DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

B.E. COMPUTER SCIENCE AND ENGINEERING

CURRICULUM & SYLLABI

Regulations 2020

(Applicable to candidates admitted in the Academic Year 2020 -2021)

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

Namakkal (Dt), Tamilnadu, India

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

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

(Autonomous)

DEPARTMENT OF COMPUTER SCIENCE AND ENIGNEERING

(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 mutually beneficial partnership with global industries and Institutions through knowledge sharing, collaborative research and innovation.

Vision of the Department / Programme: (Computer Science and Engineering)

DV	To create ever green professionals for software industry, academicians for knowledge cultivation and researchers for contemporary society modernization.

Mission of the Department / Programme: (Computer Science and Engineering)

DM 1	To produce proficient design, code and system engineers for software development.
DM 2	To keep updated contemporary technology and fore coming challenges for welfare of the society.

Programme Educational Objectives (PEOs): (Computer Science and Engineering)

The graduates of the programme will be able to

PEO 1	**Rational Computing:** Figure out, formulate, analyze typical problems and develop effective solutions by imparting the idea and principles of science, mathematics, engineering fundamentals and computing.
PEO 2	**Professional Excellence:** Competent professionally and successful in their chosen career through life-long learning.
PEO 3	**Social and Ethical Technocrats:** Excel individually or as member of a team in carrying out projects and exhibit social needs and follow professional ethics.

Programme Outcomes (POs) of B.E. - Computer Science and 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, and demonstrate the knowledge of, and need for sustainable development.
PO8	**Ethics:** Apply ethical principles and commit to professional ethics and 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	**Technical competency:** Develop and Implement computer solutions that accomplish goals to the industry, government or research by exploring new technologies.
PSO2	**Professional awareness:** Grow intellectually and professionally in the chosen field.

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Department	Department of Computer Science and Engineering
Programme	B.E - Computer Science and 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.	20CH051	Engineering Chemistry (Common To All Branches)	BSC	3	0	0	3	30	70	100
4.	20EE041	Basics of Electrical and Electronics Engineering (Common To AU, CE, CS, IT, ME & SF)	ESC	3	0	0	3	30	70	100
5.	20CS111	Problem Solving Techniques (Common To CS & EC)	ESC	3	0	0	3	30	70	100
MANDATORY COURSES										
6.	20MC151	Induction Program* (Common To All Branches)	MC	0	0	0	0	-	-	-
PRACTICAL										
7.	20CH028	Chemistry Laboratory (Common To All Branches)	BSC	0	0	3	1	50	50	100
8.	20CS121	Problem Solving Techniques Laboratory (Common To CS & EC)	ESC	0	0	3	1	50	50	100
9.	20AU127	Engineering Graphics Laboratory (Common To CE, CS, EC, EE &IT)	ESC	0	0	3	1	50	50	100
			Total	**17**	**1**	**10**	**19**			**800**

*** Induction Program will be conducted for 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.	20MA232	Discrete Mathematics (Common to CS & IT)	BSC	3	1	0	4	30	70	100
3.	20PH051	Engineering Physics (Common To All Branches)	BSC	3	0	0	3	30	70	100
4.	20EE231	Digital principles and Computer Design	ESC	3	0	0	3	30	70	100
5.	20CS211	C Programming	PCC	3	0	0	3	30	70	100
MANDATORY COURSES										
6	20MC052	Environmental Science and Engineering (Common To All Branches)	MC	3	0	0	0	-	-	-
PRACTICAL										
7.	20PH028	Physics Laboratory (Common To All Branches)	BSC	0	0	3	1	50	50	100
8.	20EE225	Digital Systems Laboratory	ESC	0	0	3	1	50	50	100
9.	20CS221	C Programming Laboratory	PCC	0	0	3	1	50	50	100
10.	20GE028	Manufacturing Practices Laboratory (Common To All Branches)	ESC	0	0	3	1	50	50	100
		Total		**17**	**1**	**13**	**20**			**900**

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Department	Department of Computer Science and Engineering
Programme	B.E - Computer Science and Engineering

SEMESTER – III

Sl.No.	Course Code	Course Name	Category	Hours/ Week			Credit	Maximum Marks		
				L	T	P	C	CA	ES	Total
THEORY										
1.	20MA343	Numerical Computational Techniques (Common to CS & IT)	BSC	3	1	0	4	30	70	100
2.	20CS311	Python Programming	PCC	3	0	0	3	30	70	100
3.	20CS312	Data Structures	PCC	3	0	0	3	30	70	100
4.	20CS313	Operating systems	PCC	3	0	0	3	30	70	100
5.	20CS314	Computer Organization and Architecture	PCC	3	0	0	3	30	70	100
6.	20CS315	Software Engineering	PCC	3	0	0	3	30	70	100
PRACTICAL										
7.	20CS321	Python Programming Laboratory	PCC	0	0	3	1	50	50	100
8.	20CS322	Data Structures Laboratory	PCC	0	0	3	1	50	50	100
9.	20CS323	Operating Systems Laboratory	PCC	0	0	3	1	50	50	100
10.	20HR351	Career Development Skills I (Common To All Branches)	EEC	0	2	0	0	50	50	100
Total				**18**	**3**	**9**	**22**			**1000**

SEMESTER – IV

Sl.No.	Course Code	Course Name	Category	Hours/ Week			Credit	Maximum Marks		
				L	T	P	C	CA	ES	Total
THEORY										
1.	20MA441	Probability and Decision Models (Common to CS & IT)	BSC	3	1	0	4	30	70	100
2.	20CS411	Theory of Computation	PCC	3	1	0	4	30	70	100
3.	20CS412	Java programming	PCC	3	0	0	3	30	70	100
4.	20CS413	Database Management Systems	PCC	3	0	0	3	30	70	100
5.	20CS414	Design and Analysis of Algorithms	PCC	3	1	0	4	30	70	100
6.	20EE431	Microprocessors and Microcontrollers	ESC	3	0	0	3	30	70	100
PRACTICAL										
7.	20CS421	Java programming Laboratory	PCC	0	0	3	1	50	50	100
8.	20CS422	Database Management Systems Laboratory	PCC	0	0	3	1	50	50	100
9.	20EE425	Microprocessors and Microcontrollers Laboratory	ESC	0	0	3	1	50	50	100
10.	20HR432	Career Development Skills II	EEC	0	2	0	0	50	50	100
Total				**18**	**5**	**9**	**24**			**1000**

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Department	Department of Computer Science and Engineering
Programme	B.E - Computer Science and Engineering

SEMESTER – V

Sl.No.	Course Code	Course Name	Category	Hours/ Week			Credit	Maximum Marks		
				L	T	P	C	CA	ES	Total
THEORY										
1.	20CS511	Principles of Compiler Design	PCC	3	1	0	4	30	70	100
2.	20CS512	Web Programming	PCC	3	0	0	3	30	70	100
3.	20CS513	Object Oriented Analysis and Design	PCC	3	0	0	3	30	70	100
4.	20CS514	Computer Networks	PCC	3	0	0	3	30	70	100
5.	20CS515	Entrepreneurship Development	HSMC	3	0	0	3	30	70	100
6.		Professional Elective – I	PEC	3	0	0	3	30	70	100
PRACTICAL										
7.	20CS521	Web Programming Laboratory	PCC	0	0	3	1	50	50	100
8.	20CS522	Computer Networks Laboratory	PCC	0	0	3	1	50	50	100
9.	20HR533	Career Development Skills III	EEC	0	2	0	0	50	50	100
Total				**18**	**3**	**6**	**21**			**900**

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 Harmony (Common To All Branches)	HSMC	3	0	0	3	30	70	100
2.	20CS601	C# and .Net Framework (Common To CS & EC)	PCC	3	0	0	3	30	70	100
3.	20CS611	Cryptography and Network Security	PCC	3	0	0	3	30	70	100
4.	20CS612	Software testing	PCC	3	0	0	3	30	70	100
5.		Professional Elective – II	PEC	3	0	0	3	30	70	100
6.		Open Elective – I	OEC	3	0	0	3	30	70	100
PRACTICAL										
7.	20CS621	C# and .Net Framework Laboratory	PCC	0	0	3	1	50	50	100
8.	20CS622	Mini project	PROJ	0	0	6	3	50	50	100
9.	20HR634	Career Development Skills IV	EEC	0	2	0	0	50	50	100
Total				**18**	**2**	**9**	**22**			**900**

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Programme	B.E - Computer Science and Engineering

