF ENGINEERING (Autonomous) **R 2020**

SEMESTER - VIII

20EC883	**MEDICAL IMAGE PROCESSING**	L	T	P	C
		3	0	0	3

Prerequisite: Image Processing

Course Outcomes : On successful completion of the course, the student will be able to		***Cognitive Level***
CO1:	*Perform spatial domain processing*	*Apply*
CO2:	*Apply different frequency domain processing to perform feature extraction and filtering.*	*Apply*
CO3:	*Apply Medical Image Restoration and Segmentation process*	*Apply*
CO4:	*Perform Medical image compression*	*Apply*
CO5:	*Perform Medical image representation and recognition*	*Apply*

UNIT - I SPATIAL DOMAIN PROCESSING [09]

Steps in Digital Image Processing - Components – Elements of Visual Perception - Image Sensing and Acquisition - Image Sampling and Quantization - Relationships between pixels - color models - DICOM, Various modalities of Medical Imaging - CT, Angiography, MRI, Thermography, CAD System, – Basics of Spatial Filtering – Smoothing and Sharpening Spatial Filtering.

UNIT - II FREQUENCY DOMAIN PROCESSING [09]

Smoothing and Sharpening frequency domain filters – Ideal, Butterworth and Gaussian filters. Wavelets -Sub band coding-Multi resolution expansions Wavelets based image processing. Image Enhancement- Frequency domain filtering. Feature extraction using Wavelet Medical Image Processing Spatial Domain Processing Medical Image Restoration - Inverse Filtering – Wiener filtering.

UNIT - III MEDICAL IMAGE RESTORATION AND SEGMENTATION [09]

Image Restoration - Inverse Filtering – Wiener filtering. Detection of Discontinuities–Edge Linking and Boundary detection – Region based segmentation- Region Growing, Region Splitting, Morphological processing- erosion and dilation, K Means and Fuzzy Clustering. Image segmentation – Edge detection, line detection and point detection. Region based Segmentation. Basic Morphological operations

UNIT - IV MEDICAL IMAGE COMPRESSION [09]

Image Compression models – Error Free Compression – Variable Length Coding – Bit-Plane Coding – Lossless Predictive Coding – Lossy Compression – Lossy Predictive Coding – Compression Standards -JPEG, JPEG2000. Image compression techniques.

UNIT - V MEDICAL IMAGE REPRESENTATION AND RECOGNITION [09]

Boundary representation - Chain Code- Polygonal approximation, signature, boundary segments -Boundary description – Shape number -Fourier Descriptor, moments- Regional Descriptors – Topological feature, Texture - Patterns and Pattern classes - Recognition based on matching, Content Based Image Retrieval. Analysis of Tissue Structure.

Total (L= 45, T = 0) = 45 Periods

Text Books :

1 G.R. Sinha, Bhagwaticharan patel, Medical Image Processing: Concepts and Applications, PHI Learning private limited.2014

2 Kayvan Najarian and Robert Splinter, Biomedical Signal and Image Processing, CRC Press, Second Edition, 2005

Reference Books :

1 E. R. Davies, Computer & Machine Vision, Academic Press, Fourth Edition, 2012

2 Rafael C. Gonzalez, Richard E. Woods, Steven L. Eddins, Digital Image Processing Using MATLAB, Tata McGraw Hill Pvt. Ltd., Third Edition, 2011.

3 Anil Jain K. Fundamentals of Digital Image Processing, PHI Learning Pvt. Ltd., 2011.

4 Malay K. Pakhira, Digital Image Processing and Pattern Recognition, First Edition, PHI Learning Pvt. Ltd., 2011.

K.S.R. COLLEGE OF ENGINEERING (Autonomous)
DEPARTMENT OF ELECTRONICS AND COMMUNICATION

Course Code: 20EC883 **Regulation: R2020**

Course Name: MEDICAL IMAGE PROCESSING

CO PO MAPPING

CO	Course Outcomes	Programme Outcomes													
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	*Perform spatial domain processing*	3	3	2	-	-	-	3	-	-	-	-	2	3	-
CO2	*Apply different frequency domain processing to perform feature extraction and filtering.*	3	3	2	-	-	-	1	-	-	-	-	2	3	-
CO3	*Apply Medical Image Restoration and Segmentation process*	3	3	3	-	-	-	2	-	-	-	-	3	3	-
CO4	*Perform Medical image compression*	3	3	3	-	-	-	2	-	-	-	-	3	3	-
CO5	*Perform Medical image representation and recognition*	3	3	3	-	-	-	2	-	-	-	-	3	3	-
	Average	**3**	**3**	**3**	**-**	**-**	**-**	**2**	**-**	**-**	**-**	**-**	**3**	**3**	**-**

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

K.S.R. COLLEGE OF ENGINEERING (Autonomous) **R 2020**

SEMESTER - VIII

		L	T	P	C
20EC868	**ADHOC NETWORKS (ELECTIVE)**	**3**	**0**	**0**	**3**

Prerequisite: *Computer networks*

Course Outcomes: On successful completion of the course, the student will be able to		***Cognitive Level***
CO1:	*Describe* the basics of Adhoc networks.	*Understand*
CO2:	*Discuss the challenges in designing MAC, routing and transport protocols for wireless Adhoc networks.*	*Understand*
CO3:	*Outline the design issues and energy efficiency for Adhoc networks.*	*Understand*
CO4:	*Explain the network security solution and routing mechanism.*	*Understand*
CO5:	*Describe cross layer design and energy management in Adhoc networks.*	*Understand*

UNIT - I OVERVIEW OF ADHOC NETWORKS [09]

Introduction - Characteristics - Issues in ad hoc networks, Comparison of cellular, Adhoc and sensor networks, applications - Adhoc mobility models: Random based mobility model, temporal dependency model.

UNIT - II MEDIUM ACCESS PROTOCOLS [09]

MAC protocols: - Design issues, goals - Classification: Contention based protocols with reservation and scheduling algorithms - Other MAC protocols: Multichannel, CSMA MAC protocol.

UNIT - III NETWORK ROUTING PROTOCOLS [09]

Routing protocols: - Design issues - Classification: Proactive routing, reactive routing, hybrid routing - Multicast routing: Tree based routing, energy efficient multicasting - Hierarchical routing.

UNIT - IV TRANSPORT LAYER AND SECURITY [09]

Transport layer - Issues - classification - TCP over ad hoc networks - Security: Vulnerabilities, potential attacks- Prevention techniques: Intrusion detection, key management, secure routing protocols.

UNIT - V CROSS LAYER DESIGN AND ENERGY MANAGEMENT [09]

Cross layer feedback - Design goals - Cross layer optimization subsystem - Energy management: Need for energy management - Classification: Battery management scheme, system power management.

Total (L= 45) = 45 Periods

Text Books:

1 C.Siva Ram Murthy, B.S.Manoj., Ad hoc Wireless Networks Architectures and Protocols, Pearson Education, Indiana, Second edition, Seventeenth impression, 2012.

2 Prasanth Mohapatra, Srikanth V.Krishnamurthy, Adhoc Network Technologies and Protocols, Springer, New York, 2005.

Reference Books:

1 Charles E. Perkins, Ad hoc Networking, Addison - Wesley, United States, Sixth impression, 2012.

2 V.T. Raisinhani and S.Iyer, Cross Layer Design Optimization in Wireless Protocol Stacks, Elsevier, Computer Communications, Vol. 27, Issue No. 8, pp 720.-724, 2004.

3 T.G.Basavaraju, C.Puttamadappa, Adhoc Mobile Wireless Networks, Auerbach Publications- Taylor and Francis group, United States, 2016.

4 Charles E. Perkins, Ad hoc Networking, Addison - Wesley, United States, Sixth impression, 2012.

K.S.R. COLLEGE OF ENGINEERING, TIRUCHENGODE – 637215
DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING
CO-PO MAPPING

Regulation: R 2020

Course Code: 20EC868 **Course Name: ADHOC NETWORKS**

CO	Course Outcomes	Programme Outcomes													
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	*Describe* the basics of Adhoc networks.	3	2	-	-	-	-	-	-	-	-	-	-	3	2
CO2	*Discuss the challenges in designing MAC, routing and transport protocols for wireless Adhoc networks.*	3	2	-	-	-	-	-	-	-	-	-	-	3	2
CO3	*Outline the design issues and energy efficiency for Adhoc networks.*	3	2	-	-	-	-	-	-	-	-	-	-	3	2
CO4	*Explain the network security solution and routing mechanism.*	3	2	-	-	-	-	-	-	-	-	-	-	3	2
CO5	*Describe cross layer design and energy management in Adhoc networks.*	3	2	-	-	-	-	-	-	-	-	-	-	3	2
	Average	**3**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**3**	**2**

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

K.S.R. COLLEGE OF ENGINEERING (Autonomous) **R 2020**

SEMESTER - VIII

		L	T	P	C
20EC869	**MEMS TECHNOLOGY**	**3**	**0**	**0**	**3**

Prerequisite: Nil

Course Outcomes: On successful completion of the course, the student will be able to		**Cognitive Level**
CO1:	*Explain the basic principles of* MEMS and micro system products.	*Understand*
CO2:	*Describe the various materials used for MEMS products.*	*Understand*
CO3:	*Illustrate the fabrication process of MEMS devices.*	*Understand*
CO4:	*Interpret the design consideration, issues and constraints of micro system design.*	*Understand*
CO5:	*Describe the diverse applications of MEMS sensors*	*Understand*

UNIT - I INTRODUCTION [09]

Overview – MEMS and micro system products – Microsystems and Microelectronics – Working Principle of Microsystems – Micro actuation techniques.

UNIT - II MATERIALS FOR MICROSYSTEMS [09]

Substrate and wafer – single crystal silicon wafer formation – ideal substrates – Mechanical properties – silicon compounds – Sio2, SiC, Si3N4and polycrystalline silicon – Silicon piezo resistors – Gallium arsenide - quartz – Piezoelectric crystals - polymers

UNIT - III MICRO SYSTEM FABRICATION PROCESS [09]

Photolithography – Ion implantation – Diffusion – oxidation – CVD – physical vapor deposition- Deposition by epitaxy – etching process.

UNIT - IV MICRO SYSTEM DESIGN [09]

Design considerations- Process design- mask layout design – Design constraints – Selection of Materials – Manufacturing Process - Signal transduction – packaging – Application of Micro system in automotive industry – Biomedical – Aerospace – telecommunication

UNIT - V MICRO SENSORS [09]

Introduction – Microsensors – Biomedical sensors – Pressure sensors – Thermal Sensors – Chemical sensors – Optical sensors – Microactuation – MEMS with actuators.

Total (L: 45) = 45 Periods

Text Books:

1 Tai-Ran Hus, MEMS & Microsystems Design, Manufacture and Nanoscale engineering, John Wiley & sons, California, Second Edition, 2013.

2 Julian W.Gardner, Vijay K.Varadan, Osama O.Awadel Karim, Microsensors MEMS and Smart Devices, New York, John Wiley & sons, Second Edition, 2011.

Reference Books:

1 Chang Liu, Foundations of MEMS, Pearson Education Inc., London, Second Edition, 2012.

2 Stephen D Senturia, Microsystem Design, Springer Publication, New York, Second Edition, 2000.

3 James J. Allen, Micro Electro Mechanical System Design, CRC Press Publisher, United states, First Edition, 2005.

4 Thomas M. Adams and Richard A. Layton, Introduction MEMS, Fabrication and Application, Unites states, Springer, Second Edition, 2010.

K.S.R. COLLEGE OF ENGINEERING, TIRUCHENGODE – 637215
DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING
CO-PO MAPPING

Regulation: **R 2020**

Course Code: 20EC869 **Course Name:** **MEMS TECHNOLOGY**

CO	Course Outcomes	Programme Outcomes													
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	*Explain the basic principles of* MEMS and micro system products.	3	3	-	-	-	-	-	-	-	-	-	-	2	3
CO2	*Describe the various materials used for MEMS products.*	3	3	-	-	-	-	-	-	-	-	-	-	2	3
CO3	*Illustrate the fabrication process of MEMS devices.*	3	3	-	-	-	-	-	-	-	-	-	-	2	3
CO4	*Interpret the design consideration, issues and constraints of micro system design.*	3	3	-	-	-	-	-	-	-	-	-	-	2	3
CO5	*Describe the diverse applications of MEMS sensors*	3	3	-	-	-	-	-	-	-	-	-	-	2	3
Average		**3**	**3**	**-**	**-**		**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2**	**3**

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

K.S.R. COLLEGE OF ENGINEERING (Autonomous) **R 2020**

SEMESTER - VIII

20EC870	**TELECOMMUNICATION SYSTEM MODELING AND SIMULATION (ELECTIVE)**	**L**	**T**	**P**	**C**
		3	**0**	**0**	**3**

Prerequisite: Digital communication systems and Probability and stochastic process

Course Outcomes: On successful completion of the course, the student will be able to		**Cognitive Level**
CO1:	*Discuss different types of the simulation methodology*	*Understand*
CO2:	*Explain the constituents of a telecommunication systems.*	*Understand*
CO3:	*Compare various modeling methodologies and simulation techniques.*	*Understand*
CO4:	*Illustrate the performance measures of telecommunication systems*	*Understand*
CO5:	*Outline the system modeling in telecommunication*	*Understand*

UNIT - I SIMULATION METHODOLOGY **[09]**

Introduction - Aspects of methodology - Performance estimation - Sampling frequency - Low pass equivalent models for band pass signals - Multicarrier signals - Non-linear and time varying systems - Post processing - Basic graphical techniques and estimations

UNIT - II SIMULATION OF RANDOM VARIABLES AND RANDOM PROCESSES **[09]**

Generation of random numbers and sequence - Gaussian and uniform random numbers - Correlated random sequences - Testing of random numbers generators - Stationary and uncorrelated noise - Goodness of fit test

UNIT - III MODELING OF COMMUNICATION SYSTEMS **[09]**

Radio frequency and optical sources - Analog and digital signals - Communication channel and models - Free space channels - Multipath channel and discrete channel noise interference - MIMO Channel.

UNIT - IV ESTIMATION OF PERFORMANCE MEASURE FROM SIMULATION **[09]**

Quality of estimator - Estimation of SNR - Probability density function and bit error rate - Monte carlo method - Importance sampling method - Extreme value theory

UNIT - V SIMULATION AND MODELING METHODOLOGY **[09]**

Simulation environment - Modeling considerations - Performance evaluation techniques - Error source simulation - Validation - Case studies: Simulations of light wave communication link and satellite system

Total (L: 45) = 45 Periods

Text Books:

1 MC.Jeruchim, P.Balaban and Sam K Shanmugam, Simulation of communication systems: Modeling, Methodology and Techniques, Plenum Press, New York, Second Edition, 2006.

2 Averill.M.Law and W.DavidKelton, Simulation Modeling and Analysis, McGraw-Hill Inc., Noida, Fifth Edition, 2014.

Reference Books:

1 Geoffrey Gorden, System Simulation, Prentice Hall of India, New Delhi, Second Edition, 2008.

2 W.Turin, Performance Analysis and Modeling of Digital Transmission Systems, Computer Science Press, New York, Second Edition, 2013

3 Jerry banks, John S.Carson, Barry L.Nelson, David M.Nicol and S.Shahabudeen, Discrete Event System Simulation, Prentice Hall of India, New Delhi, Second Edition, Reprint 2013.

4 William H. Tranter, K. Sam shanmugam, Theodore s. Rappaport, K.KurtL.Kosbar, Principles of Communication Systems Simulation , Pearson Education Pvt Ltd, Noida, First Edition,2004.

K.S.R. COLLEGE OF ENGINEERING, TIRUCHENGODE – 637215
DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING
CO-PO MAPPING
Regulation: R 2020

Course Code: 20EC870 **Course Name: Telecommunication System Modeling and Simulation**

CO	Course Outcomes	Programme Outcomes													
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	*Discuss different types of the simulation methodology*	3	3	-	-	-	-	-	-	-	-	-		2	3
CO2	*Explain the constituents of a telecommunication systems.*	3	3	-	-	-	-	-	-	-	-	-		2	3
CO3	*Compare various modeling methodologies and simulation techniques.*	3	3	-	-	-	-	-	-	-	-	-		2	3
CO4	*Illustrate the performance measures of telecommunication systems*	3	3	-	-	-	-	-	-	-	-	-	-	2	3
CO5	*Develop system modeling in telecommunication*	3	3	-	-	-	-	-	-	-	-	-	-	2	3
Average		**3**	**3**	**-**	**-**	**-**	-	**-**	**-**	**-**	**-**	**-**	**-**	**2**	**3**

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

K.S.R. COLLEGE OF ENGINEERING (Autonomous) **R 2020**

SEMESTER –VIII

		L	T	P	C
20EC871	**ARM SYSTEM ARCHITECTURE**	3	0	0	3

Prerequisite: *Microprocessors and Microcontrollers*

Course Outcomes : On Completion of this course, the student will be able to		**Cognitive Level**
CO1	*Describe the programmer's model of ARM processor.*	*Understand*
CO2	*Develop assembly level programming using ARM and Thumb instructions.*	*Apply*
CO3	*Demonstrate the implementation of various ARM processor cores.*	*Understand*
CO4	*Identify the architectural support of ARM.*	*Understand*
CO5	*Discuss the various processors for advanced communication.*	*Understand*

UNIT– I PROCESSOR ARCHITECTURE AND DESIGN [09]

Introduction: Processor architecture and organization - Abstraction in hardware design - MU0 a simple processor Instruction set design - Processor design and trade-offs - Reduced Instruction Set Computer (RISC) - Design for low power consumption - ARM architecture: Acorn RISC machine - Architectural inheritance - ARM programmer's model – ARM development tools.

UNIT – II ARM INSTRUCTION SET [09]

Introduction - Exceptions - Conditional execution - Branch, branch with link and exchange - Software interrupt – Data processing instructions - Multiply instructions - Single word and unsigned byte data transfer instructions - Half word and signed byte data transfer instructions - Multiple register transfer instructions - Swap memory and register instructions - Coprocessor instructions - Thumb instruction set.

UNIT – III ARM PROCESSOR CORES ORGANIZATION AND IMPLEMENTATION [09]

Cores: ARM7TDMI - ARM8 - ARM9TDMI - ARM10TDMI - ARM Organization: 3 stage pipeline - 5 stage pipeline - Instruction execution - Implementation - Coprocessor interface.

UNIT – IV ARCHITECTURAL SUPPORT FOR SYSTEM DEVELOPMENT [09]

ARM memory interface - Advanced Microcontroller Bus Architecture (AMBA) - ARM reference peripheral specification - Hardware system prototyping tools - ARMulator - JTAG boundary scan test architecture - ARM debug architecture - Embedded trace - Signal processing support.

UNIT – V ARM PROCESSOR FOR ADVANCED COMMUNICATION [09]

VLSI Ruby II advanced communication processor - VLSI ISDN subscriber processor - One CTMVWS22100 GSM chip - VLSI Bluetooth baseband controller - ARM 7500 and ARM 7500FE - ARM 7100 - SA 1100.

Total (L: 45) = 45 Periods

Text Books :

1 Steve Furber, ARM System-on-Chip Architecture, Pearson Education, United States, Second Edition, 2015.

2 Andrew N.Sloss, Dominic Symes, Chris Wright,ARM System Developer's Guide, Designing and Optimizing System Software, Morgan Kaufmann, Elsevier, Netherlands, First Edition, 2011.

Reference Books :

1 David Seal, ARM Architecture Reference Manual, Pearson Education, United States, Second Edition, 2007.

2 J. R. Gibson, ARM Assembly Language - An Introduction, Lulu.com, United States, Second Edition, 2011.

3 Dave Jaggar, ARM Architecture Reference Manual, Prentice Hall PTR, United States, First Edition, 2005.

4 http://nptel.ac.in/courses/108102045/5,www.arm.com.

K.S.R. COLLEGE OF ENGINEERING, TIRUCHENGODE – 637215
DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING
CO-PO MAPPING

Regulation : R 2020

Course Code:20EC871 **Course Name : ARM SYSTEM ARCHITECTURE**

CO	Course Outcomes	Programme Outcomes													
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	*Describe the programmer's model of ARM processor.*	3	3	-	-	-	-	-	-	-	-	-	-	3	3
CO2	*Develop assembly level programming using ARM and Thumb instructions.*	3	3	2	-	-	-	-	-	-	-	-	-	3	3
3CO3	*Demonstrate the implementation of various ARM processor cores.*	3	3	-	-	-	-	-	-	-	-	-	-	3	3
CO4	*Identify the architectural support of ARM.*	3	3	-	-	-	-	-	-	-	-	-	-	3	3
CO5	*Discuss the various processors for advanced communication.*	3	3	-	-	-	-	-	-	-	-	-	-	3	3
	Average	**3**	**3**	**2**	-		-	-	-	-	-	-	-	**3**	**3**

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

K.S.R. COLLEGE OF ENGINEERING (Autonomous) **R 2018**

SEMESTER - VIII

20EC872	**ARCHITECTURE OF DSPs**	L	T	P	C
		3	0	0	3

Prerequisite: *Digital Signal Processing, Microprocessor and Microcontroller*

Course Outcomes: On successful completion of the course, the student will be able to	***Cognitive Level***
CO1: Explain the DSP computational building blocks in DSP processor.	*Understand*
CO2: Outline the numbering formats and errors in DSP processors for real time signals.	*Understand*
CO3: Illustrate the features of on-chip peripheral devices and its interfacing with DSP TMS320C54XX.	*Understand*
CO4: Demonstrate the memory organization in TMS320C54X processor and interfacing of input and output devices.	*Understand*
CO5: Interpret the importance of real-time DSP for a broad class of engineering applications.	*Understand*

UNIT - I ARCHITECTURES FOR PDSP DEVICES [09]

Introduction - Basic architectural features - DSP computational building blocks - Bus architecture and memory - Data addressing capabilities - Address generation unit - Programmability and program execution - Features for external interfacing.

UNIT - II COMPUTATIONAL ACCURACY IN DSP IMPLEMENTATIONS [09]

Number formats for signals and coefficients in DSP systems - Dynamic range and precision - Sources of error in DSP implementations - A/D conversion errors - DSP computational errors - D/A conversion errors - Compensating filter.

UNIT - III PROGRAMMABLE DIGITAL SIGNAL PROCESSORS [09]

Introduction - Commercial digital signal processing devices - TMS320C54X: Data addressing modes, Memory space of processors, Program control, Instructions and programming, On - chip peripherals, Interrupts of processors, Pipeline operation of processor.

UNIT - IV INTERFACING MEMORY AND I/O PERIPHERALS TO PDSP DEVICES [09]

TMS320C54X: Memory space organization, External bus interfacing signals, Memory Interface, Parallel I/O interface, Programmed I/O, Interrupts and I/O, Direct memory access, Synchronous serial interface, CODEC interface circuit.

UNIT - V APPLICATIONS OF PDSP DEVICES [09]

DSP Based Bio-telemetry receiver - Speech processing system - Echo cancellation - Spectrum analyzer - Image processing system.

Total (L: 45) = 45 Periods

Text Books :

1 Avtar Singh and S.Srinivasan, Digital Signal Processing, Implementations using DSP Microprocessors with Examples from TMS32054xx, Cengage learning India Private Limited, First Edition, New Delhi, 2012.

2 B Venkataramani and M Bhaskar, Digital Signal Processors Architectures, Programming and Applications, Tata McGraw Hill, New Delhi, Second Edition, 2011.

Reference Books :

1 Sen M. Kuo and Woon-Seng S. Gan, Digital Signal Processors, Architectures, Implementations, Applications, Pearson Education, New Delhi, First Edition, 2013.

2 Lapsleyand Jeff Bier, DSP Processor Fundamentals, Architectures & Features, Wiley India Pvt Ltd, Noida, First Edition, 2009.

3 John G Proakis- Dimtris G Manolakis, Digital Signal Processing Principles, Algorithms and Application, Pearson Education, New Delhi, Fourth Edition, 2007.

4 Sanjit K. Mitra, Digital Signal Processing: A Computer-Based Approach, Tata McGraw-Hill Education, New Delhi, First Edition, 2013.

K.S.R. COLLEGE OF ENGINEERING, TIRUCHENGODE – 637215
DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING
CO-PO MAPPING

Regulation: R 2020

Course Code: 20EC872 **Course Name: ARCHITECTURE OF DSPs**

CO	Course Outcomes	Programme Outcomes													
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1:	*Explain the DSP computational building blocks in DSP processor.*	3	3	-	-	2	-	-	-	-	-	-	-	3	-
CO2:	*Outline the numbering formats and errors in DSP processors for real time signals.*	3	3	-	-	2	-	-	-	-	-	-	-	3	-
CO3:	*Illustrate the features of on-chip peripheral devices and its interfacing with DSP TMS320C54XX.*	3	3	-	-	2	-	-	-	-	-	-	-	3	-
CO4:	*Demonstrate the memory organization in TMS320C54X processor and interfacing of input and output devices.*	3	3	-	-	2	-	-	-	-	-	-	-	3	-
CO5:	*Interpret the importance of real-time DSP for a broad class of engineering applications.*	3	3	-	-	2	-	-	-	-	-	-	-	3	-
	Average	**3**	**3**	**-**	**-**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**3**	**-**

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

K.S.R. COLLEGE OF ENGINEERING (Autonomous) **R 2020**

SEMESTER –VIII

20EC873	**CRYPTOGRAPHY AND NETWORK SECURITY**	L	T	P	C
		3	0	0	3

Prerequisite: *Computer Networks*

Course Outcomes: On Completion of this course, the student will be able to		**Cognitive Level**
CO1:	*Discuss the concepts of symmetric ciphers and encryption techniques*	*Understand*
CO2:	*Describe the concept of cryptography key techniques for finding plain and cipher text.*	*Understand*
CO3:	*Compare the various cryptographic hash functions and MAC*	*Understand*
CO4:	*Describe the key management and authentication mechanisms*	*Understand*
CO5:	*Illustrate the concepts of electronic mail and IP*	*Understand*

UNIT– I SYMMETRIC CIPHERS [09]

OSI security architecture - Classical encryption techniques - Block cipher principles - Data encryption standard - Block cipher design principles - Advanced encryption standard: Structure, transformation function, key expansion.

UNIT – II ASYMMETRIC CIPHERS [09]

Introduction to number theory - Public key cryptography and RSA: Principles of public key cryptosystems, RSA algorithms - Diffie-Hellman key exchange - Elgamal cryptographic system - Elliptic curve arithmetic and elliptic curve cryptography.

UNIT – III CRYPTOGRAPHIC DATA INTEGRITY ALGORITHMS [09]

Cryptographic hash functions: Applications, two simple hash function, secure hash algorithm, SHA-3 - Message authentication codes: Requirements, functions, security of MAC, HMAC, CMAC - Digital signatures.

UNIT – IV NETWORK AUTHENTICATION [09]

Key management: Symmetric key distribution using symmetric and asymmetric encryption, X.509 certificates - Authentication: Remote user authentication principles, remote user authentication using symmetric and asymmetric encryption, kerberos - Secure socket layer and transport layer security.

UNIT – V INTERNET SECURITY [09]

Electronic mail security: Pretty good privacy, S/MIME, domain keys identified mail - IP Security: IP security overview, IP security policy and encapsulating security payload - Intrusion detection - Viruses and related threats - Firewall design principles.

Total = 45 Periods

Text Books :

1 William Stallings, Cryptography and Network Security - Principles and Practices, Pearson Education,Bengaluru, Eighth Edition, 2023.

2 Behrouz A. Foruzan, Cryptography and Network Security, Tata McGraw Hill, New Delhi, Second Edition, 2015.

Reference Books :

1 Wade Trappe and Lawrence C. Washington, Introduction to Cryptography with Coding theory, Pearson Education, Bengaluru, Third Edition, 2020.

2 Wenbo Mao, Modern Cryptography Theory and Practice, Pearson Education, Bengaluru, Second Edition, 2016.

3 Thomas Calabrese, Information Security Intelligence: Cryptographic Principles and Applications, Thomson Delmar Learning, First Edition, 2006.

4 https://onlinecourses.nptel.ac.in/noc21_cs16/preview.

K.S.R. COLLEGE OF ENGINEERING, TIRUCHENGODE – 637215
DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING
CO-PO MAPPING

Regulation : R 2020

Course Code: 20EC873 **Course Name : Cryptography and Network Security**

CO	Course Outcomes	Programme Outcomes													
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	*Discuss the concepts of symmetric ciphers and encryption techniques*	3	3	-	-	-	-	-	-	-	-	-	-	2	2
CO2	*Describe the concept of cryptography key techniques for finding plain and cipher text.*	3	3	-	-	-	-	-	-	-	-	-	-	2	2
CO3	*Compare the various cryptographic hash functions and MAC*	3	3	-	-	-	-	-	-	-	-	-	-	2	2
CO4	*Describe the key management and authentication mechanisms*	3	3	-	-	-	-	-	-	-	-	-	-	2	2
CO5	*Illustrate the concepts of electronic mail and IP*	3	3	-	-	-	-	-	-	-	-	-	-	2	2
	Average	**3**	**3**	**-**	-	**-**	**-**	**-**		**-**	**-**	**-**	**-**	**2**	**2**

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

K.S.R. COLLEGE OF ENGINEERING (Autonomous) **R 2020**

SEMESTER - VIII

		L	T	P	C
20EC874	**NEURAL NETWORKS AND DEEP LEARNING (ELECTIVE)**	**3**	**0**	**0**	**3**

Prerequisite: Neural Networks

Course Outcomes: On successful completion of the course, the student will be able to		***Cognitive Level***
CO1:	*Illustrate the basics of neural networks.*	*Understand*
CO2:	*Summarize the different types of associative memory and unsupervised learning networks.*	*Understand*
CO3:	*Discuss CNN and its variants for suitable applications*	*Understand*
CO4:	*Describe the key computations underlying deep learning and use them to build and train deep neural networks for various tasks.*	*Understand*
CO5:	*Interpret autoencoders and generative models for suitable applications.*	*Understand*

UNIT - I NEURAL NETWORKS [09]

Neural Networks-Application Scope of Neural Networks-Artificial Neural Network: An Introduction- Evolution of Neural Networks -Basic Models of Artificial Neural Network- Important Terminologies of ANNs-Supervised Learning Network.

UNIT - II ASSOCIATIVE MEMORY AND UNSUPERVISED LEARNING NETWORKS [09]

Training Algorithms for Pattern Association-Autoassociative Memory Network-Heteroassociative Memory Network- Hopfield Networks-Kohonen Self-Organizing Feature Maps-Counter propagation Networks-Adaptive Resonance Theory Network.

UNIT - III THIRD-GENERATION NEURAL NETWORKS [09]

Spiking Neural Networks-Convolutional Neural Networks: The Convolution Operation – Motivation – Pooling – Variants of the Basic Convolution Function – Structured Outputs – Data Types – Efficient Convolution Algorithms – Applications: Computer Vision, Image Generation, Image Compression.

UNIT - IV DEEP FEEDFORWARD NETWORKS [09]

History of Deep Learning- A Probabilistic Theory of Deep Learning- Gradient Learning – Chain Rule and Backpropagation - Regularization: Dataset Augmentation – Noise Robustness -Early Stopping, Bagging and Dropout - batch normalization- VC Dimension and Neural Nets.

UNIT - V RECURRENT NEURAL NETWORKS [09]

Recurrent Neural Networks: Introduction – Recursive Neural Networks – Bidirectional RNNs – Deep Recurrent Networks – Applications: Image Generation, Image Compression, Natural Language Processing. Complete Auto encoder, Regularized Autoencoder, Stochastic Encoders and Decoders, Contractive Encoders.

Total (L= 45) = 45 Periods

Text Books:

1 Ian Goodfellow, Yoshua Bengio, Aaron Courville, Deep Learning, MIT Press, Cambridge, Second Edition,2016.

2 Francois Chollet, Deep Learning with Python, Manning Publications, New York, Second Edition, 2021.

Reference Books:

1 Charu C. Aggarwal, Neural Networks and Deep Learning: A Textbook, Springer International Publishing, New York, First Edition, 2018.

2 S Rajasekaran, G A Vijayalakshmi Pai, Neural Networks, Fuzzy Logic and Genetic Algorithm, Synthesis and Applications, PHI Learning, New Delhi, Fifteenth Printing, 2017.

3 Laurene V. Fausett, Fundamentals of Neural Networks & Deep Learning, Pearson Education, London, First Edition, 2004.

4 I.A. Dhotre, Neural Networks & Deep Learning, Technical Publications, Chennai,2023.

K.S.R. COLLEGE OF ENGINEERING, TIRUCHENGODE – 637215
DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING
CO-PO MAPPING

Regulation: R 2020

Course Code: 20EC874 **Course Name: NEURAL NETWORKS AND DEEP LEARNING**

CO	Course Outcomes	Programme Outcomes													
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1:	*Illustrate the basics of neural networks.*	3	3	-	-	-	-	-	-	-	-	-	3	3	-
CO2:	*Summarize the different types of associative memory and unsupervised learning networks.*	3	3	-	-	-	-	-	-	-	-	-	3	3	-
CO3:	*Discuss CNN and its variants for suitable applications*	3	3	-	-	-	-	-	-	-	-	-	3	3	-
CO4:	*Describe the key computations underlying deep learning and use them to build and train deep neural networks for various tasks.*	3	3	-	-	-	-	-	-	-	-	-	3	3	-
CO5:	*Interpret autoencoders and generative models for suitable applications.*	3	3	-	-	-	-	-	-	-	-	-	3	3	-
	Average	**3**	**3**	**-**	**-**	**-**	**-**		**-**	**-**	**-**	**-**	**3**	**3**	**-**

K.S.R. COLLEGE OF ENGINEERING (Autonomous) **R 2020**

SEMESTER - VIII

		L	T	P	C
20EC875	**ASIC DESIGN**	3	0	0	3

Prerequisite: *VLSI Design*

Course Outcomes: On successful completion of the course, the student will be able to		***Cognitive Level***
CO1:	*Infer the basics of ASIC design flow and cell libraries.*	*Understand*
CO2:	*Interpret the logical cells and I/O cells.*	*Understand*
CO3:	*Illustrate the interconnections in various vendors of FPGA.*	*Understand*
CO4:	*Develop various logic synthesis techniques, simulation and testing.*	*Apply*
CO5:	*Design of floor planning, placement and routing in ASIC.*	*Apply*

UNIT - I INTRODUCTION TO ASIC, CMOS LOGIC AND ASIC LIBRARY [09]

Types of ASICs – Design flow – CMOS transistors – Combinational logic cell – Sequential logic cell – Data path logic cells – Transistors as resistors – Transistor parasitic capacitance – Logical effort.

UNIT - II LOGIC CELLS AND I/O CELLS [09]

Antifuse – Static RAM, EPROM and EEPROM technology – Xilinx LCA – Altera FLEX – Altera MAX – DC & AC inputs and outputs – Clock and power inputs – Xilinx I/O blocks.

UNIT - III INTERCONNECT AND DESIGN SOFTWARE [09]

Xilinx LCA – Xilinx EPLD – Altera MAX 5000 and 7000 – Altera MAX 9000 – Altera FLEX – Design systems – Half gate ASIC – Schematic entry – Low level design languages – PLA tools – EDIF.

UNIT - IV LOGIC SIMULATION AND SYNTHESIS, PARTITIONING [09]

Types of simulation – Verilog and logic synthesis – VHDL and logic synthesis – System partitioning – FPGA partitioning – Partitioning methods: Examples, constructive and iterative partitioning, K-L algorithm.

UNIT - V FLOOR PLANNING, PLACEMENT AND ROUTING [09]

Floor planning: goals, objectives – Placement: Terms and definitions, goals, objective, placement algorithms, simple placement examples – Physical design flow – Global routing: Goals, objectives, methods, between blocks, inside flexible blocks – Detailed routing: Goals, objective, measurement of channel density, left-edge algorithm, area routing algorithm – Circuit extraction – DRC.

Total (L: 45) = 45 Periods

Text Books :

1 M.J.S.Smith, Application Specific Integrated Circuits, Pearson Education, New Delhi, First Edition, 2012.

2 Farzad Nekoogar and Faranak Nekoogar, From ASICs to SOCs: A Practical Approach, Prentice Hall, New Delhi, First Edition, 2003.

Reference Books :

1 Wayne Wolf, FPGA-Based System Design, Pearson Education, New Delhi, First Edition, 2009.

2 John V. Oldfield, Richard C. Dorf ,Field Programmable Gate Arrays, Wiley india, New Delhi, Reprint, 2008.

3 Rajsuman.R, System-on-a-Chip Design and Test, Artech House Publishers, Boston, Second Edition, 2009.

4 Laung-Terng Wang, Yao-Wen Chang, Kwang-Ting Cheng, Morgan, Electronic Design Automation: Synthesis, Verification, and Test, Morgan Kaufmann Publishers, USA, First Edition 2009.

K.S.R. COLLEGE OF ENGINEERING, TIRUCHENGODE – 637215
DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING
CO-PO MAPPING

Regulation: R 2020

Course Code: 20EC875 **Course Name: ASIC DESIGN**

CO	Course Outcomes	Programme Outcomes													
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1:	*Infer the basics of ASIC design flow and cell libraries.*	2	2	-	-	-	-	-	-	-	-	-	-	3	-
CO2:	*Interpret the logical cells and i/o cells.*	2	2	-	-	-	-	-	-	-	-	-	-	3	-
CO3:	*Illustrate the interconnections in various vendors of FPGA.*	2	2	-	-	-	-	-	-	-	-	-	-	3	-
CO4:	*Develop various logic synthesis techniques, simulation and testing in ICs.*	2	2	2	-	3	-	-	-	-	-	-	-	3	-
CO5:	*Design of floor planning, placement and routing in ASIC.*	2	2	2	-	-	-	-	-	-	-	-	-	3	-
	Average	**2**	**2**	**2**	**-**	**3**	**-**		**-**	**-**	**-**	**-**	**-**	**3**	**-**

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

K.S.R. COLLEGE OF ENGINEERING (Autonomous) **R 2020**

		L	T	P	C
20EC876	**4G / 5G COMMUNICATION NETWORKS**	3	0	0	3

Prerequisite: *Wireless Networks*

Course Outcomes: On Completion of this course , the student will be able to		***Cognitive level***
CO1	*Describe the evolution of wireless networks*	*Understand*
CO2	*Illustrate the concepts of 5G networks.*	*Understand*
CO3	*Comprehend the 5G architecture and protocols.*	*Understand*
CO4	*Discuss the dynamic spectrum management.*	*Understand*
CO5	*Infer the security aspects in 5G networks.*	*Understand*

UNIT – I EVOLUTION OF WIRELESS NETWORKS [09]

Networks evolution: 2G, 3G, 4G, evolution of radio access networks, need for 5G. 4G versus 5G, Next Generation core (NG-core), visualized Evolved Packet core (vEPC).

UNIT – II 5G CONCEPTS AND CHALLENGES [09]

Fundamentals of 5G technologies, overview of 5G core network architecture,5G new radio and cloud technologies, Radio Access Technologies (RATs), EPC for 5G.

UNIT – III NETWORK ARCHITECTURE AND THE PROCESSES [09]

5G architecture and core, network slicing, multi access edge computing(MEC)visualization of 5G components, end-to-end system architecture, service continuity, relation to EPC, and edge computing. 5G protocols: 5G NAS, NGAP, GTP-U, IP Sec and GRE.

UNIT – IV DYNAMIC SPECTRUM MANAGEMENT AND MM-WAVES [09]

Mobility management, Command and control, spectrum sharing and spectrum trading, cognitive radio based on 5G, millimeter waves.

UNIT – V SECURITY IN 5G NETWORKS [09]

Security features in 5G networks, network domain security, user domain security, flow based QoS framework, mitigating the threats in 5G.

Total (L: 45) = 45 Periods

Text Books :

1 5G Core networks: Powering Digitalization , Stephen Rommer, Academic Press, First edition,2019

2 An Introduction to 5G Wireless Networks: Technology, Concepts and Use cases, Saro Velrajan, First Edition, 2020.

Reference Books :

1 5G Simplified: ABCs of Advanced Mobile Communications Jyrki. T.J.Penttinen, Copyrighted Material.

2 5G system Design: An end to end Perspective, Wan Lee Anthony, Springer Publications, First Edition, 2020.

3 A Comprehensive Guide to 5G Security, Madhusanka Liyanage, Wiley, First edition, 2018.

4 https://nptel.ac.in/courses/108105134

K.S.R. COLLEGE OF ENGINEERING, TIRUCHENGODE – 637215
DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING
CO-PO MAPPING

Regulation : R 2020

Course Code: 20EC876 **Course Name : 4G / 5G COMMUNICATION NETWORKS**

CO	Course Outcomes	Programme Outcomes													
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	*Describe the evolution of wireless networks*	3	2	-	-	-	-	-	-	-	-	-	-	2	2
CO2	*Illustrate the concepts of 5G networks.*	3	2	-	-	-	-	-	-	-	-	-	-	2	2
CO3	*Comprehend the 5G architecture and protocols*	3	2	-	-	-	-	-	-	-	-	-	-	2	2
CO4	*Discuss the dynamic spectrum management*	3	2	-	-	-	-	-	-	-	-	-	-	2	2
CO5	*Infer the security aspects in 5G networks..*	3	2	-	-	-	-	-	-	-	-	-	-	2	2
Average		**3**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**3**	**2**

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

K.S.R. COLLEGE OF ENGINEERING (Autonomous) **R 2018**

SEMESTER - VII

20EC877	**COGNITIVE RADIO NETWORK**	L	T	P	C
		3	0	0	3

Prerequisite: *Wireles Communication*

Course Outcomes: On successful completion of the course, the student will be able to		***Cognitive Level***
CO1:	*Infer the design principles on software defined radio and cognitive radio*	*Understand*
CO2:	*Describe the Cognitive Radio Architecture and standards*	*Understand*
CO3:	*Develop the ability to design and implement algorithms for cognitive radio spectrum and sensing and dynamic spectrum access*	*Apply*
CO4:	*Apply the various routing protocols of cognitive radio in real time wireless applications*	*Apply*
CO5:	*Apply the knowledge of advanced features of cognitive radio for real world applications*	*Apply*

UNIT - I INTRODUCTION TO SOFTWARE-DEFINED RADIO AND COGNITIVE RADIO [09]

Evolution of Software Defined Radio and Cognitive radio: goals, benefits, definitions, architectures, relations with other radios, issues, enabling technologies, radio frequency spectrum and regulations.

UNIT - II COGNITIVE RADIO ARCHITECTURE [09]

Cognition cycle – orient, plan, decide and act phases, Organization, SDR as a platform for Cognitive Radio – Hardware and Software Architectures, Overview of IEEE 802.22 standard for broadband wireless access in TV bands

UNIT - III SPECTRUM SENSING AND DYNAMIC SPECTRUM ACCESS [09]

Introduction – Primary user detection techniques – energy detection, feature detection, matched filtering, cooperative detection and other approaches, Fundamental Tradeoffs in spectrum sensing, Spectrum Sharing Models of Dynamic Spectrum Access - Unlicensed and Licensed Spectrum Sharing, Fundamental Limits of Cognitive Radio.

UNIT - IV MAC AND NETWORK LAYER DESIGN FOR COGNITIVE RADIO [09]

MAC for cognitive radios – Polling, ALOHA, slotted ALOHA, CSMA, CSMA / CA, Network layer design – routing in cognitive radios, flow control and error control techniques.

UNIT - V COGNITIVE RADIO PLATFORMS [09]

Overview of security issues in cognitive radios, auction based spectrum markets in cognitive radio networks, public safety and cognitive radio, cognitive radio for Internet of Things.

Total (L: 45) = 45 Periods

Text Books :

1 Alexander M. Wyglinski, Maziar Nekovee, Thomas Hou, Cognitive Radio Communications and Networks, Academic Press, Elsevier, San Francisco, First edition, 2010.

2 Linda E-Doyle CUP , Essentials of Cognitive Radio, Cambridge University Press, New York, First Edition, 2009.

Reference Books :

1 Huseyin Arslan (Ed.), ―Cognitive Radio, Software Defined Radio, and Adaptive Wireless Systems, Springer, Firat Edition, 2007.

2 Bruce Fette, ―Cognitive Radio Technology, Newnes, 2006.

3 Kwang-Cheng Chen, Ramjee Prasad, ― Cognitive Radio Networks, John Wiley and Sons,2009.

4 https://www.youtube.com/watch?v=z-E5jIoUFbA

K.S.R. COLLEGE OF ENGINEERING, TIRUCHENGODE – 637215
DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING
CO-PO MAPPING

Regulation: R 2020

Course Code: 20EC877 **Course Name: COGNITIVE RADIO NETWORK**

CO	Course Outcomes	Programme Outcomes													
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1:	*Infer the design principles on software defined radio and cognitive radio*	2	3	3	-	-	-	-	-	-	-	-	-	3	3
CO2:	*Describe the Cognitive Radio Architecture and standards*	3	3	3	-	-	-	-	-	-	-	-	-	3	3
CO3:	*Develop the ability to design and implement algorithms for cognitive radio spectrum and sensing and dynamic spectrum access*	2	3	3	-	-	-	-	-	-	-	-	-	3	3
CO4:	*Apply the various routing protocols of cognitive radio in real time wireless applications*	3	3	3	-	-	-	-	-	-	-	-	-	3	3
CO5:	*Apply the knowledge of advanced features of cognitive radio for real world applications*	2	3	3	-	-	-	-	-	-	-	-	-	3	3
	Average	**3**	**3**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**3**	**3**

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

K.S.R. COLLEGE OF ENGINEERING (Autonomous) **R 2020**

		L	T	P	C
20EC878	**WIRELESS BROAD BAND NETWORKS**	3	0	0	3

Prerequisite: *NIL*

Course Outcomes: On Completion of this course , the student will be able to		***Cognitive level***
CO1	Design and implement the various protocols in wireless networks	*Apply*
CO2	Design the interconnecting network functionalities by layer level functions.	*Apply*
CO3	Analyze the difference of LTE-A network design from 4G standard	*Analyze*
CO4	Analyze the architecture of 3G network standards	*Analyze*
CO5	Explore the current generation (5G) network architecture.	*Understand*

UNIT – I WIRELESS PROTOCOLS **[09]**

Mobile network layer- Fundamentals of Mobile IP, data forwarding procedures in mobile IP, IPv4, IPv6, IP mobility management, IP addressing - DHCP, Mobile transport layer-Traditional TCP, congestion control, slow start, fast recovery/fast retransmission, classical TCP improvements- Indirect TCP, snooping TCP, Mobile TCP.

UNIT – II LAYER-LEVEL FUNCTIONS **[09]**

Characteristics of wireless channels - downlink physical layer, uplink physical layer, MAC scheme -frame structure, resource structure, mapping, synchronization, reference signals and channel estimation, SC-FDMA, interference cancellation – CoMP, Carrier aggregation, Services - multimedia broadcast/multicast, location-based services.

UNIT – III 3G EVOLUTION **[09]**

IMT-2000 - W-CDMA, CDMA 2000 - radio & network components, network structure, packet-data transport process flow, Channel Allocation, core network, interference-mitigation techniques, UMTS-services, air interface, network architecture of 3GPP, UTRAN – architecture, High Speed Packet Data-HSDPA,HSUPA.

UNIT – IV 4G EVOLUTION **[09]**

Introduction to LTE-A – Requirements and Challenges, network architectures – EPC, E- UTRAN architecture - mobility management, resource management, services, channel -logical and transport channel mapping, downlink/uplink data transfer, MAC control element, PDU packet formats, scheduling services, random access procedure.

UNIT – V 5G EVOLUTION **[09]**

5G Roadmap - Pillars of 5G - 5G Architecture, The 5G internet - IoT and context awareness - Networking reconfiguration and virtualization support - Mobility QoS control - emerging approach for resource over provisioning, Small cells for 5G mobile networks- capacity limits and achievable gains with densification - Mobile data demand, Demand Vs Capacity, Small cell challenges, conclusion and future directions.

Total = 45 Periods

Text Books :

1 KavehPahlavan, Principles of wireless networks,Prentice-Hall of India, Delhi, first Edition, 2008.
2 Vijay K.Garg,Wireless Network Evolution - 2G & 3G, Prentice-Hall of India, Delhi, First Edition ,2008

Reference Books :

1 Clint Smith,P.E, Dannel Collins,3G Wireless Networks,Tata McGraw- Hill, Noida, Second Edition, 2011.
2 Sassan Ahmadi,LTE-Advanced – A practical systems approach to understanding the 3GPP LTE Releases 10 and 11 radio access technologies, Oxford Elsevier Science, United States 2014.
3 Jonathan Rodriguez,Fundamentals of 5G Mobile networks, John Wiley, Canada,2015.

K.S.R. COLLEGE OF ENGINEERING, TIRUCHENGODE – 637215
DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING
CO-PO MAPPING

Regulation : R 2020

Course Code: 20EC878 **Course Name : WIRELESS BROAD BAND NETWORKS**

CO	Course Outcomes	Programme Outcomes													
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	Design and implement the various protocols in wireless networks	3	3	3	3	2	-	-	-	-	-	-	-	3	2
CO2	Analyze the architecture of 3G network standards	3	3	3	3	2	-	-	-	-	-	-	-	3	2
CO3	Analyze the difference of LTE-A network design from 4G standard	3	3	3	3	2	-	-	-	-	-	-	-	3	2
CO4	Design the interconnecting network functionalities by layer level functions.	3	3	3	3	2	-	-	-	-	-	-	-	3	2
CO5	Explore the current generation (5G) network architecture.	3	3	3	3	2	-	-	-	-	-	-	-	3	2
	Average	**3**	**3**	**3**	**3**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**3**	**2**

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

K.S.R. COLLEGE OF ENGINEERING: TIRUCHENGODE - 637 215

(Autonomous)

(REGULATIONS 2020)

OPEN ELECTIVE COURSES

K.S.R. COLLEGE OF ENGINEERING (Autonomous) **R 2020**

20AU901	**BASICS OF AUTOMOBILE ENGINEERING** (Open Elective)	L	T	P	C
		3	0	0	3

Prerequisite: -

Course Outcomes : On successful completion of the course, the student will be able to		***Cognitive Level***
CO1:	*Provide basic platform knowledge of automobile engineering*	*Understand*
CO2:	*Explain the working principal of petrol and diesel engines*	*Understand*
CO3:	*Interpret the method of power transmission unit*	*Understand*
CO4:	*Built knowledge of steering and brake*	*Understand*
CO5:	*Illustrate the knowledge of automotive electrical systems and functioning*	*Understand*

UNIT - I INTRODUCTION [09]

Automobile - Components of an automobile - Classification of automobiles - Layout of chassis - Types of drives front wheel-rear wheel - four wheel.

UNIT - II IC ENGINES [09]

Classification - ignition system - firing order - Otto/ Diesel cycles - Two stroke and four stroke engines – scavenging - Cooling and Lubrication systems - Fuel Supply system – air fuel ratio - Carburetor – types.

UNIT - III TRANSMISSION SYSTEM [09]

Clutch - Function - single plate - multi plate - friction clutches - Centrifugal and semi centrifugal clutch - Gear Box -slide mesh - constant mesh and synchromesh gear box - Torque convertor – overdrive - Propeller shaft and rear axle- Universal joint – Differential - Rear axle drives - Wheels and Tyres.

UNIT - IV STEERING AND BRAKE [09]

Steering system - function and principle - Ackerman and Davis steering principles - wheel alignment –steering gear boxes. Brakes - Mechanical - hydraulic and vacuum brake - master cylinder - wheel cylinder -Bleeding of brakes.