SEMESTER - VII

Sl.No.	Course Code	Course Name	Category	Hours/ Week			Credit	Maximum Marks		
				L	T	P	C	CA	ES	Total
THEORY										
1.	20CS711	Mobile Computing	PCC	3	0	0	3	30	70	100
2.	20CS712	Graphics and Multimedia	PCC	3	0	0	3	30	70	100
3.	20CS713	Cloud and Big Data Analytics	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.	20CS721	Graphics and Multimedia Laboratory	PCC	0	0	3	1	50	50	100
8.	20CS722	Cloud and Big Data Laboratory	PCC	0	0	3	1	50	50	100
Total				**18**	**0**	**6**	**20**			**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.		Open Elective – III	OEC	3	0	0	3	30	70	100
PRACTICAL										
3.	20CS821	Project Work	PROJ	0	0	12	6	50	50	100
Total				**6**	**0**	**12**	**12**			**300**

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List of Electives

PROFESSIONAL ELECTIVE - I (SEMESTER - V)

Sl.No.	Course Code	Course Name	Specialization	Category	Hours/ Week			Credit	Maximum Marks		
					L	T	P	C	CA	ES	Total
1.	20CS561	Distributed Systems	S4	PEC	3	0	0	3	30	70	100
2.	20IE591	Augmented Intelligence led Managed Services – I (Industry Elective)	S1	PEC	3	0	0	3	30	70	100
3.	20CS563	Data Warehousing and Data Mining	S2	PEC	3	0	0	3	30	70	100
4.	20CS564	Open Source Technologies	S1	PEC	3	0	0	3	30	70	100
5.	20CS565	Advanced Database Technology	S2	PEC	3	0	0	3	30	70	100
6.	20CS566	Artificial Intelligence and Expert Systems	S4	PEC	3	0	0	3	30	70	100

PROFESSIONAL ELECTIVE - II (SEMESTER - VI)

Sl.No.	Course Code	Course Name	Specialization	Category	Hours/ Week			Credit	Maximum Marks		
					L	T	P	C	CA	ES	Total
1.	20CS661	Green computing	S4	PEC	3	0	0	3	30	70	100
2.	20IE691	Augmented Intelligence led Managed Services – II (Industry Elective)	S1	PEC	3	0	0	3	30	70	100
3.	20CS663	Internet of Things	S2	PEC	3	0	0	3	30	70	100
4.	20CS664	Android Application Development	S2	PEC	3	0	0	3	30	70	100
5.	20CS665	Application Frameworks	S1	PEC	3	0	0	3	30	70	100
6.	20CS666	High Speed Networks	S3	PEC	3	0	3	3	30	70	100

PROFESSIONAL ELECTIVE – III (SEMESTER - VII)											
Sl.No.	Course Code	Course Name	Specialization	Category	Hours/ Week			Credit	Maximum Marks		
					L	T	P	C	CA	ES	Total
1.	20CS761	Information Security	S3	PEC	3	0	0	3	30	70	100
2.	20CS762	Social network analysis	S3	PEC	3	0	0	3	30	70	100
3.	20CS763	Agile Software Development	S4	PEC	3	0	0	3	30	70	100
4.	20CS764	User Interface Design	S2	PEC	3	0	0	3	30	70	100
5.	20CS765	Business Intelligence	S2	PEC	3	0	0	3	30	70	100
6.	20CS766	Soft Computing	S1	PEC	3	0	0	3	30	70	100

PROFESSIONAL ELECTIVE – IV (SEMESTER – VII)											
Sl.No.	Course Code	Course Name	Specialization	Category	Hours/ Week			Credit	Maximum Marks		
					L	T	P	C	CA	ES	Total
1.	20CS767	Service Oriented Architecture	S4	PEC	3	0	0	3	30	70	100
2.	20CS768	Cyber Security	S3	PEC	3	0	0	3	30	70	100
3.	20CS769	Software Defined Networks	S3	PEC	3	0	0	3	30	70	100
4.	20CS771	Information storage management	S2	PEC	3	0	0	3	30	70	100
5.	20CS772	Machine Learning Techniques	S4	PEC	3	0	0	3	30	70	100
6.	20CS773	Data Science	S2	PEC	3	0	0	3	30	70	100

PROFESSIONAL ELECTIVE – V (SEMESTER – VIII)											
Sl.No.	Course Code	Course Name	Specialization	Category	Hours/ Week			Credit	Maximum Marks		
					L	T	P	C	CA	ES	Total
1.	20CS861	Blockchain Technologies	S1	PEC	3	0	0	3	30	70	100
2.	20CS862	Ethical Hacking	S3	PEC	3	0	0	3	30	70	100
3.	20CS863	Software Project Management	S5	PEC	3	0	0	3	30	70	100
4.	20CS864	Knowledge Based Decision Support System	S5	PEC	3	0	0	3	30	70	100
5.	20CS865	Pervasive Computing	S1	PEC	3	0	0	3	30	70	100
6.	20CS866	Ad hoc and Sensor Networks	S3	PEC	3	0	0	3	30	70	100

S1 - Recent Technologies and Computing
S2 - Data and Knowledge Engineering
S3 - Computer Networks and Security
S4 - Systems and Software Engineering
S5 - Entrepreneurship and Managerial Skills

OPEN ELECTIVE COURSES

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 System	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

Sl.No.	Course Code	Course Name	Specialization	Category	Hours/ Week			Credit	Maximum Marks		
					L	T	P	C	CA	ES	Total
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
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

Sl.No.	Course Code	Course Name	Specialization	Category	Hours/ Week			Credit	Maximum Marks		
					L	T	P	C	CA	ES	Total
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 Intelligenc	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
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 Agricultura 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

Sl.No.	Course Code	Course Name	Specialization	Category	Hours/ Week			Credit	Maximum Marks		
					L	T	P	C	CA	ES	Total
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

LIST OF VALUE ADDED COURSES

Sl. No.	Course Code	Course Name	Number of Hours	Offered by Internal / External
1	VACCS01	Core Java	15 Hours	CSE/KSRCE
2	VACCS02	Full Stack Development	15 Hours	CSE/KSRCE
3	VACCS03	C# and .Net	15 Hours	CSE/KSRCE
4	VACCS04	App Development	15 Hours	CSE/KSRCE
5	VACCS05	Python Programming in Machine Learning	15 Hours	CSE/KSRCE
6	VACCS06	Advanced C Programming	15 Hours	CSE/KSRCE
7	VACCS07	Website Design and Development	15 Hours	CSE/KSRCE
8	VACCS08	Service Now	15 Hours	CSE/KSRCE
9	VACCS09	Salesforce Developers	15 Hours	CSE/KSRCE
10	VACCS10	Digital Marketing	15 Hours	CSE/KSRCE
11	VACCS11	Intellectual Property Rights	15 Hours	EXTERNAL
12	VACCS12	General Physiology	15 Hours	EXTERNAL
13	VACCS13	Disaster Management	15 Hours	EXTERNAL
14	VACCS14	Basic Knowledge about Grooming	15 Hours	EXTERNAL
15	VACCS15	Yoga and Fitness Practical	15 Hours	EXTERNAL

COURSE COMPONENT SUMMARY

S. No.	Subject Area	Credits Per Semester								Credits Total	Percentage Credits
		I	II	III	IV	V	VI	VII	VIII		
1.	**HSMC**	3	3	-	-	3	3	-	-	12	7.5
2.	**BSC**	8	8	4	4	-	-	-	-	24	15
3.	**ESC**	8	5	-	4	-	-	-	-	17	10.62
4.	**PCC**	-	4	18	16	15	10	11	-	74	46.25
5.	**PEC**	-	-	-	-	3	3	6	3	15	9.3
6.	**OEC**	-	-	-	-	-	3	3	3	9	5.62
7.	**PROJ**	-	-	-	-	-	3	-	6	9	5.62
TOTAL		**19**	**20**	**22**	**24**	**21**	**22**	**20**	**12**	**160**	**100**

HSMC - Humanities and Social Sciences including Management courses
BSC - Basic Science Courses
ESC - Engineering Science Courses
PCC - Professional core courses
PEC- Professional Elective courses
OEC - Open Elective courses
MC - Mandatory courses
PROJ - Project

Total No. of Credits = 160

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

B.E. COMPUTER SCIENCE AND ENGINEERING

CURRICULUM & SYLLABI

Regulations 2020

(Applicable to candidates admitted in the Academic Year 2021 - 2022)

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

Namakkal (Dt), Tamilnadu, India

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

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

(Autonomous)

DEPARTMENT OF COMPUTER SCIENCE AND ENIGNEERING

(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 mutually beneficial partnership with global industries and Institutions through knowledge sharing, collaborative research and innovation.