UNIT - V ELECTRICAL SYSTEMS [09]

Battery – types - Dynamo and Alternator – Cut-out relay - Diagram of Wiring system - Lighting System and Accessories - Headlight - switches - Windscreen Wipers – Horn – Speedometer – Heater and Air conditioning.

Total = 45 Periods

Text Books :

1 Kirpal Singh, Automobile Engineering, Vol. I & II, Standard Publishers, New Delhi, Fourteenth Edition, 2018.

2 Gupta,S. K., A Textbook of Automobile Engineering, S.Chand Publishing, New Delhi, Second Edition, 2020.

Reference Books :

1 Rajput, R K, A Textbook of Automobile Engineering, Laxmi Publications (P) Ltd, New Delhi, Second Edition, 2017.

2 Ganesan. V, Internal Combustion Engines, Tata McGraw-Hill Publishing Co., New Delhi, Fourth Edition, 2012.

3 Mathur M.L. and Sharma R.P, A Course in Internal Combustion Engines, DhanpatRai and sons, New Delhi, Second Edition, 2016.

4 Ramalingam K.K, Automobile Engineering, Scitech Publications (India) Pvt. Ltd, Chennai, Second Edition, 2011.

K.S.R. COLLEGE OF ENGINEERING, TIRUCHENGODE – 637215
DEPARTMENT OF AUTOMOBILE ENGINEERING
CO-PO MAPPING

Regulation: R 2020

Course Code: 20AU901 **Course Name: Basics of Automobile Engineering**

CO	Course Outcomes	Programme Outcomes													
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	*Provide basic platform knowledge of automobile engineering*	3	3	2	-	-	-	-	-	-	-	-	-	-	-
CO2	*Explain the working principal of petrol and diesel engines*	3	3	2	-	-	-	-	-	-	-	-	-	-	-
CO3	*Interpret the method of power transmission unit*	3	3	2	-	-	-	-	-	-	-	-	-	-	-
CO4	*Built knowledge of steering and brake*	3	3	2	-	-	-	-	-	-	-	-	-	-	-
CO5	*Illustrate the knowledge of automotive electrical systems and functioning*	3	3	2	-	-	-	-	-	-	-	-	-	-	-
	Average	**3**	**3**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

K.S.R. COLLEGE OF ENGINEERING (Autonomous) **R 2020**

20AU902	**AUTOMOTIVE ENGINE TECHNOLOGY** (Open Elective)	L	T	P	C
		3	0	0	3

Prerequisite: -

Course Outcomes : On successful completion of the course, the student will be able to		***Cognitive Level***
CO1:	*Illustrate the fundamental concepts and functions of an automotive engine and working cycles*	*Understand*
CO2:	*Explain the combustion phenomena in SI engines*	*Understand*
CO3:	*Identify the CI engines injection, ignition and combustion phenomena*	*Understand*
CO4:	*Outline the emission control techniques.*	*Understand*
CO5:	*Demonstrate the measurement techniques and emission standards.*	*Understand*

UNIT – I CONSTRUCTION AND OPERATION [09]

Constructional details of spark ignition (SI) and compression ignition (CI) engines. Working principles. Two stroke SI and CI engines. Comparison of SI and CI engines and four stroke and two stroke engines. Engine classification, firing order. Otto, diesel and dual cycles. Introduction to Lean burn engine technologies.

UNIT – II SI ENGINES [09]

Air fuel ratio requirements - Carburetion - Throttle body injection, Multi point injection. Function of Components, Spark plug, Ignition System - battery coil, magneto coil, Electronic. Combustion in SI Engines - Combustion Chambers, Stages of Combustion - factors affecting flame propagation, Knock in SI engines, variables affecting knocking. Pollution from SI engines.

UNIT – III CI ENGINES [09]

Diesel fuel injection system, Function of Components, Jerk type pump, Distributor pump, Mechanical and pneumatic Governor, Fuel Injector, Types of nozzles, importance of Swirl, Squish, Turbulence air motion, Combustion in CI Engines - Combustion Chambers, Stages of Combustion, Factors affecting Ignition Delay, Knock in CI engines. Pollution from CI engines.

UNIT - IV EMISSION CONTROL TECHNIQUES [09]

Design of engine, optimum selection of operating variables for control of emissions, EGR, charge stratification, SCR, DPF, Lean NOX catalyst technology. Thermal reactors, secondary air injection, catalytic converters, catalysts, fuel modifications, fuel cells, Two stroke engine pollution and control.

UNIT - V MEASUREMENT TECHNIQUES, EMISSION STANDARDS AND TEST PROCEDURES [09]

NDIR, FID, Chemiluminescent analyzers, Gas Chromatograph, smoke meters, emission standards, driving cycles - USA, Japan, Euro and India. Test procedures - ECE, FTP Tests. SHED Test - Chassis dynamometers, dilution tunnels.

Total = 45 Periods

Text Books :

1 Ganesan. V, Internal Combustion Engines, Tata McGraw-Hill Publishing Co., New Delhi, Fourth Edition, 2012.

2 Mathur M.L. and Sharma R.P, A Course in Internal Combustion Engines, Dhanpat Rai and sons, New Delhi, Second Edition, 2016.

Reference Books :

1 Ramalingam K.K, Automobile Engineering, Scitech Publications (India) Pvt. Ltd, Chennai, Second Edition, 2011.

2 John B. Heywood, Internal Combustion Engine Fundamentals, Tata McGraw Hill Education, New Delhi, Second Edition, 2018.

3 Gupta H.N, Fundamentals of Internal Combustion Engines, PHI Learning Private Ltd., New Delhi, Second Edition, 2013.

4 Obert, E.F., Internal Combustion Engineering and Air Pollution, Intext Education Publishers, New York, Third Edition, 1988.

K.S.R. COLLEGE OF ENGINEERING, TIRUCHENGODE – 637215
DEPARTMENT OF AUTOMOBILE ENGINEERING
CO-PO MAPPING

Regulation: R 2020

Course Code: 20AU902 **Course Name: Automotive Engine Technology**

CO	Course Outcomes	Programme Outcomes													
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	*Illustrate the fundamental concepts and functions of an automotive engine and working cycles*	3	3	2	-	-	-	-	-	-	-	-	-	-	-
CO2	*Explain the combustion phenomena in SI engines.*	3	3	2	-	-	-	-	-	-	-	-	-	-	-
CO3	*Identify the CI engines injection, ignition and combustion phenomena*	3	3	2	-	-	-	-	-	-	-	-	-	-	-
CO4	*Outline the emission control techniques.*	3	3	2	-	-	-	-	-	-	-	-	-	-	-
CO5	*Demonstrate the measurement techniques and emission standards.*	3	3	2	-	-	-	-	-	-	-	-	-	-	-
	Average	**3**	**3**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

K.S.R. COLLEGE OF ENGINEERING (Autonomous) **R 2020**

		L	T	P	C
20AU903	**AUTOMOTIVE VEHICLE TECHNOLOGY** (Open Elective)	3	0	0	3

Prerequisite: -

Course Outcomes : On successful completion of the course, the student will be able to		***Cognitive Level***
CO1:	*Identify the construction and working of various types of automobile engines.*	*Understand*
CO2:	*Evaluate the significance of clutch and transmission system.*	*Understand*
CO3:	*Illustrate the types of axle, suspension and classification of steering system.*	*Understand*
CO4:	*Discuss the various vehicle control systems.*	*Understand*
CO5:	*Demonstrate the various new generation vehicles.*	*Understand*

UNIT - I AUTOMOBILE ENGINE [09]

Construction layout, types and components of engines, SI – CI – Wankel engine, working of engines, lubrication system, coolant system, power supply, alternate and dynamo, flywheel and damper.

UNIT - II CLUTCH AND TRANSMISSION [09]

Types of clutches, construction and working procedure of single plate clutch, multi-plate clutch, cone clutch, gears – types of gears, terminology of spur gear, gear trains, construction and working of manual and automatic gear box.

UNIT - III AXLE, SUSPENSION AND STEERING [09]

Types of axles, necessity of axle for an automobile, suspension system, types and construction of suspension system, significance of suspension system, steering system and vehicle handling, classification of steering system, merits and demerits of power steering.

UNIT - IV VEHICLE CONTROL SYSTEM [09]

Cruise control, antilock braking system, tyre slip controller, electronic steering control, global positioning system, autonomous navigation system.

UNIT - V NEW GENERATION VEHICLES [09]

Electric vehicles, hybrid vehicles, flexible fuel vehicles, solar powered vehicles, high energy and power density batteries, regenerative braking, safety air bags.

Total = 45 Periods

Text Books :

1 David A. Crolla, Automotive Engineering – Powertrain, Chassis system and Vehicle body, Butterworth-Heinemann, New Delhi, First Edition, 2009.

2 Ganesan. V, Internal Combustion Engines, Tata McGraw-Hill Publishing Co., New Delhi, Fourth Edition, 2012.

Reference Books :

1 Heinz Heisler,Advance Vehicle Technology, Butterworth-Heinemann, London, Second Edition, 2002.

2 Mathur M.L. and Sharma R.P, A Course in Internal Combustion Engines, Dhanpat Rai and sons, New Delhi, Second Edition, 2016.

3 James Larminie and John Lowry, Electric Vehicle Technology Explained, John Wiley & Sons, New York, Second Edition, 2012.

4 William B Ribbens, Understanding Automotive Electronics, Butterworth-Heinemann, Woburn, Eighth edition, 2017.

K.S.R. COLLEGE OF ENGINEERING, TIRUCHENGODE – 637215
DEPARTMENT OF AUTOMOBILE ENGINEERING
CO-PO MAPPING

Regulation: R 2020

Course Code: 20AU903 **Course Name: Automotive Vehicle Technology**

CO	Course Outcomes	Programme Outcomes													
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	*Identify the construction and working of various types of automobile engines.*	3	3	3	-	-	-	-	-	-	-	-	-	-	-
CO2	*Evaluate the significance of clutch and transmission system.*	3	3	3	-	-	-	-	-	-	-	-	-	-	-
CO3	*Illustrate the types of axle, suspension and classification of steering system.*	3	3	3	-	-	-	-	-	-	-	-	-	-	-
CO4	*Discuss the various vehicle control systems.*	3	3	3	-	-	-	-	-	-	-	-	-	-	-
CO5	*Demonstrate the various new generation vehicles.*	3	3	3	-	-	-	-	-	-	-	-	-	-	-
	Average	**3**	**3**	**3**	**-**	-	-	-	-	**-**	**-**	**-**	**-**	**-**	**-**

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

K.S.R. COLLEGE OF ENGINEERING (Autonomous) **R 2020**

		L	T	P	C
20AU904	**AUTOMOTIVE SAFETY** (Open Elective)	3	0	0	3

Prerequisite: -

Course Outcomes : On successful completion of the course, the student will be able to		***Cognitive Level***
CO1:	*Explain the automotive safety and its importance.*	*Understand*
CO2:	*Analyze the safety concepts.*	*Understand*
CO3:	*Illustrate the various safety equipment functions and importance*	*Understand*
CO4:	*Identify the various crash test and impact test mechanics.*	*Understand*
CO5:	*Examine the function of warning and avoidance systems.*	*Understand*

UNIT - I INTRODUCTION [09]

Evolution of automotive safety - Active safety: driving safety, conditional safety, perceptibility safety, operating safety- passive safety: exterior safety, interior safety, safety sandwich construction – NCAP.

UNIT - II SAFETY CONCEPTS [09]

Design of the body for safety -Energy equation - engine location - deceleration of vehicle inside passenger compartment - deceleration on impact with stationary and movable obstacle.

UNIT - III SAFETY EQUIPMENTS [09]

Seat belt - regulations, automatic seat belt tightener system - collapsible steering column - tiltable steering wheel - air bags - electronic system for activating air bags - bumper design for safety - Collision warning system - Central Locking system - Child safety.

UNIT - IV CRASH AND IMPACT MECHANICS [09]

Design of crash crumple zones - Behavior of specific body structures in crash testing - Roll over crash tests - Regulatory requirements for crash testing & testing procedure - vehicle impacts- Side and Frontal Pole Impact.

UNIT - V COMFORT AND CONVENIENCE SYSTEM [09]

Steering and mirror adjustment - central locking system - Garage door opening system - tyre pressure control system - rain sensor system - environment information system.

Total = 45 Periods

Text Books :

1 LjuboVlacic, Michel Parent and Fumio Harashima, Intelligent Vehicle Technologies, Butterworth-Heinemann publications, Oxford, First Edition, 2001.

2 Robert Bosch GmbH, Safety, Comfort and Convenience Systems, John Wiley& Sons, New Delhi, Third edition, 2007

Reference Books :

1 Bosch, Automotive HandBook, SAE International, New York, Eighth Edition, 2011.

2 Vivek D. Bhise, Ergonomics in the automotive design process. CRC Press, New York, 2012.

3 Ronald K Jurgen, Automotive Electronics Handbook, Tata McGraw-Hill Inc., New York, Second Edition, 1999.

4 William B Ribbens, Understanding Automotive Electronics, Butterworth-Heinemann, Woburn, Eighth edition, 2017.

K.S.R. COLLEGE OF ENGINEERING, TIRUCHENGODE – 637215
DEPARTMENT OF AUTOMOBILE ENGINEERING
CO-PO MAPPING

Regulation: R 2020

Course Code: 20AU904 **Course Name: Automotive Safety**

CO	Course Outcomes	Programme Outcomes													
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	*Explain the automotive safety and its importance.*	3	3	3	-	-	-	-	-	-	-	-	3	-	-
CO2	*Analyze the safety concepts.*	3	3	3	-	-	-	-	-	-	-	-	3	-	-
CO3	*Illustrate the various safety equipment functions and importance*	3	3	3	-	-	-	-	-	-	-	-	3	-	-
CO4	*Identify the various crash test and impact test mechanics.*	3	3	3	-	-	-	-	-	-	-	-	3	-	-
CO5	*Examine the function of warning and avoidance systems.*	3	3	3	-	-	-	-	-	-	-	-	3	-	-
	Average	**3**	**3**	**3**	-	-	-	-	-	**-**	**-**	**-**	**3**	**-**	**-**

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

K.S.R. COLLEGE OF ENGINEERING (Autonomous) **R 2020**

		L	T	P	C
20AU905	**HYBRID VEHICLES** (Open Elective)	3	0	0	3

Prerequisite: -

Course Outcomes : On successful completion of the course, the student will be able to		***Cognitive Level***
CO1:	*Summarize the electric and hybrid vehicle operation and architectures.*	*Understand*
CO2:	*Explain the different subsystems of hybrid and electric vehicle*	*Understand*
CO3:	*Demonstrate the energy requirement for vehicles*	*Understand*
CO4:	*Model and simulate the vehicle characteristics, operating modes, and performance parameters of the vehicle*	*Understand*
CO5:	*Design and develop the systems of hybrid and electric vehicles*	*Understand*

UNIT - I NEED FOR ALTERNATIVE SYSTEM [09]

Need for hybrid and electric vehicles – main components and working principles of a hybrid and electric vehicles, Different configurations of hybrid and electric vehicles. Comparative study of diesel, petrol, hybrid and electric Vehicles. Advantages and Limitations of hybrid and electric Vehicles.

UNIT - II SUBSYSTEMS OF HYBRID AND ELECTRIC VEHICLES [09]

Basics – Types, Parameters – Capacity, Discharge rate, State of charge, state of Discharge, Depth of Discharge, Technical characteristics, Battery pack Design, Properties of Batteries.

UNIT - III ENERGY SOURCES [09]

Battery Parameters- - Different types of batteries – Lead Acid- Nickel Metal Hydride – Lithium ion- Sodium based- Metal Air. Battery Modeling- Equivalent circuits, Battery charging- Quick Charging devices. Fuel Cell- Fuel cell Characteristics- Fuel cell types-Half reactions of fuel cell. Ultra capacitors. Battery Management System.

UNIT - IV MOTORS AND CONTROLLERS [09]

Types of Motors, Characteristic of DC motors, AC single phase and 3-phase motor, PM motors, Switched reluctance motors, Motor Drives and speed controllers, Torque Vectoring, Regenerative Braking. Rectifiers, Inverters, DC/DC converters.

UNIT - V DESIGN CONSIDERATIONS FOR ELECTRIC VEHICLES [09]

Design requirement for electric vehicles- Range, maximum velocity, acceleration, power requirement, mass of the vehicle. Various Resistance- Transmission efficiency- Electric vehicle chassis and Body Design, Electric Vehicle Recharging and Refueling Systems, performance of electrical vehicles.

Total = 45 Periods

Text Books :

1 Iqbal Husain, Electric and Hybrid Vehicles-Design Fundamentals, CRC Press, New York, Second Edition, 2010.

2 Mehrdad Ehsani, Modern Electric, Hybrid Electric and Fuel Cell Vehicles, CRC Press, New York, Second Edition, 2009.

Reference Books :

1 James Larminie and John Lowry, Electric Vehicle Technology Explained, John Wiley & Sons, New York, Second Edition, 2012.

2 Lino Guzzella, Vehicle Propulsion Systems, Springer-Verlag Berlin, Heidelberg, Third Edition, 2013

3 Ron HodKinson, Light Weight Electric/ Hybrid Vehicle Design, Butterworth Heinemann Publication, London, 2001

4 Ronald K Jurgen, Electric and Hybrid – Electric Vehicles, SAE International, New York, First Edition, 2011.

K.S.R. COLLEGE OF ENGINEERING, TIRUCHENGODE – 637215
DEPARTMENT OF AUTOMOBILE ENGINEERING
CO-PO MAPPING

Regulation: R 2020

Course Code: 20AU905 **Course Name: Hybrid Vehicles**

CO	Course Outcomes	Programme Outcomes													
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	*Summarize the electric and hybrid vehicle operation and architectures.*	3	3	2	-	-	-	3	-	-	-	-	-	-	-
CO2	*Explain the different subsystems of hybrid and electric vehicle*	3	3	2	-	-	-	3	-	-	-	-	-	-	-
CO3	*Demonstrate the energy requirement for vehicles*	3	3	3	-	-	-	3	-	-	-	-	-	-	-
CO4	*Model and simulate the vehicle characteristics, operating modes, and performance parameters of the vehicles.*	3	3	2	-	-	-	3	-	-	-	-	-	-	-
CO5	*Design and develop the systems of hybrid and electric vehicles.*	3	2	2	-	-	-	3	-	-	-	-	-	-	-
	Average	**3**	**3**	**2**	**-**	**-**	**-**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

K.S.R. COLLEGE OF ENGINEERING (Autonomous) **R 2020**

		L	T	P	C
20AU906	**OFF HIGHWAY VEHICLES** (Open Elective)	3	0	0	3

Prerequisite: -

Course Outcomes : On successful completion of the course, the student will be able to		***Cognitive Level***
CO1:	*Describe the construction and requirement of off road vehicles.*	*Understand*
CO2:	*Explain the different types of earth moving machines and explain the different sub systems.*	*Understand*
CO3:	*Describe the specifications, functions, merits and demerits of different types and subsystems of scrappers, graders and ditchers.*	*Understand*
CO4:	*Discuss the construction and working principle of farm equipment, military and combat vehicles.*	*Understand*
CO5:	*Explain the vehicle systems and features.*	*Understand*

UNIT - I CLASSIFICATION AND REQUIREMENTS OF OFF ROAD VEHICLES [09]

Construction layout, capacity and applications. Power Plants, Chassis and Transmission, Multi-axle vehicles.

UNIT - II EARTH MOVING MACHINES [09]

Earthmovers like dumpers, loaders - single bucket, Multi bucket and rotary types - bulldozers, excavators, backhoe loaders, scrappers, drag and self powered types, Bush cutters, stumpers, tree dozer, rippers etc. – Power and capacity of earth moving machines.

UNIT - III SCRAPPERS ,GRADERS, SHOVELS AND DITCHERS [09]

Scrappers, elevating graders, motor graders, self powered scrappers and graders, Power shovel, revolving and stripper shovels – drag lines – ditchers – capacity of shovels.

UNIT - IV FARM EQUIPMENT, MILITARY AND COMBAT VEHICLES [09]

Power take off, special implements. Special features and constructional details of tankers, gun carriers and transport vehicles.

UNIT - V VEHICLE SYSTEMS AND FEATURES [09]

Brake system and actuation – OCDB and dry disc caliper brakes. Body hoist and bucket operational hydraulics. Hydro-pneumatic suspension cylinders. Power steering system. Kinematics for loader and bulldozer operational linkages. Safety features, safe warning system for dumper.

Total = 45 Periods

Text Books :

1 Robert L. Peurifoy, Clifford J. Schexnayder, Construction, planning, equipment and methods, Tata McGraw HillPublishing company Ltd, New Delhi, Ninth Edition, 2018.

2 Nakra C.P., Farm machines and equipment, Dhanparai Publishing company, New Delhi, First Edition, 2003.

Reference Books :

1 Wong.J.Y., Theory of Ground Vehicles, John Wiley & Sons, New York, Fifth Edition, 2022.

2 Ageikin S., Off the road wheeled and combined traction devices – Ashgate Publishing Co. Ltd., New Delhi, First Edition,1988

3 Heinz Heisler, Vehicle and Engine Technology, , SAE International, New York, Second Edition, 1999

4 Sean Bennet and Ian Andrew Norman, Heavy Duty Truck systems, Delmar Cengage learning, New York, Fifth Edition, 2011.

K.S.R. COLLEGE OF ENGINEERING, TIRUCHENGODE – 637215
DEPARTMENT OF AUTOMOBILE ENGINEERING
CO-PO MAPPING

Regulation: R 2020

Course Code: 20AU906 **Course Name: Off Highway Vehicles**

CO	Course Outcomes	Programme Outcomes													
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	*Describe the construction and requirement of off road vehicles.*	3	3	2	-	-	-	3	3	-	-	-	-	-	-
CO2	*Explain the different types of earth moving machines and explain the different sub systems.*	3	3	2	-	-	-	3	-	-	-	-	-	-	-
CO3	*Describe the specifications, functions, merits and demerits of different types and subsystems of scrappers, graders and ditchers.*	3	3	3	-	-	-	3	3	-	-	-	-	-	-
CO4	*Discuss the construction and working principle of farm equipment, military and combat vehicles.*	3	3	2	-	-	-	3	3	-	-	-	-	-	-
CO5	*Explain the vehicle systems and features.*	3	2	2	-	-	-	3	-	-	-	-	-	-	-
	Average	**3**	**3**	**2**	**-**	**-**	**-**	**3**	**3**	**-**	**-**	**-**	**-**	**-**	**-**

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

	K.S.R. COLLEGE OF ENGINEERING (Autonomous)				R 2020
20AU907	**MODERN AND INTELLIGENT VEHICLE SYSTEM** (Open Elective)	L	T	P	C
		3	0	0	3

Prerequisite: -

Course Outcomes : On successful completion of the course, the student will be able to		***Cognitive Level***
CO1:	*Identify the various systems involved in driver support systems and their working principle.*	*Understand*
CO2:	*Familiarize with global positioning systems, geographical information systems and navigation systems.*	*Understand*
CO3:	*Comprehend the constructional and working features of safety systems and security systems.*	*Understand*
CO4:	*Recognize about the various comfort systems.*	*Understand*
CO5:	*Explain the various adaptive control systems.*	*Understand*

UNIT - I DRIVER ASSISTANCE SYSYTEMS [09]

Introduction, driver support systems – driver information, driver perception, driver convenience, driver monitoring. Vehicle support systems – general vehicle control, vehicle status monitoring and automated highway systems.

UNIT - II TELEMATICS [09]

Global positioning systems, geographical information systems, navigation systems, automotive vision system, road recognition and application of Internet of Things (IoT) in automotive industry.

UNIT - III SAFETY SYSTEMS AND SECURITY SYSTEMS [09]

Airbags, seat belt tightening system, collision avoidance and warning systems, child lock, antilock braking systems, Anti-theft technologies, smart card system and number plate coding.

UNIT - IV COMFORT SYSTEMS [09]

Active suspension systems, requirement and characteristics, different types, power steering, collapsible and tiltable steering column and power windows.

UNIT - V ADAPTIVE CONTROL SYSTEMS [09]

Adaptive cruise control, adaptive noise control, anti spin regulation, traction control systems and cylinder cut off technology and autonomous driving.

Total = 45 Periods

Text Books :

1 LjuboVlacic, Michel Parent and Fumio Harashima, Intelligent Vehicle Technologies, Butterworth-Heinemann publications, Oxford, First Edition, 2001.

2 Ronald K Jurgen, Navigation and Intelligent Transportation Systems – Progress in Technology, Automotive Electronics Series, SAE, New York, First Edition, 1998.

Reference Books :

1 Richard Bishop, Intelligent Vehicle Technology and Trends, Artech House, London, First Edition, 2005.

2 William B Ribbens, Understanding Automotive Electronics, Butterworth-Heinemann, Woburn, Eighth edition, 2017.

3 Robert Bosch, Automotive Handbook, Bently Publishers, Cambridge, Tenth Edition, 2018.

4 Robert Bosch, Bosch Automotive Electrics and Automotive Electronics, Springer Vieweg Wiesbaden, Switzerland, Fifth Edition, 2013.

K.S.R. COLLEGE OF ENGINEERING, TIRUCHENGODE – 637215
DEPARTMENT OF AUTOMOBILE ENGINEERING
CO-PO MAPPING

Regulation: R 2020

Course Code: 20AU907 **Course Name: Modern and Intelligent Vehicle System**

CO	Course Outcomes	Programme Outcomes													
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	*Identify the various systems involved in driver support systems and their working principle.*	3	3	3	-	-	-	-	-	-	-	-	3	-	-
CO2	*Familiarize with global positioning systems, geographical information systems and navigation systems.*	3	3	3	-	-	-	-	-	-	-	-	3	-	-
CO3	*Comprehend the constructional and working features of safety systems and security systems*	3	3	3	-	-	-	-	-	-	-	-	3	-	-
CO4	*Recognize about the various comfort systems.*	3	3	3	-	-	-	-	-	-	-	-	3	-	-
CO5	*Explain the various adaptive control systems.*	3	3	3	-	-	-	-	-	-	-	-	3	-	-
	Average	**3**	**3**	**3**	**-**	-	-	-	-	-	**-**	**-**	**3**	**-**	**-**

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

K.S.R. COLLEGE OF ENGINEERING (Autonomous) **R 2020**

20AU908	**VEHICLE MAINTENANCE** (Open Elective)	L	T	P	C
		3	0	0	3

Prerequisite: -

Course Outcomes : On successful completion of the course, the student will be able to		***Cognitive Level***
CO1:	*Describe the importance, types and requirements of vehicle maintenance and related records and schedules.*	*Understand*
CO2:	*Practice the engine overhauling, reconditioning; methods, procedures, tools of power plants, ignition system, cooling system and other engine components.*	*Understand*
CO3:	*Demonstrate the maintenance procedures of clutch, gear box, propeller shaft and steering systems.*	*Understand*
CO4:	*Demonstrate the construction, testing, fault diagnosis and maintenance of body panel and body tinkering.*	*Understand*
CO5:	*Describe the maintenance procedures of electrical systems. .*	*Understand*

UNIT - I MAINTENANCE TOOL, SHOP, SCHEDULE, RECORDS [09]

Standard tool set, torque wrenches, compression and vacuum gauges, engine analyzer and scanner, computerized wheel alignment and balancing, gauges for engine tune up and pollution measurement, spark plug cleaner, cylinder re-boring machine, fuel injection calibration machine. Importance of maintenance. Schedule and unscheduled maintenance.
Scope of maintenance. Equipment downtime. Vehicle inspection. Reports. Log books. Trip sheet. Lay out and requirements of maintenance shop.

UNIT - II ENGINE REPAIR AND OVERHAULING [09]

Dismantling of engine and its components. Cleaning methods. Inspection and checking. Repair and reconditioning methods for all engine components. Maintenance of ignition system, fuel injection system, cooling system – lubrication system. Engine trouble shooting chart.

UNIT - III MAINTENANCE, REPAIR AND OVERHAULING OF THE CHASSIS [09]

Maintenance, servicing and repair of clutch, fluid coupling, gearbox, torque converter, propeller shaft. Maintenance of front axle, rear axle, brakes, steering systems.

UNIT - IV MAINTENANCE AND REPAIR OF VEHICLE BODY [09]

Body panel tools for repairing. Tinkering and painting. Use of soldering, metalloid paste. Tyre maintenance, metallic ,plastics

UNIT - V MAINTENANCE AND REPAIR OF ELECTRICAL SYSTEMS [09]

Care, maintenance, testing and troubleshooting of battery, starter motor, dynamo, alternator and regulator. Transistorized regulator problems.

Total = 45 Periods

Text Books :

1 John E. Dolce, Analytical Fleet Maintenance Management, SAE International, New York, Third Edition, 2009.

2 James D. Halderman, Advanced Engine Performance Diagnosis, Pearson Education, New Delhi, Seventh Edition, 2019.

Reference Books :

1 Bosch Automotive Handbook, SAE International, New York, Tenth Edition,2018

2 Willam H. Crouse and Donald L. Anglin, Automotive Mechanics, Tata McGraw Hill Publishing Company, New Delhi, Tenth Edition, 2007.

3 Service Manuals from different vehicle manufacturers.

4 Judge. A.N, Motor vehicle engine servicing, Pitman Paper pack, London, Third Edition, 1969.

K.S.R. COLLEGE OF ENGINEERING, TIRUCHENGODE – 637215
DEPARTMENT OF AUTOMOBILE ENGINEERING
CO-PO MAPPING

Regulation: R 2020

Course Code: 20AU908 **Course Name: Vehicle Maintenance**

CO	Course Outcomes	Programme Outcomes													
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	*Describe the importance, types and requirements of vehicle maintenance and related records and schedules.*	3	3	2	-	-	-	-	-	-	-	-	3	-	-
CO2	*Practice the engine overhauling, reconditioning; methods, procedures, tools of power plants, ignition system, cooling system and other engine components.*	3	3	2	-	-	-	-	-	-	-	-	3	-	-
CO3	*Demonstrate the maintenance procedures of clutch, gear box, propeller shaft and steering systems.*	3	3	2	-	-	-	-	-	-	-	-	3	-	-
CO4	*Demonstrate the construction, testing, fault diagnosis and maintenance of body panel and body tinkering.*	3	3	2	-	-	-	-	-	-	-	-	3	-	-
CO5	*Describe the maintenance procedures of electrical systems.*	3	3	2	-	-	-	-	-	-	-	-	3	-	-
	Average	**3**	**3**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**3**	**-**	**-**

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

K.S.R. COLLEGE OF ENGINEERING (Autonomous) **R 2020**

20CE901 **ARCHITECTURAL HERITAGE OF INDIA** (Open Elective)

L	T	P	C
3	0	0	3

Prerequisite: *No prerequisites are needed for enrolling into the course*

Course Outcomes : On successful completion of the course, the student will be able to		***Cognitive Level***
CO1:	*Illustrate various materials used and construction style of Indus Valley Civilization*	*Understand*
CO2:	*Demonstrate the materials used and construction style of Chera, Chola and Pandya architecture*	*Understand*
CO3:	*Describe the materials used and construction style of Mughal architecture*	*Understand*
CO4:	*Explain the various materials and construction style of British* architecture	*Understand*
CO5:	*Describe various materials and construction style of Portuguese, Dutch, French and Danish*	*Understand*

UNIT - I INDUS VALLEY CIVILIZATION [09]

Indus valley civilization – Chronological introduction – Construction style – Materials used – The cities Harappa, lothal and Mohenjo-Daro, The great bath – The granary at Harappa – The assembly hall – Ajanta-Ellora Cave temples – Mahabodhi temple complex

UNIT - II SOUTH INDIAN ARCHITECTURE [09]

Chera-Chola-Pandya architecture – Chronological introduction – Construction style – Materials used – Brihadeeswarar Temple – Meenakshi Temple – Kalinga – Chalukya – Pallava architecture – Mahabalipuram stone temples – Khajuraho – MuskinBhanvi – Konark Sun Temple – Hoysala – Vijayanagara architecture – twin temples Mosale – Virupaksha temple Raya Gopura at Hampi

UNIT - III MUGHAL ARCHITECTURE [09]

Mughal architecture – Chronological introduction – Construction style – Materials used – QutubMinar – TajMahal – Humayun's Tomb – Redfort – Fatehpur Sikri – Agra fort – Jama Masjid – Rajput civil architecture – Chronological introduction – Construction style – Materials used – All hill forts of Rajasthan

UNIT - IV BRITISH ARCHITECTURE [09]

British colonial architecture – Chronological introduction – Construction style – Materials used – Buildings in Chennai, Mumbai, Shimla – Churches – Mountain railways of India-bridges.

UNIT - V COLONIAL ARCHITECTURE [09]

Other colonial architecture – Portuguese-Dutch-French-Danish – Chronological introduction – Construction style – Materials used – Churches – Churches and Convents of Goa and Cochi – French town of Puducherry – Tranquebar fort – Bungalow on the beach

Total (L= 45, T = 0) = 45 Periods

Text Books :

1 Bindia Thapar, Surat Kumar Manto, and Suparna Bhalla., Introduction to Indian Architecture: Arts of Asia, Periplus Editions (HK) ltd, Hong Kong, First Edition, 2005

2 Sandhya Ketkar., The History of Indian Art, Jyotsna Prakashan Publisher, Maharashtra, E – Edition, 2020

Reference Books :

1 Christopher Tadgell., The History of Architecture in India, Phaidon Press Ltd, New York, First Edition, 1990

2 Mark M. Jarzombek, Vikramaditya Prakash, Francis D. K. Ching., A Global History of Architecture, John Wiley & Sons, Hoboken, Second Edition, 2010

3 https://nptel.ac.in/courses/124106009

4 https://ncert.nic.in/textbook/pdf/kefa106.pdf

K.S.R. COLLEGE OF ENGINEERING, TIRUCHENGODE – 637215
DEPARTMENT OF CIVIL ENGINEERING
CO-PO MAPPING

Regulation: **R 2020**

Course Code: **20CE901** **Course Name:** **Architectural Heritage of India**

CO	Course Outcomes	Programme Outcomes													
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	*Illustrate various materials used and construction style of Indus Valley Civilization*	3	3	-	2	-	2	2	-	-	-	-	3	-	-
CO2	*Demonstrate the materials used and construction style of Chera, Chola and Pandya architecture*	3	3	-	2	-	2	2	-	-	-	-	3	-	-
CO3	*Describe the materials used and construction style of Mughal architecture*	3	3	-	1	-	2	2	-	-	-	-	3	-	-
CO4	*Explain the various materials and construction style of British* architecture	3	3	-	2	-	2	2	-	-	-	-	3	-	-
CO5	*Describe various materials and construction style of* Portuguese, Dutch, French and Danish	3	3	-	1	-	2	2	-	-	-	-	3	-	-
	Average	**3**	**3**	**-**	**2**	**-**	**2**	**2**	**-**	**-**	**-**	-	**3**	-	-

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

K.S.R. COLLEGE OF ENGINEERING (Autonomous) **R 2020**

		L	T	P	C
20CE902	**BUILDING PLANNING AND CONSTRUCTION** (Open Elective)	3	0	0	3

Prerequisite: *No prerequisites are needed for enrolling into the course*

Course Outcomes : On successful completion of the course, the student will be able to		***Cognitive Level***
CO1:	*Outline the factors to be considered in planning and construction of buildings*	*Understand*
CO2:	*Infer the different components and Foundations of building in their construction practices.*	*Understand*
CO3:	*Interpret masonry and* alternative *materials of wood, aluminum and glass.*	*Understand*
CO4:	*Discuss different types of floors, roofs and the materials which are commonly used for construction.*	*Understand*
CO5:	*Explain about dampness and fire resistance in buildings*	*Understand*

UNIT - I **FUNCTIONAL PLANNING OF BUILDINGS** **[09]**

Types of Buildings, Aspects and Principles of Building Planning, Building By - laws and Regulations, Site Selection criteria, Orientation of Building and its relation to surrounding environment, Sustainability and Green Buildings - Building Bye - laws and Building code of India 2016.

UNIT - II **BUILDING COMPONENTS AND FOUNDATIONS** **[09]**

Lintels, arches, different types of floors-concrete, mosaic, terrazzo floors, pitched, flat and curved roofs, lean-to roof, coupled roofs, trussed roofs, king and queen post trusses; RCC roofs, madras terrace/shell roofs. Foundations: Shallow foundations, spread, combined, strap and mat footings.

UNIT - III **ALTERNATIVE MATERIALS AND MASONRY** **[09]**

Structure, properties, seasoning of timber; Classification of various types of woods used in buildings, defects in timber; Alternative materials for wood, galvanized iron, fibre-reinforced plastics, steel, aluminium and glass; Types of masonry, English and Flemish bonds, rubble and ashlars masonry, cavity and partition walls - Light weight concrete blocks – merits and demerits.

UNIT - IV **FLOORS,ROOFS AND STAIRCASES** **[09]**

Components of a floor, materials used for floor construction, Different types of flooring, Ground floor and upper floors, Types of roofs, Basic roofing elements and Roof coverings. Functional requirements of a good stair, type of stairs, planning a stair case.

UNIT - V **DAMP PROOFING AND FIRE PROTECTION** **[09]**

Damp proofing and Fire protection: Causes and effect of dampness on buildings, Materials and methods used for damp proofing, Fire hazards, Grading of buildings according to fire resistance, Fire resisting properties of common building materials, Fire resistant construction.

Total (L= 45, T = 0) = 45 Periods

Text Books :

1 Varghese P. C., Building construction, PHI Learning Pvt. Ltd, New Delhi ,Second Edition, 2016.

2 B. C. Punmia , Ashok Kumar Jain, Arun Kumar Jain, Building Construction, Laxmi Publications, New Delhi ,Eleventh Edition,2019.

Reference Books :

1 S. K. Duggal, Building Materials II, New Age International (P) Limited, New Delhi ,Fourth Edition, 2016,

2 Bulding Bye-laws 2019

3 National Building Code of India, 2016.

4 www.nptel.ac.in/courses/105101088/2 home.htm

K.S.R. COLLEGE OF ENGINEERING, TIRUCHENGODE – 637215
DEPARTMENT OF CIVIL ENGINEERING
CO-PO MAPPING

Regulation: R 2020

Course Code: 20CE902 **Course Name: Building Planning and Construction**

CO	Course Outcomes	Programme Outcomes													
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	*Outline the factors to be considered in planning and construction of buildings*	3	2	1	1	-	3	2	-	-	-	-	2	-	-
CO2	*Infer the different components and Foundations of building in their construction practices.*	3	2	-	2	-	2	3	-	-	-	-	2	-	-
CO3	*Interpret masonry and* alternative *materials of wood, aluminum and glass.*	2	-	-	2	-	3	2	-	-	-	-	2	-	-
CO4	*Discuss different types of floors, roofs and the materials which are commonly used for construction.*	3	2	-	2	-	3	2	-	-	-	-	2	-	-
CO5	*Explain about dampness and fire resistance in buildings*	3	2	-	2	-	3	3	-	-	-	-	2	-	-
	Average	**3**	**2**	**1**	**2**	**1**	**3**	**3**	**-**	-	-	**-**	**2**	-	-

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

K.S.R. COLLEGE OF ENGINEERING (Autonomous) **R 2020**

20CE903 **ELEMENTARY CIVIL ENGINEERING** (Open Elective)

L	T	P	C
3	0	0	3

Prerequisite: *No prerequisites are needed for enrolling into the course*

Course Outcomes : On successful completion of the course, the student will be able to	***Cognitive Level***
CO1: Provide an overview of civil engineering	*Understand*
CO2: Explain the basics of surveying , modern tools of surveying and mapping	*Understand*
CO3: Summarize the fundamentals of building materials in civil engineering	*Understand*
CO4: Explain the components of building structures.	*Understand*
CO5: Interpret various infrastructures of civil engineering in construction	*Understand*

UNIT - I OVERVIEW OF CIVIL ENGINEERING **[09]**

History of Civil Engineering - Role and Functions of Civil Engineer - Fields of Civil Engineering - Importance of Civil Engineering

UNIT - II BASICS OF SURVEYING **[09]**

Introduction - Basic Definitions (Surveying, leveling, Plans, Maps, Scales) - Introduction to divisions of surveying - Classification of surveying - Fundamental principles of surveying - Measurement in Surveying - Phases of Surveying

MODERN TOOLS OF SURVEYING AND MAPPING:

Introduction to Global Positioning System - Remote Sensing and Geographic Information System

UNIT - III FUNDAMENTALS OF BUILDING MATERIALS **[09]**

Bricks – stones – sand – M-sand - cement – fly ash - silica fume - mortar- concrete – steel – glass - wood –plastics – ceramics

UNIT - IV COMPONENTS OF BUILDING **[09]**

Foundations – stone masonry – brick masonry – beams – columns – lintels – roofing – flooring – plastering- damp proofing weathering course

UNIT - V STRUCTURES **[09]**

Introduction to dams, weirs, barrages and check dams - Role of transportation in national development - Modes of transportation - Introduction to road traffic and traffic control - Introduction to mass transportation system

Total (L= 45, T = 0) = 45 Periods

Text Books :

1 Anurag Kandya, Elements of Civil Engineering, Charotar Publishing House Pvt. Ltd, Gujarat, Third Edition, 2017.

2 Palanichamy M.S., Basic Civil Engineering, Tata McGraw-Hill, New Delhi, Fourth Edition, 2011.

Reference Books :

1 Poonam Sharma & Swati Rajput, Sustainable Smart Cities in India – Challenges and Future Perspectives, Springer, First Edition, 2017.

2 Dr.B.C.Punamia, Surveying, Laxmi Publication, New Delhi, Seventh Edition, 2016.

3 https://nptel.ac.in/courses/105102088

4 https://byjusexamprep.com/civil-engineering-exams/building-materials

K.S.R. COLLEGE OF ENGINEERING, TIRUCHENGODE – 637215
DEPARTMENT OF CIVIL ENGINEERING
CO-PO MAPPING

Regulation: R 2020

Course Code: 20CE903 **Course Name: Elementary Civil Engineering**

CO	Course Outcomes	Programme Outcomes													
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	*Provide an overview of civil engineering*	1	-	-	-	-	1	-	-	-	-	-	1	-	-
CO2	*Explain the basics of surveying and modern tools of surveying and mapping*	2	1	-	-	-	2	-	-	-	-	-	1	-	-
CO3	*Summarize the fundamentals of building materials in civil engineering*	2	1	-	-	-	2	2	-	-	-	-	1	-	-
CO4	*Explain the components of building structures.*	2	1	-	-	-	2	-	-	-	-	-	1	-	-
CO5	*Interpret various infrastructures of civil engineering in construction*	3	2	1	-	-	3	2	-	-	-	-	1	-	-
	Average	**3**	**2**	**1**	**-**	**-**	**3**	**2**	**-**	**-**	**-**	**-**	**1**	**-**	-

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

K.S.R. COLLEGE OF ENGINEERING (Autonomous) **R 2020**

		L	T	P	C
20CE904	**ENERGY AND ENVIRONMENT** (Open Elective)	3	0	0	3

Prerequisite: *No prerequisites are needed for enrolling into the course*

Course Outcomes : On successful completion of the course, the student will be able to		***Cognitive Level***
CO1:	*Outline the earth's energy, environment and the processes leading to climate change.*	*Understand*
CO2:	*Infer the atmospheric issues related to the chemistry, greenhouse gases*	*Understand*
CO3:	*Summarize the role of the terrestrial energy-environment-climate system*	*Understand*
CO4:	*Interpret the Possible effects of Global Warming and climate change.*	*Understand*
CO5:	*Outline the Natural and Anthropogenic and Green House Gas theory*	*Understand*

UNIT - I **INTRODUCTION** **[09]**

Overview on the Earth's energy requirements-Climate Change-Origins of the terrestrial atmosphere-Earth's early atmosphere- Introduction to Climate-Layers of the atmosphere.

UNIT - II **GLOBAL ATMOSPHERIC ISSUES** **[09]**

Composition of the present day atmosphere-Introduction to Atmospheric chemistry-Green House Gases, and the O3 - depletion problem-Post Industrial Revolution Scenario

UNIT - III **ENERGY BALANCE** **[09]**

Earth Atmosphere System- Solar and Terrestrial Radiation- Absorption of Radiation by gases.-Energy balance- Solar variability and the Earth's Energy Balance.

UNIT - IV **ATMOSPHERIC CHEMISTRY AND CLIMATE** **[09]**

The Global Temperature Record.-Possible effects of Global Warming. – Indian Context. Atmospheric Chemistry and Climate Change- Atmospheric Aerosol and Cloud Effects on Climate.

UNIT - V **ENVIRONMENTAL VARIABILITY** **[09]**

Natural (volcanoes, forest fires) and Anthropogenic (Antarctic Ozone Hole, Global Warming).-Green House Gas theory.- Effects of urbanization- Landscape changes-Influence of Irrigation-Desertification and Deforestation

Total (L= 40, T = 5) = 45 Periods

Text Books :

1 Peter E Hodgson, Energy the Environment and Climate Change, Imperial College Press, London, First Edition, 2010
2. Ahluwalia V K, Energy and Environment, The Energy and Resources Institute, New Delhi, First Edition, 2019

Reference Books :

1 Richard Wolfson, Energy, Environment, and Climate, Publisher: W. W. Norton & Company, New York Edition,2011
2 Saeed Moaveni ,Energy, Environment, and Sustainability with Mind Tap, Cengage India Private Limited ,New Delhi, First Edition,2017
3 Wilbanks, T., Bilello D, Schmalzer D, Scott, Climate Change and Energy Supply and Use: Technical Report for the U.S. Department of Energy in Support of the National Climate Assessment., Island Press,Washington,2013
4 Frank T. Princiotta, Global Climate Change - The Technology Challenge, Springer Publisher, New York, First Edition, 2011

K.S.R. COLLEGE OF ENGINEERING, TIRUCHENGODE – 637215
DEPARTMENT OF CIVIL ENGINEERING
CO-PO MAPPING

Regulation: R 2020

Course Code: 20CE904 **Course Name: Energy and Environment**

CO	Course Outcomes	Programme Outcomes													
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	*Outline The Earth's Energy, Environment and the processes leading to climate change.*	3	3	-	-	-	2	2	-	-	-	-	2	-	-
CO2	*Infer the Atmospheric issues related to the chemistry, Green House Gases*	3	3	-	-	-	2	2	-	-	-	-	2	-	-
CO3	*Summarize the role of the Terrestrial Energy-Environment-Climate System*	3	3	-	-	-	2	2	-	-	-	-	2	-	-
CO4	*Interpret the* Possible effects of Global Warming and climate change.	3	3	-	-	-	2	2	-	-	-	-	2	-	-
CO5	*Outline the* Natural and Anthropogenic and Green House Gas theory	3	3	-	-	-	2	2	-	-	-	-	2	-	-
	Average	**3**	**3**	**-**	-	**-**	**2**	**2**	**-**	-	-	**-**	**2**	**-**	-

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

K.S.R. COLLEGE OF ENGINEERING (Autonomous) **R 2020**

20CE905	**ENVIRONMENTAL LAWS AND POLICIES** (Open Elective)	L	T	P	C
		3	0	0	3

Prerequisite: *No prerequisites are needed for enrolling into the course*

Course Outcomes : On successful completion of the course, the student will be able to		***Cognitive Level***
CO1:	*Summarize the basic concepts in environmental laws and its judicial activism*	*Understand*
CO2:	*Interpret different water acts and marine laws in India*	*Understand*
CO3:	*Summarize various Environment protection laws and acts in the framework of Mega projects*	*Understand*
CO4:	*Explain the management and handling of various hazardous waste management*	*Understand*
CO5:	*Summarize the International Environmental laws framed at various conferences.*	*Understand*

UNIT - I **BASIC CONCEPTS IN ENVIRONMENTAL LAW** **[09]**

An introduction to the legal system – Constitution – Acts – Rules – Regulations - Indian Judiciary - Doctrine of precedents - judicial review - Writ petitions - PIL– liberalization of the rule of locus standi - Judicial activism - Introduction to environmental laws in India - Constitutional provisions - Stockholm conference - Bhopal gas tragedy - Rio conference - General principles in Environmental law - Precautionary principle - Polluter pays principle - Sustainable development- Public trust doctrine - Overview of legislations and basic concepts.

UNIT - II **AIR- WATER - MARINE LAWS** **[09]**

National Water Policy and some state policies - Laws relating to prevention of pollution, access and management of water and institutional mechanism - Water Act, 1974 - Water Cess Act, 1977 - EPA, 1986 - Pollution Control Boards Ground water and law Judicial remedies and procedures Marine laws of India - Coastal zone regulations - Legal framework on Air pollution - Air Act,1981 - EPA, 1986

UNIT - III **ENVIRONMENT PROTECTION LAWS - LARGE PROJECTS** **[09]**

Legal framework on environment protection - Environment Protection Act as the framework legislation - strength and weaknesses of EIA - National Green tribunal the courts infrastructure projects

UNIT - IV **HAZARDOUS SUBSTANCES AND ACTIVITIES** **[09]**

Legal framework - EPA and rules made there under PLI Act, 199 - Principles of strict and absolute liability - Hazardous Wastes (Management, Handling and Transboundary) Rules, 2008 - Biomedical Waste (Management and Handling) Rules, 1998 - Municipal Solid Wastes (Management and Handling) Rules, 2000 - E - Waste (Management and Handling) Rules, 2011 - Batteries (Management & Handling) Rules, 2001

UNIT - V **INTERNATIONAL ENVIRONMENTAL LAW** **[09]**

Development of international environmental law, nature and scope of key international environmental law principles and rights (substantive and procedural), Establishment of Environmental Institutions like UNEP, Ozone Protection – Montreal Protocol for the Protection of Ozone Layer, 1987 as amended; U.N. Convention on Climate Change1992, Kyoto Protocol, 1997; Public Participation in Decision-making and Access to Justice in Environmental Matters, 1998 (Aarhus Convention); Johannesburg Conference, 2002.

Total (L= 45, T = 0) = 45 Periods

Text Books :

1 Divan,S and Rosencranz, A., Environmental Law and Policy in India, Oxford India Paperbacks, New Delhi, Second edition, 2005.

2 Kanchan Chopra., Development and Environmental Policy in India: The Last Few Decades, Springer Publication, New Delhi, First edition, 2017.

Reference Books :

1 Birnie, P Boyle, and Red well's., International Law and the Environment ,Oxford University Press, United Kingdom, Fourth edition,2021.

2 Upadhyay S. and Upadhyay V., Hand Book on Environmental Law- Forest Laws, Wildlife Laws and the Environment; Vols. I, II and III, Lexis Nexis Butterworths , New Delhi ,India, First Edition , 2001.

3 Leelakrishnan,P., Environmental Law Case Book, Lexis Nexis, India, Sixth Edition, 2021.

4 Sands, P., Principles of International Environmental Law, Cambridge University press, United Kingdom, Second Edition, 2002.

K.S.R. COLLEGE OF ENGINEERING, TIRUCHENGODE – 637215
DEPARTMENT OF CIVIL ENGINEERING
CO-PO MAPPING

Regulation: R 2020

Course Code: 20CE905 **Course Name: Environmental Laws and Policies**

CO	Course Outcomes	Programme Outcomes													
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	*Summarize the basic concepts in Environmental laws and its judicial activism*	3	2	2	-	-	2	-	-	-	-	2	3	-	-
CO2	*Interpret different water acts and marine laws in India*	3	2	2	-	-	-	-	-	-	-	-	3	-	-
CO3	*Summarize Various Environment protection laws and acts in the framework of Mega projects*	3	2	3	-	-	2	-	-	-	-	2	3	-	-
CO4	*Explain the management and Handling of various hazardous waste management*	3	2	3	1	-	3	1	-	-	-	2	3	-	-
CO5	*Summarize the International Environmental laws framed at various conferences.*	3	2	3	2	-	3	-	-	-	-	2	3	-	-
	Average	**3**	**2**	**3**	**3**	**-**	**3**	**1**	**-**	**-**	**-**	**2**	**3**	-	-

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

K.S.R. COLLEGE OF ENGINEERING (Autonomous) **R 2020**

		L	T	P	C
20CE906	**GLOBAL WARMING AND CLIMATE CHANGE** (Open Elective)	3	0	0	3

Prerequisite: *No prerequisites are needed for enrolling into the course*

Course Outcomes : On successful completion of the course, the student will be able to		***Cognitive Level***
CO1:	*Outline the concept of the causes and effects of global warming*	*Understand*
CO2:	*Summarize about physical and chemical characteristics of atmosphere*	*Understand*
CO3:	*Identify the causes and effects of climate change*	*Remember*
CO4:	*Infer the agreements took place among the countries regarding climate change*	*Understand*
CO5:	*Summarize skills about the concept of mitigation measures against climate change*	*Understand*

UNIT - I **EARTH'S CLIMATE SYSTEM** **[09]**

Role of ozone in environment – Ozone layer – Ozone depleting gases – Greenhouse gases and its sources - Green House Effect, Radiative Effects of Greenhouse Gases -The Hydrological Cycle – Green House Gases and Global Warming – Effects and causes of Global Warming, Carbon Cycle.

UNIT - II **ATMOSPHERE AND ITS COMPONENTS** **[09]**

Importance of Atmosphere – Physical Chemical Characteristics of Atmosphere - Vertical structure of the atmosphere - Composition of the atmosphere - Atmospheric stability -Temperature profile of the atmosphere - Lapse rates-Temperature inversion - effects of inversion on pollution dispersion.

UNIT - III **IMPACTS OF CLIMATE CHANGE** **[09]**

Causes of Climate change – Change of Temperature in the environment - Melting of ice Pole-sea level rise - Impacts of Climate Change on various sectors – Agriculture, Forestry and Ecosystem – Water Resources – Human Health – Industry, Settlement and Society – Methods and Scenarios – Projected Impacts for Different Regions – Uncertainties in the Projected Impacts of Climate Change – Risk of Irreversible Changes.

UNIT - IV **OBSERVED CHANGES AND ITS CAUSES** **[09]**

Climate change and Carbon credits – CDM- Initiatives in India - Kyoto Protocol - Intergovernmental Panel on Climate change - Climate Sensitivity and Feedbacks – The Montreal Protocol – UNFCCC – IPCC – Evidences of Changes in Climate and Environment – on a Global Scale and in India .

UNIT - V **CLIMATE CHANGE AND MITIGATION MEASURES** **[09]**

Clean Development Mechanism – Carbon Trading – Examples of future Clean Technology – Biodiesel – Natural Compost – Eco- Friendly Plastic – Alternate Energy – Hydrogen – Bio-fuels – Solar Energy – Wind – Hydroelectric Power – Mitigation Efforts in India and Adaptation funding - Key Mitigation Technologies and Practices – Energy Supply – Transport – Buildings – Industry – Agriculture – Forestry - Carbon sequestration – Carbon capture and storage (CCS) - Waste(MSW & Bio waste, Biomedical, Industrial waste – International and Regional cooperation.

Total (L= 40, T = 5) = 45 Periods

Text Books :

1 Kandarp Tarkeshprasad Vaishnav., Climate Change Solutions, Global Warming Solutions & Innovative Ideas For Construction of World Development, Notion Press, Chennai, First Edition, 2018

2 Vivian Moritz., Climate Change and Global Warming, Syrawood Publishing House, New York, First Edition, 2017

Reference Books :

1 Marie Antonette and Chloe Marechal., Climate Change Past, Present & Future, Wiley-Blackwell, New Jersey, First Edition, 2015.

2 Empereur Raymond., Global Warming and Climate Change, Litfire Publishing, Atlanta, First Edition, 2017.

3 Agarwal S.K., Global Warming and Climate Change Past, Present & Future, Ashish Publishing House, New Delhi, First Edition, 2004.

4 https://onlinecourses.swayam2.ac.in/arp19_ap55/preview

K.S.R. COLLEGE OF ENGINEERING, TIRUCHENGODE – 637215
DEPARTMENT OF CIVIL ENGINEERING
CO-PO MAPPING

Regulation: R 2020

Course Code: 20CE906 **Course Name: Global Warming and Climate Change**

CO	Course Outcomes	Programme Outcomes													
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	*Outline the concept of the causes and effects of global warming*	3	2	2	-		3	2	-	-	-	-	2	-	-
CO2	*Summarize about physical and chemical characteristics of atmosphere*	3	2	-	-	-	3	3	-	-	-	2	2	-	-
CO3	*Identify the causes and effects of climate change*	3	-	-	2	-	3	2	-	-	-	2	3	-	-
CO4	*Infer the agreements took place among the countries regarding climate change*	3	2	-	2	-	3	2	-	2	-	-	2	-	-
CO5	*Summarize skills about the concept of mitigation measures against climate change*	3	2	-	-	-	3	3	-	3	-	2	3	-	-
	Average	**3**	**2**	**2**	**2**	**2**	**3**	**3**	**-**	**3**	-	**2**	**3**	-	-

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

K.S.R. COLLEGE OF ENGINEERING (Autonomous) **R 2020**

		L	T	P	C
20CE907	**INTRODUTION TO DISASTER MANAGEMENT AND MITIGATION** (Open Elective)	3	0	0	3

Prerequisite: Nil

Course Outcomes : On successful completion of the course, the student will be able to		***Cognitive Level***
CO1:	*Explain the concepts of disaster and its effect in Indian scenario.*	*Understand*
CO2:	*Elaborate the difference between natural and manmade disasters.*	*Understand*
CO3:	*Outline the disaster management cycle and its operation.*	*Understand*
CO4:	*Outline the disaster management in India and its profile.*	*Understand*
CO5:	*Propose the application of geo-informatics for disaster management and mitigation.*	*Apply*

UNIT - I INTRODUCTION TO DISASTER [09]

Definition of Disaster, hazard, global and Indian scenario, general perspective, importance of study in human life, Direct and indirect effects of disasters, long term effects of disasters. Introduction to global warming and climate change.

UNIT - II NATURAL DISASTER AND MANMADE DISASTERS [09]

Natural Disaster: Meaning and nature of natural disaster, Flood, Flash flood, drought, cloud burst, Earthquake, Landslides, Avalanches, Volcanic eruptions, Mudflow, Cyclone, Storm, Storm Surge, climate change, global warming, sea level rise, ozone depletion.

Manmade Disasters: Chemical, Industrial, Nuclear and Fire Hazards. Role of growing population and subsequent industrialization, urbanization and changing lifestyle of human beings in frequent occurrences of manmade disasters.

UNIT - III DISASTER MANAGEMENT CYCLE AND FRAMEWORK [09]

Disaster Management Cycle, Paradigm Shift in Disaster Management Pre-Disaster Risk Assessment and Analysis, Risk Mapping, zonation and Micro zonation, Prevention and Mitigation of Disasters, Early Warning System; Preparedness, Capacity Development, Awareness During Disaster Evacuation, Disaster Communication, Search and Rescue, Emergency Operation Centre, Incident Command System, Relief and Rehabilitation, Damage and Needs Assessment, Restoration of Critical Infrastructure, Early Recovery, Reconstruction and Redevelopment, IDNDR, Yokohama Strategy, Hyogo Framework of Action.

UNIT - IV DISASTER MANAGEMENT IN INDIA DISASTER PROFILE OF INDIA [09]

Mega Disasters of India and Lessons Learnt, Disaster Management Act 2005, Institutional and Financial Mechanism, National Policy on Disaster Management, National Guidelines and Plans on Disaster Management, Role of Government, Non-Government and Inter-Governmental Agencies.

UNIT - V APPLICATIONS OF SCIENCE AND TECHNOLOGY FOR DISASTER MANAGEMENT & MITIGATION [09]

Geo-informatics in Disaster Management, Disaster Communication System, Land Use Planning and Development Regulations, Structural and Non Structural Mitigation of Disasters, S&T Institutions for Disaster Management in India.

Total (L= 45, T = 0) = 45 Periods

Text Books :

1 R B Singh., Disaster Management and Mitigation, World focus Publisher, New Delhi, First Edition, 2016.

2 Satish Modh, Introduction to disaster management, Macmillan publishers India ltd, New Delhi, Second Edition, 2019.

Reference Books :

1 R B Singh., Natural Hazards and Disaster Management: Vulnerability and Mitigation, Rawat Publications, New Delhi, Reprint Edition, 2006.

2 Pardeep Sahni, Disaster Risk Reduction in South Asia, PHI Learning, New Delhi, Fourth Edition, 2018.

3 M. Saravanakumar, Disaster Management, Himalaya Publishing House, Bangalore, First Edition, 2017

4 Singh, Disaster Management: Future Challenges, IK International, New Delhi, First Edition, 2017.

K.S.R. COLLEGE OF ENGINEERING, TIRUCHENGODE – 637215
DEPARTMENT OF CIVIL ENGINEERING
CO-PO MAPPING

Regulation: **R 2020**

Course Code: **20CE907** **Course Name:** **Introduction to Disaster Management and Mitigation**

CO	Course Outcomes	Programme Outcomes													
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1:	*Explain the concepts of disaster and its effect in Indian scenario.*	3	3	1	-	-	2	-	-	-	-	-	3	-	-
CO2:	*Elaborate the difference between natural and manmade disasters.*	3	3	1	-	-	3	-	-	-	-	-	3	-	-
CO3:	*Outline the disaster management cycle and its operation*	3	3		-	-	2	-	-	-	-	-	3	-	-
CO4:	*Outline the disaster management in India and its profile*	3	3	1	-	-	3	-	-	-	-	-	3	-	-
CO5:	*Propose the application of geo-informatics for disaster management and mitigation.*	3	3	3	-	2	3	-	-	-	-	-	3	-	-
	Average	**3**	**3**	**1**	-	**2**	**3**	**-**	**-**	**-**	**-**	**-**	**3**	**-**	-

K.S.R. COLLEGE OF ENGINEERING (Autonomous) **R 2020**

		L	T	P	C
20CE908	**INTRODUCTION TO EARTHQUAKE ENGINEERING** (Open Elective)	3	0	0	3

Prerequisite: *No prerequisites are needed for enrolling into the course*

Course Outcomes : On successful completion of the course, the student will be able to		***Cognitive Level***
CO1:	*Illustrate the causes and effects of earthquake.*	*Understand*
CO2:	*Explain the basic concepts in seismology and correlate to earthquake engineering.*	*Understand*
CO3:	*Summarize the theory of vibrations.*	*Understand*
CO4:	*Outline the design process for earthquake resisting structures*	*Understand*
CO5:	*Predict the performance of building and structures under the earthquake.*	*Understand*

UNIT - I **CAUSES AND EFFECTS OF EARTHQUAKE** **[09]**

Causes of earthquake by natural sources and manmade sources - Earthquake effects on building structure - Liquefaction of soils, effects of liquefaction, methods to reduce liquefaction - Land and rock slides - tsunamis.

UNIT - II **ELEMENTS OF ENGINEERING SEISMOLOGY** **[09]**

Plate tectonics, Elastic rebound, seismic zoning map of India , Focus, epicenter, seismic waves, magnitude, intensity, intensity scale and its correlation with ground acceleration, characteristics of strong ground motions.

UNIT - III **THEORY OF VIBRATIONS** **[09]**

Basic concepts of vibration - Difference between static loading and dynamic loading - Types of vibration - Vibration measuring instruments - Degrees of freedom -Types of Damping.

UNIT - IV **DESIGN METHODOLOGY** **[09]**

Design methodology - Architectural consideration - Geotechnical consideration - Structural design consideration, earthquake design philosophy, importance of ductility - Capacity design - Techniques of aseismic design - Design spectrum.

UNIT - V **PERFORMANCE OF BUILDING AND STRUCTURES** **[09]**

Lessons learnt from the past earthquakes - Shear wall, types of shear wall ,function of shear wall - Concepts of seismic base isolation technique - Base isolation devices - Seismic dampers - Seismic active control.

Total (L= 45, T = 0) = 45 Periods

Text Books :

1 Duggal,S .K., Earthquake Resistant Design of Structures, Oxford University Press, London, Second Edition, 2013.

2 Damodarasamy, S.R. and Kavitha, S., Basics of structural dynamics and Aseismic design, PHI Learning Pvt. Ltd, New Delhi, Fifth Edition, 2006.

Reference Books :

1 Pankaj Agarwal. and Manish Shrikhande., Earthquake Resistant Design of Structures, Prentice Hall of India, New Delhi, Third Edition, 2009.

2 Chopra, Anil. K., Dynamics of Structures -Theory and Applications to Earthquake Engineering, Prentice Hall of India (P), New Delhi, Fifth Edition, 2020.

3 Murty C.V.R .Earthquake tips, IITK, Building material and technology promotion council, New Delhi, First Edition, 2005.

4 http://nptel.ac.in/syllabus/105101004/

K.S.R. COLLEGE OF ENGINEERING, TIRUCHENGODE – 637215
DEPARTMENT OF CIVIL ENGINEERING
CO-PO MAPPING

Regulation: R 2020

Course Code: 20CE908 **Course Name: Introduction to Earthquake Engineering**

CO	Course Outcomes	Programme Outcomes												
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	*Illustrate the causes and effects of earthquake.*	3	2	2	-	-	-	2	-	-	-	-	3	-	-
CO2	*Explain the basic concepts in seismology and correlate to earthquake engineering.*	3	2	2	-	-	-	2	-	-	-	-	3	-	-
CO3	*Summarize the theory of vibrations.*	3	2	3	-	-	-	2	-	-	-		3	-	-
CO4	*Outline the design process for earthquake resisting structures*	3	2	3	2	-	-	2	-	-	-		3	-	-
CO5	*Predict the performance of building and structures under the earthquake.*	3	2	3	2	-	-	2	-	-	-	-	3	-	-
	Average	**3**	**2**	**3**	**2**	**-**	**-**	**2**	**-**	**-**	**-**		**3**	-	-

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

K.S.R. COLLEGE OF ENGINEERING (Autonomous) **R 2020**

		L	T	P	C
20CE909	**SOLID WASTE MANAGEMENT** (Open Elective)	3	0	0	3

Prerequisite: *No prerequisites are needed for enrolling into the course*

Course Outcomes : On successful completion of the course, the student will be able to		***Cognitive Level***
CO1:	*Overview the concept of Solid waste and management.*	*Understand*
CO2:	*Summarize about on-site storage and processing of solid waste.*	*Understand*
CO3:	*Summarize about collection and transportation of waste.*	*Understand*
CO4:	*Summarize about off-Site Processing of solid waste.*	*Understand*
CO5:	*Interpret about safe disposal of solid waste.*	*Understand*

UNIT - I **Solid Waste and its Perspectives** **[09]**

Sources – Types – Composition – Properties – Characteristics – Quantities – Generation rates – Types of Sampling – Functional elements – Legislative measures – 3R concept – Participatory waste management.

UNIT - II **On-Site Storage and Processing** **[09]**

On-site storage methods - materials used for containers –on site segregation of solid wastes -public health & economic aspects of storage - options under Indian conditions - Critical Evaluation of Options.

UNIT - III **Collection and Transfer** **[09]**

Collection services – Classification of container systems – Analysis of collection system – Collection routes – Guidelines – Transfer station –Site selection – Types – Manpower requirement.

UNIT - IV **Off-Site Processing** **[09]**

Processing techniques and Equipment; Resource recovery from solid wastes – composting – Factors affecting composting – Indore and Bangalore processes – Vermicomposting, Incineration, Pyrolysis - options under Indian conditions.

UNIT - V **Disposal** **[09]**

Sanitary landfills – site selection – merits and demerits - methods and operation of sanitary landfills - Leachate collection and control methods – Incinerators - types – hazardous wastes and its effects on environment – case studies.

Total (L= 40, T = 5) = 45 Periods

Text Books :

1 Tchobanoglous, G., Frank Kreith, Hand Book of Solid Waste Management, McGraw-Hill, Inc., California, Second Edition, 2002.

2 Ramachandra, T. V., Management of Municipal Solid Waste, TERI Press, New Delhi, First Edition, 2009

Reference Books :

1 William A. Worrell, P. Aarne Vesilind, Solid Waste Engineering, Cengage Learning Asia Pte Limited, Second Edition, 2012.

2 Rao, M.N., Sultana, Razia Kota, Sri Harsha, Solid and Hazardous Waste Management: Science and Engineering, Butterworth-Heinemann, Burlington, First Edition, 2016

3 John Pichtel, Waste Management Practices: Municipal, Hazardous, and Industrial, CRC Press, US, Second Edition, 2014.

4 Freeman, H. M., ―Standard Handbook of Hazardous Waste Treatment and Disposall, McGraw-Hill, Inc., Second Edition, Noida, 1997.

K.S.R. COLLEGE OF ENGINEERING, TIRUCHENGODE – 637215
DEPARTMENT OF CIVIL ENGINEERING
CO-PO MAPPING

Regulation: R 2020

Course Code: 20CE909 **Course Name: Solid Waste Management**

CO	Course Outcomes	Programme Outcomes													
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	*Overview the concept of Solid waste and management.*	3	3	3	-	-	-	-	-	2	-	-	-	-	-
CO2	*Summarize about on-site storage and processing of solid waste.*	3	3	3	-	-	-	-	-	2	-	-	-	-	-
CO3	*Summarize about Collection and transportation of waste.*	3	3	3	-	-	-	-	-	2	-	-	-	-	-
CO4	*Summarize about off-Site Processing of solid waste.*	3	3	3	-	-	-	-	-	2	-	-	-	-	-
CO5	*Interpret about safe disposal of solid waste.*	3	3	3	-	-	-	-	-	2	-	-	-	-	-
	Average	**3**	**3**	**3**	**-**	**-**	**-**	**-**	**-**	**2**	**-**	**-**	**-**	**-**	**-**

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

K.S.R. COLLEGE OF ENGINEERING (Autonomous) **R 2020**

20CE910 **WATER AND AIR POLLUTION MANAGEMENT**
(Open Elective)

L	T	P	C
3	0	0	3

Prerequisite: *No prerequisites are needed for enrolling into the course*

Course Outcomes : On successful completion of the course, the student will be able to		***Cognitive Level***
CO1:	*Explain water and air quality standards*	*Understand*
CO2:	*Discuss water treatment and fundamentals of air pollution*	*Understand*
CO3:	*Demonstrate the particulate of air pollution.*	*Understand*
CO4:	*Classify air pollution control technologies.*	*Understand*
CO5:	*Describe air pollution control equipment.*	*Understand*

UNIT - I INTRODUCTION [09]

Water effluent standards -water quality indices - physical- chemical and biological parameters of water- water quality requirement - potable water standards -Air pollutants – Sources – Classification of air pollutants – Particulates and gaseous pollutants – Effects of air pollutants on human health, vegetation and property – Global issues and air pollution – Global warming – Ozone layer depletion – Ambient air quality and emission standards – Air pollution indices – Air act.

UNIT - II WATER TREATMENT AND FUNDAMENDALS OF ATMOSPHERIC POLLUTANTS [09]

Water purification systems in natural systems- physical processes-chemical processes and biological processes primary, secondary and tertiary treatment-Unit operations-unit processes. Mixing, clarification - sedimentation; Types; aeration and gas transfer – coagulation and flocculation, coagulation processes - stability of colloids –Disinfection - Fundamentals of meteorology – Wind roses – Atmospheric stability – Atmospheric diffusion of pollutants – Transport, transformation and deposition of air contaminants – Plume behaviour – Atmospheric diffusion theories – Plume rise.

UNIT - III PARTICULATE AIR POLLUTION [09]

Control principles – Principles and equipment description of control technologies – Particulates control by Gravitation, centrifugal, filtration, scrubbing, electrostatic precipitation – Absorption, adsorption, condensation, incineration and biofiltration for control of gaseous air pollutants.

UNIT - IV AIR POLLUTION CONTROL TECHNOLOGIES [09]

Biological air pollution control technologies – Bioscrubbers, biofilters. Air pollutants in indoor environments – Levels of pollutants in indoor and outdoor air – Indoor air pollution from outdoor sources – Measurement methods – Control Technologies.

UNIT - V AIR POLLUTION CONTROL EQUIPMENT [09]

Introduction – Installation of Settling chambers, Inertial separators, Dust trap, Involute cyclone, Multiple cyclone, Filters, Electrostatic precipitators, Scrubbers, Separating devices – Efficiency of equipment.

Total (L= 45, T = 0) = 45 Periods

Text Books :

1 Rao, C. S., Environmental Pollution Control Engineering, New Age International, New Delhi, First Edition, 2006.
2 Davis M. L. and Cornwell D. A., Introduction to Environmental Engineering, Tata McGraw Hill Education Pvt. Ltd,. New Delhi, First Edition, 2010.

Reference Books :

1 Rao, C. S., Environmental Pollution Control Engineering, New Age International, New Delhi, First Edition, 2006.
2 Anjaneyulu, D., Air Pollution and Control Technologies, Allied Publishers, Mumbai, First Edition 2002.
3 S.K. Garg, “Water Supply Engineering”, Khanna Publishers, New Delhi, Thirty three Edition, 2010.
4 https://nptel.ac.in/courses/122106030

K.S.R. COLLEGE OF ENGINEERING, TIRUCHENGODE – 637215
DEPARTMENT OF CIVIL ENGINEERING
CO-PO MAPPING

Regulation: R 2020

Course Code: 20CE910 **Course Name: Water and Air Pollution Management**

CO	Course Outcomes	Programme Outcomes													
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	*Explain water and air quality standards*	3	3	-	-	-	-	2	-	-	-	-	3	-	-
CO2	*Discuss water treatment and fundamentals of air pollution*	3	3	-	-	-	-	-	-	-	-	-	2	-	-
CO3	*Demonstrate the particulate of air pollution.*	3	2	-	-	-	-	2	-	-	-	-	3	-	-
CO4	*Classify air pollution control technologies*	3	3	-	-	-	-	2	-	-	-	-	3	-	-
CO5	*Describe air pollution control equipment.*	3	3	-	-	-	-	2	-	-	-	-	3	-	-
	Average	**3**	**3**	**-**	-	**-**	**-**	**2**	**-**	**-**	**-**	**-**	**3**	-	-

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

K.S.R. COLLEGE OF ENGINEERING (Autonomous) **R 2020**

		L	T	P	C
20CS901	**PROGRAMMING IN JAVA**				
	(Open Elective)	3	0	0	3

Prerequisite:

Course Outcomes : On successful completion of the course, the student will be able to		***Cognitive Level***
CO1:	*Discover java programming fundamentals to solve real world problem.*	*Understand*
CO2:	*Implement the concept of class and constructor.*	*Apply*
CO3:	*Examine important features of java like inheritance and interfaces.*	*Understand*
CO4:	*Illustrate the features of package and exception handling.*	*Understand*
CO5:	*Apply the concepts of string manipulations.*	*Apply*

UNIT – I JAVA FUNDAMENTALS [09]

The Java Buzzwords – Data Types – Variables– Local Variable – Instant Variable – Static variable – Array-Single Dimensional Array-Multi Dimensional Array – Operators – Control Statements – if – if else – nested if– else if– for – for each – while – do while – Switch – Break– Continue.

UNIT – II CLASS FUNDAMENTALS AND CONSTRUCTORS [09]

Class Fundamentals –Declaring Objects – Methods – Instant Method– Static Method– Method Overloading– Recursion – this keyword – Garbage Collection – Constructors – Argument constructor– No-Argument Constructor – Constructor Overloading – Access Control.

UNIT – III INHERITANCE AND INTERFACES [09]

Inheritance – Single – Multilevel – Hierarchical – Super keyword – Method Overriding – Abstract class – Final variable– Final class – Interfaces – Default Interface Methods – Static Methods in Interface.

UNIT – IV PACKAGES AND EXCEPTION HANDLING [09]

Packages –User define Package – Predefine Package – Access Protection – Importing Packages – Array List– Wrapper Classes – Exception Handling Fundamentals – Exceptions Types –Try and Catch – Multiple Catch – Nested Try – Throw – Throws – Finally.

UNIT – V STRING AND STRING BUFFER [09]

The String Constructors – String Length – Character Extraction – String Comparison – Searching Strings – Modifying a String – Data Conversion using valueOf method – Methods in String Buffer – append – delete – replace – insert – reverse – capacity.

Total (L= 45, T = 0) = 45 Periods

Text Books :

1 Herbert Schildt, Java - The Complete Reference, Oracle Press, McGraw-Hill Education, New Delhi, Eleventh Edition, 2018.

2 Cay S. Horstmann, Core Java Volume 1 - Fundamentals, Prentice Hall, India, Tenth Edition, 2015.

Reference Books :

1 Herbert Schildt, Java - A Beginner Guide, Oracle Press, McGraw-Hill Education, New Delhi, Sixth Edition, 2014.

2 Joshua Bloch, Effective Java: A Programming Language Guide, Addison-Wesley Professional, USA, Third Edition, 2018.

3 Allen B. Downey and Chris Mayfield, Think Java: How to Think Like a Computer Scientist, O'Reilly, California, First Edition, 2016.

4 https://onlinecourses.nptel.ac.in/noc19_cs07/preview

K.S.R. COLLEGE OF ENGINEERING, TIRUCHENGODE – 637215
DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING
CO-PO MAPPING

Regulation: R 2020

Course Code: 20CS901 **Course Name: PROGRAMMING IN JAVA**

CO	Course Outcomes	Programme Outcomes													
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	*Discover java programming fundamentals to solve real world problem.*	3	3	2	3	3	-	-	-	-	-	-	3	-	-
CO2	*Implement the concept of class and constructor.*	3	3	2	3	2	-	-	-	-	-	-	3	-	-
CO3	*Examine important features of java like inheritance and interfaces.*	3	3	1	3	2	-	-	-	-	-	-	2	-	-
CO4	*Illustrate the features of package and exception handling.*	3	3	2	2	3	-	-	-	-	-	-	3	-	-
CO5	*Apply the concepts of string manipulations.*	3	3	2	3	2	-	-	-	-	-	-	3	-	-
	Average	**3**	**3**	**2**	**3**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**3**	**-**	**-**

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

K.S.R. COLLEGE OF ENGINEERING (Autonomous) **R 2020**

20CS902	**BASIC CONCEPTS OF DATA STRUCTURE** (Open Elective)	L	T	P	C
		3	0	0	3

Prerequisite:

Course Outcomes : On successful completion of the course, the student will be able to		***Cognitive Level***
CO1:	*Elaborate the different linear data structure to solve simple problems.*	*Understand*
CO2:	*Build the various tree structures with its operations.*	*Understand*
CO3:	*Describe the concept of AVL tree, splay tree, B tree and B+ tree.*	*Understand*
CO4:	*Apply graph data structure to solve real time problems.*	*Apply*
CO5:	*Discover various sorting, hashing and searching techniques.*	*Apply*

UNIT– I ARRAY AND LINKED LIST [09]

Abstract Data Types (ADT) – List ADT – Array Based Implementation – Linked List Implementation – Singly Linked Lists – Doubly Linked Lists – Circularly Linked Lists – Applications of Lists: Polynomial Manipulation – Radix sort.

UNIT– II STACK AND QUEUE [09]

Stack ADT – Implementation of Stack using Array and Linked List – Applications of Stack : Evaluating arithmetic expressions – Conversion of Infix to postfix expression Recursion – Queue ADT – Implementation of Queue using Array and Linked List – Applications of Queues

UNIT – III TREE STRUCTURES [09]

Tree ADT – Binary Tree ADT – Binary Tree Traversal – Expression Trees – Applications of Trees – Binary Search Tree – AVL Trees – B Tree – B+ Tree.

UNIT – IV GRAPHS [09]

Introduction to Graphs and its Types – Breadth First Traversal – Depth First Traversal – Topological Sorting – Minimum Spanning Tree: Prim's and Kruskal's algorithms –- Shortest Path Algorithms: Dijkstra's Algorithm – Applications of Graphs.

UNIT – V SEARCHING,HASHING AND SORTING [09]

Searching: Linear and Binary Search – Hashing :Hash function– Separate Chaining – Open Addressing – Sorting: Bubble Sort – Selection Sort – Insertion Sort – Heap Sort – Merge Sort.

Total (L= 45, T = 0) = 45 Periods

Text Books :

1 M. A. Weiss, Data Structures and Algorithm Analysis in C, Pearson Education, India, Second Edition, 2015.

2 Reema Thareja, Data Structures Using C, Oxford University Press, England, Second Edition, 2011

Reference Books :

1 R. F. Gilberg, B. A. Forouzan, Data Structures, Thomson, India, Second Edition, 2005.

2 A.K. Sharma, Data Structures using C, Pearson Education, India, First Edition, 2011.

3 Ellis Horowitz, Sartaj Sahni, Susan Anderson-Freed, Fundamentals of Data Structures in C++,University Press, United States, Second Edition, 2008

4 http://www.nptelvideos.in/2012/11/data-structures-and-algorithms.html

K.S.R. COLLEGE OF ENGINEERING, TIRUCHENGODE – 637215

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

CO-PO MAPPING

Regulation: **R 2020**

Course Code: **20CS902** **Course Name:** **BASIC CONCEPTS OF DATA STRUCTURE**

CO	Course Outcomes	Programme Outcomes													
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	*Elaborate the different linear data structure to solve simple problems.*	3	2	3	-	2	-	-	-	-	-	-	2	-	-
CO2	*Build the various tree structures with its operations.*	3	2	3	-	2	-	-	-	-	-	-	2	-	-
CO3	*Describe the concept of AVL tree, splay tree, B tree and B+ tree.*	3	3	2	-	2	-	-	-	-	-	-	2	-	-
CO4	*Apply graph data structure to solve real time problems.*	3	2	2	-	2	-	-	-	-	-	-	2	-	-
CO5	*Discover various sorting, hashing and searching techniques.*	3	2	2	-	2	-	-	-	-	-	-	2	-	-
	Average	**3**	**2**	**2**	**-**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**2**	-	**-**

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

K.S.R. COLLEGE OF ENGINEERING (Autonomous) **R 2020**

20CS903 **FUNDAMENTALS OF DATABASE CONCEPTS** (Open Elective)

L	T	P	C
3	0	0	3

Prerequisite:

Course Outcomes : On successful completion of the course, the student will be able to		***Cognitive Level***
CO1:	*Outline database architecture and the E-R Model for Database design.*	*Understand*
CO2:	*Apply Structured query language to create and manipulate a relational database.*	*Apply*
CO3:	*Build functions, triggers and recursive queries.*	*Apply*
CO4:	*Demonstrate the purpose of normalization.*	*Understand*
CO5:	*Discover about transaction and query processing concepts.*	*Understand*

UNIT – I BASIC CONCEPTS AND E-R MODEL [9]

Database System Applications – Purpose of Database Systems – Views of Data – Database Languages –Database and Application Architecture. Overview of the Design Process – The Entity-Relationship model – Complex Attributes – Mapping Cardinalities and Keys.

UNIT – II RELATIONAL MODEL AND SQL FUNDAMENTALS [9]

Introduction to Relational Model: Structure of Relational Databases – Database Schema –Keys – Schema Diagrams. Overview of the SQL Query Language – SQL Data Definition – Basic Structure of SQL Queries – Additional Basic Operations – Set operations – Null values – Aggregate functions – Modification of the Database.

UNIT - III INTERMEDIATE SQL AND ADVANCED SQL [09]

Join Expressions – Views – Transactions – Integrity Constraints – Authorization –Accessing SQL from Programming Language – Functions and Procedures – Triggers – Recursive Queries.

UNIT - IV NORMALIZATION [09]

Functional Dependencies – Non-loss Decomposition – First, Second and Third Normal Forms, Dependency Preservation – Boyce/Codd Normal Form – Multi-valued Dependencies and Fourth Normal Form – Join Dependencies and Fifth Normal Form.

UNIT - V TRANSACTIONS AND QUERY PROCESSING [09]

Transaction Concept – A Simple Transaction Model – Storage Structure – Transaction Atomicity and Durability – Transaction Isolation – Serializability – Concurrency Control – Lock-Based protocols – Query Processing overview

Total (L= 45, T = 0) = 45 Periods

Text Books :

1 Abraham Silberschatz, Henry F. Korth and S. Sudharshan, Database System Concepts, Tata McGraw Hill, New Delhi, Seventh Edition, 2019.

2 RamezElmasri and Shamkant B. Navathe, Fundamentals of Database Systems, Pearson Education, New Delhi, Seventh Edition, 2016.

Reference Books :

1 Abraham Silberschatz, Henry F. Korth and S. Sudharshan, Database System Concepts, Tata McGraw Hill, New Delhi, Sixth Edition, 2015.

2 S.K.Singh, Database Systems Concepts, Design and Applications, Pearson Education, New Delhi, Second Edition, 2011.

3 C.J.Date, A.Kannan and S.Swamynathan, An Introduction to Database Systems, Pearson Education, New DelhiEighth Edition, 2006.

4 http://freevideolectures.com/course/2668/database-management-system#

K.S.R. COLLEGE OF ENGINEERING, TIRUCHENGODE – 637215

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

CO-PO MAPPING

Regulation: **R 2020**

Course Code: **20CS903** **Course Name:** **FUNDAMENTALS OF DATABASE CONCEPTS**

CO	Course Outcomes	Programme Outcomes													
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	*Outline database architecture and the E-R Model for Database design.*	3	3	3	-	2	2	-	-	-	-	-	2	-	-
CO2	*Apply Structured query language to create and manipulate a relational database.*	3	3	3	-	2	2	-	-	-	-	-	2	-	-
CO3	*Build functions, triggers and recursive queries.*	3	3	3	-	2	2	-	-	-	-	-	2	-	-
CO4	*Demonstrate the purpose of normalization.*	3	3	3	-	2	2	-	-	-	-	-	2	-	-
CO5	*Discover about transaction and query processing concepts.*	3	3	3	-	2	2	-	-	-	-	-	2	-	-
	Average	**3**	**3**	**3**	**-**	**2**	**2**	**-**	**-**	**-**	**-**	**-**	**2**	**-**	**-**

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

K.S.R. COLLEGE OF ENGINEERING (Autonomous) **R 2020**

20CS904	**INTERNET PROGRAMMING** (Open Elective)	L	T	P	C
		3	0	0	3

Prerequisite:

Course Outcomes : On successful completion of the course, the student will be able to		***Cognitive Level***
CO1:	*Summarize the technologies around the internet.*	*Understand*
CO2:	*Construct the idea of web designing at user interface.*	*Apply*
CO3:	*Discuss the concept of data processing on client and server side.*	*Understand*
CO4:	*Construct the web oriented response at server side in PHP and XML format*	*Apply*
CO5:	*Illustrate the web service architecture and to enable rich client presentation using AJAX.*	*Understand*

UNIT – I INTRODUCTION TO WEB [09]

Web Essentials: Clients, Servers, and Communications. The Internet – History – Basic Internet Protocols: TCP and IP – DNS – URL. The World Wide Web – HTTP: Request Message – Response Message – Web Clients – Web Servers – Case Study.

UNIT – II BASICS OF HTML AND CSS [09]

HTML. An Introduction to HTML History and Version - Structure of HTML Page – HTML tags for data formatting - Tables – Links – Images - List – Frames – Forms - HTML 5 Tags and Validation. Style Sheets: CSS Syntax and Structure – CSS Rules for Backgrounds, Colours, and Properties – Manipulating Texts, Fonts, borders and Boxes - Margin – Padding Lists – CSS Positioning.

UNIT– III CLIENT SIDE SCRIPTING [09]

JavaScript: Syntax and Execution – Internal, embedded and External JavaScript. JavaScript: Variables – Arrays – Functions – Conditions – Loops – Type Conversion – Objects and DOM – Inbuilt Functions – Validation and Regular Expressions – Event Handling.

UNIT – IV SERVER SIDE SCRIPTING [09]

PHP: Introduction – Using PHP – variables – Program Control. Built-in Functions: Connecting to Database – Using cookies – Regular Expression. XML: Basics – DTD – XML Scheme – DOM and Presenting XML – XML parsers and validation.

UNIT– V AJAX and WEB SERVICE [09]

AJAX: Introduction – Ajax Client Server Architecture, XML http Request Object – Call Back Methods. Introduction to Web Services – Java web services: Basics – SOAP – WSDL: Creating, Publishing and Describing a web service – Consuming a web service – Database Driven Web Service from an application.

Total (L= 45, T = 0) = 45 Periods

Text Books :

1 Randy Connolly and Ricardo Hoar, Fundamentals of Web Development, Pearson Education New Delhi, First Edition, 2016.

2 Paul Deitel, Harvey Deitel and Abbey Deitel , Internet and World Wide Web – How to Program, Pearson Education, New Delhi, Fifth Edition, 2012.

Reference Books :

1 Chris Bates, Web Programming – Building Internet Applications, John Wiley & Sons Ltd, USA, Third Edition, 2007.

2 John Dean, Web Programming With HTML5, CSS and JavaScript, Jones and Bartlett Publishers, Inc, United States, Third Edition, 2008.

3 Jon Duckett, Beginning Web Programming With HTML, XHTML and CSS, Wiley Publishing Inc, India, Second Edition, 2008.

4 www.tutorialspoint.com

K.S.R. COLLEGE OF ENGINEERING, TIRUCHENGODE – 637215

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

CO-PO MAPPING

Regulation: R 2020

Course Code: 20CS904 **Course Name: INTERNET PROGRAMMING**

CO	Course Outcomes	Programme Outcomes													
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	*Summarize the technologies around the internet.*	3	3	3	-	3	2	-	-	-	-	-	3	-	-
CO2	*Construct the idea of web designing at user interface.*	3	3	3	-	3	2	-	-	-	-	-	3	-	-
CO3	*Discuss the concept of data processing on client and server side.*	3	3	3	-	3	1	-	-	-	-	-	2	-	-
CO4	*Construct the web oriented response at server side in PHP and XML format*	3	3	3	-	3	1	-	-	-	-	-	2	-	-
CO5	*Illustrate the web service architecture and to enable rich client presentation using AJAX.*	3	2	3	-	3	2	-	-	-	-	-	3	-	-
	Average	**3**	**3**	**3**	**-**	**3**	**2**	**-**	**-**	**-**	**-**	**-**	**3**	**-**	**-**

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

K.S.R. COLLEGE OF ENGINEERING (Autonomous) **R 2020**

20CS905	**FUNDAMENTALS OF MOBILE APPLICATION DEVELOPMENT** (Open Elective)	L	T	P	C
		3	0	0	3

Prerequisite:

Course Outcomes : On successful completion of the course, the student will be able to		***Cognitive Level***
CO1:	*Identify various concepts of mobile programming that make it unique from programming for other platforms.*	*Understand*
CO2:	*Critique mobile applications on their design pros and cons.*	*Understand*
CO3:	*Utilize rapid prototyping techniques to design and develop sophisticated mobile interfaces.*	*Apply*
CO4:	*Program mobile applications for the Android operating system that use basic and advanced phone features.*	*Understand*
CO5:	*Deploy applications to the Android marketplace for distribution.*	*Apply*

UNIT – I OVERVIEW OF THE ANDROID PLATFORM [09]

Introducing Android – Setting Up Your Android Development Environment – Writing Your First Android Application – Mastering the Android Development Tools

UNIT – II ANDROID APPLICATION BASICS [09]

Understanding the Anatomy of an Android Application – Defining Your Application Using the Android Manifest File – Managing Application Resources

UNIT – III ANDROID USER INTERFACE DESIGN ESSENTIALS [09]

Exploring User Interface Screen Elements – Designing User Interfaces with Layouts – Working with Fragments – Working with Dialogs

UNIT – IV ANDROID APPLICATION DESIGN ESSENTIALS [09]

Android application design: Using Android Preferences – Working with Files and Directories – Using Content Providers – Designing Compatible Applications

UNIT– V PUBLISHING AND DISTRIBUTING ANDROID APPLICATIONS [09]

Android Software Development Process – Designing and Developing Bulletproof Android Applications – Testing Android Applications – Publishing Your Android Application

Total (L= 45, T = 0) = 45 Periods

Text Books :

1 Lauren Darcey, Shane Conder, Android Wireless Application Development, Pearson Education, India, Second Edition, 2011.

2 Ed Burnette, Hello Android: Introducing Google's Mobile Development Platform, The Pragmatic Publishers, North Carolina USA, Third Edition, 2010.

Reference Books :

1 Google Developer Training, Android Developer Fundamentals Course – Concept Reference, Google Developer Training Team, 2016.

2 Zigurd Mednieks, Laird Dornin, Blake Meike G, Masumi Nakamura, Programming Android: Java Programming for the New Generation of Mobile Devices, OReilly Media, USA, Second Edition, 2011.

3 2016Reto Meier, Professional Android 4 Application Development, Wrox Publications, John Wiley, New York, First Edition, 2012.

4 https://developer.android.com/training/basics/firstapp

K.S.R. COLLEGE OF ENGINEERING, TIRUCHENGODE – 637215

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

CO-PO MAPPING

Regulation: **R 2020**

Course Code: **20CS905** **Course Name:** **FUNDAMENTALS OF MOBILE APPLICATION DEVELOPMENT**

CO	Course Outcomes	Programme Outcomes													
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	*Identify various concepts of mobile programming that make it unique from programming for other platforms.*	3	2	2	-	1	-	-	-	-	-	-	1	-	-
CO2	*Critique mobile applications on their design pros and cons.*	3	2	3	-	2	-	-	-	-	-	-	2	-	-
CO3	*Utilize rapid prototyping techniques to design and develop sophisticated mobile interfaces.*	3	2	3	-	2	-	-	-	-	-	-	2	-	-
CO4	*Program mobile applications for the Android operating system that use basic and advanced phone features.*	3	2	2	-	2	-	-	-	-	-	-	1	-	-
CO5	*Deploy applications to the Android marketplace for distribution.*	3	2	3	-	2	-	-	-	-	-	-	2	-	-
	Average	**3**	**2**	**2**	**-**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**2**	**-**	**-**

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

K.S.R. COLLEGE OF ENGINEERING (Autonomous) **R 2020**

20CS906 **PRINCIPLES OF ETHICAL HACKING** (Open Elective)

L	T	P	C
3	0	0	3

Prerequisite:

Course Outcomes : On successful completion of the course, the student will be able to		***Cognitive Level***
CO1:	*Discuss the basics of hacking with its ethics*	*Understand*
CO2:	*Extend the possibilities and types of Attacks*	*Understand*
CO3:	*Summarize the testing process with programming Language.*	*Understand*
CO4:	*Infer about the impact of hacking wireless network*	*Understand*
CO5:	*Outline about the protection scheme.*	*Understand*

UNIT - I ETHICAL HACKING OVERVIEW [9]

Introduction to Ethical Hacking – What You Can Do Legally – What You Cannot Do Legally – TCP/IP Concepts Review – IP Addressing – Overview of Numbering Systems

UNIT - II NETWORK ATTACKS AND ITS IMPACT [9]

Malicious Software – Protecting Against Malware Attacks – Intruder Attacks on Networks and Computers - Addressing Physical Security – Using Web Tools for Foot printing – Conducting Competitive Intelligence – Introduction to Social Engineering – Using Port-Scanning Tools – Conducting Ping Sweeps – Understanding Scripting.

UNIT - III SECURITY TESTING [9]

Enumerating Operating Systems – Introduction to Computer Programming – Understanding C,HTML, Pearl and Object Oriented Programming Basics – Windows OS Vulnerabilities – Tools for Identifying Vulnerabilities in Windows – Windows and Other Embedded Operating Systems – Vulnerabilities of Embedded OSs.

UNIT - IV WEB APPLICATION AND WIRELESS NETWORK [9]

Understanding Web Applications – Understanding Web Application Vulnerabilities – Tools for Web Attackers and Security Testers – Hacking Wireless Networks

UNIT - V PROTECTION SYSTEM [9]

Understanding Cryptography Basics – Understanding Symmetric and Asymmetric Algorithms – Understanding Public Key Infrastructure – Understanding Cryptography Attacks – Understanding Routers and Firewalls – Understanding Intrusion Detection and Prevention Systems – Understanding Honeypots

Total (L= 45, T = 0) = 45 Periods

Text Books :

1 Michael T. Simpson and Nicholas Antill, Ethical Hacking and Network defense, Cengage Learning, New Delhi, Third Edition, 2017.

2 Ankit Fadia, Ethical Hacking, Macmillan India Ltd, India, Second Edition, 2006.

Reference Books :

1 Steven Defino, Barry Kaufman and Nick Valenteen, Official Certified Ethical Hacker review guide, Cenage learning New Delhi, Second Edition, 2012.

2 Ankit Fadia, The Ethical Hacking Guide to Corporate Security, Macmillan Publishers, India, Second Edition, 2010.

3 James S. Tiller, The Ethical Hack: A Framework for Business value Penetration Testing, CRC Press, Florida, First Edition, 2005.

4 https://onlinecourses.nptel.ac.in/noc22_cs13

K.S.R. COLLEGE OF ENGINEERING, TIRUCHENGODE – 637215
DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

CO-PO MAPPING

Regulation: **R 2020**

Course Code: **20CS906** **Course Name:** **PRINCIPLES OF ETHICAL HACKING**

CO	Course Outcomes	Programme Outcomes													
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	*Discuss the basics of hacking with its ethics*	3	3	3	-	3	3	-	3	-	-	-	2	-	-
CO2	*Extend the possibilities and types of Attacks*	3	3	2	-	1	2	-	1	-	-	-	1	-	-
CO3	*Summarize the testing process with programming Language.*	3	3	2	-	3	3	-	2	-	-	-	3	-	-
CO4	*Infer about the impact of hacking wireless network*	3	3	2	-	3	2	-	1	-	-	-	2	-	-
CO5	*Outline about the protection scheme.*	3	3	2	-	3	2	-	1	-	-	-	3	-	-
	Average	**3**	**3**	**2**	**-**	**3**	**2**	**-**	**1**	**-**	**-**	**-**	**2**	**-**	**-**

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

K.S.R. COLLEGE OF ENGINEERING (Autonomous) **R 2020**

20CS907 **GREEN TECHNOLOGY** (Open Elective)

L	T	P	C
3	0	0	3

Prerequisite:

Course Outcomes : On successful completion of the course, the student will be able to		***Cognitive Level***
CO1:	*Identify Green IT with its different dimensions and Strategies.*	Understand
CO2:	*Describe Green data centres and storage along with its green software methodologies.*	Understand
CO3:	*Outline the concepts o to manage the green IT with necessary components.*	Understand
CO4:	*Recognize various green enterprise activities, functions and their role with IT.*	Understand
CO5:	*Categorize various laws, standards and protocols for regulating green IT.*	Understand

UNIT – I GREEN IT [09]

Environmental Concerns and Sustainable Development – Environmental Impacts of IT – Green IT – Holistic Approach to Greening IT – Greening IT – Applying IT for enhancing Environmental sustainability – Green IT Standards and Eco-Labelling of IT – Enterprise Green IT strategy – Life Cycle of a device or hardware – Reuse, Recycle and Dispose.

UNIT – II SUSTAINABLE SOFTWARE DEVELOPMENT AND GREEN DATA CENTRES [09]

Current Practices – Sustainable Software – Attributes – Metrics – Methodology – Defining Actions – Data Centres: Associated Energy Challenges – IT Infrastructure – Management – Green Data Centre Metrics – Green Data Storage – Storage Media Power Characteristics – Energy Management Techniques for Hard Disks.

UNIT – III ENTERPRISE GREEN IT STRATEGY [09]

Approaching Green IT Strategies – Business Drivers – Business Dimensions for Green IT Transformation – Organizational Considerations – Steps to Develop Green IT Strategy – Metrics and Measurements – Multilevel Sustainable Information – Sustainability Hierarchy Models.

UNIT – IV GREEN ENTERPRISE READINESS AND THE ROLE OF IT [09]

Readiness and Capability – Development and Measuring of an Organization's G-Readiness Framework – Organizational and Enterprise Greening – Information systems in Greening Enterprises – IT Usage and Hardware – Inter-Organizational Enterprise activities and Green Issues – Enablers and making the case for IT and Green Enterprise.

UNIT – V LAWS, STANDARDS AND PROTOCOLS [09]

The regulatory environment and IT manufacturers – Non regulatory government initiatives – Industry associations and standards bodies – Green building standards – Green data centres – Social movements and Greenpeace – Cloud Computing – Energy Usage Model.

Total (L= 45, T = 0) = 45 Periods

Text Books :ENERGY MANAGEMENT

1 San Murugesan, G.R. Gangadharan, Harnessing Green IT - Principles and Practices, Wiley Publication, India, First Edition, 2012.

2 Bhuvan Unhelkar, Green IT Strategies and Applications - Using Environmental Intelligence, CRC Press, Florida, First Edition, 2016.

Reference Books :

1 Woody Leonhard, Katherrine Murray, Green Home computing for dummies, Wiley Publication, India, First Edition, 2009.

2 Bud E. Smith, Green Computing: Tools and Techniques for Saving Energy, Money and Resources, CRC Press, Florida, Second Edition, 2014.

3 Jason Harris, Green Computing and Green IT - Best Practices on regulations and industry, Lulu.com, First edition, 2008.

4 https://nptel.ac.in/courses/106/105/106105167/

K.S.R. COLLEGE OF ENGINEERING, TIRUCHENGODE – 637215

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

CO-PO MAPPING

Regulation: **R 2020**

Course Code: **20CS907** **Course Name:** **GREEN TECHNOLOGY**

CO	Course Outcomes	Programme Outcomes													
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	*Identify Green IT with its different dimensions and Strategies.*	3	3	3	-	3	-	-	-	-	-	-	2	-	-
CO2	*Describe Green data centres and storage along with its green software methodologies.*	3	2	2	-	3	-	-	-	-	-	-	1		-
CO3	*Outline the concepts o to manage the green IT with necessary components.*	3	3	2	-	3	-	-	-	-	-	-	2	-	-
CO4	*Recognize various green enterprise activities, functions and their role with IT.*	3	3	3	-	3	-	-	-	-	-	-	1	-	-
CO5	*Categorize various laws, standards and protocols for regulating green IT.*	3	3	3	-	3	-	-	-	-	-	-	2	-	-
	Average	3	3	3	-	3	-	-	-	-	-	-	2		

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

K.S.R. COLLEGE OF ENGINEERING (Autonomous) **R 2020**

20CS908	**ARTIFICIAL INTELLIGENCE AND ROBOTICS** (Open Elective)	L	T	P	C
		3	0	0	3

Prerequisite:

Course Outcomes : On successful completion of the course, the student will be able to		***Cognitive Level***
CO1:	*Describe agents structure and predict uninformed search algorithms for any AI problem*	*Understand*
CO2:	*Illustrate appropriate AI methods to solve a given problem.*	*Apply*
CO3:	*Explain a problem using first order and predicate logic.*	*Understand*
CO4:	*Identify planning algorithms and illustrate about learning*	*Apply*
CO5:	*Infer about robotics concept.*	*Understand*

UNIT – I FUNDAMENTALS OF ARTIFICIAL INTELLIGENCE [9]

Intelligent Agents – Agents and environments – Good behavior– The Nature of Environments – The Structure of Agents – Solving Problems by Searching: Problem-Solving Agents – Example problems – Searching for solutions – Uninformed search strategies.