Vision of the Department / Programme: (Computer Science and Engineering)

DV	To create ever green professionals for software industry, academicians for knowledge cultivation and researchers for contemporary society modernization.

Mission of the Department / Programme: (Computer Science and Engineering)

DM 1	To produce proficient design, code and system engineers for software development.
DM 2	To keep updated contemporary technology and fore coming challenges for welfare of the society.

Programme Educational Objectives (PEOs): (Computer Science and Engineering)

The graduates of the programme will be able to

PEO 1	**Rational Computing:** Figure out, formulate, analyze typical problems and develop effective solutions by imparting the idea and principles of science, mathematics, engineering fundamentals and computing.
PEO 2	**Professional Excellence:** Competent professionally and successful in their chosen career through life-long learning.
PEO 3	**Social and Ethical Technocrats:** Excel individually or as member of a team in carrying out projects and exhibit social needs and follow professional ethics.

Programme Outcomes (POs) of B.E. - Computer Science and 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, and demonstrate the knowledge of, and need for sustainable development.
PO8	**Ethics:** Apply ethical principles and commit to professional ethics and 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	**Technical competency:** Develop and Implement computer solutions that accomplish goals to the industry, government or research by exploring new technologies.
PSO2	**Professional awareness:** Grow intellectually and professionally in the chosen field.

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

Department	Department of Computer Science and Engineering
Programme	B.E - Computer Science and 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.	20CH051	Engineering Chemistry (Common To All Branches)	BSC	3	0	0	3	40	60	100
4.	20EE041	Basics of Electrical and Electronics Engineering (Common To AU,CE,CS,IT,ME & SF)	ESC	3	0	0	3	40	60	100
5.	20CS142	Problem Solving Techniques (Common To CS & EC)	ESC	3	0	0	3	40	60	100
MANDATORY COURSES										
6.	20MC151	Induction Program* (Common To All Branches)	MC	0	0	0	0	-	-	-
PRACTICAL										
7.	20CH028	Chemistry Laboratory (Common To All Branches)	BSC	0	0	3	1	60	40	100
8.	20CS171	Problem Solving Techniques Laboratory (Common To CS & EC)	ESC	0	0	3	1	60	40	100
9.	20AU127	Engineering Graphics Laboratory (Common To CE,CS,EC,EE &IT)	ESC	0	0	3	1	60	40	100
			Total	**17**	**1**	**10**	**19**			**800**

*** Induction Program will be conducted for 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.	20MA232	Discrete Mathematics (Common to CS & IT)	BSC	3	1	0	4	40	60	100
3.	20PH051	Engineering Physics (Common To All Branches)	BSC	3	0	0	3	40	60	100
4.	20EE231	Digital principles and Computer Design	ESC	3	0	0	3	40	60	100
5.	20CS211	C Programming	PCC	3	0	0	3	40	60	100
MANDATORY COURSES										
6	20MC052	Environmental Science and Engineering (Common To All Branches)	MC	3	0	0	0	-	-	-
PRACTICAL										
7.	20PH028	Physics Laboratory (Common To All Branches)	BSC	0	0	3	1	60	40	100
8.	20EE225	Digital Systems Laboratory	ESC	0	0	3	1	60	40	100
9.	20CS221	C Programming Laboratory	PCC	0	0	3	1	60	40	100
10.	20GE028	Manufacturing Practices Laboratory (Common To All Branches)	ESC	0	0	3	1	60	40	100
		Total		**17**	**1**	**13**	**20**			**900**

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

Department	Department of Computer Science and Engineering
Programme	B.E - Computer Science and Engineering

SEMESTER – III

Sl.No.	Course Code	Course Name	Category	Hours/ Week			Credit	Maximum Marks		
				L	T	P	C	CA	ES	Total
THEORY										
1.	20MA343	Numerical Computational Techniques (Common to CS & IT)	BSC	3	1	0	4	40	60	100
2.	20CS311	Python Programming	PCC	3	0	0	3	40	60	100
3.	20CS312	Data Structures	PCC	3	0	0	3	40	60	100
4.	20CS313	Operating systems	PCC	3	0	0	3	40	60	100
5.	20CS314	Computer Organization and Architecture	PCC	3	0	0	3	40	60	100
6.	20CS315	Software Engineering	PCC	3	0	0	3	40	60	100
PRACTICAL										
7.	20CS321	Python Programming Laboratory	PCC	0	0	3	1	60	40	100
8.	20CS322	Data Structures Laboratory	PCC	0	0	3	1	60	40	100
9.	20CS323	Operating Systems Laboratory	PCC	0	0	3	1	60	40	100
10.	20HR351	Career Development Skills I (Common To All Branches)	EEC	0	2	0	0	60	40	100
Total				**18**	**3**	**9**	**22**			**1000**

SEMESTER – IV

Sl.No.	Course Code	Course Name	Category	Hours/ Week			Credit	Maximum Marks		
				L	T	P	C	CA	ES	Total
THEORY										
1.	20MA441	Probability and Decision Models (Common to CS & IT)	BSC	3	1	0	4	40	60	100
2.	20CS411	Theory of Computation	PCC	3	1	0	4	40	60	100
3.	20CS412	Java programming	PCC	3	0	0	3	40	60	100
4.	20CS413	Database Management Systems	PCC	3	0	0	3	40	60	100
5.	20CS414	Design and Analysis of Algorithms	PCC	3	1	0	4	40	60	100
6.	20EE431	Microprocessors and Microcontrollers	ESC	3	0	0	3	40	60	100
PRACTICAL										
7.	20CS421	Java programming Laboratory	PCC	0	0	3	1	60	40	100
8.	20CS422	Database Management Systems Laboratory	PCC	0	0	3	1	60	40	100
9.	20EE425	Microprocessors and Microcontrollers Laboratory	ESC	0	0	3	1	60	40	100
10.	20HR432	Career Development Skills II	EEC	0	2	0	0	60	40	100
Total				**18**	**5**	**9**	**24**			**1000**

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Department	Department of Computer Science and Engineering
Programme	B.E - Computer Science and Engineering

SEMESTER – V

Sl.No.	Course Code	Course Name	Category	Hours/ Week			Credit	Maximum Marks		
				L	T	P	C	CA	ES	Total
THEORY										
1.	20CS511	Principles of Compiler Design	PCC	3	1	0	4	40	60	100
2.	20CS512	Web Programming	PCC	3	0	0	3	40	60	100
3.	20CS513	Object Oriented Analysis and Design	PCC	3	0	0	3	40	60	100
4.	20CS514	Computer Networks	PCC	3	0	0	3	40	60	100
5.	20CS515	Entrepreneurship Development	HSMC	3	0	0	3	40	60	100
6.		Professional Elective – I	PEC	3	0	0	3	40	60	100
PRACTICAL										
7.	20CS521	Web Programming Laboratory	PCC	0	0	3	1	60	40	100
8.	20CS522	Computer Networks Laboratory	PCC	0	0	3	1	60	40	100
9.	20HR533	Career Development Skills III	EEC	0	2	0	0	60	40	100
Total				**18**	**3**	**6**	**21**			**900**

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 Harmony (Common To All Branches)	HSMC	3	0	0	3	40	60	100
2.	20CS601	C# and .Net Framework (Common To CS & EC)	PCC	3	0	0	3	40	60	100
3.	20CS611	Cryptography and Network Security	PCC	3	0	0	3	40	60	100
4.	20CS612	Software testing	PCC	3	0	0	3	40	60	100
5.		Professional Elective – II	PEC	3	0	0	3	40	60	100
6.		Open Elective – I	OEC	3	0	0	3	40	60	100
PRACTICAL										
7.	20CS621	C# and .Net Framework Laboratory	PCC	0	0	3	1	60	40	100
8.	20CS622	Mini project	PROJ	0	0	6	3	60	40	100
9.	20HR634	Career Development Skills IV	EEC	0	2	0	0	60	40	100
Total				**18**	**2**	**9**	**22**			**900**

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Department	Department of Computer Science and Engineering
Programme	B.E - Computer Science and Engineering