UNIT – II INFORMED SEARCHING TECHNIQUES [9]

Informed (Heuristic) Search Strategies – Heuristic functions – Local Search and Optimization Problems – Adversarial Search – Games – Optimal decisions in games – Alpha-Beta Pruning – Constraint Satisfaction Problems – Defining Constraint Satisfaction Problems.

UNIT – III LOGICAL REASONING [9]

First order logic – Representation revisited – Syntax and semantics for first order logic – Using first order logic – Knowledge engineering in first order logic – Inference in First order logic – Prepositional versus first order logic – Unification and lifting – Forward chaining – Backward chaining.

UNIT – IV PLANNING AND LEARNING [9]

Classical Planning: Definition of Classical Planning – Algorithm for Planning as State – Space Search –Planning graphs – Analysis of Planning Approaches – Learning from Examples: Forms of Learning – Supervised learning – Learning Decision trees – Ensemble Learning – Explanation-Based Learning.

UNIT – V ROBOTICS [9]

Introduction – Robot Hardware – Robot Perception – Planning to Move – Planning Uncertain Movements – Moving – Robotic Software Architectures – Application Domains.

Total (L= 45, T = 0) = 45 Periods

Text Books :

1 Stuart Russell and Peter Norvig, Artificial Intelligence – A Modern Approach, Pearson Education, New Delhi, Third Edition, 2016

2 Kevin Night and Elaine Rich, Nair B., Artificial Intelligence (SIE) , McGraw Hill, New Delhi, Third Edition, 2008

Reference Books :

1 Dan W. Patterson, Introduction to AI and ES, Pearson Education, New Delhi, Third Edition, 2007.

2 Peter Jackson, Introduction to Expert Systems, Pearson Education, New Delhi, Third Edition, 2007.

3 Deepak Khemani, Artificial Intelligence, Tata McGraw Hill, New Delhi, Third Edition, 2013.

4 David L. Poole and Alan K. Mackworth, ―Artificial Intelligence: Foundations of Computational Agents‖, Cambridge University Press, England, First Edition, 2010.

K.S.R. COLLEGE OF ENGINEERING, TIRUCHENGODE – 637215

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

CO-PO MAPPING

Regulation: **R 2020**

Course Code: **20CS908** **Course Name:** **ARTIFICIAL INTELLIGENCE AND ROBOTICS**

CO	Course Outcomes	Programme Outcomes													
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	*Describe agents structure and predict uninformed search algorithms for any AI problem*	3	3	3	-	3	2	-	-	-	-	-	3	-	-
CO2	*Illustrate appropriate AI methods to solve a given problem.*	3	3	3	-	3	2	-	-	-	-	-	3	-	-
CO3	*Explain a problem using first order and predicate logic.*	3	3	3	-	3	2	-	-	-	-	-	3	-	-
CO4	*Identify planning algorithms and illustrate about learning*	3	3	3	-	3	2	-	-	-	-	-	3	-	-
CO5	*Infer about robotics concept.*	3	3	3	-	3	2	-	-	-	-	-	3	-	-
	Average	**3**	**3**	**3**	**-**	**3**	**2**	**-**	**-**	**-**	**-**	**-**	**3**	**-**	**-**

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

K.S.R. COLLEGE OF ENGINEERING (Autonomous) **R 2020**

20CS909	**BIG DATA AND ANALYTICS** (Open Elective)	L	T	P	C
		3	0	0	3

Prerequisite:

Course Outcomes : On successful completion of the course, the student will be able to		***Cognitive Level***
CO1:	*Discover the insights of big data analytics*	*Understand*
CO2:	*Identify the file systems and to know the map reduce technique*	*Understand*
CO3:	*Summarize data by utilizing various statistical and data mining approaches*	*Understand*
CO4:	*Deploy and Perform analytics on real-time streaming data*	*Understand*
CO5:	*Comprehend the various NoSql alternative database models*	*Understand*

UNIT – I INTRODUCTION TO BIG DATA [9]

Big Data – Definition, Characteristic Features – Big Data Applications – Big Data vs Traditional Data – Risks of Big Data – Structure of Big Data – Web Data – Evolution of Analytic Scalability – Evolution of Analytic Processes, Tools and methods – Analysis Vs Reporting – Modern Data Analytic Tools.

UNIT – II HADOOP FRAMEWORK [9]

Distributed File Systems – Large-Scale File System Organization – HDFS concepts – Map Reduce Execution, Algorithms using Map Reduce, Matrix-Vector Multiplication – Hadoop YARN.

UNIT - III DATA ANALYSIS [9]

Statistical Methods : Regression modelling – Multivariate Analysis – Classification: SVM & Kernel Methods – Rule Mining – Cluster Analysis – Types of Data in Cluster Analysis – Predictive Analytics – Data analysis using R.

UNIT – IV MINING DATA STREAMS [9]

Streams: Concepts – Stream Data Model and Architecture – Sampling data in a stream – Mining Data Streams and Mining Time-series data – Real Time Analytics Platform Applications – Real Time Sentiment Analysis – Stock Market Predictions.

UNIT – V BIG DATA FRAMEWORKS [9]

Introduction to NoSQL – Aggregate Data Models – Hbase: Data Model and Implementations – Hbase Clients – Examples – Cassandra: Data Model – Examples – Cassandra Clients – Hadoop Integration. Pig – Grunt – Pig Data Model – Pig Latin – developing and testing Pig Latin scripts.

Total (L= 45, T = 0) = 45 Periods

Text Books :

1 Bill Franks, Taming the Big Data Tidal Wave: Finding Opportunities in Huge Data Streams with Advanced AnalyticsII, John Wiley & Sons, Incorporated, United States, First Edition, 2012.

2 David Loshin, Big Data Analytics: From Strategic Planning to Enterprise Integration with Tools, Techniques, NoSQL, and Graph, Elsevier Science, Netherlands, First Edition, 2013.

Reference Books :

1 Michael Berthold, David J. Hand, Intelligent Data Analysis, Springer, Germany, Second Edition, 2014.

2 Michael Minelli, Michelle Chambers, and Ambiga Dhiraj, Big Data, Big Analytics: Emerging Business Intelligence and Analytic Trends for Today's Businesses, Wiley, United States, First Edition, 2013.

3 P. J. Sadalage and M. Fowler, NoSQL Distilled: A Brief Guide to the Emerging World of Polyglot Persistence, Addison-Wesley Professional, United States, Third Edition, 2013.

4 Richard Cotton, Learning R – A Step-by-step Function Guide to Data Analysis, O_Reilly Media, California, Third Edition, 2018.

K.S.R. COLLEGE OF ENGINEERING, TIRUCHENGODE – 637215

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

CO-PO MAPPING

Regulation: **R 2020**

Course Code: **20CS909** **Course Name:** **BIG DATA AND ANALYTICS**

CO	Course Outcomes	Programme Outcomes													
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	*Discover the insights of big data analytics*	3	3	2	-	3	2	-	-	-	-	-	1	-	-
CO2	*Identify the file systems and to know the map reduce technique*	3	2	1	-	3	3	-	-	-	-	-	1	-	-
CO3	*Summarize data by utilizing various statistical and data mining approaches*	3	3	2	-	3	2	-	-	-	-	-	1	-	-
CO4	*Deploy and Perform analytics on real-time streaming data*	3	3	2	-	3	2	-	-	-	-	-	1	-	-
CO5	*Comprehend the various NoSql alternative database models*	3	3	1	-	3	2	-	-	-	-	-	1	-	-
	Average	**3**	**3**	**2**	**-**	**3**	**2**	**-**	**-**	**-**	**-**	**-**	**1**	**-**	**-**

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

K.S.R. COLLEGE OF ENGINEERING (Autonomous) **R 2020**

20CS910	**HARDWARE AND TROUBLE SHOOTING** (Open Elective)	L	T	P	C
		3	0	0	3

Prerequisite:

Course Outcomes : On successful completion of the course, the student will be able to		***Cognitive Level***
CO1:	*Identify with the Basic functional units of a computer system.*	*Understand*
CO2:	*Discover the working Concepts of I/O devices in computer.*	*Understand*
CO3:	*Examine the interfaces and controllers connected to PC.*	*Understand*
CO4:	*Outline the system configuration, Installation and maintenance of PC.*	*Understand*
CO5:	*Summarize about faults, diagnostics and troubleshooting in PC.*	*Understand*

UNIT – I INTRODUCTION [9]

Introduction - Computer Organization – Number Systems and Codes – Memory – ALU – CU – Instruction prefetch – Interrupts – I/O Techniques – Device Controllers – Error Detection Techniques – Microprocessor – Personal Computer Concepts – Advanced System Concepts – Microcomputer Concepts – OS – Multitasking and Multiprogramming – Virtual Memory – Cache Memory – Modern PC and User.

UNIT – II PERIPHERAL DEVICES [9]

Introduction – Keyboard – CRT Display Monitor – Printer – Magnetic Storage Devices –FDD – HDD – Special Types of Disk Drives – Mouse and Trackball – Modem – Fax Modem – CD ROM Drive – Scanner – Digital Camera – DVD – Special Peripherals.

UNIT – III PC HARDWARE OVERVIEW [9]

Introduction – Hardware BIOS DOS Interaction – The PC family – PC hardware – Inside the System Box – Motherboard Logic – Memory Space – Peripheral Interfaces and Controllers – Keyboard Interface – CRT Display interface – FDC – HDC – Microprocessors in PC.

UNIT – IV INSTALLATION AND PREVENTIVE MAINTENANCE [9]

Introduction – system configuration – pre installation planning – Installation practice – routine checks – PC Assembling and integration – BIOS setup – Engineering versions and compatibility – preventive maintenance – DOS – Virus – Data Recovery.

UNIT – V TROUBLESHOOTING [9]

Introduction – computer faults – Nature of faults – Types of faults – Diagnostic programs and tools – Microprocessor and Firmware – Programmable LSI's – Bus Faults – Faults Elimination process – Systematic Troubleshooting – Symptoms observation and analysis – fault diagnosis – fault rectification – Troubleshooting levels – FDD, HDD, CD ROM Problems.

Total (L= 45, T = 0) = 45 Periods

Text Books :

1 B. Govindarajalu, IBM PC Clones Hardware, Troubleshooting and Maintenance, McGraw-Hill, New Delhi, Second Edition, 2003.

2 K.L. James, Computer Hardware Installation, Interfacing, Troubleshooting and maintenance, PHI Learning Private Limited, India, First Edition, 2013.

Reference Books :

1 Craig Zacker and John Rourke, PC Hardware: The Complete Reference, McGraw-Hill, New Delhi, Fifth Edition, 2001.

2 Jean Andrews, Guide to Hardware Managing, Maintaining and Troubleshooting, Cengage Learning (Course Technology), Boston, Fifth Edition, 2010

3 Cheryl A. Schmidt, Complete A+ guide to IT Hardware and Software, Pearson Education, India, Eighth Edition, 2020.

4 Scott M. Mueller, Upgrading and Repairing PCs, Pearson Education, India, Twenty Second Edition, 2012.

K.S.R. COLLEGE OF ENGINEERING, TIRUCHENGODE – 637215

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

CO-PO MAPPING

Regulation: R 2020

Course Code: 20CS910 **Course Name: HARDWARE AND TROUBLE SHOOTING**

CO	Course Outcomes	Programme Outcomes													
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	*Identify with the Basic functional units of a computer system.*	3	2	-	-	2	-	-	-	-	-	-	2	-	-
CO2	*Discover the working Concepts of I/O devices in computer.*	3	2	-	-	2	-	-	-	-	-	-	2	-	-
CO3	*Examine the interfaces and controllers connected to PC.*	3	2	-	-	2	-	-	-	-	-	-	2	-	-
CO4	*Outline the system configuration, Installation and maintenance of PC.*	3	2	-	-	2	-	-	-	-	-	-	2	-	-
CO5	*Summarize about faults, diagnostics and troubleshooting in PC.*	3	2	-	-	2	-	-	-	-	-	-	2	-	-
	Average	**3**	**2**	**-**	**-**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**2**	**-**	**-**

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

K.S.R. COLLEGE OF ENGINEERING (Autonomous) **R 2020**

		L	T	P	C
20EE901	**ELECTRICAL DRIVES AND CONTROL** (Open Elective)	3	0	0	3

Prerequisite:

Course Outcomes : On successful completion of the course, the student will be able to		***Cognitive Level***
CO1:	*Categorize and explain the operation of electrical drives*	*Understand*
CO2:	*Explain the characteristics of various electrical drives*	*Understand*
CO3:	*Interpret the operation of starting and braking methods of AC and DC machines*	*Understand*
CO4:	*Choose the appropriate speed control techniques for DC motor drives*	*Understand*
CO5:	*Choose the appropriate speed control techniques for AC motor drives*	*Understand*

UNIT - I INTRODUCTION [09]

Electrical drives – Need – Advantage of electrical drives – Basic elements of electrical drives – Factors influencing the choice of electrical drives – Four quadrant operation of a motor driving a hoist load – Load torques – Selection of motors with regard to thermal overloading – Classes of motor duty.

UNIT - II CHARACTERISTICS OF ELECTRIC DRIVES [09]

DC Motors: DC shunt, DC series, DC compound and Permanent Magnet DC motors – AC Motors: Single phase and three phase Induction motors – Speed–Torque characteristics of various types of loads and drive motors.

UNIT - III MOTOR STARTING AND BRAKING METHODS [09]

Types of Starters: Two Point Starter, Three Point Starter, Four Point Starter, DOL Starter, Y-Δ Starter. Braking of Electrical Motors: Shunt Motor, Series Motor, Single Phase Induction Motor.

UNIT - IV DC DRIVES [09]

Speed control of DC series and shunt motors — Armature and field control – Ward-Leonard control system – Controlled Rectifiers Fed DC motor Drive – Chopper fed DC motor Drive: Buck, Boost and Buck-Boost – Applications.

UNIT - V AC DRIVES [09]

Speed control of three phase induction motor – Voltage control, voltage / frequency control, slip power recovery scheme – Inverter and AC Voltage Controller Based Induction Drives – Applications.

Total (L= 45, T = 0) = 45 Periods

Text Books :

1 Dubey G.K, Fundamentals of Electrical Drives, Narosa Publishing House, New Delhi, Second Edition, 2019.

2 Vedam Subramaniam, Electric Drives: Concepts and Applications, Tata McGraw Hill Publishing Company, New Delhi, Second Edition, 2010.

Reference Books :

1 Krishnan. R, Electric Motor Drives: Modeling, Analysis and Control, Prentice Hall Pvt. Ltd, New Delhi, Second Edition, 2003.

2 Pillai.S.K, A First Course on Electric Drives, Wiley Eastern Limited, New Delhi, Fourth Edition, 2012.

3 Nagrath I.J and Kothari D. P, Electrical machines, Tata McCraw Hill Publishing Company Ltd, New Delhi, Fifth Edition, 2017.

4 M.D. Singh and K.B. Khanchandani, Power Electronics, Tata McGraw Hill Publishing Co Ltd., New Delhi, Second Edition, 2013.

K.S.R. COLLEGE OF ENGINEERING, TIRUCHENGODE – 637215
DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING
CO-PO MAPPING

Regulation: R 2020

Course Code: 20EE901 **Course Name: Electrical Drives and Control**

CO	Course Outcomes	Programme Outcomes													
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	*Categorize and explain the operation of electrical drives*	3	-	1	-	-	2	2	1	-	-	-	2	-	-
CO2	*Explain the characteristics of various electrical drives*	3	-	1	-	-	2	2	1	-	-	-	2	-	-
CO3	*Interpret the operation of starting and braking methods of AC and DC machines*	3	-	1	-	-	2	2	1	-	-	-	2	-	-
CO4	*Choose the appropriate speed control techniques for DC motor drives*	3	-	1	-	-	2	2	1	-	-	-	2	-	-
CO5	*Choose the appropriate speed control techniques for AC motor drives*	3	-	1	-	-	2	2	1	-	-	-	2	-	-
	Average	**3**	**-**	**1**	**-**	**-**	**2**	**2**	**1**	**-**	**-**	**-**	**2**	**-**	**-**

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

K.S.R. COLLEGE OF ENGINEERING (Autonomous) **R 2020**

20EE902	**POWER SEMICONDUCTOR DEVICES** (Open Elective)	L	T	P	C
		3	0	0	3

Prerequisite:

Course Outcomes : On successful completion of the course, the student will be able to		***Cognitive Level***
CO1:	*Explain the power diode characteristics and applications for adjustable speed motor control*	Understand
CO2:	*Infer the static and dynamic characteristics of current controlled power semiconductor devices*	Understand
CO3:	*Realize the static and dynamic characteristics of voltage controlled power semiconductor devices*	Understand
CO4:	*Examine the gate drive requirements for power devices and isolation techniques between the gate and power circuits*	Understand
CO5:	*Discuss the electrical analogy of thermal models and the methods for cooling power devices*	*Understand*

UNIT - I POWER SEMICONDUCTOR DIODES AND CIRCUITS [09]

Power diode: Structure, V-I and reverse recovery characteristics–types of power diodes – Series and parallel connected diodes – Diode rectifiers: Single phase half wave and full wave rectifiers with R,RL load.

UNIT - CURRENT CONTROLLED DEVICES [09]

BJT's: Construction, operation, static and switching characteristics, Negative temperature coefficient and secondary breakdown, on-state losses, safe operating area. Thyristors: Construction, working, Two transistor analogy, V–I and switching characteristics, series and parallel operation; comparison of BJT and Thyristor – Basics of TRIAC, RCT,GTO, MCT.

UNIT - III VOLTAGE CONTROLLED DEVICES [09]

Power MOSFETs and IGBTs – Principle of voltage controlled devices, construction, types, static and switching characteristics, Comparison of Power MOSFET and IGBTs – Applications.

UNIT - IV FIRING AND PROTECTING CIRCUITS [09]

Gate drives circuit: SCR, MOSFET, IGBTs and base driving for power BJT – Necessity of isolation, Isolation of gate and base drives: pulse transformer and optocoupler – Overvoltage and overcurrent protections for power devices – Design of snubber circuits.

UNIT - V THERMAL PROTECTION [09]

Heat transfer – conduction, convection and radiation; Cooling – liquid cooling, vapour and phase cooling; Guidance for heat sink selection – Thermal resistance and impedance – Electrical analogy of thermal components, heat sink types and design – Mounting types- switching loss calculation for power device.

Total (L= 45, T = 0) = 45 Periods

Text Books :

1 Rashid.M.H, Power Electronics Circuits Devices and Applications, PHI learning private limited, New Delhi, Fourth Edition, 2017.

2 Bimbhra.P.S, Power Electronics, Khanna Publishing, New Delhi, Fifth Edition, 2013.

Reference Books :

1 M.D. Singh and K.B. Khanchandani, Power Electronics, Tata McGraw Hill Publishing Co Ltd., New Delhi, 2013.

2 Ned Mohan Tore. M. Undeland, William. P. Robbins, Power Electronics: Converters, Applications and Design, John Wiley and sons Ltd, United States, Second Edition, 2013.

3 Sen.P.C, Power Electronics, Tata McGraw Hill Publishing Co Ltd., New Delhi, Thirtieth reprint, 2008.

4 Joseph Vithayathil, Power Electronics: Principles and Applications, Delhi, Tata McGraw-Hill, 2010.

K.S.R. COLLEGE OF ENGINEERING, TIRUCHENGODE – 637215
DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING
CO-PO MAPPING

Regulation: **R 2020**

Course Code: **20EE902** **Course Name:** **Power Semiconductor Devices**

CO	Course Outcomes	Programme Outcomes													
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	*Explain the power diode characteristics and applications for adjustable speed motor control*	3	2	-	-	-	-	-	-	-	-	-	2	-	-
CO2	*Infer the static and dynamic characteristics of current controlled power semiconductor devices*	3	2	-	-	-	-	-	-	-	-	-	2	-	-
CO3	*Realize the static and dynamic characteristics of voltage controlled power semiconductor devices*	3	2	-	-	-	-	-	-	-	-	-	2	-	-
CO4	*Examine the gate drive requirements for power devices and isolation techniques between the gate and power circuits*	3	2	-	-	-	-	-	-	-	-	-	2	-	-
CO5	*Discuss the electrical analog of thermal models and the methods for cooling power devices*	3	2	-	-	-	-	-	-	-	-	-	2	-	-
	Average	**3**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2**	-	**-**

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

K.S.R. COLLEGE OF ENGINEERING (Autonomous) **R 2020**

20EE903	**ELECTRICAL POWER GENERATION SYSTEMS** (Open Elective)	L	T	P	C
		3	0	0	3

Prerequisite:

Course Outcomes : On successful completion of the course, the student will be able to		***Cognitive Level***
CO1:	*Describe the layout and function of various parts inside the thermal power plant.*	*Remember*
CO2:	*Outline the layout, construction, working of the components inside the hydro power plant.*	*Understand*
CO3:	*Explain the principle of operation, layout and types of nuclear reactor in a nuclear power plant.*	*Understand*
CO4:	*Discuss about the types, performance and layout of gas and diesel power plants.*	*Understand*
CO5:	*Infer the basic concepts of different non-conventional energy sources.*	*Understand*

UNIT - I Thermal power plant [09]

Basic thermodynamic laws - various components of steam power plant – layout - pulverized coal burners - Fluidized bed combustion - coal handling and ash handling systems - Forced draft and induced draft fans – Boilers - feed pumps – superheater - regenerator – condenser – deaerators - cooling tower.

UNIT - II Hydro power plant [09]

Hydel power plant classifications- essential elements, selection of water turbines - selection of site for a hydel power plant - layout – dams – pumped storage power plants - micro hydel developments.

UNIT - III Nuclear power plant [09]

Principles of nuclear energy - nuclear fission - nuclear reactor, types – pressurized water reactor, boiling water reactor, gas cooled reactor, liquid metal fast breeder reactor-nuclear power plants

UNIT - IV Gas and diesel power plant [09]

Fuels - gas turbine material, open and closed cycle gas turbine, work output & thermal efficiency, methods to improve performance - advantages and disadvantages- types of diesel engine power plant- components and layout.

UNIT - V Renewable energy [09]

Solar energy collectors – OTEC - wind power plants, tidal power plants and geothermal resources, fuel cell, MHD power generation principle.

Total (L= 45, T = 0) = 45 Periods

Text Books :

1 Domkundwa, Arora Domkundwar, A Course in Power Plant Engineering, Dhanpat Rai and Co. Pvt. Ltd., New Delhi, Eighth edition, 2016.

2 P.K. Nag, Power Plant Engineering, Tata McGraw Hill Publishing Co Ltd., New Delhi, Third Edition, 2010.

Reference Books :

1 Philip Kiameh, Power Generation Handbook, Tata McGraw Hill Publishing Co Ltd., New Delhi, Third Edition, 2013.

2 P.C. Sharma, Power Plant Engineering, S.K. Kataria and Sons, New Delhi, First Edition, 2013.

3 Raja, A.K., Amit Prakash Manish Dwivedi, Power Plant Engineering, New Age International, New Delhi, First Edition, 2012.

4 Gupta, Manoj Kumar, Power Plant Engineering, PHI learning private limited, New Delhi, First Edition, 2012.

K.S.R. COLLEGE OF ENGINEERING, TIRUCHENGODE – 637215
DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING
CO-PO MAPPING

Regulation: **R 2020**
Course Code: **20EE903** **Course Name:** **Electrical Power Generation Systems**

CO	Course Outcomes	Programme Outcomes													
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	*Describe the layout and function of various parts inside the thermal power plant.*	3	1	-	-	-	2	3	2	-	-	-	1	-	-
CO2	*Outline the layout, construction, working of the components inside the hydro power plant.*	3	2	-	-	-	2	3	1	-	-	-	1	-	-
CO3	*Explain the principle of operation, layout and types of nuclear reactor in a nuclear power plant.*	3	2	-	-	-	3	3	2	-	-	-	1	-	-
CO4	*Discuss about the types, performance and layout of gas and diesel power plants.*	3	2	-	-	-	2	3	1	-	-	-	1	-	-
CO5	*Infer the basic concepts of different non-conventional energy sources.*	3	1	-	-	-	3	3	2	-	-	-	1	-	-
	Average	**3**	**2**	**-**	**-**	**-**	**2**	**3**	**2**	**-**	**-**	**-**	**1**	**-**	**-**

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

K.S.R. COLLEGE OF ENGINEERING (Autonomous) **R 2020**

20EE904	**CONTROL ENGINEERING** (Open Elective)	L	T	P	C
		3	0	0	3

Prerequisite: Applied Mathematics

Course Outcomes : On successful completion of the course, the student will be able to		***Cognitive Level***
CO1:	*Obtain the transfer function of electrical and mechanical systems.*	*Apply*
CO2:	*Determine the time-domain response of first and second order systems.*	*Apply*
CO3:	*Examine the stability of open loop system using bode / polar plot.*	*Apply*
CO4:	*Analyze the stability of the system by Root locus and Routh Hurwitz criterion.*	*Apply*
CO5:	*Design lag, lead, lag-lead compensator using bode plot.*	*Apply*

UNIT - I SYSTEM AND THEIR REPRESENTATION [09]

Basic elements in control system – Classification of control systems: Open and closed loop systems– Electrical, Mechanical translational and rotational system – Block diagram reduction techniques – Signal flow graphs.

UNIT - II TIME RESPONSE ANALYSIS [09]

Types and order of systems – Types of test signal – First and second order time response –Time domain specification of second order under damped systems – Generalized error series–Steady state error and error constants.

UNIT - III FREQUENCY RESPONSE ANALYSIS [09]

Frequency response of the system – Bode plot – Polar plot – Constant M and N circles – Determination of closed loop response from open loop response.

UNIT - IV STABILITY OF CONTROL SYSTEM [09]

Characteristics equation – Routh Hurwitz criterion – Root locus construction – Effect of pole, zero addition.

UNIT - V COMPENSATOR AND CONTROLLER [09]

Lag, lead and lag-lead networks – Lag, lead and lag-lead compensator using bode plots – P, PI, PID controllers.

Total (L= 45, T = 0) = 45 Periods

Text Books :

1 Nagrath, J., and Gopal,V., Control Systems Engineering, New Age International (p) Limited, Publishers, New Delhi, Fourth Edition, 2007.

2 Benjamin C. Kuo, Automatic Control systems, PHI Learning, New Delhi, Seventh Edition, 2009.

Reference Books :

1 Ogata,K., Modern Control Engineering, PHI, New Delhi, Fifth Edition, 2009.

2 Norman S. Nise, Control Systems Engineering, John Wiley, New Delhi, Seventh Edition, 2014.

3 Smarajit Ghosh, Control systems, Pearson Education, New Delhi, Second Edition, 2009.

4 Roychoudhury,D., Modern control engineering, Prentice Hall of India, Second Edition, 2005.

K.S.R. COLLEGE OF ENGINEERING, TIRUCHENGODE – 637215
DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING
CO-PO MAPPING

Regulation: R 2020

Course Code: 20EE904 **Course Name: Control Engineering**

CO	Course Outcomes	Programme Outcomes													
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	*Obtain the transfer function of electrical and mechanical systems.*	3	3	2	2	-	-	-	-	-	-	-	2	-	-
CO2	*Determine the time-domain response of first and second order systems.*	3	3	2	2	-	-	-	-	-	-	-	2	-	-
CO3	*Examine the stability of open loop system using bode / polar plot.*	3	3	3	2	-	-	2	-	-	-	-	2	-	-
CO4	*Analyze the stability of the system by Root locus and Routh Hurwitz criterion.*	3	3	3	2	-	-	2	-	-	-	-	2	-	-
CO5	*Design lag, lead, lag-lead compensator using bode plot.*	3	3	3	2	-	-	2	-	-	-	-	2	-	-
	Average	**3**	**3**	**3**	**2**	**-**	**-**	**2**	**-**	**-**	**-**	**-**	**2**	**-**	**-**

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

K.S.R. COLLEGE OF ENGINEERING (Autonomous) **R 2020**

20EE905	**INDUSTRIAL AUTOMATION** (Open Elective)	L	T	P	C
		3	0	0	3

Prerequisite:

Course Outcomes : On successful completion of the course, the student will be able to		***Cognitive Level***
CO1:	*Explain the major components of Programmable Logic Controller and its applications.*	*Understand*
CO2:	*Summarize the logical functions, timers and counters of PLC*	*Understand*
CO3:	*Discuss the various instructions and modes of operation related to PLC.*	*Understand*
CO4:	*Realize the architecture and various interfacing techniques of Distributed Control Systems*	*Understand*
CO5:	*Examine the different applications of PLC and Distributed Control Systems (DCS).*	*Understand*

UNIT - I INTRODUCTION TO PROGRAMMABLE LOGIC CONTROLLER (PLC) [09]

Introduction - PLC Evolution – PLC Vs Computers – Block Diagram of PLC – Parts of a PLC- Principles of Operation- Modifying the Operation**-** PLC Hardware Components: I/O modules, Power Supply, CPU – PLC size and Applications.

UNIT - II LOGIC FUNDAMENTALS, TIMER AND COUNTER [09]

Logic functions – Boolean instructions and functions – Hardwired logic Vs Programmed Logic - Developing circuits from Boolean instructions **–** PLC timer: classification and instructions – PLC counter: classification, instructions and applications

UNIT - III PLC PROGRAMMING [09]

PLC-memory map - Program scan – Relay type instructions – Instruction addressing - Branch instructions - Internal relay instructions - EXAMINE IF CLOSED and EXAMINE IF OPEN instructions - Modes of operation – Basic relay ladder logic and its control flow chart

UNIT - IV DISTRIBUTED CONTROL SYSTEM [09]

Distributed control system : Evolution – Architectures – Comparison – Local control unit – Process interfacing issues – Communication facilities – HMI Interface – Low and high level operator interfaces – Operator displays – Low and high level engineering interfaces – Introduction to SCADA.

UNIT - V APPLICATIONS OF PLC AND DCS [09]

PLC applications: Automatic Control of WareHouse Door – Automatic Lubricating Oil Supplier – Conveyor Belt motor Control – Automatic Car Washing Machine – DCS applications: Pulp and paper environment, Petroleum and refining environment.

Total (L= 45, T = 0) = 45 Periods

Text Books :

1 Frank D. and Petruzella, Programmable Logic controllers,Tata McGraw Hill Publishing Company Limited, New Delhi, Fifth Edition,2017

2 Lucas ,M.P., Distributed Control System, Van Nostrand and Reinhold Co., New york, First Edition, 1986.

Reference Books :

1 Gary Dunning, Introduction to Programmable Logic Controllers, Delmar Thomson Learning, New york, Third Edition, 2010

2 John W.Webb and Ronald A.Reis, Programmable Logic Controllers: Principles and Applications, PHI Private Ltd., New Delhi, Fifth Edition, 2003

3 Krishna Kant, “Computer - Based Industrial Control”, Prentice Hall, New Delhi, Second Edition(Revised), 2011

4 Madhuchhanda Mitra and Smarajit Sen Gupta, Programmable Logic Controllers and Industrial Automation, Penram International Publishing (India) Pvt. Ltd, Mumbai, Second Edition, 2009

K.S.R. COLLEGE OF ENGINEERING, TIRUCHENGODE – 637215
DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING
CO-PO MAPPING

Regulation: **R 2020**
Course Code: **20EE905** **Course Name:** **Industrial Automation**

CO	Course Outcomes	Programme Outcomes													
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	*Explain the major components of Programmable Logic Controller and its applications.*	3	2	3		2	-	-	-	-	-	-	1	-	-
CO2	*Summarize the logical functions, timers and counters of PLC*	3	2	3		2	-	-	-	-	-	-	1	-	-
CO3	*Discuss the various instructions and modes of operation related to PLC.*	3	2	3		2	-	-	-	-	-	-	1	-	-
CO4	*Realize the architecture and various interfacing techniques of Distributed Control Systems*	3	2	3		1	-	-	-	-	-	-	1	-	-
CO5	*Examine the different applications of PLC and Distributed Control Systems (DCS)*	3	2	3		2	-	-	-	-	-	-	1	-	-
	Average	**3**	**2**	**3**		**2**	**–**	**-**	**-**	**-**	**-**	**-**	**1**	-	**-**

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

K.S.R. COLLEGE OF ENGINEERING (Autonomous) **R 2020**

20EE906	**ELECTRICAL INSTRUMENTS AND MEASUREMENTS** (Open Elective)	L	T	P	C
		3	0	0	3

Prerequisite:

Course Outcomes : On successful completion of the course, the student will be able to		***Cognitive Level***
CO1:	*Explain the construction and calibration of moving coil and Moving iron meters*	*Understand*
CO2:	*Discuss the operation and error correction method of wattmeter and Energy meter.*	*Understand*
CO3:	*Describe the various types of potentiometer and their limitations*	*Understand*
CO4:	*Determine the values of resistor, inductor, capacitor and frequency using bridges.*	*Understand*
CO5:	*Explain the concepts of storage and display devices.*	*Understand*

UNIT - I MEASUREMENT OF VOLTAGE AND CURRENT [9]

Galvanometers – Ballistic, D'Arsonval galvanometer – Principle, construction, operation and comparison of moving coil, moving iron meter – Extension of range and calibration of voltmeter and ammeter – Errors and compensation.

UNIT - II MEASUREMENT OF POWER AND ENERGY [9]

Wattmeters: Induction, Electro-dynamometer - Theory & its errors - Methods of correction – Calibration of wattmeter – Energy meter: Single Phase Energy Meter - Construction, Theory, Errors - Adjustment of Errors – Construction and principle of working of single phase dynamometer type power factor meter.

UNIT - III POTENTIOMETERS & INSTRUMENT TRANSFORMERS [9]

DC potentiometer – Basic circuit, standardization – Laboratory type (Crompton's) – AC potentiometer – Drysdale (polar type) type – Gall-Tinsley (coordinate) type – Limitations & applications – C.T and P.T construction, theory, operation, phasor diagram – Applications.

UNIT - IV BRIDGE MEASUREMENT [9]

Measurement of resistance : Wheatstone bridge, Kelvin double bridge, Megger – Measurement of Inductance : Maxwell Bridge, Anderson bridge – Measurement of Capacitance: Schering bridge, Desauty's Bridge – Determination of frequency using Wein Bridge.

UNIT - V STORAGE AND DISPLAY DEVICES [9]

Recorders: Strip Chart, X-Y Recorders – Digital Plotters – Digital Storage Oscilloscope – Digital multimeters – LED – DLP – Dot Matrix Display – Data Loggers

Total (L= 45, T = 0) = 45 Periods

Text Books :

1 Golding, E.W and Widdis F.C, Electrical Measurements & Measuring Instruments, A.H.Wheeler & Co, Allahabad, India, Sixth Edition,2019.

2 Sawhney, A.K., A course in Electrical & Electronic Measurements and Instrumentation, Dhanpat Rai & Co (P) Ltd, Delhi, Nineteenth Edition, 2021.

Reference Books :

1 Gupta, J.B, Electrical Measurements and Measuring Instruments, S.K. Kataria & Sons, Delhi, Third edition, 2012.

2 Singh, S.K, Industrial Instrumentation and control, Tata McGraw Hill, New york, Second Edition, 2003.

3 Kalsi H.S, Electronic Instrumentation, Tata McGraw Hill, New york, Second Edition, 2004.

4 Martia U. Reissland, Electrical Measurement, New Age International (P) Ltd., New Delhi, Second Edition, 2001.

K.S.R. COLLEGE OF ENGINEERING, TIRUCHENGODE – 637215
DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING
CO-PO MAPPING

Regulation: **R 2020**

Course Code: **20EE906** **Course Name:** **Electrical Instruments and Measurements**

CO	Course Outcomes	Programme Outcomes													
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	*Explain the construction and calibration of moving coil and Moving iron meters*	3	3	2	-	-	1	1	-	-	-	-	3	2	3
CO2	*Discuss the operation and error correction method of wattmeter and Energy meter.*	3	3	2	-	-	1	1	-	-	-	-	3	2	3
CO3	*Describe the various types of potentiometer and their limitations*	3	3	2	-	-	1	1	-	-	-	-	3	2	3
CO4	*Determine the values of resistor, inductor, capacitor and frequency using bridges.*	3	3	2	-	-	1	1	-	-	-	-	3	2	3
CO5	*Explain the concepts of storage and display devices.*	3	3	2	-	-	1	1	-	-	-	-	3	2	3
	Average	**3**	**3**	**2**	**-**	**-**	**1**	**1**	**-**	**-**	**-**	**-**	**3**	**2**	**3**

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

K.S.R. COLLEGE OF ENGINEERING (Autonomous) **R 2020**

20EE907 **ENERGY CONSERVATION AND MANAGEMENT** (Open Elective)

L	T	P	C
3	0	0	3

Prerequisite:

Course Outcomes : On successful completion of the course, the student will be able to		***Cognitive Level***
CO1:	*Give the introduction about energy conservation principle and practices*	*Remember*
CO2:	*Describe the concept of energy efficiency in the building.*	*Understand*
CO3:	*Explain the concept of energy efficiency in the industry*	*Understand*
CO4:	*Illustrate the concept of energy efficiency in the power plant*	*Understand*
CO5:	*Describe the importance energy management and Demand Control Techniques*	*Understand*

UNIT - I ENERGY CONSERVATION PRINCIPLES AND PRACTICES [09]

Energy scenario – Principles and imperatives of energy conservation – Energy consumption pattern – Resource availability – Need for energy saving – Overview of energy consumption and its effects –Energy Monitoring, targetng and reporting - Role of Bureau of Energy Efficiency - Standards and labeling.

UNIT - II ENERGY EFFICIENCY IN BUILDINGS [09]

Introduction, definition and concepts – Energy and water as a resource – Electrical energy conservation: Opportunities and techniques for energy conservation in buildings – Green buildings, Intelligent buildings, Rating of buildings, Efficient use of buildings – Solar passive architecture – Eco-housing concepts.

UNIT - III ENERGY EFFICIENCY IN INDUSTRIES [09]

Potential areas for electrical energy conservation in various industries – Conservation methods – Energy management opportunities in electrical heating, cable selection – Energy efficient motors – Adjustable AC drives – Application and its use – Energy efficiency in lighting.

UNIT - IV ENERGY EFFICIENCY IN POWER PLANTS [09]

Captive power generation systems – Sequence operation of power plants – Gas Insulated Substation – Bus ducts – Types and working principle - Energy management opportunities in transformer – Power transformer – Types of switchgear (HT and LT switchgear) GCB and generator.

UNIT - V ENERGY MANAGEMENT AND AUDIT [09]

Energy Management : Definition, Objective, Importance of energy management, Load management: Demand control techniques - Utility monitoring control system. Energy Audit: definition, types of energy audit, Methodology, Need for energy Audit, Steps involved in energy auditing.

Total (L= 45, T = 0) = 45 Periods

Text Books :ENERGY MANAGEMENT

1 Mehmet Kanoglu and Yunus A. Cengel Dr, Energy Efficiency and Management for Engineers, Tata Mcgrow Hill, New Delhi, First Edition, 2019

2 Craig B. Smith, Energy Management Principles, Pergamon Press, United Kingdom, Second Edition, 2015.

Reference Books :

1 Wayne C Turner, Energy Management Handbook, The Fairmount Press, Newyork, Eighth Edition, 2006.

2 Bureau of Energy Efficiency Study material for Energy Managers and Auditors Examination: Paper I to IV

3 G. G. Rajan, Optimizing Energy Efficiencies in Industry", Tata McGraw Hill, New Delhi , Fourth Edition, , 2004

4 Frank Kreith and Yogi Goswami D, Energy Management and Conservation Handbook, Taylor & Francis, New Delhi Second Edition, 2016.

K.S.R. COLLEGE OF ENGINEERING, TIRUCHENGODE – 637215
DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING
CO-PO MAPPING

Regulation: **R 2020**

Course Code: **20EE907** **Course Name:** **Energy Conservation and Management**

CO	Course Outcomes	Programme Outcomes													
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	*Give the introduction about energy conservation principle and practices*	2	1	2	-	-	-	1	3	1	-	-	3	-	-
CO2	*Describe the concept of energy efficiency in the building.*	2	2	2	-	-	-	1	3	1	-	-	3	-	-
CO3	*Explain the concept of energy efficiency in the industry*	2	2	2	-	-	-	1	3	1	-	-	3	-	-
CO4	*Illustrate the concept of energy efficiency in the power plant*	2	2	2	-	-	-	1	3	1	-	-	3	-	-
CO5	*Describe the importance energy management and Demand Control Techniques*	2	2	2	-	-	-	1	3	-	-	-	3	-	-
	Average	**2**	**2**	**2**	**-**	**-**	**-**	**1**	**3**	**1**	**-**	**-**	**3**	**-**	**-**

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

K.S.R. COLLEGE OF ENGINEERING (Autonomous) **R 2020**

		L	T	P	C
20EE908	**ELECTRICAL WIRING, ESTIMATION AND COSTING** (Open Elective)	3	0	0	3

Prerequisite:

Course Outcomes : On successful completion of the course, the student will be able to		***Cognitive Level***
CO1:	*Describe the various wiring materials and protective devices.*	Understand
CO2:	*Discuss the internal wiring system and illumination.*	Understand
CO3:	*Outline the external wiring system and installations.*	Understand
CO4:	*Apply the knowledge to prepare electrical estimation for domestic installation.*	Apply
CO5:	*Apply the knowledge to prepare the electrical estimation details for industrial installation.*	Apply

UNIT - I INTRODUCTION TO WIRING AND PROTECTIVE DEVICES [09]

Wiring accessories – main switch – isolator and load break duty – classification of main switches – functional switches – one way, two way, intermediate switches – knife switches – specification of switches – function and specification of socket outlets, ceiling roses, fan regulators – Fuses, need, classification, Neutral link – Miniature circuit breaker, classification, function and specification – ELCB – RCCB.

UNIT - II INTERNAL WIRING SYSTEM [09]

Design and Drawing of Internal wiring system for various types of Residential, Commercial and Industrial buildings – Electrical layout – Clearance of line – Different types of circuits, Light circuit, Power circuit, Sub-main wiring, Main wiring, Single Line diagram – Different types of Lamps used in Residential, Commercial and Industrial buildings.

UNIT - III EXTERNAL WIRING SYSTEM AND EARTHING [09]

Different types of Under Ground (UG) Cables – Cable Laying – Electrical Control Panels – External Electrical Distribution System – Single Line Diagram – Load Calculations – General Specifications of Generating Set, Transformer – Street Lighting – Earthing, Different types of earthing system – Plate earthing, Pipe Earthing.

UNIT - IV ESTIMATION OF DOMESTIC INSTALLATION [09]

Selection of cables for internal wiring – Cable size calculation – Selection criteria for control switches – main switch – size of earth continuity conductor and earthing conductor – Preparation of schematic diagrams and wiring diagrams – Estimation problems regarding Electrification of domestic buildings – Relevant rules regarding electrification of high rise buildings.

UNIT - V ESTIMATION OF INDUSTRIAL INSTALLATIONS [09]

Installation of motor pump set – Estimation problem regarding domestic and irrigation pump sets – Estimation problems in small workshops below 50kW connected load – Service connection, definition, classification – use of weather proof cables – estimation problems for single phase and three phase overhead service connections.

Total (L= 45, T = 0) = 45 Periods

Text Books :

1 Raina, K.B. and Bhattacharya, S.K., Electrical Design Estimating and Costing, New Age International, Bengaluru, Second Edition, 2017.

2 Gupta, J.B., A Course in Electrical Installation Estimating and Costing, S K Kataria & Sons,New Delhi, First Edition Reprint, 2013.

Reference Books :

1 Surjith Singh, Electrical estimating and costing, Dhanpat Rai Publishing Company, New Delhi, First Edition,2016.

2 Uppal, S.L., Electrical Wiring, Estimating and Costing, Khanna Publisher, New Delhi, Sixth Edition, 1987.

3 Soni, P.M. and Upadhyay, P.A.,Wiring, Estimating, Costing & Contracting, ATUL PRAKASHAN, Gujarat, First Edition, 2017.

4 Bureau of Indian Standards, I.E. rules for wiring, Electricity Supply Act-1948.

K.S.R. COLLEGE OF ENGINEERING, TIRUCHENGODE – 637215
DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING
CO-PO MAPPING

Regulation: **R 2020**

Course Code: **20EE908** **Course Name:** **Electrical Wiring, Estimation and Costing**

CO	Course Outcomes	Programme Outcomes													
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	Describe the various wiring materials and protective devices.	3	-	1	-	-	-	-	-	-	-	-	-	-	-
CO2	Discuss the internal wiring system and illumination.	3	-	1	-	-	-	-	-	-	-	-	-	-	-
CO3	Outline the external wiring system and installations.	3	-	1	-	-	-	-	-	-	-	-	-	-	-
CO4	Explain the electrical estimation for domestic installation.	3	2	1	-	1	-	-	-	-	-	-	-	-	-
CO5	Describe the electrical estimation details for industrial installation.	3	2	1	-	1	-	-	-	-	-	-	-	-	-
	Average	**3**	**2**	**1**	**-**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	-	-

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

K.S.R. COLLEGE OF ENGINEERING (Autonomous) **R 2020**

20EE909 **FUNDAMENTALS OF ELECTRICAL MACHINERY** (Open Elective)

L	T	P	C
3	0	0	3

Prerequisite:

Course Outcomes : On successful completion of the course, the student will be able to		***Cognitive Level***
CO1:	*Discuss fundamentals in various electrical circuits.*	Understand
CO2:	*Explain the operation and characteristics of DC machines.*	Understand
CO3:	*Determine the efficiency and regulation of the transformer.*	Understand
CO4:	*Explain the operation and starting methods of Induction Motors.*	Understand
CO5:	*Describe the applications of Synchronous Machines.*	Understand

UNIT - I INTRODUCTION [09]

Electromagnetic Induction– Faraday's Laws – Series and Parallel circuits – Self and Mutual Inductance-Numerical problems – Purpose of Earthing – Methods of Earthing – Merits of Earthing – Different types of Electrical Machines.

UNIT - II DC MACHINES [09]

Principle of operation of DC generator – Types of DC machines – EMF equation – Open Circuit Characteristics – Principle of operation of DC Motor – Torque Equation – Speed control methods of DC motor – Losses in DC machines – Performance Characteristics.

UNIT - III TRANSFORMERS [09]

Principle of operation and construction Details – Classification of Transformers – EMF equation – Losses in a Transformer – Calculation of efficiency and regulation – Autotransformer.

UNIT - IV INDUCTION MOTORS [09]

Principle of operation – Constructional Details – Classification – Revolving Magnetic Fields – Starting Methods – Principle of operation of Single Phase Induction Motor – Starting Methods – Applications.

UNIT - V SYNCHRONOUS MACHINES [09]

Principle of operation and construction of alternators – EMF Equation – Regulation of alternator by Synchronous Impedance Method – Principle of operation of synchronous motor – Synchronous Condenser – Applications.

Total (L= 45, T = 0) = 45 Periods

Text Books :

1 Rajendra Prasad, Fundamentals of Electrical Engineering, PHI Publications, New Delhi, Second Edition, 2005

2 B L Theraja and AK Theraja, A Textbook of Electrical Technology: Volume 2 AC and DC Machines, S. Chand & Co Ltd, New Delhi, Twenty Third Edition, 2006

Reference Books :

1 D. P. Kothari and I. J. Nagrath, Electric Machines, Tata McGraw Hill Publishing Company Ltd, Noida, Fourth Edition, 2017

2 Stephen J.Chapman, Electric Machinery Fundamentals, Tata McGraw Hill, New Delhi, Fourth Edition, 2018.

3 P. S. Bimbhra, Electrical Machinery, Khanna Publishers, New Delhi, Seventh Edition, 2018

4 J.B. Gupta, Theory & Performance of Electrical Machines, S.K. Kataria & Sons, New Delhi, First Edition Reprint, 2013.

K.S.R. COLLEGE OF ENGINEERING, TIRUCHENGODE – 637215
DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING
CO-PO MAPPING

Regulation: **R 2020**

Course Code: **20EE909** **Course Name:** **Fundamentals of Electrical Machinery**

CO	Course Outcomes	Programme Outcomes													
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	*Discuss fundamentals in various electrical circuits.*	3	1	-	-	-		-	-	-	-	-	-	-	-
CO2	*Explain the operation and characteristics of DC machines.*	3	1	-	-	-		2	-	-	-	-	-	-	-
CO3	*Determine the efficiency and regulation of the transformer.*	3	1	-	-	-		2	-	-	-	-	-	-	-
CO4	*Explain the operation and starting methods of Induction Motors.*	3	1	-	-	-		2	-	-	-	-	-	-	-
CO5	*Describe the applications of Synchronous Machines.*	3	1	-	-	-		2	-	-	-	-	-	-	-
	Average	**3**	**1**	**-**	**-**	**-**		**2**	**-**	**-**	**-**	**-**	**-**	-	**-**

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

K.S.R. COLLEGE OF ENGINEERING (Autonomous) **R 2020**

20EE910	**PRINCIPLES OF SOFT COMPUTING TECHNIQUES** (Open Elective)	L	T	P	C
		3	0	0	3

Prerequisite:

Course Outcomes : On successful completion of the course, the student will be able to		***Cognitive Level***
CO1:	*Describe the concepts of artificial neural network*	*Understand*
CO2:	*Summarize the various types of neural network*	*Understand*
CO3:	*Discuss the basic concepts of fuzzy logic system*	*Understand*
CO4:	*Illustrate various methods used in fuzzy systems*	*Understand*
CO5:	*Outline the genetic algorithm and hybrid genetic algorithm concepts*	*Understand*

UNIT - I Introduction artificial neural network [09]

Artificial neural networks - biological neurons, Basic models of artificial neural networks – Connections, Learning, Activation Functions, McCulloch and Pitts Neuron, Hebb network.

UNIT - II Neural network architecture and algorithms [09]

Perceptron networks – Learning rule – Training and testing algorithm, Adaptive Linear Neuron, Back propagation Network – Architecture, Training algorithm.

UNIT - III Introduction to fuzzy logic [09]

Fuzzy logic - fuzzy sets - properties - operations on fuzzy sets, fuzzy relations - operations on fuzzy relations.

UNIT - IV Fuzzy logic system [09]

Fuzzy membership functions, fuzzification, Methods of membership value assignments – intuition – inference – rank ordering, Lambda –cuts for fuzzy sets, Defuzzification methods.

UNIT - V Genetic and hybrid algorithms [09]

Introduction to genetic algorithm, operators in genetic algorithm - coding - selection - crossover – mutation, Stopping condition for genetic algorithm , Genetic neuro hybrid systems, Genetic-Fuzzy rule based system

Total (L= 45, T = 0) = 45 Periods

Text Books :

1 S.N.Sivanandam and S.N.Deepa, Principles of soft computing, Wiley India, New Delhi, Third edition, 2011.

2 Timothy J. Ross, Fuzzy Logic with engineering applications, Wiley India, New Delhi, Third edition, 2010.

Reference Books :

1 N. K. Sinha and M. M. Gupta, Soft Computing & Intelligent Systems: Theory & Applications, Academic Press /Elsevier, Massachusetts, First edition, 2009.

2 Simon Haykin, Neural Network, A Comprehensive Foundation, Prentice Hall International, New Jersey, Third edition, 2009.