SEMESTER - VII

Sl.No.	Course Code	Course Name	Category	Hours/ Week			Credit	Maximum Marks		
				L	T	P	C	CA	ES	Total
THEORY										
1.	20CS711	Mobile Computing	PCC	3	0	0	3	40	60	100
2.	20CS712	Graphics and Multimedia	PCC	3	0	0	3	40	60	100
3.	20CS713	Cloud and Big Data Analytics	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.	20CS721	Graphics and Multimedia Laboratory	PCC	0	0	3	1	60	40	100
8.	20CS722	Cloud and Big Data Laboratory	PCC	0	0	3	1	60	40	100
Total				**18**	**0**	**6**	**20**			**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.		Open Elective – III	OEC	3	0	0	3	40	60	100
PRACTICAL										
3.	20CS821	Project Work	PROJ	0	0	12	6	60	40	100
Total				**6**	**0**	**12**	**12**			**300**

	K.S.R. COLLEGE OF ENGINEERING (Autonomous) (Approved by AICTE & Affiliated to Anna University) K.S.R. Kalvi Nagar, Tiruchengode- 637 215	CURRICULUM UG R - 2020
Department	Department of Computer Science and Engineering	
Programme	B.E -Computer Science and Engineering	

List of Electives

PROFESSIONAL ELECTIVE - I (SEMESTER - V)

Sl.No.	Course Code	Course Name	Specialization	Category	Hours/ Week			Credit	Maximum Marks		
					L	T	P	C	CA	ES	Total
1.	20CS561	Distributed Systems	S4	PEC	3	0	0	3	40	60	100
2.	20IE591	Augmented Intelligence led Managed Services – I (Industry Elective)	S1	PEC	3	0	0	3	40	60	100
3.	20CS563	Data Warehousing and Data Mining	S2	PEC	3	0	0	3	40	60	100
4.	20CS564	Open Source Technologies	S1	PEC	3	0	0	3	40	60	100
5.	20CS565	Advanced Database Technology	S2	PEC	3	0	0	3	40	60	100
6.	20CS566	Artificial Intelligence and Expert Systems	S4	PEC	3	0	0	3	40	60	100

PROFESSIONAL ELECTIVE - II (SEMESTER - VI)

Sl.No.	Course Code	Course Name	Specialization	Category	Hours/ Week			Credit	Maximum Marks		
					L	T	P	C	CA	ES	Total
1.	20CS661	Green computing	S4	PEC	3	0	0	3	40	60	100
2.	20IE691	Augmented Intelligence led Managed Services – II (Industry Elective)	S1	PEC	3	0	0	3	40	60	100
3.	20CS663	Internet of Things	S2	PEC	3	0	0	3	40	60	100
4.	20CS664	Android Application Development	S2	PEC	3	0	0	3	40	60	100
5.	20CS665	Application Frameworks	S1	PEC	3	0	0	3	40	60	100
6.	20CS666	High Speed Networks	S3	PEC	3	0	3	3	40	60	100

PROFESSIONAL ELECTIVE – III (SEMESTER - VII)											
Sl.No.	**Course Code**	**Course Name**	**Specialization**	**Category**	**Hours/ Week**			**Credit**	**Maximum Marks**		
					L	**T**	**P**	**C**	**CA**	**ES**	**Total**
1.	20CS761	Information Security	S3	PEC	3	0	0	3	40	60	100
2.	20CS762	Social network analysis	S3	PEC	3	0	0	3	40	60	100
3.	20CS763	Agile Software Development	S4	PEC	3	0	0	3	40	60	100
4.	20CS764	User Interface Design	S2	PEC	3	0	0	3	40	60	100
5.	20CS765	Business Intelligence	S2	PEC	3	0	0	3	40	60	100
6.	20CS766	Soft Computing	S1	PEC	3	0	0	3	40	60	100

PROFESSIONAL ELECTIVE – IV (SEMESTER – VII)											
Sl.No.	**Course Code**	**Course Name**	**Specialization**	**Category**	**Hours/ Week**			**Credit**	**Maximum Marks**		
					L	**T**	**P**	**C**	**CA**	**ES**	**Total**
1.	20CS767	Service Oriented Architecture	S4	PEC	3	0	0	3	40	60	100
2.	20CS768	Cyber Security	S3	PEC	3	0	0	3	40	60	100
3.	20CS769	Software Defined Networks	S3	PEC	3	0	0	3	40	60	100
4.	20CS771	Information storage management	S2	PEC	3	0	0	3	40	60	100
5.	20CS772	Machine Learning Techniques	S4	PEC	3	0	0	3	40	60	100
6.	20CS773	Data science	S2	PEC	3	0	0	3	40	60	100

PROFESSIONAL ELECTIVE – V (SEMESTER – VIII)											
Sl.No.	**Course Code**	**Course Name**	**Specialization**	**Category**	**Hours/ Week**			**Credit**	**Maximum Marks**		
					L	**T**	**P**	**C**	**CA**	**ES**	**Total**
1.	20CS861	Blockchain Technologies	S1	PEC	3	0	0	3	40	60	100
2.	20CS862	Ethical Hacking	S3	PEC	3	0	0	3	40	60	100
3.	20CS863	Software Project Management	S5	PEC	3	0	0	3	40	60	100
4.	20CS864	Knowledge Based Decision Support System	S5	PEC	3	0	0	3	40	60	100
5.	20CS865	Pervasive Computing	S1	PEC	3	0	0	3	40	60	100
6.	20CS866	Ad hoc and Sensor Networks	S3	PEC	3	0	0	3	40	60	100

B.E./B.TECH. HONOURS (SPECIALIZATION IN THE SAME DISCIPLINE): VERTICALS
Emerging Areas: Computer science and Engineering

(i) 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.

Vertical Courses

VERTICAL – I: FULL STACK DEVELOPMENT											
Sl.No.	Course Code	Course Name	Specialization	Category	Hours/ Week			Credit	Maximum Marks		
					L	T	P	C	CA	ES	Total
1.	20CS567	Fundamentals of DevOps	S1	PEC	3	0	0	3	40	60	100
2.	20CS568	Augmented Reality and Virtual Reality	S1	PEC	3	0	0	3	40	60	100
3.	20CS664	Android Application Development	S1	PEC	3	0	0	3	40	60	100
4.	20CS665	Application Frameworks	S1	PEC	3	0	0	3	40	60	100
5.	20CS774	R Programming	S1	PEC	3	0	0	3	40	60	100
6.	20CS775	Web Application Security	S1	PEC	3	0	0	3	40	60	100
7.	20CS867	UI and UX Design	S1	PEC	3	0	0	3	40	60	100
8.	20CS868	Principles of Programming Languages	S1	PEC	3	0	0	3	40	60	100

VERTICAL – 2: CLOUD COMPUTING AND SECURITY											
Sl.No.	Course Code	Course Name	Specialization	Category	Hours/ Week			Credit	Maximum Marks		
					L	T	P	C	CA	ES	Total
1.	20CS563	Data Warehousing and Data Mining	S2	PEC	3	0	0	3	40	60	100
2.	20CS667	Cloud Services Management	S4	PEC	3	0	0	3	40	60	100
3.	20CS768	Cyber Security	S3	PEC	3	0	0	3	40	60	100
4.	20CS773	Data science	S2	PEC	3	0	0	3	40	60	100
5.	20CS776	Storage Technologies	S3	PEC	3	0	0	3	40	60	100
6.	20CS861	Blockchain Technologies	S2	PEC	3	0	0	3	40	60	100
7.	20CS862	Ethical Hacking	S3	PEC	3	0	0	3	40	60	100
8.	20CS869	Security and Privacy in Cloud	S3	PEC	3	0	0	3	40	60	100

S1 - Recent Technologies and Computing
S2 - Data and Knowledge Engineering
S3 - Computer Networks and Security
S4 - Systems and Software Engineering
S5 - Entrepreneurship and Managerial Skills

OPEN ELECTIVE COURSES

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

Sl.No.	Course Code	Course Name	Specialization	Category	Hours/ Week			Credit	Maximum Marks		
					L	T	P	C	CA	ES	Total
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
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

Sl.No.	Course Code	Course Name	Specialization	Category	Hours/ Week			Credit	Maximum Marks		
					L	T	P	C	CA	ES	Total
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 Intelligenc	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
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 Agricultura 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

Sl.No.	Course Code	Course Name	Specialization	Category	Hours/ Week			Credit	Maximum Marks		
					L	T	P	C	CA	ES	Total
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

LIST OF VALUE ADDED COURSES

Sl. No.	Course Code	Course Name	Number of Hours	Offered by Internal / External
1	VACCS01	Core Java	15 Hours	CSE/KSRCE
2	VACCS02	Full Stack Development	15 Hours	CSE/KSRCE
3	VACCS03	C# and .Net	15 Hours	CSE/KSRCE
4	VACCS04	App Development	15 Hours	CSE/KSRCE
5	VACCS05	Python Programming in Machine Learning	15 Hours	CSE/KSRCE
6	VACCS06	Advanced C Programming	15 Hours	CSE/KSRCE
7	VACCS07	Website Design and Development	15 Hours	CSE/KSRCE
8	VACCS08	Service Now	15 Hours	CSE/KSRCE
9	VACCS09	Salesforce Developers	15 Hours	CSE/KSRCE
10	VACCS10	Digital Marketing	15 Hours	CSE/KSRCE
11	VACCS11	Intellectual Property Rights	15 Hours	EXTERNAL
12	VACCS12	General Physiology	15 Hours	EXTERNAL
13	VACCS13	Disaster Management	15 Hours	EXTERNAL
14	VACCS14	Basic Knowledge about Grooming	15 Hours	EXTERNAL
15	VACCS15	Yoga and Fitness Practical	15 Hours	EXTERNAL

COURSE COMPONENT SUMMARY

S. No.	Subject Area	Credits Per Semester								Credits Total	Percentage Credits
		I	II	III	IV	V	VI	VII	VIII		
1.	**HSMC**	3	3	-	-	3	3	-	-	12	7.5
2.	**BSC**	8	8	4	4	-	-	-	-	24	15
3.	**ESC**	8	5	-	4	-	-	-	-	17	10.62
4.	**PCC**	-	4	18	16	15	10	11	-	74	46.25
5.	**PEC**	-	-	-	-	3	3	6	3	15	9.3
6.	**OEC**	-	-	-	-	-	3	3	3	9	5.62
7.	**PROJ**	-	-	-	-	-	3	-	6	9	5.62
TOTAL		**19**	**20**	**22**	**24**	**21**	**22**	**20**	**12**	**160**	**100**

HSMC - Humanities and Social Sciences including Management courses
BSC - Basic Science Courses
ESC - Engineering Science Courses
PCC - Professional core courses
PEC- Professional Elective courses
OEC - Open Elective courses
MC - Mandatory courses
PROJ – Project

Total No. of Credits = 160

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

B.E. COMPUTER SCIENCE AND ENGINEERING

CURRICULUM & SYLLABI

Regulations 2020

(Applicable to candidates admitted in the Academic Year 2022 - 2023)

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

Namakkal (Dt), Tamilnadu, India

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

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

(Autonomous)

DEPARTMENT OF COMPUTER SCIENCE AND ENIGNEERING

(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 mutually beneficial partnership with global industries and Institutions through knowledge sharing, collaborative research and innovation.

Vision of the Department / Programme: (Computer Science and Engineering)

DV	To create ever green professionals for software industry, academicians for knowledge cultivation and researchers for contemporary society modernization.

Mission of the Department / Programme: (Computer Science and Engineering)

DM 1	To produce proficient design, code and system engineers for software development.
DM 2	To keep updated contemporary technology and fore coming challenges for welfare of the society.

Programme Educational Objectives (PEOs): (Computer Science and Engineering)

The graduates of the programme will be able to

PEO 1	**Rational Computing:** Figure out, formulate, analyze typical problems and develop effective solutions by imparting the idea and principles of science, mathematics, engineering fundamentals and computing.
PEO 2	**Professional Excellence:** Competent professionally and successful in their chosen career through life-long learning.
PEO 3	**Social and Ethical Technocrats:** Excel individually or as member of a team in carrying out projects and exhibit social needs and follow professional ethics.

Programme Outcomes (POs) of B.E. - Computer Science and 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, and demonstrate the knowledge of, and need for sustainable development.
PO8	**Ethics:** Apply ethical principles and commit to professional ethics and 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	**Technical competency:** Develop and Implement computer solutions that accomplish goals to the industry, government or research by exploring new technologies.
PSO2	**Professional awareness:** Grow intellectually and professionally in the chosen field.

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

Department	Department of Computer Science and Engineering
Programme	B.E - Computer Science and 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.	20CH051	Engineering Chemistry (Common To All Branches)	BSC	3	0	0	3	40	60	100
4.	20EE041	Basics of Electrical and Electronics Engineering (Common To AU,CE,CS,IT,ME & SF)	ESC	3	0	0	3	40	60	100
5.	20CS142	Problem Solving Techniques (Common To CS & EC)	ESC	3	0	0	3	40	60	100
MANDATORY COURSES										
6.	20MC151	Induction Program* (Common To All Branches)	MC	0	0	0	0	-	-	-
PRACTICAL										
7.	20CH028	Chemistry Laboratory (Common To All Branches)	BSC	0	0	3	1	60	40	100
8.	20CS171	Problem Solving Techniques Laboratory (Common To CS & EC)	ESC	0	0	3	1	60	40	100
9.	20AU127	Engineering Graphics Laboratory (Common To CE,CS,EC,EE &IT)	ESC	0	0	3	1	60	40	100
			Total	**17**	**1**	**10**	**19**			**800**

*** Induction Program will be conducted for 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.	20MA232	Discrete Mathematics (Common to CS & IT)	BSC	3	1	0	4	40	60	100
3.	20PH051	Engineering Physics (Common To All Branches)	BSC	3	0	0	3	40	60	100
4.	20EE231	Digital principles and Computer Design	ESC	3	0	0	3	40	60	100
5.	20CS211	C Programming	PCC	3	0	0	3	40	60	100
MANDATORY COURSES										
6.	20MC052	Environmental Science and Engineering (Common To All Branches)	MC	3	0	0	0	-	-	-
7.	20GE051	தமிழ் மரபு/Heritage of Tamils	MC	3	0	0	1	40	60	100
PRACTICAL										
8.	20PH028	Physics Laboratory (Common To All Branches)	BSC	0	0	3	1	60	40	100
9.	20EE225	Digital Systems Laboratory	ESC	0	0	3	1	60	40	100
10.	20CS221	C Programming Laboratory	PCC	0	0	3	1	60	40	100
11.	20GE028	Manufacturing Practices Laboratory (Common To All Branches)	ESC	0	0	3	1	60	40	100
		Total		**17**	**1**	**13**	**21**			**1000**

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Department	Department of Computer Science and Engineering
Programme	B.E - Computer Science and Engineering

SEMESTER – III

Sl.No.	Course Code	Course Name	Category	Hours/ Week			Credit	Maximum Marks		
				L	T	P	C	CA	ES	Total
THEORY										
1.	20MA343	Numerical Computational Techniques (Common to CS & IT)	BSC	3	1	0	4	40	60	100
2.	20CS311	Python Programming	PCC	3	0	0	3	40	60	100
3.	20CS312	Data Structures	PCC	3	0	0	3	40	60	100
4.	20CS313	Operating systems	PCC	3	0	0	3	40	60	100
5.	20CS314	Computer Organization and Architecture	PCC	3	0	0	3	40	60	100
6.	20CS315	Software Engineering	PCC	3	0	0	3	40	60	100
MANDATORY COURSES										
7.	20GE052	தமிழரும் தொழில்நுட்பமும்/ Tamils and Technology	MC	3	0	0	1	40	60	100
PRACTICAL										
8.	20CS321	Python Programming Laboratory	PCC	0	0	3	1	60	40	100
9.	20CS322	Data Structures Laboratory	PCC	0	0	3	1	60	40	100
10.	20CS323	Operating Systems Laboratory	PCC	0	0	3	1	60	40	100
11.	20HR351	Career Development Skills I (Common To All Branches)	EEC	0	2	0	0	60	40	100
Total				**18**	**3**	**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.	20MA441	Probability and Decision Models (Common to CS & IT)	BSC	3	1	0	4	40	60	100
2.	20CS411	Theory of Computation	PCC	3	1	0	4	40	60	100
3.	20CS412	Java programming	PCC	3	0	0	3	40	60	100
4.	20CS413	Database Management Systems	PCC	3	0	0	3	40	60	100
5.	20CS414	Design and Analysis of Algorithms	PCC	3	1	0	4	40	60	100
6.	20EE431	Microprocessors and Microcontrollers	ESC	3	0	0	3	40	60	100
PRACTICAL										
7.	20CS421	Java programming Laboratory	PCC	0	0	3	1	60	40	100
8.	20CS422	Database Management Systems Laboratory	PCC	0	0	3	1	60	40	100
9.	20EE425	Microprocessors and Microcontrollers Laboratory	ESC	0	0	3	1	60	40	100
10.	20HR432	Career Development Skills II	EEC	0	2	0	0	60	40	100
Total				**18**	**5**	**9**	**24**			**1000**