3 Bart Kosko, Neural Network and Fuzzy Systems, Prentice Hall, New Jersey, First edition,1992.

4 Goldberg D.E., Genetic Algorithms in Search, Optimization, and Machine Learning, Addison Wesley, Boston ,First edition,1989

K.S.R. COLLEGE OF ENGINEERING, TIRUCHENGODE – 637215
DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING
CO-PO MAPPING

Regulation: R 2020

Course Code: 20EE910 **Course Name: Principles of Soft Computing Techniques**

CO	Course Outcomes	Programme Outcomes													
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	*Describe the concepts of artificial neural network*	3	2	-	-	-	-	-	-	-	-	-	1	-	-
CO2	*Summarize the various types of neural network.*	3	2	-	-	-	-	-	-	-	-	-	1	-	-
CO3	*Discuss the basic concepts of fuzzy logic system.*	3	2	-	-	3	-	-	-	-	-	-	1	-	-
CO4	*Illustrate various methods used in fuzzy systems*	3	2	-	-	3	-	-	-	-	-	-	1	-	-
CO5	*Outline the genetic algorithm and hybrid genetic algorithm concepts*	3	2	-	-	3	-	-	-	-	-	-	1	-	-
	Average	**3**	**2**	-	-	**3**	-	-	-	-	-	-	1	-	-

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

K.S.R. COLLEGE OF ENGINEERING (Autonomous) **R 2020**

20EE911	**EMBEDDED SYSTEM TECHNOLOGY** (Open Elective)	L	T	P	C
		3	0	0	3

Prerequisite:

Course Outcomes : On successful completion of the course, the student will be able to		***Cognitive Level***
CO1:	*Illustrate the fundamentals of embedded systems.*	*Understand*
CO2:	*Outline the various types of embedded communication protocols*	*Understand*
CO3:	*Explain the concept of software development process and tools*	*Understand*
CO4:	*Describe the functions of real time operating systems*	*Understand*
CO5:	*Discuss the applications of real time embedded systems*	*Understand*

UNIT – I INTRODUCTION TO EMBEDDED SYSTEMS [09]

Embedded System Vs General Computing System – Classification of embedded systems – Functional building blocks of embedded systems – Structural units in embedded processor – Selection of processor & memory devices – Processor interfacing with memory and I/O units – Embedded hardware unit.

UNIT - II EMBEDDED NETWORKS [09]

Introduction to I/O device ports & buses – Serial communication using I^2C,CAN,SPI and USB bus – Parallel communication using PCI, PCI-X buses, ARM bus.

UNIT – III EMBEDDED FIRMWARE DEVELOPMENT ENVIRONMENT [09]

Introduction to embedded software development process and tools – Host and target machines – linking and locating software – Embedded Product Development Life Cycle – objectives, different phases of EDLC, Modeling of EDLC.

UNIT – IV REAL TIME OPERATING SYSTEMS [09]

Introduction to basic concepts of RTOS – Task, process & threads – Context switching – Multiprocessing and Multitasking – Preemptive and nonpreemptive scheduling – Round Robin scheduling – Task communication – shared memory, message passing – Interprocess communication – semaphores, Message queue, Mailbox, pipes.

UNIT – V RTOS BASED EMBEDDED SYSTEM DESIGN [09]

Basic Functions and Types of RTOS – Interrupt routines in RTOS – Case Study of Washing Machine – Automotive Application – Smart card system – ATM machine – Digital camera.

Total (L= 45, T = 0) = 45 Periods

Text Books :

1 Rajkamal.P, Embedded System – Architecture, Programming, Design, Tata McGraw Hill Education Private Limited, New Delhi, Third Edition, 2016.

2 John B.Peatman, Design With PIC microcontroller, Pearson Education, India, First Edition, 2009.

Reference Books :

1 Frank Vahid and Tony Givargi, Embedded System Design - A Unified Hardware & Software Introduction, John Wiley, New Jersey, Third Edition, 2011.

2 David E.Simon, An Embedded software primer, Pearson Education, India, First Edition, 2007.

3 Steve Heath, Embedded System Design, Elsevier, India, Second Edition, 2003.

4 Wayne wolf, Computers as components: Principles of embedded computing system design, Morgan Kaufmann publishers, USA, Third Edition, 2012.

K.S.R. COLLEGE OF ENGINEERING, TIRUCHENGODE – 637215
DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING
CO-PO MAPPING

Regulation: R 2020

Course Code: 20EE911 **Course Name: Embedded System Technology**

CO	Course Outcomes	Programme Outcomes													
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	*Illustrate the fundamentals of embedded systems*	3	2	3	-	3	3	-	-	-	-	-	3	-	-
CO2	*Outline the various types of embedded communication protocols*	3	2	3	-	3	3	-	-	-	-	-	3	-	-
CO3	*Explain the concept of software development process and tools.*	3	2	3	-	3	3	-	-	-	-	-	3	-	-
CO4	*Describe the functions of real time operating systems.*	3	2	3	-	3	3	-	-	-	-	-	3	-	-
CO5	*Discuss the applications of real time embedded systems*	3	2	3	-	3	3	-	-	-	-	-	3	-	-
	Average	**3**	**2**	**3**	**-**	**3**	**3**	**-**	**-**	**-**	**-**	**-**	**3**	**-**	**-**

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

K.S.R. COLLEGE OF ENGINEERING (Autonomous) **R 2020**

		L	T	P	C
20EC901	**BASICS OF MEDICAL ELECTRONICS** (Open Elective)	3	0	0	3

Prerequisite:

Course Outcomes : On the successful completion of the course, students will be able to		***Cognitive Level***
CO1	*Describe the recording methods of various bio-potentials.*	*Understand*
CO2	*Illustrate the working of various equipment that deal with bio-chemical and non-electrical parameter measurement.*	*Understand*
CO3	*Discuss the different types of therapeutic equipment.*	*Understand*
CO4	*Interpret the principles of various medical imaging modalities.*	*Understand*
CO5	*Outline the recent trends in medical instrumentation.*	*Understand*

UNIT – I ELECTRO-PHYSIOLOGY AND BIO-POTENTIAL RECORDING [09]

The origin of bio-potentials - Bio-potential electrodes - Carrier, chopper and isolation amplifiers -Transducers for biomedical applications: Strain gauge, piezoelectric transducer, thermocouple, thermistor, biosensors - ECG, EEG, EMG, PCG, ERG and EOG: Lead systems, recording methods.

UNIT - II BIO-CHEMICAL AND NON ELECTRICAL PARAMETER MEASUREMENT [09]

Blood gas analyzers - Electrophoresis - Colorimeter & Photometer - Auto analyzer - Blood flow meter - Cardiac output - Respiratory measurement - Blood pressure measurement - Temperature measurement - Pulse measurement -Blood cell counters: Coulter counters.

UNIT - III THERAPEUTIC EQUIPMENTS [09]

Cardiac pacemakers - DC defibrillator - Dialyzers - Surgical diathermy - Physiotherapy and electrotherapy equipment - Oxygenators - Heart lung machine.

UNIT - IV MEDICAL IMAGING [09]

X-Ray - Computer Axial Tomography - Positron Emission Tomography - MRI and NMR - Ultrasonic Imaging systems.

UNIT - V RECENT TRENDS IN MEDICAL INSTRUMENTATION - [09]

Thermograph - Endoscopy unit - LASER in medicine - Biomedical telemetry - Radio-pill - Cardiac catheterization laboratory - Electrical safety of medical equipment.

Total (L: 45) = 45 Periods

Text Books :

1 R.S.Khandpur, Handbook of Biomedical Instrumentation, Tata McGraw Hill, New Delhi, Third Edition, 2014

2 Leslie Cromwel, Fred J.Weibel, Erich A. Pfeiffer, Biomedical Instrumentation and Measurements, Pearson/Prentice Hall India, New Delhi,Second Edition, 2011.

Reference Books :

1 John G.Webster, Medical Instrumentation Application and Design, John Wiley & Sons Inc, New Jersy, Fourth Edition, 2009.

2 Joseph J.Carr and John M.Brown, Introduction to Biomedical Equipment Technology, John Wiley &Sons, New Jersy, Fourth Edition, 2008.

3 M. Arumugam, Biomedical Instrumentation, Anuradha Publications, Chennai, Second Edition, Reprint 2009.

4 R.L. Reka & C. Ravikumar, Biomedical Instrumentation/ Medical Electronics, Lakshmi Publications, Chennai, Second Edition, Reprint 2010.

K.S.R. COLLEGE OF ENGINEERING (Autonomous)
DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING
CO PO MAPPING

Regulation: **R 2020**

Course Code : 20EC901 **Course Name:** **Basics of Medical Electronics**

CO	Course Outcomes	Programme Outcomes													
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	*Describe the recording methods of various bio-potentials.*	2	1	2	-	-	1	-	-	-	-	-	1	-	-
CO2	*Illustrate the working of various equipment that deal with bio-chemical and non-electrical parameter measurement.*	2	1	2	-	-	1	-	-	-	-	-	1	-	-
CO3	*Discuss the different types of therapeutic equipment.*	2	1	2	-	-	1	-	-	-	-	-	1	-	-
CO4	*Interpret the principles of various medical imaging modalities.*	2	1	2	-	-	1	-	-	-	-	-	1	-	-
CO5	*Outline the recent trends in medical instrumentation.*	2	1	2	-	-	1	-	-	-	-	-	1	-	-
	Average	**2**	**1**	**2**		**-**	**1**	**-**	**-**	**-**	**-**	**-**	**1**		**-**

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

K.S.R. COLLEGE OF ENGINEERING (Autonomous) **R 2020**

20EC902	**NANO TECHNOLOGY**	L	T	P	C
	(Open Elective)	3	0	0	3

Prerequisite:

Course Outcomes: On completion of this course, the student will be able to	***Cognitive Level***
CO1 Describe the evolution and associated techniques of Nano science.	*Understand*
CO2 Interpret the diversities in Nano systems.	*Understand*
CO3 Classify different Nano particles, shells and their Characterization.	*Understand*
CO4 Illustrate the importance of nanotechnology in biotechnology.	*Understand*
CO5 Outline the applications of nanotechnology in industry and society.	*Understand*

UNIT – I INTRODUCTION [09]

Nano science - Evolution - Electron microscopes - Scanning probe microscopes - Optical microscopes for nanotechnology - X ray diffraction - Associated techniques.

UNIT – II DIVERSITY IN NANO SYSTEMS [09]

Fullerenes - Synthesis and purification - Mass spectrometry and ion/molecule reactions - Chemistry of fullerenes - Endo-hedral chemistry - Conductivity and super conductivity in doped fullerenes - Carbon nanotubes - Synthesis and purification - Electronic structure - Transport - Mechanical - Physical properties applications - Semiconductor quantumdots - Synthesis and applications.

UNIT – III METAL NANO PARTICLES AND NANO SHELLS [09]

Method of preparation - Characterization - Functions and applications - Core shell nanoparticles: Types of system - Characterization - Functions and applications - Nano shells: Types, characterization, properties and applications.

UNIT – IV EVOLVING INTERFACES IN NANO [09]

Nano biology - Interaction between bio molecules and nano particle surfaces - Applications of nano in biology -Microprobes for medical diagnosis and biotechnology - Current status - Nano sensors - Order from chaos - Applications - Smart dust sensors - Nano medicines various kinds - Future directions.

UNIT – V IMPACT OF NANO TECHNOLOGY ON SOCIETY [09]

Introduction - Industrial revolution to Nano revolution - Implications of Nano sciences and Nano technology on society - Issues - Nano policies and institutions - Nanotech and war - Nano arms race - Harnessing nano technology for economic and social development.

Total = 45 Periods

Text Books :

1 PradeepT, Nano: The Essentials, Understanding Nano Science and Nano technology,TMH, New Delhi, FirstEdition, 2007.

2 Mick Wilson, Kamali Kannargare., Geoff Smith, Nano technology: Basic Science and Emerging technologies, Overseas Press, New Delhi,FirstEdition, 2005.

Reference Books :

1 Nalwa H S, Encyclopedia of Nanoscience and Nanotechnology, Vol 1-10, American Scientific Publishers, California,FirstEdition 2004.

2 Rao C N R and Govindaraj A, Nanotubes and Nanowires, Royal Society of Chemistry, London,Third Edition, 2005.

3 Richard A L Jones, Soft Machines: Nanotechnology and Life, Oxford University Press, Oxford, FirstEdition,2007

4 Charles P. Poole, Frank J. Owens, Introduction to Nanotechnology, Wiley Inter science, New Jersey, First Edition, 2003.

5 Mark A. Ratner, Daniel Ratner, Nanotechnology: A gentle introduction to the next Big Idea, Pearson Education, London, 2003.

K.S.R. COLLEGE OF ENGINEERING (Autonomous)
DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING
CO PO MAPPING

Regulation: R 2020

Course Code: 20EC902 **Course Name: NANO Technology**

CO	Course Outcomes	Programme Outcomes													
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	*Describe the evolution and associated techniques of Nano science.*	3	3	3	-	-	-	-	-	-	-	-	-	-	-
CO2	*Interpret the diversities in Nano systems.*	3	3	3	-	-	-	-	-	-	-	-	-	-	-
CO3	*Classify different Nano particles, shells and their Characterization.*	3	3	3	-	-	-	-	-	-	-	-	-	-	-
CO4	*Illustrate the importance of nanotechnology in biotechnology.*	3	3	3	-	-	-	-	-	-	-	-	-	-	-
CO5	*Outline the applications of nanotechnology in industry and society.*	3	3	3	-	-	-	-	-	-	-	-	-	-	-
	Average	**3**	**3**	**3**	**-**		**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

K.S.R. COLLEGE OF ENGINEERING (Autonomous) **R 2020**

		L	T	P	C
20EC903	**ELECTRONICS AND MICROPROCESSOR** (Open Elective)	3	0	0	3

Prerequisite:

Course Outcomes: On the successful completion of the course, students will be able to		***Cognitive Level***
CO1	*Interpret the fundamental concepts of semiconductor device.*	*Understand*
CO2	*Explain the various characteristics of amplifiers.*	*Understand*
CO3	*Outline the fundamental concepts of Digital Electronics*	*Understand*
CO4	*Describe about 8085 microprocessors*	*Understand*
CO5	*Explain the applications using microprocessor*	*Understand*

UNIT – I SEMICONDUCTORS AND RECTIFIERS [09]

Classification of solids based on energy band theory - Intrinsic semiconductors - Extrinsic semiconductors - PN junction diode: Characteristics - Half wave and full wave rectifiers - Zener diode: Characteristics - Voltage regulator.

UNIT – II TRANSISTORS AND AMPLIFIERS [09]

Bipolar junction transistor: Construction and characteristics - CE configuration and characteristics - Transistor biasing: Fixed and voltage divider biasing - Construction and characteristics: FET, SCR and UJT - Concept of feedback: Negative feedback – Application in temperature and motor speed control - Common Emitter Amplifier (Qualitative treatment only).

UNIT – III DIGITAL ELECTRONICS [09]

Number system: Binary, Octal, Hexadecimal - Boolean algebra - Logic gates - Half adder and full adder - Flip flops - Shift Registers: SISO, SIPO, PISO, PIPO - Counters: 3-bit Synchronous up & down, 3-bit Asynchronous up & down - A/D conversion: Single slope, Successive approximation - D/A conversion: Binary weighted resistor type.

UNIT – IV 8085 MICROPROCESSOR [09]

Block diagram of Microcomputer – 8085: Architecture, Pin configuration, Addressing modes, Instruction set and Simple programs using arithmetic and logical operations.

UNIT – V INTERFACING AND APPLICATIONS OF MICROPROCESSOR [09]

Basic interfacing concepts - Interfacing of Input and Output devices - Applications of microprocessor: Temperature control, Stepper motor control, Traffic light control - Case study: Mining problem, Turbine monitor using 8085.

Total (L: 45) = 45 Periods

Text Books :

1 Jacob Millman and Christos C. Halkias, Integrated Electronics, Tata McGraw-Hill publishers, US, Second Edition, 2011.

2 Ramesh Gaonkar, Microprocessor Architecture ll, Programming and Applications with 8085, Penram International Publishing, USA, Sixth Edition, 2013.

Reference Books :

1 Malvino Leach and Saha, Digital Principles and Applications, Tata McGraw-Hill Education, New Delhi, Eighth Edition, 2014.

2 Mehta V.K, Principles of Electronics, S. Chand and Company Ltd., New Delhi, Seventh Edition, 2014.

3 Salivahanan S, Suresh Kumar N, Vallavaraj A, Electronic Devices and Circuits, Tata McGraw-Hill Education, New Delhi, Third Edition, 2012.

4 Krishna Kant, Microprocessors and Microcontrollers, PHI Learning Private Ltd., New Delhi, Second Edition, 2013.

K.S.R. COLLEGE OF ENGINEERING (Autonomous)
DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING
CO PO MAPPING

Regulation: **R 2020**

Course Code: 20EC903 **Course Name:** **Electronics and Microprocessor**

CO	Course Outcomes	Programme Outcomes													
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	*Interpret the fundamental concepts of semiconductor device.*	3	3	2	-	-	-	-	-	-	-	-	-	-	-
CO2	*Explain the various characteristics of amplifiers.*	3	3	2	-	-	-	-	-	-	-	-	-	-	-
CO3	*Outline the fundamental concepts of Digital Electronics*	3	3	2	-	-	-	-	-	-	-	-	-	-	-
CO4	*Describe about 8085 microprocessors*	3	3	2	-	-	-	-	-	-	-	-	-	-	-
CO5	*Explain the applications using microprocessor*	3	3	2	-	-	-	-	-	-	-	-	-	-	-
	Average	**3**	**3**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

K.S.R. COLLEGE OF ENGINEERING (Autonomous) **R 2020**

		L	T	P	C
20EC904	**ANALOG AND DIGITAL COMMUNICATION** (Open Elective)	3	0	0	3

Prerequisite:

Course Outcomes: On the successful completion of the course, students will be able to		***Cognitive Level***
CO1	*Describe analog communication techniques*	*Understand*
CO2	*Describe Digital communication techniques*	*Understand*
CO3	*Use data and pulse communication techniques*	*Understand*
CO4	*Explain Source and Error control coding*	*Understand*
CO5	*Utilize multi-user radio communication*	*Understand*

UNIT – I ANALOG COMMUNICATION [09]

Noise: Source of Noise – External Noise- Internal Noise- Noise Calculation. Introduction to Communication Systems: Modulation – Types – Need for Modulation. Theory of Amplitude Modulation – Evolution and Description of SSB Techniques – Theory of Frequency and Phase Modulation – Comparison of various Analog Communication System (AM – FM – PM).

UNIT – II DIGITAL COMMUNICATION [09]

Amplitude Shift Keying (ASK) – Frequency Shift Keying (FSK) Minimum Shift Keying (MSK) –Phase Shift Keying (PSK) – BPSK – QPSK – 8 PSK – 16 PSK – Quadrature Amplitude Modulation (QAM) – 8 QAM – 16 QAM – Bandwidth Efficiency– Comparison of various Digital Communication System (ASK – FSK – PSK – QAM).

UNIT – III DATA AND PULSE COMMUNICATION [09]

Data Communication: History of Data Communication – Standards Organizations for Data Communication- Data Communication Circuits – Data Communication Codes – Error Detection and Correction Techniques – Data communication Hardware – serial and parallel interfaces. Pulse Communication: Pulse Amplitude Modulation (PAM) – Pulse Time Modulation (PTM) – Pulse code Modulation (PCM) – Comparison of various Pulse Communication System (PAM – PTM – PCM).

UNIT – IV SOURCE AND ERROR CONTROL CODING [09]

Entropy, Source encoding theorem, Shannon fano coding, Huffman coding, mutual information, channel capacity, channel coding theorem, Error Control Coding, linear block codes, cyclic codes, convolution codes, viterbi decoding algorithm.

UNIT – V MULTI-USER RADIO COMMUNICATION [09]

Advanced Mobile Phone System (AMPS) – Global System for Mobile Communications (GSM) – Code division multiple access (CDMA) – Cellular Concept and Frequency Reuse – Channel Assignment and Hand – Overview of Multiple Access Schemes – Satellite Communication – Bluetooth.

Total (L: 45) = 45 Periods

Text Books :

1 Wayne Tomasi, Advanced Electronic Communication Systems, Pearson Education, London, Sixth Edition 2009.

2 Simon Haykin, Communication Systems, John Wiley & Sons, New Jersy, Fourth Edition,2004.

Reference Books :

1 H.Taub, D L Schilling and G Saha, Principles of Communication, McGraw Hill Education, New York, Fourth Edition, 2017.

2 B. P.Lathi, Modern Analog and Digital Communication Systems, Oxford University Press, Oxford, Third Edition, 2007.

3 Rappaport T.S, Wireless Communications: Principles and Practice, Pearson Education, London, Third Edition 2007.

4 Blake, Electronic Communication Systems, Thomson Delmar Publications, USA, Second Edition, 2001.

K.S.R. COLLEGE OF ENGINEERING (Autonomous)
DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING
CO PO MAPPING

Regulation: **R 2020**

Course Code: 20EC904 **Course Name:** **Analog and Digital Communication**

CO	Course Outcomes	Programme Outcomes													
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	*Describe analog communication techniques*	3	3	3	-	-	-	-	-	-	-	-	-	-	-
CO2	*Describe Digital communication techniques*	3	3	3	-	-	-	-	-	-	-	-	-	-	-
CO3	*Use data and pulse communication techniques*	3	3	3	-	-	-	-	-	-	-	-	-	-	-
CO4	*Explain Source and Error control coding*	3	3	3	-	-	-	-	-	-	-	-	-	-	-
CO5	*Utilize multi-user radio communication*	3	3	3	-	-	-	-	-	-	-	-	-	-	-
	Average	**3**	**3**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

K.S.R. COLLEGE OF ENGINEERING (Autonomous) **R 2020**

20EC905 **PRINCIPLES OF COMMUNICATION** (Open Elective)

L	T	P	C
3	0	0	3

Prerequisite:

Course Outcomes: On the successful completion of the course, students will be able to		***Cognitive Level***
CO1	Determine the performance of analog modulation schemes in time and frequency domains.	*Understand*
CO2	Determine the performance of systems for generation and detection of modulated analog signals.	*Understand*
CO3	Characterize analog signals in time domain as random processes and in frequency domain using Fourier transforms	*Understand*
CO4	Determine the performance of analog communication systems in the presence of Noise	*Understand*
CO5	Interpret the characteristics of pulse amplitude modulation, pulse position modulation and pulse code modulation systems.	*Understand*

UNIT – I AMPLITUDE MODULATION [09]

Introduction, Amplitude Modulation: Time & Frequency – Domain description, switching modulator, Envelop detector. Time and Frequency – Domain description, Ring modulator, Coherent detection, Costas Receiver, Quadrature Carrier Multiplexing. SSB Modulation, VSB Modulation, Frequency Translation, Frequency- Division Multiplexing, Theme Example: VSB Transmission of Analog and Digital Television.

UNIT – II ANGLE MODULATION [09]

Basic definitions, Frequency Modulation: Narrow Band FM, Wide Band FM, Transmission bandwidth of FM Signals, Generation of FM Signals, Demodulation of FM Signals, FM Stereo Multiplexing, Phase–Locked Loop: Nonlinear model of PLL, Linear model of PLL, Nonlinear Effects in FM Systems. The Super heterodyne Receiver

UNIT - III RANDOM VARIABLES & PROCESS [09]

Introduction, Probability, Conditional Probability, Random variables, Several Random Variables. Statistical Averages: Function of a random variable, Moments, Random Processes, Mean, Correlation and Covariance function: Properties of autocorrelation function, Cross–correlation functions

UNIT – IV NOISE IN ANALOG MODULATION [09]

Shot Noise, Thermal noise, White Noise, Noise Equivalent Bandwidth (refer Chapter 5 of Text), Noise Figure. Introduction, Receiver Model, Noise in DSB-SC receivers, Noise in AM receivers, Threshold effect, Noise in FM receivers, Capture effect, FM threshold effect, FM threshold reduction, Pre-emphasis and De-emphasis in FM.

UNIT – V DIGITAL REPRESENTATION OF ANALOG SIGNALS [09]

Introduction, Why Digitize Analog Sources?, The Sampling process, Pulse Amplitude Modulation, Time Division Multiplexing, Pulse-Position Modulation, Generation of PPM Waves, Detection of PPM Waves, The Quantization Process, Quantization Noise, Pulse–Code Modulation: Sampling, Quantization, Encoding, Regeneration, Decoding, Filtering, Multiplexing.

Total (L: 45) = 45 Periods

Text Books :

1 Wayne Tomasi, Advanced Electronic Communication Systems, Pearson Education, London, Sixth Edition, 2009.

2 Simon Haykin, Communication Systems, John Wiley & Sons, New Jersy, Fourth Edition2004.

Reference Books :

1 H.Taub & D.L.Schilling, Principles of Communication Systems**,** TMH, New Delhi, First Edition, 2011.

2 H.Taub, D L Schilling and G Saha, Principles of Communication, Pearson Education, London, Fourth Edition, 2017.

3 B. P.Lathi, Modern Analog and Digital Communication Systems, Oxford University Press, Oxford, Third Edition 2007.

4 Blake, Electronic Communication Systems, Thomson Delmar Publications, USA, First Edition, 2002.

K.S.R. COLLEGE OF ENGINEERING (Autonomous)
DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING
CO PO MAPPING

Regulation: **R 2020**

Course Code: 20EC905 **Course Name:** **Principles of Communication**

CO	Course Outcomes	Programme Outcomes													
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	Determine the performance of analog modulation schemes in time and frequency domains.	3	3	3	-	-	-	-	-	-	-	-	-	-	-
CO2	Determine the performance of systems for generation and detection of modulated analog signals.	3	3	3	-	-	-	-	-	-	-	-	-	-	-
CO3	Characterize analog signals in time domain as random processes and in frequency domain using Fourier transforms	3	3	3	-	-	-	-	-	-	-	-	-	-	-
CO4	Determine the performance of analog communication systems in the presence of Noise	3	3	3	-	-	-	-	-	-	-	-	-	-	-
CO5	Interpret the characteristics of pulse amplitude modulation, pulse position modulation and pulse code modulation systems.	3	3	3	-	-	-	-	-	-	-	-	-	-	-
	Average	**3**	**3**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

K.S.R. COLLEGE OF ENGINEERING (Autonomous) **R 2020**

		L	T	P	C
20EC906	**FUNDAMENTALS OF ROBOTICS** (Open Elective)	3	0	0	3

Prerequisite:

Course Outcomes: On completion of this course, the students will be able to		***Cognitive Level***
CO1	*Describe the basis of Robotics*	*Understand*
CO2	*Describe the technologies applicable for Robotics in computer based vision*	*Understand*
CO3	*Interpret the different sensing elements of robot*	*Understand*
CO4	*Develop the algorithms applicable for robotics*	*Apply*
CO5	*Develop 4-axis and 6-axis robot*	*Apply*

UNIT – I INTRODUCTION TO ROBOTICS [09]

Motion - Potential function - Road maps - Cell decomposition sensor and sensor planning - Kinematics - Forward and inverse kinematics - Transformation matrix and DH transformation - Geometric methods and algebraic methods.

UNIT – II COMPUTER VISION [09]

Projection - Optics, projection on the Image plane and radiometry - Image processing - Connectivity - Images - Gray Scale and binary images - Blob filling - Histogram - Convolution - Digital convolution and filtering and Masking techniques - Edge detection - Face detection.

UNIT - III SENSORS AND SENSING DEVICES [09]

Introduction to various types of sensor - Resistive sensors - Range sensors – Radar and Infra-red - Introduction to sensing - Light sensing - Heat sensing - Touch sensing and position sensing.

UNIT – IV ARTIFICIAL INTELLIGENCE [09]

Uniform Search strategies - Breadth first, Depth first, Depth limited - Iterative and deepening depth first search and bidirectional search - The A* algorithm - Planning - State-space planning - Plan - space planning - Graph plan/Sat plan and their comparison - Multi-agent planning 1 and Multi-agent planning 2 - Probabilistic reasoning

UNIT – V INTEGARATION TO ROBOT [09]

Building of 4 axis or 6 axis robot - Vision system for pattern detection - Sensors for obstacle detection - AI algorithms for path finding - Decision making.

Total (L: 45) = 45 Periods

Text Books :

1 Duda, Hart and Stork, Pattern Recognition, Wiley-Inter science, New Jersy, First Edition, 2000.

2 Mallot, Computational Vision: Information Processing in Perception and Visual Behavior, MIT Press, USA, First Edition, 2000.

Reference Books :

1 Stuart Russell and Peter Norvig, Artificial Intelligence-A Modern Approach, Pearson Education Series in Artificial Intelligence, USA, First Edition, 2004.

2 Robert Schilling and Craig., Fundamentals of Robotics, Analysis and control, PHI, New Delhi, First Edition 2003.

3 Forsyth and Ponce, Computer Vision, A modern Approach, Pearson Education, USA, First Edition 2003.

4 https://nptel.ac.in/courses/112/108/112108093/

K.S.R. COLLEGE OF ENGINEERING (Autonomous)
DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING
CO PO MAPPING

Regulation: **R 2020**

Course Code: 20EC906 **Course Name:** **Fundamentals of Robotics**

CO	Course Outcomes	Programme Outcomes													
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	*Describe the basis of Robotics*	3	3	3	-	-	-	-	-	-	-	-	-	-	-
CO2	*Describe the technologies applicable for Robotics in computer based vision*	3	3	3	-	-	-	-	-	-	-	-	-	-	-
CO3	*Interpret the different sensing elements of robot*	3	3	3	-	-	-	-	-	-	-	-	-	-	-
CO4	*Develop the algorithms applicable for robotics*	3	3	3	-	-	-	-	-	-	-	-	-	-	-
CO5	*Develop 4-axis and 6-axis robot*	3	3	3	-	-	-	-	-	-	-	-	-	-	-
	Average	**3**	**3**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

K.S.R. COLLEGE OF ENGINEERING (Autonomous) **R 2020**

		L	T	P	C
20EC907	**INTERNET OF THINGS SENSING AND ACTUATOR DEVICES** (Open Elective)	3	0	0	3

Prerequisite:

Course Outcomes: On completion of this course, the student will be able to		***Cognitive Level***
CO1	*Describe what IoT is and how it works today.*	*Understand*
CO2	Design and program IoT devices.	*Understand*
CO3	*Describe the functions and characteristics of IoT sensors.*	*Understand*
CO4	*Illustrate the wireless, energy, power, RF and sensing modules.*	*Understand*
CO5	*Describe the applications and technological challenges faced by IoT devices.*	*Understand*

UNIT – I BASICS OF IOT [09]

Definitions and Functional Requirements –Motivation – Architecture - Web 3.0 View of IoT– Ubiquitous IoT Applications – Four Pillars of IoT – DNA of IoT - The Toolkit Approach for End-user Participation in the Internet of Things. Middleware for IoT: Overview – Communication middleware for IoT –IoT Information Security

UNIT – II IOT PROTOCOLS [09]

Protocol Standardization for IoT – Efforts – M2M and WSN Protocols – SCADA and RFID Protocols – Issues with IoT Standardization – Unified Data Standards – Protocols – IEEE 802.15.4 – BAC Net Protocol – Modbus – KNX – Zigbee Architecture – Network layer – APS layer – Security

UNIT – III IOT SENSORS [09]

Industrial sensors – Description & Characteristics–First Generation – Description &Characteristics– Advanced Generation – Description & Characteristics–Integrated IoT Sensors – Description & Characteristics–Polytronics Systems – Description &Characteristics–Sensors' Swarm – Description & Characteristics–Printed Electronics –Description & Characteristics–IoT Generation Roadmap.

UNIT– IV TECHNOLOGICAL ANALYSIS [09]

Wireless Sensor Structure–Energy Storage Module–Power Management Module – RF Module– Sensing Module

UNIT – V APPLICATIONS [09]

The Role of the Internet of Things for Increased Autonomy and Agility in Collaborative Production Environments - Resource Management in the Internet of Things: Clustering, Synchronization and Software Agents. Applications - Smart Grid – Electrical Vehicle Charging

Total = 45 Periods

Text Books:

1 David Easley and Jon Kleinberg, Networks, Crowds, and Markets: Reasoning About a Highly Connected World, Cambridge University Press, London, First Edition, 2010.

2 Guillaume Girardin, Antoine Bonnabel, Dr. Eric Mounier, Technologies & Sensors for the Internet of Things Businesses & Market Trends, First Edition, 2014.

Reference Books:

1 Honbo Zhou, Dieter Uckelmann; Mark Harrison, The Internet of Things in the Cloud: A Middleware Perspective - CRC Press,USA,First Edition,2012.

2 Florian Michahelles, Architecting the Internet of Things –– Springer, Berlin, First Edition, 2011.

3 Ida N, Sensors,Actuators and Their Interfaces, Scitech Publishers, 2014.

4 Olivier Hersent, Omar Elloumi and David Boswarthick, The Internet of Things: Applications to the Smart Grid and Building Automation, Wiley, New Jersy, First Edition, 2012.

K.S.R. COLLEGE OF ENGINEERING (Autonomous)
DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING
CO PO MAPPING

Regulation: **R 2020**

Course Code: 20EC907 **Course Name:** **Internet of Things Sensing and Actuator Devices**

CO	Course Outcomes	Programme Outcomes													
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	*Describe what IoT is and how it works today.*	3	3	3	-	-	-	-	-	-	-	-	-	-	-
CO2	Design and program IoT devices.	3	3	3	-	-	-	-	-	-	-	-	-	-	-
CO3	*Describe the functions and characteristics of IoT sensors.*	3	3	3	-	-	-	-	-	-	-	-	-	-	-
CO4	*Illustrate the wireless, energy, power, RF and sensing modules.*	3	3	3	-	-	-	-	-	-	-	-	-	-	-
CO5	*Describe the applications and technological challenges faced by IoT devices.*	3	3	3	-	-	-	-	-	-	-	-	-	-	-
	Average	**3**	**3**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

K.S.R. COLLEGE OF ENGINEERING (Autonomous) **R 2020**

		L	T	P	C
20EC908	**CONSUMER ELECTRONICS** (Open Elective)	3	0	0	3

Prerequisite:

Course Outcomes: On completion of this course, the student will be able to		***Cognitive Level***
CO1	*Describe the evolution and fundamentals of consumer electronics*	*Understand*
CO2	*Discuss various entertainment electronics appliances*	*Understand*
CO3	*Demonstrate various smart home systems*	*Understand*
CO4	*Outline various home appliances*	*Understand*
CO5	*Illustrate various communication equipment's used In day to day life*	*Understand*

UNIT – I CONSUMER ELECTRONICS FUNDAMENTALS [09]

History of Electronic Devices- Vacuum Tubes, Transistors, Integrated Circuits- Moore's Law, Semiconductor Devices, Diodes, Rectifiers, Transistors, Logic Gates, Combinational Circuits, ADC, DAC and Microprocessors, Microprocessor Vs Microcontrollers, Microcontrollers in consumer electronics, Energy management, Intelligent Building Perspective.

UNIT – II ENTERTAINMENT ELECTRONICS [09]

Audio systems: Construction and working principle of: Microphone, Loud speaker, AM and FM receiver, stereo, 2.1 home theatres, 5.1 home theatres, Display systems: CRT, LCD, LED and Graphics display Video Players: DVD and Blue RAY. Recording Systems: Digital Cameras and Camcorders.

UNIT – III SMART HOME [09]

Technology involved in Smart home, Home Virtual Assistants- Alexa and Google Home. Home Security Systems - Intruder Detection, Automated blinds, Motion Sensors, Thermal Sensors and Image Sensors, PIR, IR and Water Level Sensors.

UNIT– IV HOME APPLIANCES [09]

Home Enablement Systems: RFID Home, Lighting control, Automatic Cleaning Robots, Washing Machines, Kitchen Electronics- Microwave, Dishwasher, Induction Stoves, Smart Refrigerators, Smart alarms, Smart toilet, Smart floor, Smart locks.

UNIT – V COMMUNICATION SYSTEMS [09]

Cordless Telephones, Fax Machines, PDAs - Tablets, Smart Phones and Smart Watches, Introduction to Smart OS - Android and iOS. Video Conferencing Systems - Web/IP Camera, Video security, Internet Enabled Systems, Wi-Fi, IoT, Li-Fi, GPS and Tracking Systems.

Total = 45 Periods

Text Books:

1 Dennis C Brewer, Home Automation, Que Publishing, London, First Edition, 2013.

2 Jordan Frith, Smartphones as Locative Media, Wiley, New Jersy, First Edition, 2014.

Reference Books:

1 Lyla B Das, Embedded Systems-An Integrated Approach, Pearson, London, First Edition, 2013

2 Marilyn Wolf, Computers as Components - Principles of Embedded Computing System Design, Third Edition Morgan Kaufmann Publisher (An imprint from Elsevier), 2012

3 Peckol, Embedded system Design, John Wiley & Sons, USA, First Edition, 2010

4 Thomas M. Coughlin, Digital Storage in Consumer Electronics, Elsevier and Newness, Amsterdam, Netherlands, First Edition, 2012.

K.S.R. COLLEGE OF ENGINEERING (Autonomous)
DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING
CO PO MAPPING

Regulation: **R 2020**

Course Code: 20EC908 **Course Name:** **Consumer Electronics**

CO	Course Outcomes	Programme Outcomes													
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	*Describe the evolution and fundamentals of consumer electronics*	3	3	3	-	-	-	-	-	-	-	-	-	-	-
CO2	*Discuss various entertainment electronics appliances*	3	3	3	-	-	-	-	-	-	-	-	-	-	-
CO3	*Demonstrate various smart home systems*	3	3	3	-	-	-	-	-	-	-	-	-	-	-
CO4	*Outline various home appliances*	3	3	3	-	-	-	-	-	-	-	-	-	-	-
CO5	*Illustrate various communication equipment's used In day to day life*	3	3	3	-	-	-	-	-	-	-	-	-	-	-
	Average	**3**	**3**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

K.S.R. COLLEGE OF ENGINEERING (Autonomous) **R 2020**

		L	T	P	C
20IT901	**DATA SCIENCE USING R**				
	(Open Elective)	3	0	0	3

Prerequisite: -

Course Outcomes : On successful completion of the course, the student will be able to		***Cognitive Level***
CO1:	Explain the life cycle of data science.	*Understand*
CO2:	Interpret the data manipulation statements and functional programming in R.	*Understand*
CO3:	Outline the packages to implement machine learning techniques.	*Understand*
CO4:	Explore the concepts of object-oriented programming in R.	*Understand*
CO5:	Discuss the data visualization packages in R.	*Understand*

UNIT – I DATA SCIENCE **[9]**

Data Science : Data Science Lifecycle – Dealing with Missing Values – Using R Packages – Expression – Data Types – Control Structures – Functions – Recursive Functions – Simple Programs.

UNIT – II DATA MANIPULATION AND FUNCTIONAL PROGRAMMING **[9]**

Data Manipulation – Data Import and Export – Manipulation Data – Vectoring Functions – Infix Operator – Replacement Functions – Function with arguments and return statement.

UNIT – III MACHINE LEARNING **[9]**

Dealing with large Dataset – Sampling – Supervised Learning Methods: Linear Regression – Logistic Regression – Evaluating and Validating Models – Decision Trees – Neural Network – Support Vector Machine – Unsupervised Learning – Clustering – Association Rule Mining.

UNIT – IV CLASS AND OBJECTS **[9]**

Immutable objects and Polymorphic functions – Data structures – Classes – Programming with New Classes – Inheritance and Inter-Class Relations – Virtual Classes – Creating and Validating Objects.

UNIT – V DATA VISUALIZATION AND PACKAGES **[9]**

Data Visualization**:** XY Plot – Graphics Package – ggplot2 – Package concept and tools – Creating R package – Namespace – R Oxygen – Adding data to Package – Documentation for Packages.

Total (L= 45, T = 0) = 45 Periods

Text Book:

1 Thomas Mailund, Beginning Data Science in R – Data Analysis, Visualization and Modeling for the Data Scientist, Apress Publication, New York, First Edition, 2017.

2 Hadley Wickham and Garrett Grolemund ,R for Data Science,Import, Tidy, Transform, Visualize, and Model Data, O'Reilly, India, First Edition ,2017.

Reference Books :

1 Nicholas J. Horton, Ken Kleinman,Using R and RStudio for Data Management, Statistical Analysis, and Graphics, CRC Press, United States , Second Edition, 2015.

2 Sara Baase and Allen Van Gelder, Computer Algorithms - Introduction to Design and Analysis, Pearson Education, India , Third Edition, 2010.

3 K.G.Srinivasa, G M Siddesh, Chetan Shetty, Statistical Programming in R, Oxford University Press, New Delhi, First Edition , 2017.

4 John Maindonald, W. John Braun,Data Analysis and Graphics Using R: An Example-Based Approach, University Press, Cambridge, Third Edition, 2010.

K.S.R. COLLEGE OF ENGINEERING, TIRUCHENGODE – 637215
DEPARTMENT OF INFORMATION TECHNOLOGY
CO-PO MAPPING

Regulation: **R 2020**

Course Code: **20IT901** **Course Name:** **DATA SCIENCE USING R**

CO	Course Outcomes	Programme Outcomes													
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	Explain the life cycle of data science.	3	2	3	-	2	-	-	-	-	-	-	3	-	-
CO2	Interpret the data manipulation statements and functional programming in R	3	2	3	-	2	-	-	-	-	-	-	3	-	-
CO3	Outline the packages to implement machine learning techniques	3	2	3	-	2	-	-	-	-	-	-	3	-	-
CO4	Explore the concepts of object-oriented programming in R	3	2	3	-	2	-	-	-	-	-	-	3	-	-
CO5	Discuss the data visualization packages in R	3	2	3	-	2	-	-	-	-	-	-	3	-	-
	Average	3	2	3	-	2	-	-	-	-	-	-	3	-	-

1: Slight (Low) **2: Moderate (Medium)** **3: Substantial (High)**

K.S.R. COLLEGE OF ENGINEERING (Autonomous) **R 2020**

20IT902 **PRINCIPLES OF CYBER SECURITY** (Open Elective)

L	T	P	C
3	0	0	3

Prerequisite: -

Course Outcomes : On successful completion of the course, the student will be able to		***Cognitive Level***
CO1:	*Describe the basic concepts in cyber security and cybercrime.*	*Remember*
CO2:	*Explore about classification of cyber forensics.*	*Understand*
CO3:	*Summarize the latest trends in ethical hacking.*	*Understand*
CO4:	*Discuss the fundamentals of computer forensics and evidence collection.*	*Understand*
CO5:	*Describe the vulnerabilities in cyber security.*	*Remember*

UNIT – I CYBER CRIME **[9]**

Cyber Crime – Types of Cyber Crime – Classification of Cyber Criminals – Tools used in Cyber Crime – Challenges – Strategies – Crypto Currency – Bitcoin and Block chain – Ransomware.

UNIT – II CYBER FORENSICS **[9]**

Cyber Forensics: Definition – Disk Forensics – Network Forensics – Wireless Forensics – Database Forensics – Malware Forensics – Mobile Forensics – Email Forensics.

UNIT – III ETHICAL HACKING **[9]**

Ethical Hacking– Hacking Windows – Network Hacking – Web Hacking – Password Hacking – Malware – Scanning – Cracking.

UNIT – IV DIGITAL EVIDENCE IN CRIMINAL INVESTIGATIONS **[9]**

Digital Evidence in Criminal Investigations: The Analog and Digital World – Training and Education – Evidence Collection and Data Seizure: Collection Options Obstacles – Types of Evidence –Rules of Evidence –Volatile Evidence.

UNIT – V CYBER SECURITY VULNERABILITIES **[9]**

Vulnerabilities in software – System administration – Complex Network Architectures – Open Access to Organizational Data –– Unprotected Broadband communications – Poor Cyber Security Awareness – Encryption Tool: KeePass.

Total (L= 45, T = 0) = 45 Periods

Text Books:

1 Dejey, Dr.Murugan, Cyber Forensics, Oxford University Press, India, First Edition, 2018.

2 William Stallings and Lawrie Brown, Computer Security: Principles and Practice, Prentice Hall, United States, Third Edition, 2017.

Reference Books :

1 John W. Ritting house, William M. Hancock, Cyber Security Operations Handbook, Elsevier Publications , India ,First Edition,2008

2 Deborah G Johnson, Computer Ethics, Pearson Education Publication, India ,Fourth Edition , 2014

3 https://onlinecourses.swayam2.ac.in/cec20_cs15/preview

4 https://www.simplilearn.com/tutorials/cyber-security-tutorial/cyber-security-for-beginners

K.S.R. COLLEGE OF ENGINEERING, TIRUCHENGODE – 637215
DEPARTMENT OF INFORMATION TECHNOLOGY
CO-PO MAPPING

Regulation: **R 2020**

Course Code: **20IT902** **Course Name:** **PRINCIPLES OF CYBER SECURITY**

CO	Course Outcomes	Programme Outcomes													
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	*Describe the basic concepts in cyber security and cybercrime.*	3	3	3	-	2	-	-	-	-	-	-	3	-	-
CO2	*Explore about classification of cyber forensics.*	3	3	3	-	2	-	-	-	-	-	-	3	-	-
CO3	*Summarize the latest trends in ethical hacking.*	3	3	3	-	2	-	-	-	-	-	-	3	-	-
CO4	*Discuss the fundamentals of computer forensics and evidence collection.*	3	3	3	-	2	-	-	-	-	-	-	3	-	-
CO5	*Describe the vulnerabilities in cyber security.*	3	3	3	-	2	-	-	-	-	-	-	3	-	-
	Average	**3**	**3**	**3**	**-**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**3**	**-**	**-**

1: Slight (Low) **2: Moderate (Medium)** **3: Substantial (High)**

K.S.R. COLLEGE OF ENGINEERING (Autonomous) **R 2020**

20IT903	**FUNDAMENTALS OF BUSINESS INTELLIGENCE** (Open Elective)	L	T	P	C
		3	0	0	3

Prerequisite: -

Course Outcomes : On successful completion of the course, the student will be able to		***Cognitive Level***
CO1:	*Summarize the nuances of extracting information from the various sources of digital data*	*Understand*
CO2:	*Infer the techniques involved in Online Transaction Processing and Online Analytical processing systems.*	*Understand*
CO3:	*Discuss the concept of data integration.*	*Remember*
CO4:	*Summarize the various methods of data integration.*	*Understand*
CO5:	*Describe the various process involved in the Enterprise Reporting.*	*Understand*

UNIT – I DIGITAL DATA [09]

Digital Data: Sources and Characteristics –Structured– Unstructured– Semi-Structured – Business Intelligence(BI) : Definition – BI Component Framework – BI Users – BI Applications – BI Tools.

UNIT – II OLTP AND OLAP [09]

OLTP: Advantages – Challenges – OLAP: Types of Data – OLAP Architectures: MOLAP – ROLAP – HOLAP – OLAP and OLTP – Data models for OLTP – Data models for OLAP.

UNIT – III DATA INTEGRATION [09]

Data Integration : Approaches and Advantages – Technologies – Data Quality – Data Profiling – Data Warehouse : Goals and Sources – Data Mart –Operational Data Store – Ralph Kimball's Approach– Data Mapping –Staging.

UNIT – IV MULTIDIMENSIONAL DATA MODELING [09]

Data Modeling: Entity and Attribute – Cardinality of Relationship – Types of Data Model – Data Modeling Techniques – Fact Table – Dimension table – Dimensional Models –Dimensional Modeling Life Cycle.

UNIT – V ENTERPRISE REPORTING [09]

Enterprise Reporting: Reporting Perspectives– Report Standardization and Presentation Practices – Enterprise Reporting Characteristics in OLAP –Balanced Scorecards – Create Dashboards – Scorecards Vs Dashboards.

Total (L= 45, T = 0) = 45 Periods

Text Books:

1 R. N. Prasad, Seema Acharya, Fundamentals of Business Analytics, Wiley Publication Hoboken, New Jersey, Second Edition, 2016.

2 Regi Mathew, Business Analytics for Decision Making, Pearson Education, India , First Edition,2020.

Reference Books :

1 David Stephenson, Big Data Demystified, FT Publishing International, United States, First Edition, 2018.

2 Wayne Winston, Microsoft Excel 2019 Data Analytics and Business Modeling, Microsoft Press, United States, Sixth Edition, 2019.

3 Soheil Bakhshi, Expert Data Modelling with Power BI, Packt Publishing , Mumbai, First Edition, 2021.

4 https://nptel.ac.in/courses/110107092

K.S.R. COLLEGE OF ENGINEERING, TIRUCHENGODE – 637215
DEPARTMENT OF INFORMATION TECHNOLOGY
CO-PO MAPPING

Regulation: **R 2020**

Course Code: **20IT903** **Course Name:** **FUNDAMENTALS OF BUSINESS INTELLIGENCE**

CO	Course Outcomes	Programme Outcomes													
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	*Summarize the nuances of extracting information from the various sources of digital data*	3	2	3	-	-	-	-	-	-	-	-	3	-	-
CO2	*Infer the techniques involved in Online Transaction Processing and Online Analytical processing systems.*	3	2	3	-	-	-	-	-	-	-	-	3	-	-
CO3	*Discuss the concept of data integration.*	3	2	3	-	-	-	-	-	-	-	-	3	-	-
CO4	*Summarize the various methods of data integration.*	3	2	3	-	-	-	-	-	-	-	-	3	-	-
CO5	*Describe the various process involved in the Enterprise Reporting.*	3	2	3	-	-	-	-	-	-	-	-	3	-	-
	Average	**3**	**2**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**3**	**-**	**-**

1: Slight (Low) **2: Moderate (Medium)** **3: Substantial (High)**

K.S.R. COLLEGE OF ENGINEERING (Autonomous) **R 2020**

20IT904	**BLOCKCHAIN TECHNOLOGIES** (Open Elective)	L	T	P	C
		3	0	0	3

Prerequisite: -

Course Outcomes : On successful completion of the course, the student will be able to		***Cognitive Level***
CO1:	*Infer the theoretical aspects of blockchain and apply in real case scenarios.*	*Understand*
CO2:	*Discuss the core components and working of blockchain.*	*Remember*
CO3:	*Explain the technical concepts of bit coin.*	*Understand*
CO4:	*Interpret the Ethereum blockchain for different use cases.*	*Understand*
CO5:	*Outline the end-to-end development of a decentralized application.*	*Understand*

UNIT – I BLOCKCHAIN ARCHITECTURE [9]

History –Blockchain –Centralized vs. Decentralized Systems–Layers of Blockchain–Versions of Blockchain:3.0 and 4.0 –Blockchain Uses and Use Cases –Laying the Blockchain Foundation – Cryptography.

UNIT – II WORKING OF BLOCKCHAIN [9]

Game Theory –Prisoner's Dilemma –Byzantine Generals' Problem – The Blockchain – Merkle Trees – Properties of Blockchain Solutions – Blockchain Transactions – Distributed consensus mechanisms – Blockchain applications.

UNIT – III BITCOIN [9]

History of Money – Working with Bitcoins –Bitcoin Blockchain – The Bitcoin Network – Bitcoin Scripts – Full Node svs SPVs – Bitcoin Wallets.

UNIT – IV ETHEREUM AND HYPERLEDGER [9]

Bitcoin to Ethereum – Ethereum Blockchain – Ethereum Smart Contracts – Ethereum Virtual Machine and Code Execution–Ethereum Ecosystem – Swarm – Whisper – DApp – Development components – Hyper ledger : Iroha – Blockchain Explorer – Fabric Chain tool.

UNIT – V APPLICATIONS OF BLOCKCHAIN [9]

Decentralized Applications – Blockchain Application Development – Interacting with Bitcoin Blockchain – Sending Transactions–Creating a Smart Contract – Executing Smart Contract Functions – Public vs. Private Blockchains.

Total (L= 45, T = 0) = 45 Periods

Text Books:

1 Bikramaditya Singhal, Gautam Dhameja, Priyansu Sekhar Panda, Beginning Blockchain: A Beginner's Guide to Building Blockchain Solutions, APress, New York, First Edition, 2018.

2 Brenn Hill, Samanyu Chopra, Paul Valen court, Blockchain Quick Reference: A guide to exploring decentralized blockchain application development, Packt Publishing, Mumbai, First Edition, 2018.

Reference Books :

1 Imran Bashir, Mastering Blockchain Distributed Ledgers, Decentralization and Smart Contracts Explained, Packt Publishing, Mumabi , First Edition, 2017.

2 Pethuru Raj, Chellammal Suria Narayanan, Kavita Saini, Blockchain Technology and Applications, CRC Press, United States, First Edition ,2021.

3 E. Golden Julie, J. Jesu VedhaNayahi, Noor Zaman Jhanjhi, Blockchain Technology Fundamentals, Applications, and Case Studies, CRC Press , United States, First Edition, 2021.

4 https://onlinecourses.nptel.ac.in/noc20_cs01/preview

K.S.R. COLLEGE OF ENGINEERING, TIRUCHENGODE – 637215
DEPARTMENT OF INFORMATION TECHNOLOGY
CO-PO MAPPING

Regulation: **R 2020**

Course Code: **20IT904** **Course Name:** **BLOCKCHAIN TECHNOLOGIES**

CO	Course Outcomes	Programme Outcomes													
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	*Infer the theoretical aspects of block chain and apply in real case scenarios.*	3	2	3	-	-	-	-	-	-	-	-	3	-	-
CO2	*Discuss the core components and working of block chain.*	3	2	3	-	-	-	-	-	-	-	-	3	-	-
CO3	*Explain the technical concepts of bit coin.*	3	2	3	-	-	-	-	-	-	-	-	3	-	-
CO4	*Interpret the Ethereum block chain for different use cases.*	3	2	3	-	-	-	-	-	-	-	-	3	-	-
CO5	*Outline the end-to-end development of a decentralized application.*	3	2	3	-	-	-	-	-	-	-	-	3	-	-
Average		**3**	**2**	**3**	**-**	**-**	**-**	**-**	**-**		**-**	**-**	**3**	**-**	**-**

1: Slight (Low) **2: Moderate (Medium)** **3: Substantial (High)**

K.S.R. COLLEGE OF ENGINEERING (Autonomous) **R 2020**

20IT905	**INTERNET OF THINGS AND APPLICATIONS** (Open Elective)	L	T	P	C
		3	0	0	3

Prerequisite: -

Course Outcomes : On successful completion of the course, the student will be able to		***Cognitive Level***
CO1:	*Explain the physical and logical design of IoT.*	*Understand*
CO2:	*Summarize the various design methodologies of IoT.*	*Understand*
CO3:	*Outline the various packages in Python for IoT real world application.*	*Understand*
CO4:	*Discuss IoT applications using Raspberry PI and Python.*	*Remember*
CO5:	*Infer the knowledge on design of smart IoT applications.*	*Understand*

UNIT–I FUNCTIONAL BLOCKS OF IoT **[09]**

Definition and Characteristics of IoT – Physical Design: Layers and Protocols – Logical Design: IoT Functional Blocks – IoT Communication models and APIs – IoT Enabling Technologies –IoT Levels and Deployment Templates.

UNIT–II IoT DESIGN METHODOLOGY **[09]**

M2M – M2M Vs IoT – Software Defined Networks – Network function Virtualization – IoT Platform Design Methodologies – Domain Specific IoT.

UNIT – III PYTHON PACKAGES FOR IOT AND RASPBERRY PI **[09]**

JSON – XML – HTTPLib and URLLib – SMTPLib. Raspberry Pi : Pin Configurations – Interfaces : Serial, SPI, 12C Programming – Python program with Raspberry Pi –Controlling Output – Reading input from pins.

UNIT –IV IoT APPLICATIONS USING RASPBERRY PI **[09]**

LED Controlling – Traffic Light controller – Integrating Sensors – Developing web application to control IoT device – Uploading the sensor values onto the cloud for analysis – Sending SMS – Sending images and video via mail.

UNIT–V IoT USE CASES **[09]**

Smart and Connected Cities – An IoT Strategy for Smarter Cities – Architecture – Use Cases: Street Lighting – Smart Parking – Smart Traffic – Smart Home Automation – Smart Agriculture– Weather Monitoring.

Total (L= 45, T = 0) = 45 Periods

Text Books:

1 Arshdeep Bahga and Vijay Madisetti, Internet of Things –A Hands-on Approach, Orient Blackswan Private Limited, New Delhi, First Edition, 2015.

2 David Hanes, Gonzalo Salgueiro, Patrick Grossetete, Rob Barton and Jerome Henry, IoT Fundamentals: Networking Technologies, Protocols and Use Cases for Internet of Things, Pearson Education, First Edition, 2017.

Reference Books :

1 Francis daCosta, Rethinking the Internet of Things: A Scalable Approach to Connecting Everything, Apress Publications, New York, First Edition, 2013.

2 Rajkamal, Internet of Things: Architecture, Design Principles And Applications, McGraw Hill Education, New York, First Edition, 2017.

3 Olivier Hersent, DavidBoswarthick, Omar Elloumi, The Internet of Things – Key Applications and Protocols, Wiley, New York, 2015.

4 https://onlinecourses.nptel.ac.in/noc22_cs53/preview

K.S.R. COLLEGE OF ENGINEERING, TIRUCHENGODE – 637215
DEPARTMENT OF INFORMATION TECHNOLOGY
CO-PO MAPPING

Regulation: R 2020

Course Code: 20IT905 **Course Name: INTERNET OF THINGS AND APPLICATIONS**

CO	Course Outcomes	Programme Outcomes													
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	*Explain the physical and logical design of IoT.*	3	2	3	-	-	-	-	-	-	-	-	3	-	-
CO2	*Summarize the various design methodologies of IoT.*	3	2	3	-	-	-	-	-	-	-	-	3	-	-
CO3	*Outline the various packages in Python for IoT real world application.*	3	2	3	-	-	-	-	-	-	-	-	3	-	-
CO4	*Discuss IoT applications using Raspberry PI and Python.*	3	2	3	-	-	-	-	-	-	-	-	3	-	-
CO5	*Infer the knowledge on design of smart IoT applications.*	3	2	3	-	-	-	-	-	-	-	-	3	-	-
	Average	**3**	**2**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**3**	**-**	**-**

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

K.S.R. COLLEGE OF ENGINEERING (Autonomous) **R 2020**

20IT906	**PRINCIPLES OF SOFTWARE TESTING** (Open Elective)	L	T	P	C
		3	0	0	3

Prerequisite: -

Course Outcomes : On successful completion of the course, the student will be able to		***Cognitive Level***
CO1:	*Outline the strategies for software testing.*	*Understand*
CO2:	*Infer the need and conduct of testing levels.*	*Understand*
CO3:	*Discuss the various techniques used in testing.*	*Understand*
CO4:	*Interpret the various types of testing used in real world application.*	*Understand*
CO5:	*Explain the test case templates and reviews process.*	*Understand*

UNIT - I SOFTWARE TESTING **[9]**

Software Testing – Definition of Software Testing – Objective and limits of testing – Testing Strategy – Roles and Responsibilities of a Software Tester – Independent Verification and Validation.

UNIT - II SOFTWARE TESTING REQUIREMENTS **[9]**

Software Testing Requirements – Analyzing the requirements –Functional and Non-Functional Requirements. Software Testing Review Process – Types of Reviews: Peer Review – Walkthrough – Inspection – Checklists of Review Process.

UNIT - III WHITE AND BLACK BOX TESTING **[9]**

White Box Testing Techniques: Decision/Branch Coverage – Basic Path Testing – Control Flow Graph Coverage – Conditional Coverage. Black Box Test Techniques: Boundary Value Analysis – Equivalent Class Partition – Cause-Effect Analysis – State Transition Table.

UNIT - IV TESTING TECHNIQUES **[9]**

Functional Testing: Smoke Testing – Integration and System Testing User Acceptance Testing – Non-Functional Testing: – Performance Testing – Recovery Testing – Security Testing – Compatibility Testing – Usability Testing – Ad Hoc Testing.

UNIT - V TEST CASE DESIGN **[9]**

Test Case :Standards, Characteristics , Guidelines and Naming Conventions – Test Case Templates – Creation of Test Case – Requirement Coverage –Traceability Matrix – Test Case Review Process – Test Execution – Test Log – Reporting of Test Execution

Total (L= 45, T = 0) = 45 Periods

Text Books:

1 S.Subashni, N.Satheesh Kumar, Dr.B.G.Geetha, Dr.G.Singaravel, Software Testing, Umayam Publications, First Edition, 2013.

2 Srinivasan Desikan, Gopalaswamy Ramesh, Software Testing: Principles and Practice, Pearson Education, India, Second Edition , 2017.

Reference Books :

1 MarnieL.Hutchson**,** Software Testing Fundamentals Methods and Metrics, Wiley, India, Second Edition,2003.

2 GlenfordJ.Myess**,** The Art of Testing, Wiley, India, Third Edition, 2003.

3 https://onlinecourses.nptel.ac.in/noc22_cs12/preview

4 https://www.digimat.in/nptel/courses/video/106105150/L01.html

K.S.R. COLLEGE OF ENGINEERING, TIRUCHENGODE – 637215
DEPARTMENT OF INFORMATION TECHNOLOGY
CO-PO MAPPING

Regulation: **R 2020**

Course Code: **20IT906** **Course Name:** **PRINCIPLES OF SOFTWARE TESTING**

CO	Course Outcomes	Programme Outcomes													
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	*Outline the strategies for software testing.*	3	2	3	-	-	-	-	-	-	-	-	3	-	-
CO2	*Infer the need and conduct of testing levels.*	3	2	3	-	-	-	-	-	-	-	-	3	-	-
CO3	*Discuss the various techniques used in testing.*	3	2	3	-	-	-	-	-	-	-	-	3	-	-
CO4	*Interpret the various types of testing used in real world application.*	3	2	3	-	-	-	-	-	-	-	-	3	-	-
CO5	*Explain the test case templates and reviews process.*	3	2	3	-	-	-	-	-	-	-	-	3	-	-
	Average	**3**	**2**	**3**	**-**	**-**	**-**	**-**	**-**		**-**	**-**	**3**	**-**	**-**

1: Slight (Low) **2: Moderate (Medium)** **3: Substantial (High)**

K.S.R. COLLEGE OF ENGINEERING (Autonomous) **R 2020**

20IT907	**FOUNDATION SKILLS IN LOGIC BUILDING** (Open Elective)	L	T	P	C
		3	0	0	3

Prerequisite: -

Course Outcomes : On successful completion of the course, the student will be able to		***Cognitive Level***
CO1:	*Summarize the various approaches in problem solving.*	*Understand*
CO2:	*Discuss the different algorithm design techniques.*	*Remember*
CO3:	*Demonstrate the various array based problem.*	*Understand*
CO4:	*Summarize the concept of sorting and searching.*	*Understand*
CO5:	*Outline the various methods to solve number based problem.*	*Understand*

UNIT – I PROBLEM SOLVING PROCESS [9]

Problem Solving Process –Approaches in Problem Solving: System Centric– Problem Centric– Solution Centric and Solver Centric Approach – Algorithm– Pseudocode – Flowchart– Important Problem Types.

UNIT – II ALGORTHMIC PROBLEM SOLVING [9]

Notion of the Algorithm – Algorithm Design and Analysis Process – Time and Space Complexity – Algorithm Design Techniques: Divide and Conquer – Dynamic Programming – Greedy Technique – Backtracking.

UNIT – III ARRAY BASED PROBLMES [9]

Array Order Reversal – Array Counting – Removal duplicates – Finding the kth smallest element – Swapping of elements – Subarray with given Sum – Find the longest consecutive subsequence.

UNIT – IV SORTING AND SEARCHING [9]

Searching: Linear Search – Binary Search. Sorting: Bubble Sort– Selection Sort– Insertion Sort– Merge Sort– Quicksort – Heap Sort.

UNIT – V NUMBER BASED PROBLEMS [9]

Swapping the values –Summation of Set of Number – Fibonacci Sequence and Factorial Computation –Integer Reversal – Euclid's algorithm – Prime Numbers Generation.

Total (L= 45, T = 0) = 45 Periods

Text Books:

1 R.G.Dromey, How to Solve it by Computer, Pearson Education, India, Fifth Edition, 2008.

2 ISRD GROUP, Programming and Problem Solving Using C Language, McGraw Hill Education, India , First Edition 2017.

Reference Books :

1 ITL Educational Solutions Limited, Introduction to Information Technology, Pearson Education, India, Second Edition, India, 2012.

2 G. Polya, How to Solve It : A New Aspect of Mathematical Method, Princeton University Press, New Jersey, Second Edition, 2008

3 Ellis Horowitz, Fundamentals of Programming languages, Galgotia Publications, New Delhi, Second Edition, 2012.

4 www.nptel.ac.in/courses/106104074

K.S.R. COLLEGE OF ENGINEERING, TIRUCHENGODE – 637215
DEPARTMENT OF INFORMATION TECHNOLOGY
CO-PO MAPPING

Regulation: **R 2020**

Course Code: **20IT907** **Course Name:** **FOUNDATION SKILLS IN LOGIC BUILDING**

CO	Course Outcomes	Programme Outcomes													
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	*Summarize the various approaches in problem solving.*	3	3	3	-	-	-	-	-	-	-	-	3	-	-
CO2	*Discuss the different algorithm design techniques.*	3	3	3	-	-	-	-	-	-	-	-	3	-	-
CO3	*Demonstrate the various array based problem.*	3	3	3	-	-	-	-	-	-	-	-	3	-	-
CO4	*Summarize the concept of sorting and searching.*	3	3	3	-	-	-	-	-	-	-	-	3	-	-
CO5	*Outline the various methods to solve number based problem.*	3	3	3	-	-	-	-	-	-	-	-	3	-	-
	Average	**3**	**3**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**3**	**-**	**-**

1: Slight (Low) **2: Moderate (Medium)** **3: Substantial (High)**

K.S.R. COLLEGE OF ENGINEERING (Autonomous) **R 2020**

		L	T	P	C
20IT908	**PRINCIPLES OF CLOUD COMPUTING** (Open Elective)	3	0	0	3

Prerequisite: -

Course Outcomes : On successful completion of the course, the student will be able to		***Cognitive Level***
CO1:	*Explain the characteristics of cloud computing.*	*Understand*
CO2:	*Interpret the performance of cloud computing in various computing environment.*	*Understand*
CO3:	*Discuss the concept of cloud architecture.*	*Understand*
CO4:	*Infer the knowledge on cloud simulators.*	*Understand*
CO5:	*Outline the usage of simulators like VMWare simulator.*	*Understand*

UNIT – I **CLOUD COMPUTING** **[9]**

Origins of Cloud Computing – Cloud Components – Essential Characteristics — Broad Network Access – Location Independent Resource Pooling – Rapid Elasticity – Measured Service – Roots of Cloud Computing.

UNIT – II **CLOUD INSIGHTS** **[9]**

Architectural Influences – High-Performance Computing – Utility and Enterprise Grid Computing – Cloud Scenarios – Benefits– Application Development – Security level of Third Party – Security Benefits – Regularity Issues.

UNIT – III **CLOUD ARCHITECTURE** **[9]**

Layers in Cloud Architecture – Software as a Service– Features of SaaS and benefits– Platform as a Services – Features of PaaS and benefits– Infrastructure as a Service– Features of IaaSand benefits– Cloud Service Providers – Challenges and risks in cloud adoption –Types of Cloud.

UNIT – IV **CLOUD SIMULATORS** **[9]**

CloudSim Simulator –Architecture– User code–CloudSim– GridSim– SimJava –Working platform for CloudSim– GreenCloud.

UNIT-V **VMWARE SIMULATOR** **[9]**

VMWare– Advantages of VMWare virtualization–VMWare workstation–Virtual Machines – Create a new virtual machine on local host – Cloning virtual machine – Recent Trends.

Total (L= 45, T = 0) = 45 Periods

Text Book:

1 Anthony T.Velte , Toby J. Velte Robert Elsenpeter, Cloud computing : A Practical Approach, Tata McGraw- Hill , New Delhi ,Second Edition, 2017.

2 Dan C Marinescu,Cloud Computing: Theory and Practice, MK Elsevier, Second Edition,United States,2017.

Reference Books :

1 Judith Hurwitz,Robin Bloor, Marcia Kaufman, Fern Halper,Cloud computing for Dummies, Wiley, India,Second Edition,2020.

2 Rajkumar Buyya, James Broberg,Andrzej Goscinski,Cloud Computing:Principles and Paradigms, Wiley, India,First Edition,2011.

3 https://onlinecourses.nptel.ac.in/noc22_cs20/preview

4 https://archive.nptel.ac.in/courses/106/105/106105167/

K.S.R. COLLEGE OF ENGINEERING, TIRUCHENGODE – 637215
DEPARTMENT OF INFORMATION TECHNOLOGY
CO-PO MAPPING

Regulation: **R 2020**

Course Code: **20IT908** **Course Name:** **PRINCIPLES OF CLOUD COMPUTING**

CO	Course Outcomes	Programme Outcomes													
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	*Explain the characteristics of cloud computing.*	3	3	3	-	2	-	-	-	-	-	-	3	-	-
CO2	*Interpret the performance of cloud computing in various computing environment.*	3	3	3	-	2	-	-	-	-	-	-	3	-	-
CO3	*Discuss the concept of cloud architecture.*	3	3	3	-	2	-	-	-	-	-	-	3	-	-
CO4	*Infer the knowledge on cloud simulators.*	3	3	3	-	2	-	-	-	-	-	-	3	-	-
CO5	*Outline the usage of simulators like VMWare simulator.*	3	3	3	-	2	-	-	-	-	-	-	3	-	-
Average		**3**	**3**	**3**	**-**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**3**	**-**	**-**

1: Slight (Low) **2: Moderate (Medium)** **3: Substantial (High)**

K.S.R. COLLEGE OF ENGINEERING (Autonomous) **R 2020**

20IT909	**OPEN SOURCE TECHNOLOGIES** (Open Elective)	L	T	P	C
		3	0	0	3

Prerequisite: -

Course Outcomes : On successful completion of the course, the student will be able to		***Cognitive Level***
CO1:	*Outline the need and importance of Linux Open Source Software.*	*Understand*
CO2:	*Discuss the manipulations on Array and String using PHP.*	*Remember*
CO3:	*Summarize various functions in String and Date object*	*Understand*
CO4:	*Describe simple code segment using list and tuple in Python.*	*Understand*
CO5:	*Outline the usage of decision and looping statements in PERL.*	*Remember*

UNIT – I LINUX **[09]**

Open Sources: Need, Advantages and Applications – Open Source Operating Systems : LINUX – Kernel Mode and – Process – Scheduling – Personalities – Cloning and Signals.

UNIT – II PHP **[09]**

PHP :Syntax of PHP –Common PHP Script Elements –Variables and Constants – Data types – Operators and Statements –Arrays and Functions –String Manipulations– Regular Expression.

UNIT – III MySQL **[09]**

Setting up an account – Starting, Terminating and writing your own MySQL Programs – Record Selection Technology – Strings – Date and Time – Sorting Query Results module – DDL – DDL –DCL –TDL.

UNIT – IV PYTHON **[09]**

Syntax and Style – Python Objects – Numbers – Sequences – Strings – Lists and Tuples – Dictionaries – Decision and Loops – Files – Input and Output Statements – Errors and Exceptions – Functions.

UNIT – V PERL **[09]**

Perl : Perl Parsing Rules – Variables and Data – Statements and Control Structures – Subroutines – Packages and Modules – Files and Data Manipulation.

Total (L= 45, T = 0) = 45 Periods

Text Book:

1 Martin C.Brown, Python: The Complete Reference, McGraw Hill Education, India, Fourth Edition, 2018.
2 Richard Petersen, The Complete Reference Linux, Tata McGraw Hill, New Delhi, Sixth Edition, 2017.

Reference Books :

1 Frank M. Kromann, Beginning PHP and MySQL, Apress , New York , Fifth Edition ,2018.
2 Martin C. Brown, Perl: The Complete Reference, Tata McGraw-Hill, New Delhi, Fifth, 2017.
3 Steven Holzner, PHP: The Complete Reference, Tata McGraw-Hill, New Delhi, Sixth Edition, 2017.
4 https://nptel.ac.in/courses/106106145

K.S.R. COLLEGE OF ENGINEERING, TIRUCHENGODE – 637215
DEPARTMENT OF INFORMATION TECHNOLOGY
CO-PO MAPPING

Regulation: **R 2020**

Course Code: **20IT909** **Course Name:** **OPEN SOURCE TECHNOLOGIES**

CO	Course Outcomes	Programme Outcomes													
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	*Outline the need and importance of Linux Open Source Software.*	3	3	2	-	-	-	-	-	-	-	-	3	-	-
CO2	*Discuss the manipulations on Array and String using PHP.*	3	3	3	-	-	-	-	-	-	-	-	3	-	-
CO3	*Summarize various functions in String and Date object*	3	3	3	-	-	-	-	-	-	-	-	3	-	-
CO4	*Describe simple code segment using list and tuple in Python.*	3	3	3	-	-	-	-	-	-	-	-	3	-	-
CO5	*Outline the usage of decision and looping statements in PERL.*	3	3	3	-	-	-	-	-	-	-	-	3	-	-
	Average	**3**	**3**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**3**	**-**	**-**

1: Slight (Low) **2: Moderate (Medium)** **3: Substantial (High)**

K.S.R. COLLEGE OF ENGINEERING (Autonomous) **R 2020**

20IT910 **PRINCIPLES OF SOFTWARE ENGINEERING** (Open Elective)

L	T	P	C
3	0	0	3

Prerequisite: -

Course Outcomes : On successful completion of the course, the student will be able to		***Cognitive Level***
CO1:	*Explain the software engineering process and its various models*	Understand
CO2:	*Summarize how requirements may be organized in software requirements document*	Understand
CO3:	*Illustrate the architectural design decisions and apply real time systems.*	Understand
CO4:	*Outline the methods rely on documented specifications and Design.*	Understand
CO5:	*Discuss the process involved in verification and validation.*	Understand

UNIT - I SYSTEMS ENGINEERING **[9]**

Professional and Ethical Responsibility - Systems Engineering – Legacy Systems – Critical System – Software Process Models – Process Iteration – The Rational Unified Process – Project Planning – Project Scheduling.

UNIT - II REQUIREMENTS ANALYSIS **[9]**

Software Requirements: Functional and Non-Functional Requirements - User Requirements - System Requirements – Requirements Validation – Requirements Management – System Models: Context Models, Behavioral Models, Data Models ,Object Models, Structured Methods– Risk-Driven Specification, Safety Specification.

UNIT - III ARCHITECTURAL DESIGN **[9]**

Architectural Design Decisions – System Organization – Multiprocessor Architectures – Client – Server Architectures – Data Processing Systems – Objects and Object Classes – Real–Time Operating Systems – Monitoring and Control Systems – User Interface Design : Issue, Process, Analysis.

UNIT - IV CRITICAL SYSTEMS **[9]**

Agile Methods – Rapid Application Development – Software Prototyping – Components and Component Models – Fault Tolerance – Fault-Tolerance Architectures – Software Maintenance – Evolution Processes – Legacy System Evolution .

UNIT - V VERIFICATION AND VALIDATION **[9]**

Planning Verification and Validation – Software Inspections – Verification and Formal Methods – Systems Testing – Component Testing – Test Case Design – Test Automation – Safety Assurance – Security Assessment.

Total (L= 45, T = 0) = 45 Periods

Text Books:

1 Lan Sommerville, Software Engineering, Pearson Education, India , Tenth Edition, 2017.

2 Roger Pressman, Software Engineering: A Practitioner's Approach, McGraw Publications , India , Seventh Edition ,2017

Reference Books :

1 Jalote P,An Integrated Approach to Software Engineering, Narosa Publishers, New Delhi, Third Edition, 2015.

2 Mark Richards and Neal Ford, Fundamentals of Software Architecture: An Engineering Approach, O'Relly, First Edition, 2020.

3 Rajib Mall, Fundamentals of Software Engineering, PHI Learning, India ,Fifth Edition,2018.

4 https://nptel.ac.in/courses/106105087

K.S.R. COLLEGE OF ENGINEERING, TIRUCHENGODE – 637215
DEPARTMENT OF INFORMATION TECHNOLOGY
CO-PO MAPPING

Regulation: **R 2020**

Course Code: **20IT910** **Course Name:** **PRINCIPLES OF SOFTWARE ENGINEERING**

CO	Course Outcomes	Programme Outcomes													
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	*Explain the software engineering process and its various models*	3	2	3	-		-	-	-		-	-	3	-	-
CO2	*Summarize how requirements may be organized in software requirements document*	3	2	3	-		-	-	-		-	-	3	-	-
CO3	*Illustrate the architectural design decisions and apply real time systems.*	3	2	3	-		-	-	-		-	-	3	-	-
CO4	*Outline the methods rely on documented specifications and Design.*	3	2	3	-		-	-	-		-	-	3	-	-
CO5	*Discuss the process involved in verification and validation.*	3	2	3	-		-	-	-		-	-	3	-	-
	Average	**3**	**2**	**3**	**-**		**-**	**-**	**-**		**-**	**-**	**3**	**-**	**-**

1: Slight (Low) **2: Moderate (Medium)** **3: Substantial (High)**

K.S.R. COLLEGE OF ENGINEERING (Autonomous) **R 2020**

OPEN ELECTIVE

		L	T	P	C
20ME901	**BASIC MECHANICAL ENGINEERING**	3	0	0	3

Prerequisite:

Course Outcomes : On successful completion of the course, the student will be able to		***Cognitive Level***
CO1:	*Explore the fundamental knowledge on basics of mechanical engineering*	*Understand*
CO2:	*Demonstrate the concepts of manufacturing technology.*	*Understand*
CO3:	*Describe the knowledge of power plants and pumps.*	*Understand*
CO4:	*Interpret the basic concepts of IC Engines.*	*Understand*
CO5:	*Analyze the Refrigeration and air conditioning systems*	*Analyze*

UNIT - I FUNDAMENTALS [09]

Introduction to mechanical engineering, concepts of thermal engineering, mechanical machine design, industrial engineering, and manufacturing technology.

UNIT - II MANUFACTURING TECHNOLOGY [09]

Manufacturing, classification, lathe, drilling machines, milling machines, metal joining, metal forming, casting, forging, and introduction to powder metallurgy.

UNIT - III POWER PLANT ENGINEERING [09]

Introduction, Classification of Power Plants – Working principle of steam, Gas, Diesel, Hydro-electric and Nuclear Power plants – Merits and Demerits – Pumps and turbines – working principle of Reciprocating pumps (single acting and double acting) – Centrifugal Pump.

UNIT - IV I C ENGINES [09]

Internal combustion engines as automobile power plant – Working principle of Petrol and Diesel Engines – Four stroke and two stroke cycles – Comparison of four stroke and two stroke engines.

UNIT - V REFRIGERATION AND AIR CONDITIONING SYSTEM [09]

Terminology of Refrigeration and Air Conditioning. Principle of vapour compression and absorption system–Layout of typical domestic refrigerator–Window and Split type room Air condition.

Total (L= 45, T = 0) = 45 Periods

Text Books :

1 Shantha Kumar S R J., Basic Mechanical Engineering, Hi-tech Publications, Mayiladuthurai, Second Edition, 2000.

2 Venugopal K and Prahu Raja V, Basic Mechanical Engineering, Anuradha Publishers, Kumbakonam , Fourth Edition 2000.

Reference Books :

1 Lecture notes prepared by Department of Mechanical Engineering, NITT, 2020.

2. R. K. Rajput,Manufacturing Processes, University Science Press, New Delhi, Fourth Edition, 2020.

3 Hajra Choudry, S. K., Elements of Work Shop Technology – Vol. I, Media Promoters, New Delhi, Fourth Edition, 2010.

4 Ramesh Babu, Basic civil and Mechanical Engineering, VRB Publishers, Chennai, Fourth Edition, 2017.

K.S.R COLLEGE OF ENGINEERING, TIRUCHENGODE-637215

DEPARTMENT OF MECHANICAL ENGINEERING

CO PO MAPPING

Regulation : R2020

Course Code : 20ME901 **Course Name : BASIC MECHANICAL ENGINEERING**

CO	Course Outcomes	Programme Outcomes													
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	Explore the fundamental knowledge on basics of mechanical engineering	3	3	3	-	-	2	-	-	-	-	-	-	-	-
CO2	Demonstrate the concepts of manufacturing technology	3	3	3	-	-	2	-	-	-	-	-	-	-	-
CO3	Describe the knowledge of power plants and pumps.	3	3	3	-	-	2	-	-	-	-	-	-	-	-
CO4	Interpret the basic concepts of IC Engines.	3	3	3	-	-	2	-	-	-	-	-	-	-	-
CO5	Analyze the Refrigeration and air conditioning systems	3	3	3	-	-	2	-	-	-	-	-	-	-	-
	Average	**3**	**3**	**3**	**-**	**-**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

K.S.R. COLLEGE OF ENGINEERING (Autonomous) **R 2020**

OPEN ELECTIVE

20ME902	**SOLAR ENERGY UTILIZATION**	L	T	P	C
		3	0	0	3

Prerequisite:

Course Outcomes : On successful completion of the course, the student will be able to		***Cognitive Level***
CO1:	*Explore the measurement of solar radiation and their application to various systems.*	Understand
CO2:	*Illustrate the principles of non-concentrating collectors and apply the principles in various real time applications.*	Apply
CO3:	*Describe the concept of concentrating collectors and their application to a wide range of systems.*	Apply
CO4:	*Analyze the various material characteristics of solar cell and determine maximum efficiency of solar cells.*	Analyze
CO5:	*Demonstrate the solar storage equipment and evaluate the economic analysis of various solar equipment.*	Understand

UNIT - I INTRODUCTION TO SOLAR ENERGY [09]

Introduction - Sun-Earth relationships- solar constant- solar radiation at the earth surface- depletion of solar radiation- measurement of solar radiation- solar radiation data- solar time- solar radiation geometry- solar radiation on tilted surfaces- Sun as the source of energy sun angles - overview of applications.

UNIT - II NON CONCENTRATING COLLECTORS [09]

Types and classification of solar collectors - terminology related to flat plate collectors - evacuated collectors-Heat transfer processes and efficiency of a solar collector -solar drying- solar desalination- solar mechanical cooling- solar desiccant cooling- detailed study on heat pump – it needed.

UNIT - III CONCENTRATING COLLECTORS [09]

Tracking systems - compound parabolic concentrators - parabolic trough concentrators - concentrators with point focus - Heliostats- comparison of various designs - central receiver systems - parabolic trough systems - solar performance analysis - solar power plant - solar furnace.

UNIT - IV SOLAR PHOTOVOLTAIC [09]

Fundamentals of solar cells- - types of solar cell- P-N junction photodiode- description and principle of working of a solar cell- cell structure- solar module and panel- I-V characteristics of a PV module- maximum power point- cell efficiency- fill factor- Manufacturing of solar cell.

UNIT - V SOLAR ENERGY STORAGE AND ECONOMIC ANALYSIS [09]

Storage of solar energy - thermal storage-sensible and latent heat storage-Economic Analysis: Initial and annual costs-definition of economic terms for a solar system- present worth calculation-repayment of loan in equal annual installments-annual savings- cumulative savings and life cycle savings- payback period- clean development mechanism -solar vehicle -BIPV(Building Integrated photo voltaic) - house hold appliances.

Total (L= 45, T = 0) = 45 Periods

Text Books :

1 Garg H P and Prakash J, Solar Energy: Fundamentals & Applications, McGraw Hill, New Delhi, First Revised Edition 2014 .

2 Duffie.J.A and Beckman W.A, Solar Engineering of Thermal processes, John Wiley And Sons, New York, Fourth Edition,2013 .

Reference Books :

1 Sukhatme. K and Sukhatme S.P., Solar Energy principles of thermal collection and storage, Tata McGraw Hill education, New Delhi, Third Edition,2008.

2 Rai G.D., Solar energy Utilization, Khanna Publishers, New Delhi, Fifth Edition, 2020.

3 Bhattachariya.T , Terrestrial Solar Photovoltaic, Narosa Publishers, New Delhi, Fourth Edition,2008.

4 ukhatme S.P., Solar Energy, Tata McGraw Hills P Co., Third Edition, 2008.

K.S.R COLLEGE OF ENGINEERING, TIRUCHENGODE-637215

DEPARTMENT OF MECHANICAL ENGINEERING

CO PO MAPPING

Regulation : R2020

Course Code : 20ME902 **Course Name : SOLAR ENERGY UTILIZATION**

CO	Course Outcomes	Programme Outcomes													
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	Evaluate the measurement of solar radiation and their application to various systems.	3	3	3	-	-	2	-	-	-	-	-	-	-	-
CO2	Illustrate the principles of non-concentrating collectors and apply the principles in various real time applications.	3	3	3	-	-	2	-	-	-	-	-	-	-	-
CO3	Describe the concept of concentrating collectors and their application to a wide range of systems.	3	3	3	-	-	2	-	-	-	-	-	-	-	-
CO4	Analyze the various material characteristics of solar cell and determine maximum efficiency of solar cells.	3	3	3	-	-	2	-	-	-	-	-	-	-	-
CO5	Demonstrate the solar storage equipment and evaluate the economic analysis of various solar equipment.	3	3	3	-	-	2	-	-	-	-	-	-	-	-
	Average	**3**	**3**	**3**	**-**	**-**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

K.S.R. COLLEGE OF ENGINEERING (Autonomous) **R 2020**

OPEN ELECTIVE

		L	T	P	C
20ME903	**PRODUCTION TECHNOLOGY OF AGRICULTURAL MACHINERY**	3	0	0	3

Prerequisite:

Course Outcomes : On successful completion of the course, the student will be able to		***Cognitive Level***
CO1:	*Acquire various engineering materials, classifications, compositions and properties*	Understand
CO2:	*Explore the concept and basic mechanics of metal cutting, working of standard machine tools and allied machines.*	Understand
CO3:	*Apply the manufacturing process in welding for component production.*	Apply
CO4:	*Demonstrate various advanced manufacturing process in engineering field.*	Understand
CO5:	*Describe the basic concepts of Computer Numerical Control (CNC) machine tool and CNC programming.*	Understand

UNIT – I ENGINEERING MATERIALS [09]

Engineering materials - their classification - Mechanical properties of materials, strength, elasticity, plasticity, stiffness, malleability, ductility, brittleness, toughness, hardness, resilience, machinability, formability, weldability. Steels and cast irons: Carbon steels, their classification based on percentage of carbon as low, mild, medium & high carbon steel, their properties & applications. Wrought iron, cast iron. Alloy steels: Stainless steel, tool steel.

UNIT - II MACHINING [09]

Basic principles of lathe - machine and operations performed on it. Basic description of machines and operations of Shaper-Planner, Drilling, Milling & Grinding.

UNIT - III WELDING [09]

Introduction, classification of welding processes. Gas welding, types of flames and their applications. Electric Arc welding. Resistance welding, Soldering & Brazing processes and their uses.

UNIT - IV ADVANCED MANUFACTURING PROCESS [09]

Abrasive flow machining - abrasive jet machining - water jet machining - Electro Discharge Machining (EDM) - Wire cut EDM - Electro Chemical Machining (ECM) - Ultrasonic Machining / Drilling (USM / USD) - Electron Beam Machining (EBM) - Laser Beam Machining (LBM).

UNIT - V CNC MACHINE [09]

Numerical control (NC) machine tools - CNC: types, constitutional details, special features – design considerations of CNC machines for improving machining accuracy - structural members – slide ways - linear bearings - ball screws - spindle drives and feed drives. Part programming fundamentals - manual programming.

Total (L= 45, T = 0) = 45 Periods

Text Books :

1 Kalpakjian and Schmid ,Manufacturing Engineering and Technology, Pearson, New Delhi, Eighth Edition, 2016.

2 Hajra Choudry, Elements of workshop technology - Vol II, Media promoters, New Delhi ,Fourth Edition,2018

Reference Books :

1 Gupta. K.N., and Kaushik, J.P., Workshop Technology Vol I and II, New Heights, Daryaganj, New Delhi, Second Edition, 1998,.

2 Arthur. D., et. al., General Engineering Workshop Practice, Asia Publishing House, Bombay, Third Edition,2001.

3 Chapman W.A.J., Workshop Technology, Part I, II, III, E.L.B.S. and Edward Amold Publishers Ltd, London, First Edition,1992.

4 Dr. P. Kamaraj, Dr. V. R. Ramachandran, Production Technology of Agricultural Machinery, Kerela, First Edition,2020.

K.S.R COLLEGE OF ENGINEERING, TIRUCHENGODE-637215

DEPARTMENT OF MECHANICAL ENGINEERING

CO PO MAPPING

Regulation : R2020

Course Code : 20ME903 **Course Name : PRODUCTION TECHNOLOGY OF AGRICULTURAL MACHINERY**

CO	Course Outcomes	Programme Outcomes													
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	Acquire various engineering materials, classifications, compositions and properties	3	3	3	-	-	2	-	-	-	-	-	-	-	-
CO2	Explore the concept and basic mechanics of metal cutting, working of standard machine tools and allied machines.	3	3	3	-	-	2	-	-	-	-	-	-	-	-
CO3	Apply the manufacturing process in welding for component production.	3	3	3	-	-	2	-	-	-	-	-	-	-	-
CO4	Demonstrate various advanced manufacturing process in engineering field.	3	3	3	-	-	2	-	-	-	-	-	-	-	-
CO5	Describe the basic concepts of Computer Numerical Control (CNC) machine tool and CNC programming.	3	3	3	-	-	2	-	-	-	-	-	-	-	-
	Average	**3**	**3**	**3**	**-**	**-**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

K.S.R. COLLEGE OF ENGINEERING (Autonomous) **R 2020**

OPEN ELECTIVE

20ME904	**SELECTION OF MATERIALS**	L	T	P	C
		3	0	0	3

Prerequisite:

Course Outcomes : On successful completion of the course, the student will be able to ***Cognitive Level***

CO1:	*Explore the classification and properties of engineering materials*	Understand
CO2:	*Acquire the knowledge on mechanical properties of various metal alloys.*	Understand
CO3:	*Identify different types of availability materials.*	Analyze
CO4:	*Examine required materials for engineering applications.*	Analyze
CO5:	*Select suitable material for various applications*	Evaluate

UNIT - I ENGINEERING MATERIALS [09]

Introduction – classification of engineering materials – selection of materials for engineering purposes –selection of materials and shape –classification metal and alloys, polymers, ceramics and glasses, composites, natural materials,- nonmetallic materials- smart materials - physical, metrical properties of metals.

UNIT - II MATERIAL PROPERTIES [09]

Mechanical properties – fatigue strength – fracture Toughness - Thermal Properties - Magnetic Properties - Fabrication Properties –electrical , optical properties - Environmental Properties , Corrosion properties –shape and size - Material Cost and Availability– failure analysis.

UNIT - III MANUFACTURING PROCESSING AND ECONOMIC ANALYSIS [09]

Interaction of Materials Selection, Design, and Manufacturing Processes - Production Processes and Equipment for Metals - Metal Forming, Shaping, and Casting - Plastic Parts Processing - Composites Fabrication Processes - Advanced Ceramics Processing – surface treatment - Resource -The Price and Availability of Materials.

UNIT - IV MATERIALS SELECTION CHARTS AND TESTING [09]

Ashby material selection charts-Testing of Metallic Materials - Plastics Testing - Characterization and Identification of Plastics - Professional and Testing Organizations - Ceramics Testing - Nondestructive Inspection.

UNIT - V APPLICATIONS AND USES [09]

Selection of Materials for Biomedical Applications - Medical Products - Materials in Electronic Packaging - Advanced Materials in Sports Equipment - Materials Selection for Wear Resistance - Advanced Materials in Telecommunications - Using Composites - Manufacture and Assembly with Plastics, fiber and Diamond Films.

Total (L= 45, T = 0) = 45 Periods

Text Books :

1 Ashby, M. F. , Materials selection in mechanical design, Elsevier, New Delhi, Third Edition, 2005.

2 Ashby, M. F. and Johnson, K. Materials and design – the art and science of material selection in product design. Elsevier, New Delhi, First Edition, 2002.

Reference Books :

1 Charles, J. A., Crane, F. A. A. and Furness, J. A. G. ,Selection and use of engineering materials, Butterworth-Heinemann, New Delhi, Third Edition, 1997.

2 Handbook of Materials Selection. Edited by Myer Kutz John Wiley & Sons, Inc., New York, Second Edition, 2002.

3 Fisher P.E., Selection of Engineering Materials and Adhesives ,CRC Press, US, First Edition,2020

4 Joseph Datsko ,Materials Selection for Design and Manufacturing theory and practice, CRC Press, US, First edition,2020.

K.S.R COLLEGE OF ENGINEERING, TIRUCHENGODE-637215

DEPARTMENT OF MECHANICAL ENGINEERING

CO PO MAPPING

Regulation : R2020

Course Code : 20ME904 **Course Name : SELECTION OF MATERIALS**

CO	Course Outcomes	Programme Outcomes													
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	Explore the classification and properties of engineering materials	3	3	3	-	-	1	-	-	-	-	-	-	-	-
CO2	Acquire knowledge on mechanical properties of various metal alloys.	3	3	3	-	-	1	-	-	-	-	-	-	-	-
CO3	Identify different types of availability materials.	3	3	3	-	-	1	-	-	-	-	-	-	-	-
CO4	Examine required materials for engineering applications.	3	3	3	-	-	1	-	-	-	-	-	-	-	-
CO5	Select suitable material for various applications	3	3	3	-	-	1	-	-	-	-	-	-	-	-
	Average	**3**	**3**	**3**	**-**	**-**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

K.S.R. COLLEGE OF ENGINEERING (Autonomous) **R 2020**

OPEN ELECTIVE

		L	T	P	C
20ME905	**MARINE VEHICLES**	3	0	0	3

Prerequisite:

Course Outcomes : On successful completion of the course, the student will be able to		***Cognitive Level***
CO1:	*Explore the various types of marine vehicles and its applications*	Understand
CO2:	*Acquire marine vehicle Safety, Operations and controls of bunkering.*	Understand
CO3:	*Demonstrate remotely operable vehicle design, construction and its components.*	Apply
CO4:	*Analyze submersible and autonomous under water vehicles.*	Analyze
CO5:	*Design and operational consideration of manned and un manned submersible.*	Create

UNIT - I MARINE VEHICLES [09]

Types – general – by function – commercial marine vehicles- passenger ship, cargo ships, oil and chemical tankers , cattle carriers, harbor crafts, off shore platform, container ships.

UNIT - II REEFERS AND GAS CARRIERS [09]

.Introduction – Types , design considerations, safety – operation and controls, precaution during bunkering.

UNIT - III REMOTELY OPERABLE VEHICLE (ROV), UMS SHIPS [09]

Remotely Operable Vehicles (ROV) – The ROV business – Design theory and standards – control and simulation – design and stability – components of ROV – applications, UMS operation, and controls.

UNIT - IV SUBMERSIBLES AND AUTONOMOUS UNDERWATER VEHICLE (AUV) [09]

submersibles types – applications, AUV – Design and construction considerations – components – sensors – Navigation - control strategies – applications.

UNIT - V MANNED AND UN MANNED SUBMERSIBLE [09]

Introduction – Design and operational consideration – pressure hull exo-structure – ballasting and trim – maneuvering and control – Life support and habitability – emergency devices and equipment's – certification and classification, towed vehicles – gliders – crawler – Design and construction.

Total (L= 45, T = 0) = 45 Periods

Text Books :

1 Jonathan M. Ross, human factors for naval marine vehicle design and operation, CRC Press, US, Second Edition, 2001.
2 Sabiha A. Wadoo, Pushkin Kachroo, Autonomous underwater vehicles, modeling, control design and Simulation, CRC press,US, Second Edition, 2011.

Reference Books :

1 Ferial L hawry, The ocean engineering handbook, CRC press, US, First Edition, 2000.
2 Richard A Geyer, Submersibles and their use in oceanography and ocean engineering, Elsevier, New Delhi, First Edition, 1997.
3 Robert D. Christ,Robert L. Wernli, Sr., The ROV Manual A User Guide for Remotely Operated Vehicles, Elsevier, New Delhi, second edition, 2014.
4 Frank Busby. R, Manned Submersibles, Office of the oceanographer of the Navy, United states, First Edition, 1976.

K.S.R COLLEGE OF ENGINEERING, TIRUCHENGODE-637215

DEPARTMENT OF MECHANICAL ENGINEERING

CO PO MAPPING

Regulation : R2020

Course Code : 20ME905 **Course Name : MARINE VEHICLES**

CO	Course Outcomes	Programme Outcomes													
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	Explore the various types of marine vehicles and its applications	3	3	3	-	-	2	-	-	1	-	-	-	-	-
CO2	Acquire Safety, Operations and controls of bunkering.	3	3	3	-	-	2	-	-	1	-	-	-	-	-
CO3	Demonstrate remotely operable vehicle design, construction and its components.	3	3	3	-	-	2	-	-	1	-	-	-	-	-
CO4	Analyze submersible and autonomous under water vehicles.	3	3	3	-	-	2	-	-	1	-	-	-	-	-
CO5	Design and operational consideration of manned and un manned submersible.	3	3	3	-	-	2	-	-	1	-	-	-	-	-
	Average	**3**	**3**	**3**	**-**	**-**	**2**	**-**	**-**	**1**	**-**	**-**	**-**	**-**	**-**

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

K.S.R. COLLEGE OF ENGINEERING (Autonomous) **R 2020**

OPEN ELECTIVE

		L	T	P	C
20ME906	**SENSORS AND TRANSDUCER**	3	0	0	3

Prerequisite:

Course Outcomes : On successful completion of the course, the student will be able to		***Cognitive Level***
CO1:	*Explore the basic concepts of various sensors and transducers.*	Understand
CO2:	*Develop knowledge in mechanical and electromechanical sensor.*	Apply
CO3:	*Differentiate the types of thermal sensor which are used in various applications.*	Apply
CO4:	*Identify various types of magnetic sensors and working principles*	Analyze
CO5:	*Acquire suitable sensors and its applications.*	Understand

UNIT - I INTRODUCTION [09]

Definition, classification, static and dynamic parameters, Characterization - Electrical, mechanical, thermal and chemical. Classification of errors - Error analysis, Static and dynamic characteristics of transducers.

UNIT - II MECHANICAL AND ELECTROMECHANICAL SENSORS [09]

Resistive Potentiometer - strain gauge - Inductive sensors and transducer - capacitive sensors – ultrasonic sensors.

UNIT - III THERMAL SENSOR [09]

Gas thermometric sensors - acoustic temperature sensors - magnetic thermometer, resistance change -type thermometric sensors.

UNIT - IV MAGNETIC SENSOR [09]

Force and displacement measurement - Magneto resistive sensors - Hall Effect sensor, Inductance and eddy current sensors - Angular/rotary movement transducer - Electromagnetic flow meter, squid sensor.

UNIT - V SENSORS AND THEIR APPLICATIONS [09]

Automobile sensor - Home appliance sensor - Aerospace sensors - sensors for manufacturing medical diagnostic sensors - environmental monitoring.

Total (L= 45, T = 0) = 45 Periods

Text Books :

1 Ernest O Doebelin, Measurement Systems – Applications and Design, Tata McGraw-Hill, New Delhi, Fourth edition, 2016.

2 Sawney A K and PuneetSawney, A Course in Mechanical Measurements and Instrumentation and Control, DhanpatRai and Co, New Delhi, Fourteenth edition, 2016.

Reference Books :

1 Patranabis D, Sensors and Transducers, PHI, New Delhi, Sixth Edition, 2015.

2 Richard Zurawski, Industrial Communication Technology Handbook, CRC Press, US, Second edition, 2015.

E-Resources :

1 https://nptel.ac.in/courses/108/108/108108147/

2 https://www.youtube.com/watch?v=1uPTyjxZzyo

K.S.R COLLEGE OF ENGINEERING, TIRUCHENGODE-637215

DEPARTMENT OF MECHANICAL ENGINEERING

CO PO MAPPING

Regulation : R2020

Course Code : 20ME906 **Course Name : SENSORS AND TRANSDUCER**

CO	Course Outcomes	Programme Outcomes													
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	Explore the basic concepts of various sensors and transducers.	3	3	3	-	-	1	-	-	-	-	-	-	-	-
CO2	Develop knowledge in mechanical and electromechanical sensor.	3	3	3	-	-	1	-	-	-	-	-	-	-	-
CO3	Differentiate the types of thermal sensor which are used in various applications.	3	3	3	-	-	1	-	-	-	-	-	-	-	-
CO4	Identify various types of magnetic sensors and working principles	3	3	3	-	-	1	-	-	-	-	-	-	-	-
CO5	Acquire suitable sensors and its applications.	3	3	3	-	-	1	-	-	-	-	-	-	-	-
	Average	**3**	**3**	**3**	**-**	**-**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

K.S.R. COLLEGE OF ENGINEERING (Autonomous) **R 2020**

OPEN ELECTIVE

20ME907	**ENERGY AUDITING**	L	T	P	C
		3	0	0	3

Prerequisite:

Course Outcomes : On successful completion of the course, the student will be able to		***Cognitive Level***
CO1:	*Describe the energy crisis & environmental concerns associated with the energy management and the importance of energy auditing.*	Understand
CO2:	*Identify the tools, techniques, management practices for the audit and management of electrical energy.*	Understand
CO3:	*Recognize the techniques of energy analysis and the associated energy efficient technologies for the routinely used thermal energy systems.*	Apply
CO4:	*State about the typical electrical energy powered utilities, services of industrial facilities & organizations and be able to identify the opportunities and options for the conservation & management of electrical energy.*	Understand
CO5:	*Interpret the basic economic concepts of underlay energy production and end use.*	Evaluate

UNIT - I INTRODUCTION [09]

Energy – Power – Past & Present scenario of world; National energy consumption data – Environmental aspects associated with energy utilization – Energy Auditing: Need, Types, Methodology and Barriers. Role of energy managers. Instruments for energy auditing.

UNIT - II ELECTRICAL SYSTEMS [09]

Components of EB billing – HT and LT supply, Transformers, Cable sizing, Concept of capacitors, Power factor improvement, Harmonics, Electric motors – Motors efficiency computation, Energy efficient motors, Illumination – Lux, Lumens, Types of lighting, Efficacy, LED lighting and scope of economics in illumination – Auditing in electrical systems.

UNIT - III THERMAL SYSTEMS [09]

Stoichiometry, Boilers, Furnaces and Thermal fluid heaters – Efficiency computation and economic measures. Steam: Distribution & usage, Steam traps, Condensate recovery, Flash steam utilization, Insulators & Refractories – Auditing in thermal systems.

UNIT - IV ENERGY CONSERVATION IN MAJOR UTILITIES [09]

Pumps, Fans, Blowers, Compressed air systems, Refrigeration and Air Conditioning systems – Cooling towers – D.G. sets - Auditing and energy conservation.

UNIT - V ECONOMICS [09]

Energy economics – Discount rate, Payback period, Internal rate of return, Net present value, Life cycle costing – ESCO concept – Auditing and Economics.

Total (L= 45, T = 0) = 45 Periods

Text Books :

1 Energy manager training manual (4 Volumes) available at www.energymanagertraining.com, a website administered by Bureau of energy efficiency (BEE), a statuary body under ministry of power, Government Of India, 2004.

2 Abbi,Y.B , Energy Audit, Open University, The Energy and Resources Institute, Government Of India,2012 .

Reference Books :

1 Witte. L.C., P. S. Schmidt, D.R. Brown, Industrial Energy Management and Utilization, Hemisphere Pub, Washington, First Edition, 1988 .