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

Department	Department of Computer Science and Engineering
Programme	B.E - Computer Science and Engineering

SEMESTER – V

Sl.No.	Course Code	Course Name	Category	Hours/ Week			Credit	Maximum Marks		
				L	T	P	C	CA	ES	Total
THEORY										
1.	20CS511	Principles of Compiler Design	PCC	3	1	0	4	40	60	100
2.	20CS512	Web Programming	PCC	3	0	0	3	40	60	100
3.	20CS513	Object Oriented Analysis and Design	PCC	3	0	0	3	40	60	100
4.	20CS514	Computer Networks	PCC	3	0	0	3	40	60	100
5.	20CS515	Entrepreneurship Development	HSMC	3	0	0	3	40	60	100
6.		Professional Elective – I	PEC	3	0	0	3	40	60	100
PRACTICAL										
7.	20CS521	Web Programming Laboratory	PCC	0	0	3	1	60	40	100
8.	20CS522	Computer Networks Laboratory	PCC	0	0	3	1	60	40	100
9.	20HR533	Career Development Skills III	EEC	0	2	0	0	60	40	100
Total				**18**	**3**	**6**	**21**			**900**

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 Harmony (Common To All Branches)	HSMC	3	0	0	3	40	60	100
2.	20CS601	C# and .Net Framework (Common To CS & EC)	PCC	3	0	0	3	40	60	100
3.	20CS611	Cryptography and Network Security	PCC	3	0	0	3	40	60	100
4.	20CS612	Software testing	PCC	3	0	0	3	40	60	100
5.		Professional Elective – II	PEC	3	0	0	3	40	60	100
6.		Open Elective – I	OEC	3	0	0	3	40	60	100
PRACTICAL										
7.	20CS621	C# and .Net Framework Laboratory	PCC	0	0	3	1	60	40	100
8.	20CS622	Mini project	PROJ	0	0	6	3	60	40	100
9.	20HR634	Career Development Skills IV	EEC	0	2	0	0	60	40	100
Total				**18**	**2**	**9**	**22**			**900**

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

Department	Department of Computer Science and Engineering
Programme	B.E - Computer Science and Engineering

SEMESTER - VII

Sl.No.	Course Code	Course Name	Category	Hours/ Week			Credit	Maximum Marks		
				L	T	P	C	CA	ES	Total
THEORY										
1.	20CS711	Mobile Computing	PCC	3	0	0	3	40	60	100
2.	20CS712	Graphics and Multimedia	PCC	3	0	0	3	40	60	100
3.	20CS713	Cloud and Big Data Analytics	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.	20CS721	Graphics and Multimedia Laboratory	PCC	0	0	3	1	60	40	100
8.	20CS722	Cloud and Big Data Laboratory	PCC	0	0	3	1	60	40	100
Total				**18**	**0**	**6**	**20**			**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.		Open Elective – III	OEC	3	0	0	3	40	60	100
PRACTICAL										
3.	20CS821	Project Work	PROJ	0	0	12	6	60	40	100
Total				**6**	**0**	**12**	**12**			**300**

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Department	Department of Computer Science and Engineering
Programme	B.E -Computer Science and Engineering

List of Electives

PROFESSIONAL ELECTIVE - I (SEMESTER - V)

Sl.No.	Course Code	Course Name	Specialization	Category	Hours/ Week			Credit	Maximum Marks		
					L	T	P	C	CA	ES	Total
1.	20CS561	Distributed Systems	S4	PEC	3	0	0	3	40	60	100
2.	20IE591	Augmented Intelligence led Managed Services – I (Industry Elective)	S1	PEC	3	0	0	3	40	60	100
3.	20CS563	Data Warehousing and Data Mining	S2	PEC	3	0	0	3	40	60	100
4.	20CS564	Open Source Technologies	S1	PEC	3	0	0	3	40	60	100
5.	20CS565	Advanced Database Technology	S2	PEC	3	0	0	3	40	60	100
6.	20CS566	Artificial Intelligence and Expert Systems	S4	PEC	3	0	0	3	40	60	100

PROFESSIONAL ELECTIVE - II (SEMESTER - VI)

Sl.No.	Course Code	Course Name	Specialization	Category	Hours/ Week			Credit	Maximum Marks		
					L	T	P	C	CA	ES	Total
1.	20CS661	Green computing	S4	PEC	3	0	0	3	40	60	100
2.	20IE691	Augmented Intelligence led Managed Services – II (Industry Elective)	S1	PEC	3	0	0	3	40	60	100
3.	20CS663	Internet of Things	S2	PEC	3	0	0	3	40	60	100
4.	20CS664	Android Application Development	S2	PEC	3	0	0	3	40	60	100
5.	20CS665	Application Frameworks	S1	PEC	3	0	0	3	40	60	100
6.	20CS666	High Speed Networks	S3	PEC	3	0	3	3	40	60	100

PROFESSIONAL ELECTIVE – III (SEMESTER - VII)											
Sl.No.	Course Code	Course Name	Specialization	Category	Hours/ Week			Credit	Maximum Marks		
					L	T	P	C	CA	ES	Total
1.	20CS761	Information Security	S3	PEC	3	0	0	3	40	60	100
2.	20CS762	Social network analysis	S3	PEC	3	0	0	3	40	60	100
3.	20CS763	Agile Software Development	S4	PEC	3	0	0	3	40	60	100
4.	20CS764	User Interface Design	S2	PEC	3	0	0	3	40	60	100
5.	20CS765	Business Intelligence	S2	PEC	3	0	0	3	40	60	100
6.	20CS766	Soft Computing	S1	PEC	3	0	0	3	40	60	100

PROFESSIONAL ELECTIVE – IV (SEMESTER – VII)											
Sl.No.	Course Code	Course Name	Specialization	Category	Hours/ Week			Credit	Maximum Marks		
					L	T	P	C	CA	ES	Total
1.	20CS767	Service Oriented Architecture	S4	PEC	3	0	0	3	40	60	100
2.	20CS768	Cyber Security	S3	PEC	3	0	0	3	40	60	100
3.	20CS769	Software Defined Networks	S3	PEC	3	0	0	3	40	60	100
4.	20CS771	Information storage management	S2	PEC	3	0	0	3	40	60	100
5.	20CS772	Machine Learning Techniques	S4	PEC	3	0	0	3	40	60	100
6.	20CS773	Data science	S2	PEC	3	0	0	3	40	60	100

PROFESSIONAL ELECTIVE – V (SEMESTER – VIII)											
Sl.No.	Course Code	Course Name	Specialization	Category	Hours/ Week			Credit	Maximum Marks		
					L	T	P	C	CA	ES	Total
1.	20CS861	Blockchain Technologies	S1	PEC	3	0	0	3	40	60	100
2.	20CS862	Ethical Hacking	S3	PEC	3	0	0	3	40	60	100
3.	20CS863	Software Project Management	S5	PEC	3	0	0	3	40	60	100
4.	20CS864	Knowledge Based Decision Support System	S5	PEC	3	0	0	3	40	60	100
5.	20CS865	Pervasive Computing	S1	PEC	3	0	0	3	40	60	100
6.	20CS866	Ad hoc and Sensor Networks	S3	PEC	3	0	0	3	40	60	100

B.E./B.TECH. HONOURS (SPECIALIZATION IN THE SAME DISCIPLINE): VERTICALS
Emerging Areas: Computer science and Engineering

(i) 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.