2 Sonal Desai, Handbook of Energy Audit, Tata McGraw Hill, New Delhi, Second Edition, 2015.

3 Dryden. I.G.C., The Efficient Use Of Energy, Butterworth's, London, Fourth Edition, 2013.

4 Turner W.C., Energy Management Handbook, Wiley, New York, Eighth Edition, 2014.

K.S.R COLLEGE OF ENGINEERING, TIRUCHENGODE-637215

DEPARTMENT OF MECHANICAL ENGINEERING

CO PO MAPPING

Regulation : R2020

Course Code : 20ME907 **Course Name : ENERGY AUDITING**

CO	Course Outcomes	Programme Outcomes													
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	Describe the energy crisis & environmental concerns associated with the energy management and the importance of energy auditing.	3	3	3	-	2	2	-	-	1	-	-	-	-	-
CO2	Identify the tools and techniques, and the management practices for the audit and management of electrical energy.	3	3	3	-	2	2	-	-	1	-	-	-	-	-
CO3	Recognize the techniques of energy analysis and the associated energy efficient technologies for the routinely used thermal energy systems.	3	3	3	-	2	2	-	-	1	-	-	-	-	-
CO4	State about the typical electrical energy powered utilities, services of industrial facilities & organizations and be able to identify the opportunities and options for the conservation & management of electrical energy.	3	3	3	-	2	2	-	-	1	-	-	-	-	-
CO5	Interpret the basic economic concepts of underlay energy production and end use.	3	3	3	-	2	2	-	-	1	-	-	-	-	-
	Average	**3**	**3**	**3**	**-**	**2**	**2**	**-**	**-**	**1**	**-**	**-**	**-**	**-**	**-**

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

K.S.R. COLLEGE OF ENGINEERING (Autonomous) **R 2020**

OPEN ELECTIVE

20ME908	**FIBRE REINFORCED PLASTICS**	L	T	P	C
		3	0	0	3

Prerequisite:

Course Outcomes : On successful completion of the course, the student will be able to		***Cognitive Level***
CO1:	Select various materials for designing composite structures.	Understand
CO2:	Apply knowledge of fracture mechanics of composites during designing of composite structures.	Apply
CO3:	Analyze critically damping capacity of composite materials.	Analyze
CO4:	Correlate various manufacturing/fabricating techniques for composite structures based on design.	Analyze
CO5:	Explore various composite applications.	Understand

UNIT - I INTRODUCTION [09]

Definition, Reason for composites, Classifications of composites, Thermosets - Epoxy; Unsaturated polyester resin; vinyl ester, polyimides etc.,-preparation, properties, and uses.

UNIT - II REINFORCEMENTS [09]

Types, Properties, chemistry and applications of fillers such as silica, titanium oxide, talc, mica etc., Manufacturing process, Properties, structure and uses of Glass fiber -.Carbon, Aramid, Boron, jute, sisal, cotton.

UNIT - III FABRICATIONS OF THERMOSET COMPOSITES [09]

Hand layup method, compression and transfer moulding, pressure and vacuum bag process, filament winding, protrusion, reinforced RIM, Injection moulding, of thermosets, SMC and DMC, Advantages and disadvantages of each method.

UNIT - IV TESTING OF COMPOSITES [09]

Destructive and non-destructive tests; Destructive-tensile, compression, flexural, impact strength, Hardness–Fatigue-toughness HDT ,basic concepts of fracture mechanisms.

UNIT - V APPLICATIONS OF COMPOSITES [09]

Aerospace, land transport, marine, structural, chemical plants and corrosion resistant products and energy applications sports, electrical, electronic and communication applications.

Total (L= 45, T = 0) = 45 Periods

Text Books :

1 Chawla, K.K, Composite Material s, Springer Science in progress, USA, Sixth Edition, 2019.
2 Balasubramaniam, Composite Materials, John Wiley & Sons, Indian Ed., New York, Fourth Edition, 2016.

Reference Books :

1 Sharma S.C., Composite materials, Narosa Publications, NewDelhi, Third Edition, 2015.
2 Isaac M. Daniel and Ori Ishai, Engineering Mechanics of Composite Materials, Oxford University Press, UK, Second Edition, 2017.

E-RESOURCES

1 https://nptel.ac.in/courses/112/105/112105232/
2 https://nptel.ac.in/courses/112/107/112107142/

K.S.R COLLEGE OF ENGINEERING, TIRUCHENGODE-637215

DEPARTMENT OF MECHANICAL ENGINEERING

CO PO MAPPING

Regulation : R2020

Course Code : 20ME908 **Course Name : FIBRE REINFORCED PLASTICS**

CO	Course Outcomes	Programme Outcomes													
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	Select various materials for designing composite structures.	3	3	3	-	-	1	-	-	-	-	-	-	-	-
CO2	Apply knowledge of fracture mechanics of composites during designing of composite structures.	3	3	3	-	-	1	-	-	-	-	-	-	-	-
CO3	Analyze critically damping capacity of composite materials.	3	3	3	-	-	1	-	-	-	-	-	-	-	-
CO4	Correlate various manufacturing / fabricating techniques for composite structures based on design.	3	3	3	-	-	1	-	-	-	-	-	-	-	-
CO5	Explore various composite applications.	3	3	3	-	-	1	-	-	-	-	-	-	-	-
	Average	**3**	**3**	**3**	**-**	**-**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

K.S.R. COLLEGE OF ENGINEERING (Autonomous) **R 2020**

OPEN ELECTIVE

		L	T	P	C
20ME909	**LEAN MANUFACTURING**	3	0	0	3

Prerequisite:

Course Outcomes : On successful completion of the course, the student will be able to		***Cognitive Level***
CO1:	*Demonstrate the lean manufacturing principles to find and eliminate wastes.*	*Understand*
CO2:	*Identify the lean manufacturing tools and their potential applications.*	*Understand*
CO3:	*Summarize the usage of visual management, TPM and lean practices.*	*Apply*
CO4:	*Acquire the technology drivers of lean manufacturing.*	*Understand*
CO5:	*Describe technology drivers of lean manufacturing.*	*Analyze*

UNIT - I LEAN MANUFACTURING PRINCIPLES [09]

Lean manufacturing paradigms - lean manufacturing - origin - Toyota Production System - types of wastes -tools and techniques to eliminate wastes - value stream mapping (VSM) - primary icons - secondary icons - developing the VSM.

UNIT - II LEAN MANUFACTURING TOOLS [09]

5S concepts - stages of 5S and waste elimination - Kaizen - steps of Kaizen - lean manufacturing through Kaizen – Single Minute Exchange of Die - theory of SMED - design for SMED - strategic SMED and waste elimination - pull production through Kanban - one piece flow production.

UNIT - III VISUAL MANAGEMENT, TPM AND LEAN IMPLEMENTATION [09]

Visual management - tools for eliminating wastes - overproduction, inventory, delay, transportation, processing, unnecessary motion, defective parts, underutilization of people - implementation - total productive maintenance - implementation of lean practices.

UNIT - IV MANAGEMENT AND TECHNOLOGY DRIVERS OF LEAN MANUFACTURING [09]

Lean manufacturing - twenty criteria model - management driver - organizational structure - devolution of authority - employee status and involvement - nature of management - business and technical processes - time management - agility through technology driver.

UNIT - V MANUFACTURING STRATEGY AND COMPETITIVE DRIVERS OF LEAN MANUFACTURING [09]

Quick manufacturing setups - quick response - product life cycle management - product service elimination - automation - competitive driver - status of quality and productivity - compatible cost accounting system.

Total (L= 45, T = 0) = 45 Periods

Text Books :

1 Devadasan.S.R, Mohan Sivakumar.V, Murugesh.R and Shalij.P.R, Lean Manufacturing: Theoretical, Practical and Research Futurities, PHI Learning Private Limited, New Delhi, Second Edition, 2012.

2 Pascal Dennis, Lean Production Simplified, Productivity Press, New York, Third Edition, 2007.

Reference Books :

1 Bill Carreira, Lean Manufacturing That Works, PHI Learning Private Limited, New Delhi, Third Edition, 2016.

2 Dennis P. Hobbs, LEAN Manufacturing Implementation, Cengage Learning, New Delhi, Fifth Edition, 2015.

E-RESOURCES

1 https://nptel.ac.in/courses/112/104/112104188/ - (Lean Manufacturing System Technology)

2 https://freevideolectures.com/course/4162/nptel - (Toyota Production system)

K.S.R COLLEGE OF ENGINEERING, TIRUCHENGODE-637215

DEPARTMENT OF MECHANICAL ENGINEERING

CO PO MAPPING

Regulation : R2020

Course Code : 20ME909 **Course Name : LEAN MANUFACTURING**

CO	Course Outcomes	Programme Outcomes													
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	Demonstrate the lean manufacturing principles to find and eliminate wastes .	3	3	3	-	-	2	-	-	-	-	-	-	-	-
CO2	Identify the lean manufacturing tools and their potential applications.	3	3	3	-	-	2	-	-	-	-	-	-	-	-
CO3	Summarize the usage of visual management, TPM and lean practices.	3	3	3	-	-	2	-	-	-	-	-	-	-	-
CO4	Acquire the technology drivers of lean manufacturing.	3	3	3	-	-	2	-	-	-	-	-	-	-	-
CO5	Describe technology drivers of lean manufacturing.	3	3	3	-	-	2	-	-	-	-	-	-	-	-
	Average	**3**	**3**	**3**	**-**	**-**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

K.S.R. COLLEGE OF ENGINEERING (Autonomous) **R 2020**

OPEN ELECTIVE

		L	T	P	C
20ME910	**SURFACE ENGINEERING**	3	0	0	3

Prerequisite:

Course Outcomes : On successful completion of the course, the student will be able to		***Cognitive Level***
CO1:	*Demonstrate the various factors influencing wear in materials*	Understand
CO2:	*Identify wear resistance techniques in engineering materials*	Apply
CO3:	*Acquire various surface treatment methods for alloy metals*	Understand
CO4:	*Describe various surface treatment techniques and its applications*	Analyze
CO5:	*Explore the corrosion behaviour of engineering materials*	Understand

UNIT - I WEAR [09]

Introduction tribology, surface degradation, wear and corrosion, types of wear, roles of friction and lubrication- overview of different forms of corrosion, introduction to surface engineering, importance of substrate

UNIT - II COATING [09]

Chemical and electrochemical polishing, significance, specific examples, chemical conversion coatings, phosphating, chromating, chemical colouring, anodizing of aluminium alloys, thermochemical processes -industrial practices

UNIT - III SURFACE TREATMENT [09]

Surface pre-treatment, deposition of copper, zinc, nickel and chromium - principles and practices, alloy plating, electrocomposite plating, electroless plating of copper, nickel-phosphorous, nickel-boron; electroless composite plating; application areas, properties, test standards (ASTM) for assessment of quality deposits

UNIT - IV SURFACE TREATMENT TECHNIQUES [09]

Definitions and concepts, physical vapour deposition (PVD), evaporation, sputtering, ion plating, plasma nitriding, process capabilities, chemical vapour deposition (CVD), metal organic CVD, plasma assisted CVD, specific industrial applications

UNIT - V SPRAYING [09]

Thermal spraying, techniques, advanced spraying techniques - plasma surfacing, D-Gun and high velocity oxy-fuel processes, laser surface alloying and cladding, specific industrial applications, tests for assessment of wear and corrosion behaviour

Total (L= 45, T = 0) = 45 Periods

Text Books :

1 Stachowiak, G.W & Batchelor A.W, Engineering Tribology, Butterworth-Heinemann, UK, First Edition, 2005.

2 Rabinowicz.E, Friction and Wear of materials, John Willey &Sona ,New York, Second Edition,1995.

Reference Books :

1 Sudarshan T S, Surface modification technologies - An Engineer's guide, Marcel Dekker, Newyork, First Edition,1989.

2 Varghese C.D, Electroplating and Other Surface Treatments - A Practical Guide, TMH, New Delhi, First Edition,1993.

3 Williama. J.A, Engineering Tribology, Oxford univ. Press, UK, Second Edition,1994.

4 Basu S.K,. Sengupta S.N &Ahuja B.P, Fundamentals of Tribology, Prentice-Hall of India Pvt. Ltd, New Delhi, Second Edition,2005.

K.S.R COLLEGE OF ENGINEERING, TIRUCHENGODE-637215

DEPARTMENT OF MECHANICAL ENGINEERING

CO PO MAPPING

Regulation : R2020

Course Code : 20ME910 **Course Name : SURFACE ENGINEERING**

CO	Course Outcomes	Programme Outcomes													
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	Demonstrate the lean manufacturing principles to find and eliminate wastes.	3	3	3	-	-	-	-	-	-	-	-	-	-	-
CO2	Identify the lean manufacturing tools and their potential applications.	3	3	3	-	-	-	-	-	-	-	-	-	-	-
CO3	Acquire various surface treatment methods for alloy metals	3	3	3	-	-	-	-	-	-	-	-	-	-	-
CO4	Describe various surface treatment techniques and its applications	3	3	3	-	-	-	-	-	-	-	-	-	-	-
CO5	Explore the corrosion behavior of engineering materials	3	3	3	-	-	-	-	-	-	-	-	-	-	-
	Average	**3**	**3**	**3**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

K.S.R. COLLEGE OF ENGINEERING (Autonomous) **R 2020**

20SF901	**OCCUPATIONAL HEALTH AND HYGIENE (Open Elective)**	L	T	P	C
		3	0	0	3

Prerequisite: No prerequisites are needed for enrolling into the course

Course Outcomes: On successful completion of the course, the student will be able to		***Cognitive Level***
CO1	*Compare the concept and spectrum of health functional units and activities of occupational health service.*	*Understand*
CO2	*Identify physical chemical and biological hazards in the work environment and its control measures.*	*Apply*
CO3	*Explain the principles of ventilation and its requirements.*	*Understand*
CO4	*Demonstrate about the lighting and its requirements.*	*Understand*
CO5	*Reduce the gas poisoning and its effects.*	*Apply*

UNIT - I **OCCUPATIONAL HEALTH** **[09]**

Concept and spectrum of health - functional units and activities of occupational health services - occupational and work-related disease - Levels of prevention of diseases - notifiable occupational diseases such as silicosis, asbestosis, pneumoconiosis, siderosis, anthracosis, aluminosis and anthrax.

UNIT - II **VIBRATION** **[09]**

Recognition, evaluation and control of physical hazards. Vibration - Description and measurement of vibration. Vibration control methods. Effects of whole-body vibration on human body and control measures - Noise - noise measurement, evaluation, noise control methods - hearing loss - causes - Biological effects of noise exposure.

UNIT - III **VENTILATION** **[09]**

Ventilation systems - Purpose of ventilation - General principles ventilation requirements. Physiological and comfort level. Natural ventilation - Dilution ventilation - Mechanical ventilation - Local exhaust ventilation - Ventilation measuring instruments. Fundamentals of hood and duct designs. Standards on ventilation.

UNIT - IV **LIGHTING** **[09]**

Purpose of lighting - Advantages of good illumination - Lighting and the work - Sources and kinds of artificial lighting principles of good illumination. Design of Lighting installation - Maintenance - Lighting and Color Standards on lighting and illuminations.

UNIT - V **GAS POISONING** **[09]**

Lead - Nickel, Chromium and Manganese toxicity - Gas poisoning (such as CO, ammonia, coal and dust) their effects and prevention - Local and systemic and chronic effects - Carcinogens, Mutagens, Teratogens. Personal monitoring devices - Medical support.

Total = 45 Periods

Text Books:

1. Jeanne Mager Stellman(ed) Encyclopedia of Occupational Health and Safety, International Labour Office, Geneva, Fourth Edition, 1998.
2. The Industrial Environment -Its Evaluation and Control, DHHS (NIOSH),1973.

Reference Books:

1. Barbara Cohrssen, Patty´s Industrial Hygiene and Toxicology, Wiley, Inder science, NewYork. Seventh Edition, 2021.
2. Yudenich, V.V., Accident First Aid, Mir Publishers, Moscow, 1986.
3. Cantlie, James., First aid to the injured. St John Ambulance Association, 1932.
4. S.K. Halder, Industrial and Occupational Health, Kindle Edition, 2017.

K.S.R. COLLEGE OF ENGINEERING, TIRUCHENGODE – 637215
DEPARTMENT OF SAFETY AND FIRE ENGINEERING
CO PO MAPPING

Regulation: R2020

Course Code: 20SF901 **Course Name: Occupational Health and Hygiene**

CO	Course Outcomes	Programme Outcomes													
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	*Compare the concept and spectrum of health functional units and activities of occupational health service.*	3	2	2	-	-	3	2	2	-	-	-	2	-	-
CO2	*Identify physical chemical and biological hazards in the work environment and its control measures.*	3	2	2	-	-	3	2	2	-	-	-	2	-	-
CO3	*Explain the principles of ventilation and its requirements.*	3	2	2	-	-	3	2	2	-	-	-	2	-	-
CO4	*Demonstrate about the lighting and its requirements.*	3	2	2	-	-	3	2	2	-	-	-	2	-	-
CO5	*Reduce the gas poisoning and its effects.*	3	2	2	-	-	3	2	2	-	-	-	2	-	-
	Average	**3**	**2**	**2**	**-**	**-**	**3**	**2**	**2**	**-**	**-**	**-**	**2**	**-**	**-**

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

K.S.R. COLLEGE OF ENGINEERING (Autonomous) **R 2020**

		L	T	P	C
20SF902	**CONSTRUCTION SAFETY (Open Elective)**	3	0	0	3

Prerequisite: No prerequisites are needed for enrolling into the course

Course Outcomes: On successful completion of the course, the student will be able to		***Cognitive Level***
CO1	*List out Hazards from various Construction equipment and activities.*	*Remember*
CO2	*Mention various Control measures adopted in each Construction activity to avoid Incidents.*	*Apply*
CO3	*Demonstrate the safe use of various types of ladders, Hand held power tools, Hydraulic tools used in Construction industry.*	*Understand*
CO4	*Compare various components of cranes, safety features and its function.*	*Understand*
CO5	*Choose the minimum requirements of BOCW act to the Construction site when they work.*	*Apply*

UNIT - I **INTRODUCTION** **[09]**

Safety aspects of construction planning- Human factors in construction safety management. Roles of various groups in ensuring safety in construction industry.

UNIT - II **SAFETY IN VARIOUS CONSTRUCTION OPERATIONS** **[09]**

Excavation- underwater works- Ladders & Scaffolds - Tunneling- Blasting- Demolition- Pneumatic caissons- Confined Space- Temporary Structures. Indian Standards on construction safety- National Building Code Provisions on construction safety.

UNIT - III **SAFETY IN MATERIAL HANDLING EQUIPMENTS** **[09]**

Storage & stacking of construction materials, Safety in the use of construction equipment's - Vehicles, Cranes, Tower Cranes, Lifting gears, Hoists & Lifts, Wire Ropes, Pulley blocks, Temporary power supply, Mixers, Conveyors, Pneumatic and hydraulic tools in construction.

UNIT - IV **CONTRACT CONDITIONS ON SAFETY** **[09]**

Health, Welfare, Social Security and Insurance. Application of ergonomics for construction safety.

UNIT - V **CONTRACT LABOUR ACT AND CENTRAL RULES** **[09]**

Buildings and other Construction Workers (RE & CS) Act and Central Rules. Provisions regarding Licensing, safety, health, welfare and social security aspects only.

Total = 45 Periods

Text Books:

1. National Building Code of India, Bureau of Indian Standards, New Delhi, 2005.
2. Building & Other Construction Workers (RE &CS) Actand Central Rules, 1966.

Reference Books:

1. V.J. Davies & K. Tomasin, Construction Safety Handbook, Thomas Telford Publishing, London. 1990.
2. K.N. Vaid (Ed.), Construction Safety Management, National Institute of Construction Management and Research, Bombay,1988.
3. James B. Full man, Construction Safety, Security & Loss Prevention, John Wiley & Sons. 1984.
4. R.T. Ratay, Handbook of Temporary Structures in Construction, Mc Graw-Hill, 1984.

K.S.R. COLLEGE OF ENGINEERING, TIRUCHENGODE – 637215
DEPARTMENT OF SAFETY AND FIRE ENGINEERING
CO PO MAPPING

Regulation: R2020

Course Code: 20SF902 **Course Name: Construction Safety**

CO	Course Outcomes	Programme Outcomes													
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	*List out Hazards from various Construction equipment and activities.*	3	2	3	-	2	-	3	-	1	-	-	2	-	-
CO2	*Mention various Control measures adopted in each Construction activity to avoid Incidents.*	3	2	3	-	2	-	3	-	1	-	-	2	-	-
CO3	*Demonstrate the safe use of various types of ladders, Hand held power tools, Hydraulic tools used in Construction industry.*	3	2	3	-	2	-	3	-	1	-	-	2	-	-
CO4	*Compare various components of cranes, safety features and its function.*	3	2	3	-	2	-	3	-	1	-	-	2	-	-
CO5	*Choose the minimum requirements of BOCW act to the Construction site when they work.*	3	2	3	-	2	-	3	-	1	-	-	2	-	-
	Average	**3**	**2**	**3**	**-**	**2**	**-**	**3**	**-**	**1**	**-**	**-**	**2**	**-**	**-**

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

K.S.R. COLLEGE OF ENGINEERING (Autonomous) **R 2020**

		L	T	P	C
20SF903	**BUILDING FIRE SAFETY (Open Elective)**	3	0	0	3

Prerequisite: No prerequisites are needed for enrolling into the course

Course Outcomes: On successful completion of the course, the student will be able to		***Cognitive Level***
CO1	*Explain the human behaviour under emergency movement and the concept of planning and design of seating arrangements in assembly buildings, evacuation routes and exits.*	*Understand*
CO2	*Outline the general life safety requirements applicable to all buildings and to plan, design and locate exits in buildings.*	*Understand*
CO3	*Illustrate the fire and life safety requirements for buildings of specific occupancy.*	*Understand*
CO4	*Choose and distribute portable and fixed firefighting systems in buildings of different occupancies as per BIS.*	*Apply*
CO5	*Develop the method of carrying out fire investigation, arson identification, fire training, fire safety audit and fire risk assessment.*	*Apply*

UNIT - I **BASIC BUILDING PLANNING AND DESIGN** **[09]**

Process of emergency evacuation - special features of personnel movement. Parameter characteristics of the movement of people; Stages of evacuation; Planning and design of evacuation routes and exits; planning of seating arrangements in large assembly buildings.

UNIT - II **NBC CODES FOR BUILDINGS** **[09]**

Classification of buildings based on occupancy and type of construction according to fire resistance as per NBC; Fire zone; General fire safety requirements applicable to all individual occupancies. General exit requirements as per NBC; Internal staircases; horizontal exits; fire tower; ramps; fire lifts; external fire escape ladders; Planning of location and calculation of capacity, number and width of exit as per NBC for different occupancy classification.

UNIT - III **FIRE PREVENTION AND BIS STANDARD** **[09]**

Fire and life safety requirements in different groups of buildings-Hotel, Schools & Colleges, Hospitals, Theatres, shopping malls, etc., Fire protection and prevention in high rise buildings - Fire protection in underground structures and in buildings under construction. Sitting of detectors as per relevant Indian standard specifications; Selection and planning of alarm system as per relevant standards (BIS).

UNIT - IV **FIRE PREVENTION AND BIS STANDARD** **[09]**

Selection and distribution of portable extinguishers (for class A and B fires) and other fire protection equipment and systems for different occupancy classification as per NBC; Planning of fixed firefighting installation for different occupancy classification-sprinkler system; total flooding system; CO2 system; foam system; Fire Investigation; Detection of arson; Fire training and education - fire drill, fire order; Fire safety audits; Fire risk assessment.

UNIT - V **FIRE SAFETY AND CODES** **[09]**

Causes of fire in buildings. Stages of fire and how it spreads. Fire drill. Heat / fire / smoke detection. Alarm and extinguisher systems. Fire safety standards. General guidelines for egress design for multi-storey buildings. Understanding all the above through product literature/ field visits. Exercise on design of fire safety systems for different building types through choice, calculations, layout and drawings.

Total = 45 Periods

Text Books:

1. Butcher, E.G. And Parnell, A.C., Designing of fire safety. John Wiley and Sons Ltd., New York, U.S.A, 1983.
2. Roytman, M. Ya., Principles of Fire Safety Standards for Building Construction, Amerind Publishing Co. Pvt. Ltd., New Delhi, 1975.

Reference Books:

1. Barendra Mohan Sen, Fire Protection and Prevention the Essential Handbook, UBS Publishers and Dist., New Delhi, 2013.
2. Jain, V.K., Fire Safety in Buildings, New Age International (P) Ltd., New Delhi, Second Edition, 2010.
3. Huang, Kai, Population and Building Factors That Impact Residential Fire Rates in Large U.S. Cities, Applied Research Project, Texas State University.
4. Life Safety Code Handbook, National Fire Protection Association, Lathrop, James K.Ed. NFPA, 1991.

K.S.R. COLLEGE OF ENGINEERING, TIRUCHENGODE – 637215
DEPARTMENT OF SAFETY AND FIRE ENGINEERING
CO PO MAPPING

Regulation: R2020

Course Code: 20SF903 **Course Name: Building Fire Safety**

CO	Course Outcomes	Programme Outcomes													
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	*Explain the human behaviour under emergency movement and the concept of planning and design of seating arrangements in assembly buildings, evacuation routes and exits.*	3	3	3	-	-	-	2	-	-	1	-	2	-	-
CO2	*Outline the general life safety requirements applicable to all buildings and to plan, design and locate exits in buildings.*	3	3	3	-	-	-	2	-	-	1	-	2	-	-
CO3	*Illustrate the fire and life safety requirements for buildings of specific occupancy.*	3	3	3	-	-	-	2	-	-	1	-	2	-	-
CO4	*Choose and distribute portable and fixed firefighting systems in buildings of different occupancies as per BIS.*	3	3	3	-	-	-	2	-	-	1	-	2	-	-
CO5	*Develop the method of carrying out fire investigation, arson identification, fire training, fire safety audit and fire risk assessment.*	3	3	3	-	-	-	2	-	-	1	-	2	-	-
	Average	**3**	**3**	**3**	**-**	**-**	**-**	**2**	**-**	**-**	**1**	**-**	**2**	**-**	**-**

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

K.S.R. COLLEGE OF ENGINEERING (Autonomous) **R 2020**

20SF904	SAFETY IN ELECTRICAL ENGINEERING (Open Elective)	L	T	P	C
		3	0	0	3

Prerequisite: No prerequisites are needed for enrolling into the course

Course Outcomes: On successful completion of the course, the student will be able to		***Cognitive Level***
CO1	*Explain the working principles and applications of various kinds of Electrical Machines and/or systems.*	*Understand*
CO2	*Choose & brief the hazards associated with electricity at work place.*	*Apply*
CO3	*Recall human safety aspects over electric and magnetic fields.*	*Remember*
CO4	*Compare various protective equipment and enumerate their working and application.*	*Understand*
CO5	*Identify hazardous areas/locations in a given industrial site for selection, installation, operation and maintenance of electrical equipment.*	*Apply*

UNIT - I **INTRODUCTIONTO ELECTRICAL EQUIPMENTS** **[09]**

Transformers, DC Machines, Alternators, Induction Machines- Characteristics, application Protection Relays: Requirements of relay- types of protection, Classification: Distance Relay, Differential Relay, Static Relay- Definitions and types.

UNIT - II **CIRCUIT BREAKERS** **[09]**

Function switch gear, Arc Phenomenon- Initialization of an Arc, Arc interruption, Recovery voltage, and Restriking voltage classification and working, Working of MCB and ELCB. Faults in Power System: Causes and types, Fuses: Definition, types of fuses, selection of fuses, advantages and disadvantages.

UNIT - III **EFFECT OF ELECTRIC FIELD AND MAGNETIC FIELD** **[09]**

Human Safety Aspects, Effect of Current and Voltage on Human being- distance from the source, Typical V-I characteristics of skin - Nervous System, Electrical Shocks and their prevention, Insulation: Classes of Insulation, FRLS insulation, Continuity test.

UNIT - IV **SAFETY DURING INSTALLATION OF PLANT AND EQUIPMENT** **[09]**

Safe sequences in installation -Risk during installation, Safety during testing and commissioning- steps, Test on relays- Protection and interlock system on safety.

UNIT - V **HAZARDOUS ZONES** **[09]**

Classification of hazardous zones. Intrinsically safe and explosion proof electrical apparatus, Selection of equipment in hazardous area. Electrical Fires: Hazards of static electricity, Safety procedures in electrical maintenance, Statutory requirements from Electrical Inspectorate. Introduction to Indian Electricity Act and Rules.

Total = 45 Periods

Text Books:

1. S. Rao, Electrical Safety, Fire Safety Engineering and Safety Management, Khanna Publishers, New Delhi, Third Edition, 2019.
2. John Cadick, Electrical Safety Hand book, John Cadick, TMH Publishers, Sixth Edition, 2019.

Reference Books:

1. Charles A Gross, Fundamentals of Electrical Engineering, Taylor and Francis Group, 2012.
2. H. Wayne Beaty, Handbook for Electrical Engineers, McGrawHill, Fifteenth Edition, 2007.
3. Donald G Fink, Standard Handbook for Electrical Engineers, Mc GrawHill, Twelth Edition,1987.
4. Donald G Fink, Electrical Engineering, Mc Graw Hill, Fifteenth Edition,1907.

K.S.R. COLLEGE OF ENGINEERING, TIRUCHENGODE – 637215
DEPARTMENT OF SAFETY AND FIRE ENGINEERING
CO PO MAPPING

Regulation : R2020

Course Code: 20SF904 **Course Name: Safety in Electrical Engineering**

CO	Course Outcomes	Programme Outcomes													
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	*Explain the working principles and applications of various kinds of Electrical Machines and/or systems.*	3	1	2	-	-	2	1	-	-	-	-	-	-	-
CO2	*Choose & brief the hazards associated with electricity at work place.*	3	1	2	-	-	2	1	-	-	-	-	-	-	-
CO3	*Recall human safety aspects over electric and magnetic fields.*	3	1	2	-	-	2	1	-	-	-	-	-	-	-
CO4	*Compare various protective equipment and enumerate their working and application.*	3	1	2	-	-	2	1	-	-	-	-	-	-	-
CO5	*Identify hazardous areas/locations in a given industrial site for selection, installation, operation and maintenance of electrical equipment.*	3	1	2	-	-	2	1	-	-	-	-	-	-	-
	Average	**3**	**1**	**2**	**-**	**-**	**2**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

K.S.R. COLLEGE OF ENGINEERING (Autonomous) **R 2020**

		L	T	P	C
20SF905	**LEGAL ASPECTS OF SAFETY (Open Elective)**	3	0	0	3

Prerequisite: No prerequisites are needed for enrolling into the course

Course Outcomes: On successful completion of the course, the student will be able to		***Cognitive Level***
CO1	*Describe about the factories act and rules.*	*Understand*
CO2	*Illustrate the legal obligations regarding any injury by gaining knowledge of Workmen's Compensation Act. ESI Act & Rules.*	*Understand*
CO3	*Outline about the legal aspects granting of license for storage, transportation and usage of explosive substance as applicable as per Petroleum Act and Explosive Act.*	*Understand*
CO4	*Explain the Environment (Protection) act and Rules.*	*Understand*
CO5	*Choose the concept, powers and functions of Central, State and Joint Boards, provisions regarding prevention and control of Water & Air pollution, Penalties, Central & State Laboratories.*	*Apply*

UNIT - I FACTORIES ACT [09]

Factories Act- Definitions, Preliminary, inspecting staff, Health, Safety, Provisions relating to hazardous processes, Welfare, Working hours of adults, Employment of young persons, Special provisions - Definitions, Powers of inspectors, Power of Govt. to direct inquiry. Duties of Safety Officers, Reporting of accidents, Emergency Action Plan, Safety Committee.

UNIT - II WORKMEN'S COMPENSATION ACT [09]

Workmen's Compensation Act: Definitions, Employer´s liability for compensation, Calculation of amount of compensation. ESI Act and Rules: Applicability, Definitions and Benefits. Public Liability Insurance Act and Rules- Definitions, Calculation of amount of relief, Environmental Relief Fund, Advisory Committee, Powers of District Collector, Extent of Liability, Contribution to Relief Fund.

UNIT - III EXPLOSIVES ACT [09]

Explosives Act: Definitions, Categories of Explosives, General Safety Provisions, and Use of Explosives, Grant of license, Notice of Accidents, Inquiry into ordinary and more serious accidents. Extension of definition to other explosive substances. Explosives Rules, SMPV Rules and Gas Cylinder Rules (in brief). Petroleum Act with important rules - definitions, safety in the import, transport, storage, license, exemption, notice of accidents.

UNIT - IV ENVIRONMENT (PROTECTION) ACT [09]

Water Act and Air Act: Definitions, powers and functions of Boards, prevention and control of pollution, consent administration. Environment (Protection) Act and Rules-Definitions, powers of central government, power of giving directions, authorities. MSIHC Rules- Definitions, Duties of Authorities, Notification of major accidents, Safety Reports, Safety Audit, On- site &Off-site emergency plans.

UNIT - V POWER TO MAKE RULES [09]

Powers and Functions of Central, State and Joint Boards, Provisions regarding prevention and control of water pollution, Penalties, Central & State Water Laboratories, Power to make rules, Power of supersession and overriding effect. Rules on Consent for Establishment.

Total = 45 Periods

Text Books:

1. S.K.T. Narayanan,Safety, Health and Environment Handbook Hardcover, McGraw Hill Education (India) Private limited, First Edition, 2017.
2. Gayle Wood Side and Dianna Koeurek, Environmental Safety and Health Engineering, John Wiley & Sons, 1997.

Reference Books:

1. Ganguly & Changeriya, Health Safety and Environment, 2016.
2. Explosives Act and Related Rules & The Gas Cylinder Rules, Professional Book Publishers, 2004.
3. James B. Well, Environmental Management Handbook for Hydrocarbon Processing Industries, Factories Act, 1948.
4. Petroleum Act and Rules & The Petroleum Act, Universal Law Publishing, 1934.

K.S.R. COLLEGE OF ENGINEERING, TIRUCHENGODE – 637215
DEPARTMENT OF SAFETY AND FIRE ENGINEERING
CO PO MAPPING

Regulation: R2020

Course Code: 20SF905 **Course Name: Legal Aspects of Safety**

CO	Course Outcomes	Programme Outcomes													
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	*Describe about the factories act and rules.*	3	-	3	-	-	3	3	2	-	-	-	2	-	-
CO2	*Illustrate the legal obligations regarding any injury by gaining knowledge of Workmen's Compensation Act. ESI Act & Rules.*	3	-	3	-	-	3	3	2	-	-	-	2	-	-
CO3	*Outline about the legal aspects granting of license for storage, transportation and usage of explosive substance as applicable as per Petroleum Act and Explosive Act.*	3	-	3	-	-	3	3	2	-	-	-	2	-	-
CO4	*Explain the Environment (Protection) act and Rules.*	3	-	3	-	-	3	3	2	-	-	-	2	-	-
CO5	*Choose the concept, powers and functions of Central, State and Joint Boards, provisions regarding prevention and control of Water & Air pollution, Penalties, Central & State Laboratories.*	3	-	3	-	-	3	3	2	-	-	-	2	-	-
	Average	**3**	**-**	**3**	**-**	**-**	**3**	**3**	**2**	**-**	**-**	**-**	**2**	**-**	**-**

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

K.S.R. COLLEGE OF ENGINEERING (Autonomous) **R 2020**

		L	T	P	C
20SF906	**SAFETY IN INDUSTRIES (Open Elective)**	3	0	0	3

Prerequisite: No prerequisites are needed for enrolling into the course

Course Outcomes: On Completion of this course, the student will be able to		**Cognitive Level**
CO1	*Explain the General safety rules, principles, maintenance, Inspections in Foundry Operations.*	*Understand*
CO2	*Apply the concepts of safety in design of building fire safety.*	*Apply*
CO3	*Develop the safety in industrial operations.*	*Apply*
CO4	*Recall about welding, common hazards in welding, personal protective equipment and safety precautions in welding.*	*Remember*
CO5	*Illustrate on safety in finishing, inspection and testing of machines.*	*Understand*

UNIT - I FOUNDRY OPERATIONS SAFETY [09]

Foundry Operations - Furnace - health hazard - safe methods of operation. Forging operations heat radiation - maintenance of machines - final checking of tools, guards, lubrication, shop equipment and hand tools - safe work practice. Operations in hot and cold rolling mills. Shearing -bending - rolling - drawing - turning - boring - milling - planning - grinding. Selection and care of tools - health hazards and prevention.

UNIT - II BUILDING FIRE SAFETY [09]

Building Fire Safety Objectives of fire safe building design, Fire load, fire resistant material and fire testing - structural fire protection - structural integrity - concept of exit design -exists width calculations -fire certificates - fire safety requirements for high-rise buildings - snookers.

UNIT - III PERSONNEL RISK IN INDUSTRIAL OPERATIONS [09]

Storages and Transportation General consideration, petroleum product storages, storage tanks and vessel-storages layout segregation, separating distance, secondary containment - venting and relief, atmospheric vent, pressure, vacuum valves, flame arrestors, fire relief - fire prevention and protection - LPG storages -underground storages-loading and unloading facilities-drum and cylinder storage ware house, storage hazard assessment of LPG and LNG Hazards during transportation –pipeline transport.

UNIT - IV WORKSHOP PROCESS SAFETY [09]

Workshop Safety Hand tools and Power tools - Safety while using Grinding stone - Welding and gas cutting safety -Identification of Dangerous points - Lubrication Safety-Safety in Cold Forming and Hot Working of Metals.

UNIT - V SAFETY INSPECTION AND AUDIT [09]

Safety Inspections Safety Audit- Safety Survey - Plant safety inspection - Safety tour – Safety samplings - What is safety budget - Direct cost - indirect cost- Safety Equipment's & their budget preparation.

Total = 45 Periods

Text Books:

1. Elahi Naseer, Industrial Safety Management, Kalpaz Publication,2006.
2. Dr. Shailednrakumar U Kale,Dr. Umesh Gramopadhye, Industrial Safety Management.

Reference Books:

1. Guidelines for Hazard Evaluation Procedures, Centre for Chemical Process Safety, Third Edition, AICHE 2008.
2. Guidelines for Chemical Process Quantitative Risk Analysis, Centre for Chemical Process Safety, Second Edition, AICHE, 2000.
3. Methodologies for Risk and Safety Assessment in Chemical Process Industries, Common Wealth Science Council, UK.
4. Trevor A Klett, Hazop and Hazon, Institute of Chemical Engineering.

K.S.R. COLLEGE OF ENGINEERING, TIRUCHENGODE – 637215
DEPARTMENT OF SAFETY AND FIRE ENGINEERING
CO PO MAPPING

Regulation: R2020

Course Code: 20SF906 **Course Name: Safety in Industries**

CO	Course Outcomes	Programme Outcomes													
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	*Explain the General safety rules, principles, maintenance, Inspections in Foundry Operations.*	2	3	-	-	-	3	3	2	-	-	-	2	-	-
CO2	*Apply the concepts of safety in design of building fire safety.*	2	3	-	-	-	3	3	2	-	-	-	2	-	-
CO3	*Develop the safety in industrial operations.*	2	3	-	-	-	3	3	2	-	-	-	2	-	-
CO4	*Recall about welding, common hazards in welding, personal protective equipment and safety precautions in welding.*	2	3	-	-	-	3	3	2	-	-	-	2	-	-
CO5	*Illustrate on safety in finishing, inspection and testing of machines.*	2	3	-	-	-	3	3	2	-	-	-	2	-	-
	Average	**2**	**3**	**-**	**-**	**-**	**3**	**3**	**2**	**-**	**-**	**-**	**2**	**-**	**-**

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

K.S.R. COLLEGE OF ENGINEERING (Autonomous) **R 2020**

20SF907	**FOOD SAFETY**	L	T	P	C
	(Open Elective)	3	0	0	3

Prerequisite: No prerequisites are needed for enrolling into the course

Course Outcomes: On Completion of this course, the student will be able to		**Cognitive Level**
CO1	*Apply the knowledge on food quality in food industry.*	*Apply*
CO2	*Identify the food additives and food contaminants and their chemical and toxicological properties.*	*Apply*
CO3	*Summarize the effects of pests on food and the various methods for controlling them.*	*Understand*
CO4	*Explain about the national and international regulations for biosafety.*	*Understand*
CO5	*Demonstrate an ability to recognize the environmental, social and ethical implications of biotech applications.*	*Understand*

UNIT - I **FOOD QUALITY** **[09]**

Objective and importance of quality control, classification of quality attributes and its role in food quality, quality assessment of food materials (fruits, cereals, milk and meat), types of quality characteristics of food, methods used for determination of the quality in food industry, factors influencing the quality of food, sample and sampling methods of quality evaluation.

UNIT - II **FOOD SANITATION** **[09]**

Factors contributing to physical, chemical and biological contamination in food chain, prevention and control of food borne hazards, definition and regulation of food sanitation, sources of contamination, personal hygiene-food handlers, cleaning compounds, sanitation methods and pest control, sanitation and safety in foodservices.

UNIT - III **FOOD SAFETY** **[09]**

Principles of food safety and quality, quality assurance, Good Agricultural Practices (GAP), Good Manufacturing Practices (GMP), Good Hygienic Practices (GHP), Good Veterinary Practice (GVP),Applications of HACCP in food safety, Current challenges to food safety.

UNIT - IV **FOOD LAWS AND REGULATIONS** **[09]**

Basic concepts of food standards, Role of national regulatory agencies: Food safety and Standards Act: salient provision and prospects, FSSAI, PFA, certification- AGMARK, ISI (BIS). Role of international regulatory agencies: USDA, FDA, BRC, WHO, FAO, Codex Alimentarius commission, WTO agreements: SPS and TBT agreements, ISO and its standards for food quality and safety.

UNIT - V **FOOD SAFETY AUDITING** **[09]**

Food surveillance: International and national practices, procedure and protocols, food alerts, traceability and food product recall. Export and import of food in India: introduction, import and export policies, FDA import policy, export-import policy, export control systems. Import intelligence and alert systems, packaging and labelling, specifications and certifications.

Total = 45 Periods

Text Books:

1. Fleming & Hunt, Biological Safety, Principles and Practices, ASM Press, Fourth Edition,2006.
2. Fawatt, H.H. and Wood, W.S., Safety and Accident Prevention in Chemical Operation, Wiley Inter science, 1965.

Reference Books:

1. N.G. Marriott, G.W. Schilling and B. Robert, Principles of Food Sanitation, Springer, Fifth Edition 2018.
2. I. Alli, Food Quality Assurance - Principles & Practices, CRC Press, India, 2018.
3. Cynthia A. Robert, The Food Safety Information Hand Book, 2009.
4. Early, Guide to Quality Management Systems for the Food Industry, Springer, First Edition, 2005.

K.S.R. COLLEGE OF ENGINEERING, TIRUCHENGODE – 637215
DEPARTMENT OF SAFETY AND FIRE ENGINEERING
CO PO MAPPING

Regulation: R2020

Course Code: 20SF907 **Course Name: Food Safety**

CO	Course Outcomes	Programme Outcomes													
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	*Apply the knowledge on food quality in food industry.*	3	3	3	-	-	3	3	3	-	-	-	3	-	-
CO2	*Identify the food additives and food contaminants and their chemical and toxicological properties.*	3	3	3	-	-	3	3	3	-	-	-	3	-	-
CO3	*Summarize the effects of pests on food and the various methods for controlling them.*	3	3	3	-	-	3	3	3	-	-	-	3	-	-
CO4	*Explain about the national and international regulations for biosafety.*	3	3	3	-	-	3	3	3	-	-	-	3	-	-
CO5	*Demonstrate an ability to recognize the environmental, social and ethical implications of biotech applications.*	3	3	3	-	-	3	3	3	-	-	-	3	-	-
	Average	**3**	**3**	**3**	**-**	**-**	**3**	**3**	**3**	**-**	**-**	**-**	**3**	**-**	**-**

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

K.S.R. COLLEGE OF ENGINEERING (Autonomous) **R 2020**

		L	T	P	C
20SF908	**SAFETY MANAGEMENT AND ITS PRINCIPLE (Open Elective)**	3	0	0	3

Prerequisite: No prerequisites are needed for enrolling into the course

Course Outcomes: On Completion of this course, the student will be able to		**Cognitive Level**
CO1	*Demonstrate the knowledge and understanding of basic terms in safety management.*	*Understand*
CO2	*Compare safety organizational requirements for effective safety management.*	*Understand*
CO3	*Solve the workplace hazards and apply controls measures using hierarchy of control.*	*Apply*
CO4	*Develop the safety performance of an organization.*	*Apply*
CO5	*Explain accident investigation methodologies and apply systematic procedure to identify and unearth the root cause of the incident and accident.*	*Understand*

UNIT - I INTRODUCTION OF SAFETY [09]

Safety – Goals of safety engineering – Need for safety, Safety and productivity. Definitions: Accident, Injury, Unsafe act, Unsafe Condition, Dangerous Occurrence, Reportable accidents, History of safety movement – Theories of accident causation.

UNIT - II SAFETY ORGANIZATION [09]

Objectives, Types, Functions, Role of management, Supervisors, Workmen, Unions, Government and voluntary agencies in safety – Safety policy – Safety Officer – Responsibilities – Safety committee – Need, Types, Advantages.

UNIT - III ACCIDENT PREVENTION AND TRAINING [09]

Accident Prevention Methods – Engineering, Education and Enforcement, Safety Education & Training – Importance, Various training methods, Effectiveness of training, Behavior Oriented Training – Communication – Purpose, Barrier to communication. Housekeeping: Responsibility of management and employees – Advantages of good housekeeping – 5 ‘s of housekeeping – Work permit system – objectives, hot work and cold work permits. Typical industrial models and methodology – Entry into confined spaces.

UNIT - IV MONITORING SAFETY PERFORMANCE [09]

Frequency rate, Severity rate, Incidence rate, Activity rate – Cost of accidents – Computation of Costs – Utility of Cost data – Plant safety inspection types, Inspection procedure – Safety sampling techniques – Job safety Analysis (JSA), Safety surveys, Safety audits – Safety Inventory Technique.

UNIT - V INVESTIGATION ON ACCIDENTS [09]

Why? When? Where? Who? & How? Basics – Man – Environment & Systems. Process of Investigation – Tools – Data Collection - Handling witnesses - Case study. Accident analysis – Analytical Techniques – System Safety – Change Analysis.

Total = 45 Periods

Text Books:

1. N.V. Krishnan, Safety Management in Industry, Jaico Publishing House, 1997.
2. Ronald P. Blake, Industrial Safety, Prentice Hall, New Delhi, 1973.

Reference Books:

1. Willie Hammer, Occupational Safety Management and Engineering, Prentice Hall, Fifth Edition, 2007.
2. Ted S. Ferry, Modern Accident Investigation and Analysis, John Wiley & Sons, Second Edition, 2007.
3. John V. Grimaldi and Rollin H. Simonds, Safety Management, American Society of Safety Engineers, Fifth Edition, 1993.
4. Accident Prevention Manual for Industrial Operations, National Safety Council, Chicago, 1982.

K.S.R. COLLEGE OF ENGINEERING, TIRUCHENGODE – 637215
DEPARTMENT OF SAFETY AND FIRE ENGINEERING
CO PO MAPPING

Regulation: R2020

Course Code: 20SF908 **Course Name: Safety Management and its Principles**

CO	Course Outcomes	Programme Outcomes													
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	*Demonstrate the knowledge and understanding of basic terms in safety management.*	3	2	2	-	-	3	3	2	2	-	-	1	-	-
CO2	*Compare safety organizational requirements for effective safety management.*	3	2	2	-	-	3	3	2	2	-	-	1	-	-
CO3	*Solve the workplace hazards and apply controls measures using hierarchy of control.*	3	2	2	-	-	3	3	2	2	-	-	1	-	-
CO4	*Develop the safety performance of an organization.*	3	3	2	-	-	3	3	2	2	-	-	1	-	-
CO5	*Explain accident investigation methodologies and apply systematic procedure to identify and unearth the root cause of the incident and accident.*	3	3	2	-	-	3	3	2	2	-	-	1	-	-
	Average	**3**	**2**	**2**	**-**	**-**	**3**	**3**	**2**	**2**	**-**	**-**	**1**	**-**	**-**

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

K.S.R. COLLEGE OF ENGINEERING (Autonomous) **R 2020**

		L	T	P	C
20SF909	**SAFETY IN AUTOMOBILE ENGINEERING (Open Elective)**	3	0	0	3

Prerequisite: No prerequisites are needed for enrolling into the course

Course Outcomes: On Completion of this course, the student will be able to		**Cognitive Level**
CO1	*Explain about automobile engines, fuel systems and CMV rules for proto type testing and emission standards.*	*Understand*
CO2	*Demonstrate the electrical systems-ignition, lighting, horn, wipers, HVAC and concerned CMV rules*	*Understand*
CO3	*Classify the transmission systems - clutch, gearbox, steering, and differential. Chassis - springs, axles and brakes and corresponding CMV rules.*	*Understand*
CO4	*Outline the lubricating systems, cooling systems and miscellaneous systems. CMV rules for safety devices.*	*Understand*
CO5	*Choose passive and active safety.*	*Apply*

UNIT - I INTRODUCTION AND EMISSION [09]

Types of automobiles. Limiting Dimensions as per Central Motor Vehicles Rules. Engines - Classification, Construction, Materials of engine components. Prototype Testing as per Central Motor Vehicles Rules. Fuel System - Fuel tank, Fuel filter, Types of Fuel system. Carburettor – Simple and Modern, Fuel injection System. Emission Standards as per CMV Rules.

UNIT - II ELECTRICITY STORAGE AND ITS UTILLIZATION [09]

Electrical System - Storage Battery Operations and Maintenance. Ignition System - Coil and Magneto Ignition System. Starting System, Lighting System, Horn System-Wind Shield Wiper Motors, Fans, Heaters, Trafficators. Automobile air conditioning. Central Motor Vehicles Rules regarding Lighting, Windshields, Wipers.

UNIT - III TRANSMISSION SYSTEM AND BRAKING SYSTEM [09]

Transmission System - Clutches - operation and fault finding of clutches, Fluid Flywheel, Gear Box types, Steering Systems, Chassis Springs, and Suspension. Differential, Dead and Live axles, Rims, Tyre etc. Brakes - Types, construction and fault finding. CMV Rules-Brakes, Steering & Tyre.

UNIT - IV LUBRICATION AND COOLING SYSTEM [09]

Lubrication Systems-Types, Components, Lubricating oil, Cooling system- Details of components, Study of Systems, Types. Miscellaneous - Special gadgets and accessories for fire fighting vehicles. Automobile accidents. CMV Rules regarding Safety devices for drivers, passengers.

UNIT - V PASSIVE AND ACTIVE SAFETY [09]

Design of body for safety, deceleration of vehicle, passenger. Concept of crumble zone, Safety Cage. Optimum crash pulse. Barrier test - Crash tests - Antilock braking system, Stability Control. Adaptive cruise control, Lane Keep Assist System, Collision warning, avoidance system, Blind Spot Detection system, Driver alertness detection System. ADAS, DAT.

Total = 45 Periods

Text Books:

1. Robert Bosch GmbH, Safety, Comfort and Convenience Systems, Wiley, Third Edition, 2007.
2. Ljubo Vlacic, Michel Parent, Fumio Harashima, Intelligent Vehicle Technologies Theory and Applications, Butterworth Heinemann, 2001.

Reference Books:

1. GBS Narang, Automobile Engineering, Khanna Publishers, Delhi,2014.
2. Kirpal Singh, Automobile Engineering, Vol.I &II. Standard publishes, Delhi, Thirteenth Edition,2012.
3. Joseph Heitner, Automotive Mechanics-Principles & Practices, CBS Publisher-Delhi, Second Edition, 2006.
4. P. L. Kohli, Automotive Electrical Equipment's, McGraw Hill, New Delhi,1993.

K.S.R. COLLEGE OF ENGINEERING, TIRUCHENGODE – 637215
DEPARTMENT OF SAFETY AND FIRE ENGINEERING
CO PO MAPPING

Regulation: R2020

Course Code: 20SF909 **Course Name: Safety in Automobile Engineering**

CO	Course Outcomes	Programme Outcomes													
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	*Explain about automobile engines, fuel systems and CMV rules for proto type testing and emission standards.*	3	3	2	-	-	3	3	3	-	-	-	2	-	-
CO2	*Demonstrate the electrical systems - ignition, lighting, horn, wipers, HVAC and concerned CMV rules.*	3	3	2	-	-	3	3	3	-	-	-	2	-	-
CO3	*Classify the transmission systems - clutch, gearbox, steering, and differential. Chassis - springs, axles and brakes and corresponding CMV rules.*	3	3	2	-	-	3	3	3	-	-	-	2	-	-
CO4	*Outline the lubricating systems, cooling systems and miscellaneous systems. CMV rules for safety devices.*	3	3	2	-	-	3	3	3	-	-	-	2	-	-
CO5	*Choose passive and active safety.*	3	3	2	-	-	3	3	3	-	-	-	2	-	-
	Average	**3**	**3**	**2**	**-**	**-**	**3**	**3**	**3**	**-**	**-**	**-**	**2**	**-**	**-**

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

K.S.R. COLLEGE OF ENGINEERING (Autonomous) **R 2020**

		L	T	P	C
20SF910	**SAFETY IN TRANSPORTATION (Open Elective)**	3	0	0	3

Prerequisite: No prerequisites are needed for enrolling into the course

Course Outcomes: On Completion of this course, the student will be able to		**Cognitive Level**
CO1	*Explain the Working of railways and safety aspects in railway operation*	*Understand*
CO2	*Apply the Basic geometric design features of roads*	*Apply*
CO3	*Summarize about traffic studies and traffic safety*	*Understand*
CO4	*Outline the basic layout and facilities of docks and harbour*	*Understand*
CO5	*Choose the Working of airways and safety aspects in airway operation*	*Remember*

UNIT - I RAILWAY ENGINEERING [09]

Introduction of Railway Engineering: Permanent way. Curves, super-elevation, negative super elevation, transition curve, grade compensation on curves. Railway operation and control - points and crossings turn-out. Signalling and interlocking. Centralized traffic control. Railway accidents & safety. Rapid transit railways - types, merits & demerits.

UNIT - II HIGHWAY ENGINEERING [09]

Introduction of Highway Engineering: Classification of highways and urban road patterns. Typical cross section of roads. Factors controlling the alignment of roads. Basic geometric design - stopping and overtaking sight distances.

UNIT - III TRAFFFIC ENGINEERING [09]

Introduction of Traffic Engineering: Traffic characteristics. Various traffic studies and their applications. Traffic signals. Carriage-way markings. Traffic islands. Highway intersections. Principles of highway lighting. Road Accidents prevention, investigation and reduction.

UNIT - IV HARBOUR AND DOCK ENGINEERING [09]

Introduction of Harbour & Dock Engineering: Water transportation, classification of harbours, accessibility and size, ports, Indian ports. Layout of ports, breakwater, facilities (in brief) for docking, repair, approach, loading and unloading, storing and guiding.

UNIT - V AIR TRANSPORTATIONENGINEERING [09]

Classification of air transportation, Types of air craft engines - Propellants-feeding systems – Ignition and combustion - Theory of rocket propulsion - Performance study - Staging - Terminal and characteristic velocity-Applications – spaceflights. Air way accidents & safety.

Text Books:

1. B.S. Dhillon, Transportation Systems, Reliability and Safety, CRC Press, 2011.
2. John Khisty C, Kent Lall B, Transportation Engineering - An Introduction, Prentice Hall of India, New Delhi, Third Edition 2002.

Reference Books:

1. Srinivasan, R., Harbour, Dock and Tunnel Engineering, Charotar Publishing House Pvt. Ltd, Anand,2013.
2. Chandra, S. & Agarwal, M. M. Railway Engineering, Oxford University Press, New Delhi, 2007.
3. Kadiyali, L. R., Traffic Engineering and Transport Planning, Khanna Publishers, New Delhi, 2004.
4. Khanna, S. K. and Justo, C.E.G., Highway Engineering, Nem Chand & Brothers, New Delhi, Nineth Edition,2001.

K.S.R. COLLEGE OF ENGINEERING, TIRUCHENGODE – 637215
DEPARTMENT OF SAFETY AND FIRE ENGINEERING
CO PO MAPPING

Regulation: R2020

Course Code: 20SF910 **Course Name: Safety in Transportation**

CO	Course Outcomes	Programme Outcomes												
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	*Explain the Working of railways and safety aspects in railway operation*	3	3	3	-	-	2	-	2	-	-	-	3	-	-
CO2	*Apply the Basic geometric design features of roads*	3	3	3	-	-	2	-	2	-	-	-	3	-	-
CO3	*Summarize about traffic studies and traffic safety*	3	3	3	-	-	2	-	2	-	-	-	3	-	-
CO4	*Outline the basic layout and facilities of docks and harbour*	3	3	3	-	-	2	-	2	-	-	-	3	-	-
CO5	*Choose the Working of airways and safety aspects in airway operation*	3	3	3	-	-	2	-	2	-	-	-	3	-	-
	Average	**3**	**3**	**3**	**-**	**-**	**2**	**-**	**2**	**-**	**-**	**-**	**3**	**-**	**-**

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

K.S.R. COLLEGE OF ENGINEERING (Autonomous) **R 2020**

		L	T	P	C
20SH901	**APPLI CATIONS OF STATISTICS** (Open Elective)	3	0	0	3

Prerequisite: No prerequisites are needed for enrolling into the course

Course Outcomes : On Completion of this course, the student will be able to		**Cognitive Level**
CO1	*Analyze the measures of central tendency and dispersion.*	*Analyze*
CO2	*Applying the concepts of Correlation and Regression analysis*	*Apply*
CO3	*Testing the samples using method of hypothesis to obtain inferences.*	*Remember*
CO4	*Develop their skills in Design of Experiments.*	*Remember*
CO5	*Solving Non Parametric data to obtain inferences.*	*Understand*

UNIT– I **DESCRIPTIVE STATISTICS** **[09]**

Introduction to Statistics, Measures of Central Tendency - Mean, Median, Mode, Weighted Mean, Geometric Mean, Harmonic Mean, Measures of Variability- Range, Inter-Quartile Range, Variance, Standard Deviation, Coefficient of Variation.

UNIT – II **CORRELATION AND REGRESSION ANLYSIS** **[09]**

Types of Correlation-Karl Pearson's Coefficient of Correlation- Spearman's Rank Correlation-Regression Analysis-Uses-Regression equations-X on Y and Y on X Estimation.

UNIT – III **TESTING OF HYPOTHESIS** **[09]**

Large sample test based on Normal distribution for single mean and difference of means - Tests based on t - F distributions for testing means and variances-Chi-Square Test.

UNIT – IV **DESIGN OF EXPERIMENTS** **[09]**

Analysis of variance - One-way and two-way classifications - Completely randomized design - Randomized block design - Latin square design.

UNIT – V **NON PARAMETRIC TESTS** **[09]**

The Sign Test- Rank Sum Test- Mann-Whitney U Test, One Sample run Test-Spearman's Rank Correlation and Kruskal-Wallis Test (H-test).

Total (L: 45 T:0) = 45 Periods

Text Books :

1 Gupta .S.P.,Statistical Methods , Sultan Chand & Sons Educational Publishers ,New Delhi, Thirty first Edition,2002.

2 Ross, S.M., Introduction to Probability and Statistics for Engineers and Scientists, Elsevier ,Third Edition,2004.

Reference Books :

1 Srivatsava TN and Shailaja Rego, Statistics for Management, Tata McGraw Hill,Fifth Edition, 2008.

2 Walpole. R.E., Myers. R.H., and Ye. K., Probability and Statistics for Engineers and Scientists, Pearson Education, Asia , Eighth Edition, 2007.

3 Richard I. Levin, David S. Rubin, Statistics for Management, Pearson Education, Seventh Edition, 2011.

4 Pillai R.S.N and Bagavathi.V ,Statistics ,S.Chand Publishers ,New Delhi, Seventeenth Reprint Edition 2008.

K.S.R. COLLEGE OF ENGINEERING, TIRUCHENGODE – 637215
DEPARTMENT OF SCIENCE AND HUMANITIES
CO-PO MAPPING

Regulation : R 2020

Course Code: 20SH901 **Course Name : APPLI CATIONS OF STATISTICS**

CO	Course Outcomes	Programme Outcomes													
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	*Analyze the measures of central tendency and dispersion.*	3	3	3	3	-	-	-	-	-	-	-	-	-	-
CO2	*Applying the concepts of Correlation and Regression analysis*	3	3	3	3	-	-	-	-	-	-	-	-	-	-
CO3	*Testing the samples using method of hypothesis to obtain inferences.*	3	3	3	3	-	-	-	-	-	-	-	-	-	-
CO4	*Develop their skills in Design of Experiments*	3	3	3	3	-	-	-	-	-	-	-	-	-	-
CO5	*Solving Non Parametric data to obtain inferences.*	3	3	3	3	-	-	-	-	-	-	-	-	-	-
	Average	3	3	3	**3**	-	-	-	-	-	-	-	-	-	-

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

K.S.R. COLLEGE OF ENGINEERING (Autonomous) **R 2020**

		L	T	P	C
20SH902	**COMBINATORICS AND GRAPH THEORY** (Open Elective)	3	0	0	3

Prerequisite: No prerequisites are needed for enrolling into the course

Course Outcomes : On Completion of this course, the student will be able to		**Cognitive Level**
CO1	*Interpret the concept of combinatorics Principles in Computer applications.*	*Understand*
CO2	*Acquire knowledge in Recurrences and Generating Functions.*	*Evaluate*
CO3	*Applying the concepts of graph theory*	*Apply*
CO4	*Constructing algorithm using Trees..*	*Remember*
CO5	*Developing Skills in Colouring and Directed Graphs.*	*Analyze*

UNIT– I COMBINATORICS [09]

The pigeon-hole principle - Basic counting problems- The binomial coefficients (the binomial theorem, algebraic vs. combinatorial proof, Pascal's identity, Pascal's triangle, Catalan numbers) - the principle of inclusion and exclusion.

UNIT – II RECURRENCES [09]

Fibonacci numbers - The substitution method- Linear recurrences (mostly homogenous recurrences, the characteristic polyr Generating functions.

UNIT – III INTRODUCTION TO GRAPH THEORY [09]

. Definition - examples – subgraphs – complements and graph isomorphism – Euler trail and circuits – planar graphs – Hamilton paths and cycles.

UNIT – IV TREES [09]

Definition – rooted trees – trees and sorting – weighted trees and prefix codes – bi connected components and Articulation points.

UNIT – V MATRICES, COLOURING AND DIRECTED GRAPH [09]

Chromatic number – Chromatic partitioning – Chromatic polynomial – Matching – Covering – Four color problem – Directed graphs – Types of directed graphs – Digraphs and binary relations – Directed paths and connectedness – Euler graphs.

Total (L: 45 T:0) = 45 Periods

Text Books :

1 Grimaldi, R.P. Discrete and Combinatorial Mathematics: An Applied Introduction, Fourth Edition, Pearson Education Asia, Delhi, 2007.

2 Narsingh Deo, Graph Theory With Application to Engineering and Computer Science, Prentice Hall of India, Second Edition, 2003.

Reference Books :

1 Douglas B. West, Introduction to Graph Theory, Prentice-Hall of India, Second Edition, 2012.

2 John Clark, Derek Allan Holton, A first look at Graph Theory, World Scientific Publishing Company illustrated edition, Reprint, 1991

3 Rosen, K.H., Discrete Mathematics and its Applications, Seventh Edition, Tata McGraw Hill Pub. Co. Ltd., New Delhi, Special Indian Edition, 2011.

4 Diestel, R, Graph Theory, Springer, Third Edition,2006

K.S.R. COLLEGE OF ENGINEERING, TIRUCHENGODE – 637215
DEPARTMENT OF SCIENCE AND HUMANITIES
CO-PO MAPPING

Regulation : R 2020

Course Code: 20SH902 **Course Name: COMBINATORICS AND GRAPH THEORY**

CO	Course Outcomes	Programme Outcomes													
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	*Interpret the concept of combinatorics Principles in Computer applications.*	3	3	3	3	-	-	-	-	-	-	-	-	-	-
CO2	*Acquire knowledge in Recurrences and Generating Functions.*	3	3	3	3	-	-	-	-	-	-	-	-	-	-
CO3	*Applying the concepts of graph theory*	3	3	3	3	-	-	-	-	-	-	-	-	-	-
CO4	*Constructing algorithm using Trees..*	3	3	3	3	-	-	-	-	-	-	-	-	-	-
CO5	*Developing Skills in Colouring and Directed Graphs.*	3	3	3	3	-	-	-	-	-	-	-	-	-	-
	Average	**3**	**3**	**3**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

K.S.R. COLLEGE OF ENGINEERING (Autonomous) **R 2020**

		L	T	P	C
20SH903	**OPTIMIZATION TECHNIQUES** (Open Elective)	3	0	0	3

Prerequisite: No prerequisites are needed for enrolling into the course.

Course Outcomes : On successful completion of the course , the student will be able to		**Cognitive Level**
CO1	*Enable to develop the decision making during the uncertain situations by linear programming approach.*	*Apply*
CO2	*Identify to minimize the Transportation and Assignment cost and maximize the profit in Industries.*	*Analyze*
CO3	*Developing the network techniques in project scheduling.*	*Apply*
CO4	*Study the importance of stock controlling to maximize the profit.*	*Remember*
CO5	*Understand and apply the Replacement and sequencing methods in manufacturing engineering.*	*Understand*

UNIT - I LINEAR PROGRAMMING PROBLEM [09]

Introduction - scope and role of OR - phases of OR - limitations of OR - linear programming problem - formulation of linear programming problem - optimum solution by graphical method - simplex method (using slack variables only).

UNIT - II TRANSPORTATION AND ASSIGNMENT PROBLEM [09]

Transportation Models (Minimizing and Maximizing Cases) - Balanced and unbalanced cases - Initial Basic feasible solution by North West Corner Rule, Least cost and Vogel's approximation methods. Check for optimality by Modified method.

Assignment Models (Minimizing and Maximizing Cases) - Balanced and Unbalanced Cases - Solution by Hungarian method.

UNIT - III NETWORK MODELS [09]

Network - Fulkerson's rule - construction of a network - critical path method (CPM) - optimistic, pessimistic and most likely time estimates - project scheduling by PERT analysis.

UNIT - IV INVENTORY MODEL [09]

Types of Inventory - Deterministic inventory models - EOQ and EBQ models with and without shortages - Quantity discount model - Price breaks - probabilistic inventory model.

UNIT - V REPLACEMENT MODELS AND SEQUENCING [09]

Replacement of items that deteriorate with time - value of money changing with time - not changing with time – optimum replacement policy - individual and group replacement. Sequencing problem - assumptions - processing of 'n' jobs in 2 machines, 'n' jobs with 'm' machine

Total (L: 45 T: 0) = 45 Periods

Text Books :

1 P.K. Gupta and Man Mohan, Problems in Operations Research, S. Chand and Co, New Delhi ,Fourteenth Edition, 2016.

2 Wayne. L. Winston, Operations Research applications and algorithms, Thomson learning, New Delhi, Tenth Edition 2016.

Reference Books :

1 Hira and Gupta, Problems in Operations Research, S. Chand and Co, New Delhi, Eighth Edition, 2015.

2 Taha H.A, Operation Research, Pearson Education, New Delhi, Sixth Edition, 2016.

3 J k Sharma , Operation Research, Macmillan India Pvt. Ltd., New Delhi, Seventh Edition,2007

4 R.Panneerselvam Operations Research, PHI Learning, Second Edition,2011.

K.S.R. COLLEGE OF ENGINEERING, TIRUCHENGODE – 637215
DEPARTMENT OF SCIENCE AND HUMANITIES
CO-PO MAPPING

Regulation : R 2020

Course Code:20SH903 **Course Name : OPTIMIZATION TECHNIQUES**

CO	Course Outcomes	Programme Outcomes													
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	*Enable to develop the decision making during the uncertain situations by linear programming approach.*	3	3	3	3	-	-	-	-	-	-	-	-	-	-
CO2	*Identify to minimize the Transportation and Assignment cost and maximize the profit in industries*	3	3	3	3	-	-	-	-	-	-	-	-	-	-
CO3	*Developing the network techniques in project scheduling.*	3	3	3	3	-	-	-	-	-	-	-	-	-	-
CO4	*Study the importance of stock controlling to maximize the profit.*	3	3	3	3	-	-	-	-	-	-	-	-	-	-
CO5	*Understand and apply the Replacement and sequencing methods in manufacturing engineering.*	3	3	3	3	-	-	-	-	-	-	-	-	-	-
	Average	**3**	**3**	**3**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

K.S.R. COLLEGE OF ENGINEERING (Autonomous) **R 2020**

	BASIC MILITARY EDUCATION AND TRAINING	L	T	P	C
20SH904	(Open Elective)	3	0	0	3

Prerequisite: **Only NCC Cadets are eligible for opting into the course.**

Course Outcomes: On Completion of this course , the student will be able to		***Cognitive level***
CO1	*Develop the character, camaraderie of NCC cadets*	*Apply*
CO2	*Inculcate the discipline and secular outlook.*	*Apply*
CO3	*Educate weapon handling and training.*	*Understand*
CO4	*Learn the quality of selfless service among the cadets by working as a team.*	*Remember*
CO5	*Learn the basis of military management.*	*Understand*

UNIT – I NCC ORGANIZATION & NATIONAL INTEGRATION [09]

NCC Organization – History of NCC- NCC Organization- NCC Training- NCC Uniform – Promotion of NCC cadets – Aim and advantages of NCC Training- NCC badges of Rank- Honours and Awards – Incentives for NCC cadets by central and state govt. National Integration- Unity in diversity- contribution of youth in nation building- national integration council- Images and Slogans on National Integration.

UNIT – II BASIC PHYSICAL TRAINING & DRILL [09]

Basic physical Training – various exercises for fitness (with Demonstration). Food – Hygiene and Cleanliness.

Drill- Words of commands- position and commands- sizing and forming- saluting- marching- turning on the march and wheeling- saluting on the march- side pace, pace forward and to the rear- marking time- Drill with arms- ceremonial drill- guard mounting.(WITH DEMONSTRATION)

UNIT – III WEAPON TRAINING [09]

Main Parts of a Rifle- Characteristics of 5.56mm INSAS rifle- Characteristics of .22 rifle- loading and unloading – position and holding- safety precautions – range procedure- MPI and Elevation- Group and Snap shooting- Long/Short range firing(WITH PRACTICE SESSION) - Characteristics of 7.62mm SLR- LMG- carbine machine gun.

UNIT – IV SOCIAL AWARENESS AND COMMUNITY DEVELOPMENT [09]

Aims of Social service-Various Means and ways of social services- family planning – HIV and AIDS- Cancer its causes and preventive measures- NGO and their activities- Drug trafficking- Rural development programmes - MGNREGA-SGSY-JGSY-NSAP-PMGSY-Terrorism and counter terrorism- Corruption – female feticide -dowry –child abuse-RTI Act-RTE Act- Protection of children from sexual offences act- civic sense and responsibility

UNIT – V SPECIALIZED SUBJECT (ARMY) [09]

Basic structure of Armed Forces- Military History – War heroes- battles of Indo-Pak war- Param Vir Chakra- Career in the Defense forces- Service tests and interviews-Field craft and Battle craft-Basics of Map reading including practical.

Total = 45 Periods

Text Books :

1 National Cadet Corps- A Concise handbook of NCC Cadets by Ramesh Publishing House, New Delhi, 2014.

Reference Books :

1 *Cadets Handbook – Common Subjects SD/SW published by DG NCC, New Delhi.*

2 *Cadets Handbook- Specialized Subjects SD/SW published by DG NCC, New Delhi*

3 *NCC OTA Precise published by DG NCC, New Delhi.*

K.S.R. COLLEGE OF ENGINEERING, TIRUCHENGODE – 637215
DEPARTMENT OF SCIENCE AND HUMANITIES
CO-PO MAPPING

Regulation : R 2020

Course Code: 20SH904 **Course Name: BASIC MILITARY EDUCATION AND TRAINING**

CO	Course Outcomes	Programme Outcomes													
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	Display sense of patriotism, secular values and shall be transformed into motivated youth who will contribute towards nation building through national unity and social cohesion.	3	1	1	1	3	3	3	3	3	3	-	-	-	-
CO2	Demonstrate Health Exercises, the sense of discipline, improve bearing, smartness, turnout, develop the quality of immediate and implicit obedience of orders	3	1	1	1	3	3	3	3	3	3	-	-	-	-
CO3	Basic knowledge of weapons and their use and handling.	3	2	1	1	3	3	3	3	3	3	-	-	-	-
CO4	Understanding about social evils and shall inculcate sense of whistle blowing against such evils and ways to eradicate such evils	3	2	1	1	3	3	3	3	3	3	-	-	-	-
CO5	Acquaint, expose & provide knowledge about Army/Navy/ Air force and to acquire information about expansion of Armed Forces, service subjects and important battles.	3	2	1	1	3	3	3	3	3	3	-	-	-	-
	Average	3	2	1	1	3	3	3	3	3	3	-	-	-	-

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

K.S.R. COLLEGE OF ENGINEERING (Autonomous) **2020**

		L	T	P	C
20SH905	**PROFESSIONAL COMMUNICATION (Open Elective)**	**1**	**0**	**2**	**3**

Prerequisite:

Course Outcomes : On Successful Completion of the Course, the student will be able to		**Cognitive Level**
CO1	*Organize and compose resume' and SWOT analysis.*	*Understand*
CO2	*Prioritize the skills for interviews and job hunt.*	*Understand*
CO3	*Interpret by Listening and reading a text and comprehend it.*	*Understand*
CO4	*Identify the purpose of writing short messages and presentation.*	*Understand*
CO5	Optimize the speaking skills to do well in Group Discussion.	*Understand*

UNIT – I SWOT Analysis and Resume' Writing [09]

SWOT Analysis – Key SWOT Questions- Assessment of strength and weakness – Mind map and Activity – Job Application and Resume' – Types of Resume' – Common mistakes in Resume' writing – Cover Letter (Email).

UNIT – II Interview Skills [09]

Types of Interviews – Telephone Interview (HR and Technical) – Dos and Don'ts in telephone Interview – Video Interviews – Practice for successful interviews – Video Samples.

UNIT - III Listening and Reading [09]

Listening – Listening and typing – Listening and sequencing of sentences – Filling in the blanks – Listening and answering questions.

Reading – Filling in the blanks – Cloze exercise – Vocabulary building – Reading and answering questions.

UNIT - IV Writing Short Messages and Presentation Skills [09]

Writing Memos – Email writing - Business Email – Elements of effective presentation – Structure of presentation – Audience analysis – Body Language.

UNIT - V Group Discussion and Essay Writing [09]

Introduction to Group Discussion – Structure of GD – Brainstorming the topic – Body Language – Mock GD – Five steps to writing an essay – writing short essays.

Total = 45 Periods

Text Books :

1 Ravindran, Padma, English for Work, Ebek Language Laboratories Private Limited, Trichy, First Edition, 2011

2 Kalpana V, Communication Skills Laboratory Manual, Vijay Nicole Imprints Private Limited, Chennai, First Edition,2013

Reference Books :

1 Norman Whitby, Business Benchmark: Pre-Intermediate to Intermediate - BEC Preliminary, Cambridge University Press, New Delhi, First Edition, 2008.

2 Meenakshi Raman and Sangeeta Sharma, Technical Communication English for Engineers, Oxford University Press, New Delhi, 2008.

3 Rizvi Ashraf M, Effective Technical Communication, Mc Graw Hill, New Delhi, 28th Reprint, 2015.

4 Department of English, English for Technologies and Engineers, Orient Black Swan, Hyderabad, First Edition, 2016.

K.S.R. COLLEGE OF ENGINEERING, TIRUCHENGODE – 637215
DEPARTMENT OF SCIENCE AND HUMANITIES
CO-PO MAPPING

Regulation : R 2020

Course Code: 20SH905 **Course Name : PROFESSIONAL COMMUNICATION**

CO	Course Outcomes	Programme Outcomes													
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	Organize and compose resume' and SWOT analysis.	-	-	-	-	-	-	-	-	3	3	-	2	-	-
CO2	Prioritize the skills for interviews and job hunt.	-	-	-	-	-	-	-	-	3	3	-	2	-	-
CO3	Interpret by Listening and reading a text and comprehend it.	-	-	-	-	-	-	-	-	3	3	-	2	-	-
CO4	Identify the purpose of writing short messages and presentation.	-	-	-	-	-	-	-	-	3	3	-	2	-	-
CO5	Optimize the speaking skills to do well in Group Discussion.	-	-	-	-	-	-	-	-	3	3	-	2	-	-
	Average	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**3**	**3**	**-**	**2**	**-**	**-**

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

K.S.R. COLLEGE OF ENGINEERING (Autonomous) **R 2020**

	FUNDAMENTALS OF NANOSCIENCE AND TECHNOLOGY	L	T	P	C
20SH906	(Open Elective)	3	0	0	3

Prerequisite: *NIL*

Course Outcomes: On Completion of this course , the student will be able to		***Cognitive level***
CO1	*Learn the basics of nanotechnology in physics, chemistry and biology*	*Remember*
CO2	*Recognize the methods of preparation of nanomaterials*	*Analyze*
CO3	*Relate the characterization techniques for confirming nanomaterials*	*Apply*
CO4	*Categorize the nanomaterials and its preparation*	*Analyze*
CO5	*Identify the area of application and its field*	*Understand*

UNIT – I INTRODUCTION [09]

Classifications of nanostructured materials- nano particles- quantum dots, nanowires-ultra-thin films multilayered materials. Length Scales involved and effect on properties: Mechanical, Electronic, Optical, Magnetic and Thermal properties.

UNIT – II GENERAL METHODS OF PREPARATION [09]

Bottom-up Synthesis-Top-down Approach: Co-Precipitation, Ultrasonication, Mechanical Milling, Colloidal routes, Self-assembly, Vapor phase deposition, MOCVD, Sputtering, Evaporation, Molecular Beam Epitaxy, Atomic Layer Epitaxy, MOMBE.

UNIT – III NANOMATERIALS [09]

Nanoforms of Carbon – Buckminster fullerene- graphene and carbon nanotube, Single wall carbon Nanotubes (SWCNT) and Multi wall carbon nanotubes (MWCNT)- methods of synthesis (arc-growth, laser ablation, CVD routes, Plasma CVD), structure-properties. Applications- Nanometal oxides-ZnO, TiO2,MgO, ZrO2, NiO, nano alumina, CaO, AgTiO2, Ferrites, Nano clays- functionalization and applications-Quantum wires, Quantum dots-preparation, properties and applications.

UNIT – IV CHARACTERIZATION TECHNIQUES [09]

X-ray diffraction technique, Scanning Electron Microscopy – experimental techniques, Transmission Electron Microscopy including high-resolution imaging, Surface Analysis techniques- AFM, STM, ESCA-Nanoindentation.

UNIT – V APPLICATIONS [09]

Nano InfoTech: Information storage- nano computer, molecular switch, super chip, nanocrystal, Nano biotechnology: nanoprobes in medical diagnostics and biotechnology, Nano medicines, Targeted drug delivery, Bioimaging – Micro Electro Mechanical Systems (MEMS), Nano Electro Mechanical Systems (NEMS)- Nano sensors, nano crystalline silver for bacterial inhibition, Nanoparticles for sun barrier products – In Photostat, printing, solar cell, battery.

Total = 45 Periods

Text Books :

1 John Dinardo. N, Nanoscale characterization of surfaces & Interfaces, 2nd edition, Weinheim Cambridge, Wiley-VCH, 2000

2 Introduction to Nanoscience and Nanotechnology by Chattopadhyay K.K 1 January 2013

Reference Books :

1 Timp .G, Nanotechnology, AIP press/Springer, 1999.

2 AkhleshLakhtakia (Editor),The Hand Book of Nano Technology, Nanometer Structure, Theory, Modeling and Simulations, Prentice-Hall of India (P) Ltd, New Delhi, 2007.

3 NANO: The Essentials: Understanding Nanoscience and Nanotechnology by T. Pradeep

4 An Introduction To Nanomaterials And Nanoscience (Pb 2020) by DAS A

K.S.R. COLLEGE OF ENGINEERING, TIRUCHENGODE – 637215
DEPARTMENT OF SCIENCE AND HUMANITIES
CO-PO MAPPING

Regulation : R 2020

Course Code:20SH906 **Course Name : FUNDAMENTALS OF NANOSCIENCE AND TECHNOLOGY**

CO	Course Outcomes	Programme Outcomes													
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	Learn the basics of nanotechnology in physics, chemistry and biology	3	3	-	-	2	-	-	1	-	2	-	2	-	-
CO2	Recognize the methods of preparation of nanomaterials	3	3	-	-	2	-	-	1	-	2	-	2	-	-
CO3	Relate the characterization techniques for confirming nanomaterials	3	3	-	-	2	-	-	1	-	2	-	2	-	-
CO4	Categorize the nanomaterials and its preparation	3	3	-	-	2	-	-	1	-	2	-	2	-	-
CO5	Identify the area of application and its field	3	3	-	-	2	-	-	1	-	2	-	2	-	-
	Average	**3**	**3**	**-**	**-**	**2**	**-**	**-**	**1**	**-**	**2**	**-**	**2**	**-**	**-**

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

K.S.R. COLLEGE OF ENGINEERING (Autonomous) **R 2020**

VALUE ADDED COURSE

		L	T	P	C
VACEC01	**PCB CIRCUIT DESIGN**	0	0	3	1

Course Outcomes: On Completion of this course, the student will be able to ***Cognitive level***

CO1	*Carryout Layout Design and Testing Layout Design.*	*Apply*
CO2	*Design Single layer and Multilayer PCBs*	*Apply*

Contents:

- Autodesk Eagle Basic Concepts.
- Schematics Design and Library Functions.
- Manufacturing of Copper Clad Laminates.
- PCB Layout General Rules and Parameters.
- Layout Design.
- Layout Planning.
- Multilayer PCB Design Standards.
- PCB Fabrication and Computer-aided Manufacturing (CAM)

Total : 15 Hours

CO-PO MAPPING

Regulation: **R 2020**

Course Code: VACEC01 **Course Name:** PCB Circuit Design

CO	Course Outcomes	Programme Outcomes													
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	*Carryout Layout Design and Testing Layout Design.*					3	3			3	3	3	3	3	3
CO2	*Design Single layer and Multilayer PCBs*					3	3			3	3	3	3	3	3
	Average					3	3			3	3	3	3	3	3

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

K.S.R. COLLEGE OF ENGINEERING (Autonomous) **R 2020**

VALUE ADDED COURSE

VACEC02	**PROGRAMMING PIC MICROCONTROLLERS**	L	T	P	C
		0	0	3	1

Course Outcomes: On Completion of this course, the student will be able to ***Cognitive level***

CO1	*Carryout Programming PIC Microcontroller*	*Apply*
CO2	*Program Serial Communication between different devices and PIC Microcontroller*	*Apply*

Contents:

- PIC Microcontroller Advanced Programming Techniques.
- Interrupts.
- Serial Communication.
- Timers and Counters using Registers.
- Pulse width modulation.

Total : 15 Hours

CO-PO MAPPING

Regulation: **R 2020**

Course Code: VACEC02 **Course Name:** Programming PIC Microcontrollers

CO	Course Outcomes	Programme Outcomes													
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	*Carryout Layout Design and Testing Layout Design.*	-	-	-	-	3	3	-	-	3	3	3	3	3	3
CO2	*Design Single layer and Multilayer PCBs*	-	-	-	-	3	3	-	-	3	3	3	3	3	3
	Average		**-**	**-**	**-**	**3**	**3**	**-**	**-**	**3**	**3**	**3**	**3**	**3**	**3**

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

K.S.R. COLLEGE OF ENGINEERING (Autonomous) **R 2020**

VALUE ADDED COURSE

VACEC03	**REAL TIME APPLICATIONS OF AURDUINO**	L	T	P	C
		0	0	3	1

Course Outcomes: On Completion of this course, the student will be able to

		Cognitive level
CO1	*Develop c language programme for Arduino environment*	*Apply*
CO2	*Develop Arduino programme and debugging embedded software*	*Apply*

Contents:

- Arduino environment
- C programming language
- An Arduino program
- Debugging embedded software on an Arduino.

Total : 15 Hours

CO-PO MAPPING

Regulation: **R 2020**

Course Code: VACEC03 **Course Name:** Real Time Applications of Arduino

CO	**Course Outcomes**	**Programme Outcomes**													
		PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	*Develop c language programme for Arduino environment*	-	-	-	-	3	3	-	-	3	3	3	3	3	3
CO2	*Develop Arduino programme and debugging embedded software*	-	-	-	-	3	3	-	-	3	3	3	3	3	3
	Average	**-**	**-**	**-**	**-**	**3**	**3**	**-**	**-**	**3**	**3**	**3**	**3**	**3**	**3**

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

K.S.R. COLLEGE OF ENGINEERING (Autonomous) **R 2020**

VALUE ADDED COURSE

VACEC04	**FUNDAMENTALS OF LAB VIEW**	L	T	P	C
		0	0	3	1

Course Outcomes: On Completion of this course, the student will be able to

		Cognitive level
CO1	*Interactively acquire and analyze single-channel and multi-channel data from NI DAQ devices and non-NI instruments*	*Apply*
CO2	*Use programming structures, data types, and the analysis and signal processing algorithms in LabVIEW*	*Apply*

Contents:

- Introduction to Graphical Programming and NI tools Introduction to LabVIEW Programming: Controls, Indicators (data types), Plotting data Programming with while loops Programming with For loops String Functions Arrays, clusters Sub Vis Case structure and Formula nodes. Sequence structures and state machines File I/O. Creating an application.

Total : 15 Hours

CO-PO MAPPING

Regulation: **R 2020**

Course Code: VACEC04 **Course Name:** Fundamentals of LAB View

CO	**Course Outcomes**	**Programme Outcomes**													
		PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	*Interactively acquire and analyze single-channel and multi-channel data from NI DAQ devices and non-NI instruments*	-	-	-	-	3	3	-	-	3	3	3	3	3	3
CO2	*Use programming structures, data types, and the analysis and signal processing algorithms in LabVIEW*	-	-	-	-	3	3	-	-	3	3	3	3	3	3
	Average	**-**	**-**	**-**	**-**	**3**	**3**	**-**	**-**	**3**	**3**	**3**	**3**	**3**	**3**

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

K.S.R. COLLEGE OF ENGINEERING (Autonomous) **R 2020**

VALUE ADDED COURSE

		L	T	P	C
VACEC05	**MATLAB – SIGNAL AND IMAGE PROCESSING TOOL BOX**	0	0	3	1

Course Outcomes: On Completion of this course, the student will be able to

		Cognitive level
CO1	*Perform basic signal processing and filtering using signal processing tool box*	*Apply*
CO2	*Perform image segmentation and edge detection using Image processing tool box*	*Apply*

Contents:

Signal Processing Tool Box	Image Processing Tool Box
Basics of Signal Processing.	Course Overview & Working with Image Data.
Representing Signals.	Import, visualize, and extract information from different image types and image data types
Analysis of different Signals.	Pre-processing
Complex Signals.	Color Segmentation
Filter Designing.	Texture Segmentation
Using the Filter Designing GUIs.	Improving Segmentations
Analyzing the filter plots.	Finding and Analyzing Objects
Filter Designing using Script Files.	Detecting Edges and Shapes

Total : 15 Hours

CO-PO MAPPING

Regulation: **R 2020**

Course Code: VACEC05 **Course Name:** MATLAB – Signal and Image Processing Tool Box

CO	Course Outcomes	Programme Outcomes													
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	*Perform basic signal processing and filtering using signal processing tool box*	-	-	-	-	3	3	-	-	3	3	3	3	3	3
CO2	*Perform image segmentation and edge detection using Image processing tool box*	-	-	-	-	3	3	-	-	3	3	3	3	3	3
	Average	**-**	**-**	**-**	**-**	**3**	**3**	**-**	**-**	**3**	**3**	**3**	**3**	**3**	**3**

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

K.S.R. COLLEGE OF ENGINEERING (Autonomous) **R 2020**

VALUE ADDED COURSE

		L	T	P	C
VACEC06	**INDUSTRIAL AUTOMATION USING PLC AND SCADA**	0	0	3	1

Course Outcomes: On Completion of this course, the student will be able to

		Cognitive level
CO1	*Perform Field level Instrumentation and SCADA/HMI Systems used for Industrial Automation*	*Apply*
CO2	*Perform Interfacing with SCADA/HMI systems used for remote monitoring & control of industrial process units and machines*	*Apply*

Contents:

- Industrial Field Instrumentation & Controllers
- Programmable Logic Controllers(PLC)
- SCADA / HMI (Supervisory Control and Data Acquisition / Human Machine Interface)

Total : 15 Hours

CO-PO MAPPING

Regulation: **R 2020**

Course Code: VACEC06 **Course Name:** Industrial Automation using PLC and SCADA

CO	Course Outcomes	Programme Outcomes													
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	*Perform Field level Instrumentation and SCADA/HMI Systems used for Industrial Automation*	-	-	-	-	3	3	-	-	3	3	3	3	3	3
CO2	*Perform Interfacing with SCADA/HMI systems used for remote monitoring & control of industrial process units and machines*	-	-	-	-	3	3	-	-	3	3	3	3	3	3
	Average	**-**	**-**	**-**	**-**	**3**	**3**	**-**	**-**	**3**	**3**	**3**	**3**	**3**	**3**

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

K.S.R. COLLEGE OF ENGINEERING (Autonomous) **R 2020**

VALUE ADDED COURSE

		L	T	P	C
VACEC07	**NETWORK SIMULATOR – 2**	0	0	3	1

Course Outcomes: On Completion of this course, the student will be able to

		Cognitive level
CO1	*Generate and simulate wired and wireless simulations*	*Apply*
CO2	*Modify existing routing protocol in NS2 & Automate the performance analysis of routing protocol*	*Apply*

Contents:

- Introduction to NS2
- Ubuntu OS installation on VirtualBox
- NS2 Installation on Ubuntu OS
- Introduction to TCL – I & II
- Introduction to NSG
- Standard Protocols
- Trust Management

Total : 15 Hours

CO-PO MAPPING

Regulation: **R 2020**

Course Code: VACEC07 **Course Name:** Network Simulator – 2

CO	Course Outcomes	Programme Outcomes													
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	*Generate and simulate wired and wireless simulations*	-	-	-	-	3	3	-	-	3	3	3	3	3	3
CO2	*Modify existing routing protocol in NS2 & Automate the performance analysis of routing protocol*	-	-	-	-	3	3	-	-	3	3	3	3	3	3
	Average	**-**	**-**	**-**	**-**	**3**	**3**	**-**	**-**	**3**	**3**	**3**	**3**	**3**	**3**

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

K.S.R. COLLEGE OF ENGINEERING (Autonomous) **R 2020**

VALUE ADDED COURSE

		L	T	P	C
VACEC08	**CCNA – MODULE 1**	0	0	3	1

Course Outcomes: On Completion of this course, the student will be able to

		Cognitive level
CO1	Build simple LANs, perform basic configurations for routers and switches,	*Apply*
CO2	Implement IP addressing schemes.	*Apply*

Contents:

- Module 1 introduces the architecture, structure, functions, components, and models of the Internet and other computer networks. The principles and structure of IP addressing and the fundamentals of Ethernet concepts, media, and operations are introduced to provide a foundation for the curriculum.

Total : 15 Hours

CO-PO MAPPING

Regulation: **R 2020**

Course Code: VACEC08 **Course Name:** CCNA - (Module 1)

CO	**Course Outcomes**	**Programme Outcomes**													
		PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Build simple LANs, perform basic configurations for routers and switches	-	-	-	-	3	3	-	-	3	3	3	3	3	3
CO2	Implement IP addressing schemes.	-	-	-	-	3	3	-	-	3	3	3	3	3	3
	Average	**-**	**-**	**-**	**-**	**3**	**3**	**-**	**-**	**3**	**3**	**3**	**3**	**3**	**3**

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

K.S.R. COLLEGE OF ENGINEERING (Autonomous) **R 2020**

VALUE ADDED COURSE

		L	T	P	C
VACEC09	**CCNA - ROUTING AND SWITCHING (MODULE 2)**	0	0	3	1

Course Outcomes: On Completion of this course, the student will be able to

		Cognitive level
CO1	Configure and troubleshoot routers and switches and resolve common issues with RIPv1, RIPv2, single-area.	*Apply*
CO2	Perform multi-area OSPF, virtual LANs, and inter-VLAN routing in both IPv4 and IPv6 networks.	*Apply*

Contents:

- Module 2 describes the architecture, components, and operations of routers and switches in a small network. Students learn how to configure a router and a switch for basic functionality.

Total : 15 Hours

CO-PO MAPPING

Regulation: **R 2020**

Course Code: VACEC09 **Course Name:** CCNA - Routing and Switching (Module 2)

CO	Course Outcomes	Programme Outcomes													
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	Configure and troubleshoot routers and switches and resolve common issues with RIPv1, RIPv2, single-area.	-	-	-	-	3	3	-	-	3	3	3	3	3	3
CO2	Perform multi-area OSPF, virtual LANs, and inter-VLAN routing in both IPv4 and IPv6 networks.	-	-	-	-	3	3	-	-	3	3	3	3	3	3
	Average	**-**	**-**	**-**	**-**	**3**	**3**	**-**	**-**	**3**	**3**	**3**	**3**	**3**	**3**

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

Regulation : R 2020

Course Name : CCNA - ROUTING AND SWITCHING (MODULE 2)

K.S.R. COLLEGE OF ENGINEERING (Autonomous) **R 2020**

VALUE ADDED COURSE

		L	T	P	C
VACEC10	**.NET AND PHP**	0	0	3	1

Course Outcomes: On Completion of this course, the student will be able to ***Cognitive level***

CO1	*Describe the fundamental elements SQL ,HTML & CSS*	*Understand*
CO2	*Write code in JavaScript and .NET Framework*	*Apply*

Contents:

- Module 1: Introduction.
- Module 2: SQL & Database Fundamentals.
- Module 3: HTML, CSS.
- Module 4: JavaScript & AJAX.
- Module 5: C# & OOPS.
- Module 6: .NET Framework.
- Module 7: Database Connectivity.
- Module 8: ASP.NET & Advanced Features.

Total : 15 Hours

CO-PO MAPPING

Regulation: **R 2020**

Course Code: VACEC10 **Course Name:** .NET and PHP

CO	Course Outcomes	Programme Outcomes													
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	*Describe the fundamental elements SQL ,HTML & CSS*	-	-	-	-	3	3	-	-	3	3	3	3	3	3
CO2	*Write code in JavaScript and .NET Framework*	-	-	-	-	3	3	-	-	3	3	3	3	3	3
	Average	**-**	**-**	**-**	**-**	**3**	**3**	**-**	**-**	**3**	**3**	**3**	**3**	**3**	**3**

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

K.S.R. COLLEGE OF ENGINEERING (Autonomous) **R 2020**

VALUE ADDED COURSE

VACEC11 **DATA BASE MANAGEMENT SYSTEMS**

L	T	P	C
0	0	3	1

Course Outcomes: On Completion of this course, the student will be able to

		Cognitive level
CO1	*Describe the fundamental elements of relational database management systems*	*Apply*
CO2	*Explain the basic concepts of relational data model, entity-relationship model, relational database design, relational algebra and SQL.*	*Apply*

Contents:

Module-1: DBMS Concepts- Data Abstraction - Data models and data independence.
Module-2: Data Modeling - Practice.
Module-3:Relational DBMS Model - Practice
Module-4: SQL- Practice.

Total : 15 Hours

CO-PO MAPPING

Regulation: **R 2020**

Course Code: VACEC11 **Course Name:** **Database Management Systems**

CO	Course Outcomes	Programme Outcomes													
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	*Describe the fundamental elements of relational database management systems*	-	-	-	-	3	3	-	-	3	3	3	3	3	3
CO2	*Explain the basic concepts of relational data model, entity-relationship model, relational database design, relational algebra and SQL.*	-	-	-	-	3	3	-	-	3	3	3	3	3	3
	Average	**-**	**-**	**-**	**-**	**3**	**3**	**-**	**-**	**3**	**3**	**3**	**3**	**3**	**3**

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

K.S.R. COLLEGE OF ENGINEERING (Autonomous) **R 2020**

VALUE ADDED COURSE

VACEC12	**VHDL PROGRAMMING**	L	T	P	C
		0	0	3	1

Course Outcomes: On Completion of this course, the student will be able to

		Cognitive level
CO1	*Understand the syntax and behavior of the VHDL language*	*Apply*
CO2	*Simulate and make a synthesis of extensive designs in so called "Field Programmable Gate Array"*	*Apply*

Contents:

- Digital system design concepts
- Combinatorial and sequential logic design: principles and practices
- Sequential and combinatorial VHDL design
- Synchronous and asynchronous design
- Test bench development
- FPGA timing analysis
- FPGA power analysis
- CAD design software and emulation testbed
- Applications of FPGA in practical digital system development

Total : 15 Hours

CO-PO MAPPING

Regulation: **R 2020**

Course Code: VACEC12 **Course Name:** **VHDL Programming**

CO	**Course Outcomes**	**Programme Outcomes**													
		PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	*Understand the syntax and behavior of the VHDL language*	-	-	-	-	3	3	-	-	3	3	3	3	3	3
CO2	*Simulate and make a synthesis of extensive designs in so called "Field Programmable Gate Array"*	-	-	-	-	3	3	-	-	3	3	3	3	3	3
	Average	**-**	**-**	**-**	**-**	**3**	**3**	**-**	**-**	**3**	**3**	**3**	**3**	**3**	**3**

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

K.S.R. COLLEGE OF ENGINEERING (Autonomous) **R 2020**

VALUE ADDED COURSE

		L	T	P	C
VACEC13	**TANNER TOOL**	0	0	3	1

Course Outcomes: On Completion of this course, the student will be able to ***Cognitive level***

CO1	*Design hierarchy of files, Modules and integration of all circuit description*	*Apply*
CO2	*Handle W Edit and Layout edit process.*	*Apply*

Contents:

- S Edit
- T Spice
- W Edit
- Layout Edit

Total : 15 Hours

CO-PO MAPPING

Regulation: **R 2020**

Course Code: VACEC13 **Course Name:** **TANNER Tool**

CO	Course Outcomes	Programme Outcomes													
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	*Design hierarchy of files, Modules and integration of all circuit description*	-	-	-	-	3	3	-	-	3	3	3	3	3	3
CO2	*Handle W Edit and Layout edit process.*	-	-	-	-	3	3	-	-	3	3	3	3	3	3
	Average	**-**	**-**	**-**	**-**	**3**	**3**	**-**	**-**	**3**	**3**	**3**	**3**	**3**	**3**

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

K.S.R. COLLEGE OF ENGINEERING (Autonomous) **R 2020**

VALUE ADDED COURSE

		L	T	P	C
VACEC14	**MENTOR GRAPHICS (SIEMENS EDA TOOL)**	0	0	3	1

Course Outcomes: On Completion of this course, the student will be able to ***Cognitive level***

CO1	*Perform PCB and IC Design*	*Apply*
CO2	*Write Coding in Embedded Systems.*	*Apply*

Contents:

- PCB Design tools
- Integrated Circuit (IC) Design Tools
- Embedded Systems and Software Tools
- Automotive and Functional Safety

Total : 15 Hours

CO-PO MAPPING

Regulation: **R 2020**

Course Code: VACEC14 **Course Name:** **Mentor Graphics (SIEMENS EDA Tool)**

CO	Course Outcomes	Programme Outcomes													
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	*Perform PCB and IC Design*	-	-	-	-	3	3	-	-	3	3	3	3	3	3
CO2	*Write Coding in Embedded Systems.*	-	-	-	-	3	3	-	-	3	3	3	3	3	3
	Average	**-**	**-**	**-**	**-**	**3**	**3**	**-**	**-**	**3**	**3**	**3**	**3**	**3**	**3**

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

K.S.R. COLLEGE OF ENGINEERING (Autonomous) **R 2020**

VALUE ADDED COURSE

		L	T	P	C
VACEC15	**PROGRAMMING IN DIGITAL SIGNAL PROCESSORS**	0	0	3	1

Course Outcomes: On Completion of this course, the student will be able to

		Cognitive level
CO1	*Develop and implement signal processing algorithms tailored for DSP architectures to achieve efficient execution, low latency, and high throughput.*	*Apply*
CO2	*Efficiently utilize DSP resources, including computational units, memory, and peripherals, to meet performance requirements and constraints.*	*Apply*

Contents:

- Understanding DSP Architecture
- Choose the Right Development Tools
- Algorithm Development
- DSP Programming Techniques
- Code Implementation
- Testing and Debugging**.**

Total : 15 Hours

CO-PO MAPPING

Regulation: **R 2020**

Course Code: VACEC15 **Course Name:** **Programming in Digital Signal Processors**

CO	**Course Outcomes**	**Programme Outcomes**													
		PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	*Develop and implement signal processing algorithms tailored for DSP architectures to achieve efficient execution, low latency, and high throughput.*	-	-	-	-	3	3	-	-	3	3	3	3	3	3
CO2	*Efficiently utilize DSP resources, including computational units, memory, and peripherals, to meet performance requirements and constraints.*	-	-	-	-	3	3	-	-	3	3	3	3	3	3
	Average	**-**	**-**	**-**	**-**	**3**	**3**	**-**	**-**	**3**	**3**	**3**	**3**	**3**	**3**

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

K.S.R. COLLEGE OF ENGINEERING (Autonomous) **R 2020**

VALUE ADDED COURSE

VACEC16 **HIGH FREQUENCY STRUCTURE SIMULATOR (HFSS)**

L	T	P	C
0	0	3	1

Course Outcomes: On Completion of this course, the student will be able to ***Cognitive level***

CO1	*Develop models in HFSS for EM analysis*	*Apply*
CO2	*Analyze various parameters of models using HFSS*	*Apply*

Contents:

- Develop 3D Models
- Setup analysis
- Analyze 3d Models
- Analyze various results

Total : 15 Hours

CO-PO MAPPING

Regulation: **R 2020**

Course Code: VACEC16 **Course Name:** **High Frequency Structure Simulator (HFSS)**

CO	Course Outcomes	Programme Outcomes													
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	*Develop models in HFSS for EM analysis*	-	-	-	-	3	3	-	-	3	3	3	3	3	3
CO2	*Analyze various parameters of models using HFSS*	-	-	-	-	3	3	-	-	3	3	3	3	3	3
	Average	**-**	**-**	**-**	**-**	**3**	**3**	**-**	**-**	**3**	**3**	**3**	**3**	**3**	**3**

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)