Vertical Courses

VERTICAL – I: FULL STACK DEVELOPMENT											
Sl.No.	Course Code	Course Name	Specialization	Category	Hours/ Week			Credit	Maximum Marks		
					L	T	P	C	CA	ES	Total
1.	20CS567	Fundamentals of DevOps	S1	PEC	3	0	0	3	40	60	100
2.	20CS568	Augmented Reality and Virtual Reality	S1	PEC	3	0	0	3	40	60	100
3.	20CS664	Android Application Development	S1	PEC	3	0	0	3	40	60	100
4.	20CS665	Application Frameworks	S1	PEC	3	0	0	3	40	60	100
5.	20CS774	R Programming	S1	PEC	3	0	0	3	40	60	100
6.	20CS775	Web Application Security	S1	PEC	3	0	0	3	40	60	100
7.	20CS867	UI and UX Design	S1	PEC	3	0	0	3	40	60	100
8.	20CS868	Principles of Programming Languages	S1	PEC	3	0	0	3	40	60	100

VERTICAL – 2: CLOUD COMPUTING AND SECURITY											
Sl.No.	Course Code	Course Name	Specialization	Category	Hours/ Week			Credit	Maximum Marks		
					L	T	P	C	CA	ES	Total
1.	20CS563	Data Warehousing and Data Mining	S2	PEC	3	0	0	3	40	60	100
2.	20CS667	Cloud Services Management	S4	PEC	3	0	0	3	40	60	100
3.	20CS768	Cyber Security	S3	PEC	3	0	0	3	40	60	100
4.	20CS773	Data science	S2	PEC	3	0	0	3	40	60	100
5.	20CS776	Storage Technologies	S3	PEC	3	0	0	3	40	60	100
6.	20CS861	Blockchain Technologies	S2	PEC	3	0	0	3	40	60	100
7.	20CS862	Ethical Hacking	S3	PEC	3	0	0	3	40	60	100
8.	20CS869	Security and Privacy in Cloud	S3	PEC	3	0	0	3	40	60	100

S1 - Recent Technologies and Computing
S2 - Data and Knowledge Engineering
S3 - Computer Networks and Security
S4 - Systems and Software Engineering
S5 - Entrepreneurship and Managerial Skills

OPEN ELECTIVE COURSES

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

Sl.No.	Course Code	Course Name	Specialization	Category	Hours/ Week			Credit	Maximum Marks		
					L	T	P	C	CA	ES	Total
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
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											

Sl.No.	Course Code	Course Name	Specialization	Category	Hours/ Week			Credit	Maximum Marks		
					L	T	P	C	CA	ES	Total
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 Intelligenc	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
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 Agricultura 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

Sl.No.	Course Code	Course Name	Specialization	Category	Hours/ Week			Credit	Maximum Marks		
					L	T	P	C	CA	ES	Total
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

LIST OF VALUE ADDED COURSES

Sl. No.	Course Code	Course Name	Number of Hours	Offered by Internal / External
1	VACCS01	Core Java	15 Hours	CSE/KSRCE
2	VACCS02	Full Stack Development	15 Hours	CSE/KSRCE
3	VACCS03	C# and .Net	15 Hours	CSE/KSRCE
4	VACCS04	App Development	15 Hours	CSE/KSRCE
5	VACCS05	Python Programming in Machine Learning	15 Hours	CSE/KSRCE
6	VACCS06	Advanced C Programming	15 Hours	CSE/KSRCE
7	VACCS07	Website Design and Development	15 Hours	CSE/KSRCE
8	VACCS08	Service Now	15 Hours	CSE/KSRCE
9	VACCS09	Salesforce Developers	15 Hours	CSE/KSRCE
10	VACCS10	Digital Marketing	15 Hours	CSE/KSRCE
11	VACCS11	Intellectual Property Rights	15 Hours	EXTERNAL
12	VACCS12	General Physiology	15 Hours	EXTERNAL
13	VACCS13	Disaster Management	15 Hours	EXTERNAL
14	VACCS14	Basic Knowledge about Grooming	15 Hours	EXTERNAL
15	VACCS15	Yoga and Fitness Practical	15 Hours	EXTERNAL

COURSE COMPONENT SUMMARY

S. No.	Subject Area	Credits Per Semester								Credits Total	Percentage Credits
		I	II	III	IV	V	VI	VII	VIII		
1.	**HSMC**	3	3	-	-	3	3	-	-	12	7.40
2.	**BSC**	8	8	4	4	-	-	-	-	24	14.8
3.	**ESC**	8	5	-	4	-	-	-	-	17	10.49
4.	**PCC**	-	4	18	16	15	10	11	-	74	45.67
5.	**PEC**	-	-	-	-	3	3	6	3	15	9.25
6.	**OEC**	-	-	-	-	-	3	3	3	9	5.55
7.	**PROJ**	-	-	-	-	-	3	-	6	9	5.55
8.	**MC**	-	1	1	-	-	-	-	-	2	1.23
TOTAL		**19**	**21**	**23**	**24**	**21**	**22**	**20**	**12**	**162**	**100**

HSMC - Humanities and Social Sciences including Management courses
BSC - Basic Science Courses
ESC - Engineering Science Courses
PCC - Professional core courses
PEC- Professional Elective courses
OEC - Open Elective courses
MC - Mandatory courses
PROJ - Project

Total No. of Credits = 162

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

B.E. COMPUTER SCIENCE AND ENGINEERING

CURRICULUM & SYLLABI

Regulations 2020

(Applicable to candidates admitted in the Academic Year 2023 - 2024)

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

Namakkal (Dt), Tamilnadu, India

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

(Autonomous)

DEPARTMENT OF COMPUTER SCIENCE AND ENIGNEERING

(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 mutually beneficial partnership with global industries and Institutions through knowledge sharing, collaborative research and innovation.

Vision of the Department / Programme: (Computer Science and Engineering)

DV	To create ever green professionals for software industry, academicians for knowledge cultivation and researchers for contemporary society modernization.

Mission of the Department / Programme: (Computer Science and Engineering)

DM 1	To produce proficient design, code and system engineers for software development.
DM 2	To keep updated contemporary technology and fore coming challenges for welfare of the society.

Programme Educational Objectives (PEOs): (Computer Science and Engineering)

The graduates of the programme will be able to

PEO 1	**Rational Computing:** Figure out, formulate, analyze typical problems and develop effective solutions by imparting the idea and principles of science, mathematics, engineering fundamentals and computing.
PEO 2	**Professional Excellence:** Competent professionally and successful in their chosen career through life-long learning.
PEO 3	**Social and Ethical Technocrats:** Excel individually or as member of a team in carrying out projects and exhibit social needs and follow professional ethics.

Programme Outcomes (POs) of B.E. - Computer Science and 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, and demonstrate the knowledge of, and need for sustainable development.
PO8	**Ethics:** Apply ethical principles and commit to professional ethics and 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	**Technical competency:** Develop and Implement computer solutions that accomplish goals to the industry, government or research by exploring new technologies.
PSO2	**Professional awareness:** Grow intellectually and professionally in the chosen field.

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Department	Department of Computer Science and Engineering
Programme	B.E - Computer Science and 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.	20CH051	Engineering Chemistry (Common To All Branches)	BSC	3	0	0	3	40	60	100
4.	20EE041	Basics of Electrical and Electronics Engineering (Common To AU, CE, CS, CSD,IOT,IT, ME & SF)	ESC	3	0	0	3	40	60	100
5.	20CS142	Problem Solving Techniques (Common To CS & EC)	ESC	3	0	0	3	40	60	100
MANDATORY COURSES										
6.	20MC151	Induction Program* (Common To All Branches)	MC	0	0	0	0	-	-	-
7.	20GE051	தமிழ் மரபு/Heritage of Tamils (Common to all branches)	MC	3	0	0	1	40	60	100
PRACTICAL										
8.	20CH028	Chemistry Laboratory (Common To All Branches)	BSC	0	0	3	1	60	40	100
9.	20CS171	Problem Solving Techniques Laboratory (Common To CS & EC)	ESC	0	0	3	1	60	40	100
10.	20AU127	Engineering Graphics Laboratory (Common To CE,CS,CSD,EC,EE & IT)	ESC	0	0	3	1	60	40	100
			Total	**17**	**1**	**10**	**20**			**900**

*** Induction Program will be conducted for 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.	20MA232	Discrete Mathematics (Common To CS,CSD,IOT & IT)	BSC	3	1	0	4	40	60	100
3.	20PH051	Engineering Physics (Common To All Branches)	BSC	3	0	0	3	40	60	100
4.	20EE231	Digital Principles and Computer Design	ESC	3	0	0	3	40	60	100
5.	20CS211	C Programming	PCC	3	0	0	3	40	60	100
MANDATORY COURSES										
6.	20MC052	Environmental Science and Engineering (Common To All Branches)	MC	3	0	0	0	-	-	-
7.	20GE052	தமிழரும் தொழில்நுட்பமும்/ Tamils and Technology (Common to all branches)	MC	3	0	0	1	40	60	100
PRACTICAL										
8.	20PH028	Physics Laboratory (Common To All Branches)	BSC	0	0	3	1	60	40	100
9.	20EE225	Digital Systems Laboratory	ESC	0	0	3	1	60	40	100
10.	20CS221	C Programming Laboratory	PCC	0	0	3	1	60	40	100
11.	20GE028	Manufacturing Practices Laboratory (Common To All Branches)	ESC	0	0	3	1	60	40	100
		Total		**17**	**1**	**13**	**21**			**1000**

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SEMESTER – III

Sl.No.	Course Code	Course Name	Category	Hours/ Week			Credit	Maximum Marks		
				L	T	P	C	CA	ES	Total
THEORY										
1.	20MA343	Numerical Computational Techniques (Common To CS,CSD,IOT & IT)	BSC	3	1	0	4	40	60	100
2.	20CS311	Python Programming	PCC	3	0	0	3	40	60	100
3.	20CS312	Data Structures	PCC	3	0	0	3	40	60	100
4.	20CS313	Operating systems	PCC	3	0	0	3	40	60	100
5.	20CS314	Computer Organization and Architecture	PCC	3	0	0	3	40	60	100
6.	20CS315	Software Engineering	PCC	3	0	0	3	40	60	100
PRACTICAL										
7.	20CS321	Python Programming Laboratory	PCC	0	0	3	1	60	40	100
8.	20CS322	Data Structures Laboratory	PCC	0	0	3	1	60	40	100
9.	20CS323	Operating Systems Laboratory	PCC	0	0	3	1	60	40	100
10.	20HR351	Career Development Skills I (Common To All Branches)	EEC	0	2	0	0	60	40	100
Total				**18**	**3**	**9**	**22**			**1000**

SEMESTER – IV

Sl.No.	Course Code	Course Name	Category	Hours/ Week			Credit	Maximum Marks		
				L	T	P	C	CA	ES	Total
THEORY										
1.	20MA441	Probability and Decision Models (Common To CS,CSD,IOT & IT)	BSC	3	1	0	4	40	60	100
2.	20CS411	Theory of Computation	PCC	3	1	0	4	40	60	100
3.	20CS412	Java programming	PCC	3	0	0	3	40	60	100
4.	20CS413	Database Management Systems	PCC	3	0	0	3	40	60	100
5.	20CS414	Design and Analysis of Algorithms	PCC	3	1	0	4	40	60	100
6.	20EE431	Microprocessors and Microcontrollers	ESC	3	0	0	3	40	60	100
PRACTICAL										
7.	20CS421	Java programming Laboratory	PCC	0	0	3	1	60	40	100
8.	20CS422	Database Management Systems Laboratory	PCC	0	0	3	1	60	40	100
9.	20EE425	Microprocessors and Microcontrollers Laboratory	ESC	0	0	3	1	60	40	100
10.	20HR432	Career Development Skills II	EEC	0	2	0	0	60	40	100
Total				**18**	**5**	**9**	**24**			**1000**

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SEMESTER – V

Sl.No.	Course Code	Course Name	Category	Hours/ Week			Credit	Maximum Marks		
				L	T	P	C	CA	ES	Total
THEORY										
1.	20CS511	Principles of Compiler Design	PCC	3	1	0	4	40	60	100
2.	20CS512	Web Programming	PCC	3	0	0	3	40	60	100
3.	20CS513	Object Oriented Analysis and Design	PCC	3	0	0	3	40	60	100
4.	20CS514	Computer Networks	PCC	3	0	0	3	40	60	100
5.	20CS515	Entrepreneurship Development	HSMC	3	0	0	3	40	60	100
6.		Professional Elective – I	PEC	3	0	0	3	40	60	100
PRACTICAL										
7.	20CS521	Web Programming Laboratory	PCC	0	0	3	1	60	40	100
8.	20CS522	Computer Networks Laboratory	PCC	0	0	3	1	60	40	100
9.	20HR533	Career Development Skills III	EEC	0	2	0	0	60	40	100
Total				**18**	**3**	**6**	**21**			**900**

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 Harmony (Common To All Branches)	HSMC	3	0	0	3	40	60	100
2.	20CS601	C# and .Net Framework (Common To CS & EC)	PCC	3	0	0	3	40	60	100
3.	20CS611	Cryptography and Network Security	PCC	3	0	0	3	40	60	100
4.	20CS612	Software testing	PCC	3	0	0	3	40	60	100
5.		Professional Elective – II	PEC	3	0	0	3	40	60	100
6.		Open Elective – I	OEC	3	0	0	3	40	60	100
PRACTICAL										
7.	20CS621	C# and .Net Framework Laboratory	PCC	0	0	3	1	60	40	100
8.	20CS622	Mini project	PROJ	0	0	6	3	60	40	100
9.	20HR634	Career Development Skills IV	EEC	0	2	0	0	60	40	100
Total				**18**	**2**	**9**	**22**			**900**

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SEMESTER - VII

Sl.No.	Course Code	Course Name	Category	Hours/ Week			Credit	Maximum Marks		
				L	T	P	C	CA	ES	Total
THEORY										
1.	20CS711	Mobile Computing	PCC	3	0	0	3	40	60	100
2.	20CS712	Graphics and Multimedia	PCC	3	0	0	3	40	60	100
3.	20CS713	Cloud and Big Data Analytics	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.	20CS721	Graphics and Multimedia Laboratory	PCC	0	0	3	1	60	40	100
8.	20CS722	Cloud and Big Data Laboratory	PCC	0	0	3	1	60	40	100
Total				**18**	**0**	**6**	**20**			**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.		Open Elective – III	OEC	3	0	0	3	40	60	100
PRACTICAL										
3.	20CS821	Project Work	PROJ	0	0	12	6	60	40	100
Total				**6**	**0**	**12**	**12**			**300**

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List of Electives

PROFESSIONAL ELECTIVE - I (SEMESTER - V)

Sl.No.	Course Code	Course Name	Specialization	Category	Hours/ Week			Credit	Maximum Marks		
					L	T	P	C	CA	ES	Total
1.	20CS561	Distributed Systems	S4	PEC	3	0	0	3	40	60	100
2.	20IE591	Augmented Intelligence led Managed Services – I (Industry Elective)	S1	PEC	3	0	0	3	40	60	100
3.	20CS563	Data Warehousing and Data Mining	S2	PEC	3	0	0	3	40	60	100
4.	20CS564	Open Source Technologies	S1	PEC	3	0	0	3	40	60	100
5.	20CS565	Advanced Database Technology	S2	PEC	3	0	0	3	40	60	100
6.	20CS566	Artificial Intelligence and Expert Systems	S4	PEC	3	0	0	3	40	60	100

PROFESSIONAL ELECTIVE - II (SEMESTER - VI)

Sl.No.	Course Code	Course Name	Specialization	Category	Hours/ Week			Credit	Maximum Marks		
					L	T	P	C	CA	ES	Total
1.	20CS661	Green computing	S4	PEC	3	0	0	3	40	60	100
2.	20IE691	Augmented Intelligence led Managed Services – II (Industry Elective)	S1	PEC	3	0	0	3	40	60	100
3.	20CS663	Internet of Things	S2	PEC	3	0	0	3	40	60	100
4.	20CS664	Android Application Development	S2	PEC	3	0	0	3	40	60	100
5.	20CS665	Application Frameworks	S1	PEC	3	0	0	3	40	60	100
6.	20CS666	High Speed Networks	S3	PEC	3	0	3	3	40	60	100

PROFESSIONAL ELECTIVE – III (SEMESTER - VII)											
Sl.No.	Course Code	Course Name	Specialization	Category	Hours/ Week			Credit	Maximum Marks		
					L	T	P	C	CA	ES	Total
1.	20CS761	Information Security	S3	PEC	3	0	0	3	40	60	100
2.	20CS762	Social network analysis	S3	PEC	3	0	0	3	40	60	100
3.	20CS763	Agile Software Development	S4	PEC	3	0	0	3	40	60	100
4.	20CS764	User Interface Design	S2	PEC	3	0	0	3	40	60	100
5.	20CS765	Business Intelligence	S2	PEC	3	0	0	3	40	60	100
6.	20CS766	Soft Computing	S1	PEC	3	0	0	3	40	60	100

PROFESSIONAL ELECTIVE – IV (SEMESTER – VII)											
Sl.No.	Course Code	Course Name	Specialization	Category	Hours/ Week			Credit	Maximum Marks		
					L	T	P	C	CA	ES	Total
1.	20CS767	Service Oriented Architecture	S4	PEC	3	0	0	3	40	60	100
2.	20CS768	Cyber Security	S3	PEC	3	0	0	3	40	60	100
3.	20CS769	Software Defined Networks	S3	PEC	3	0	0	3	40	60	100
4.	20CS771	Information storage management	S2	PEC	3	0	0	3	40	60	100
5.	20CS772	Machine Learning Techniques	S4	PEC	3	0	0	3	40	60	100
6.	20CS773	Data science	S2	PEC	3	0	0	3	40	60	100

PROFESSIONAL ELECTIVE – V (SEMESTER – VIII)											
Sl.No.	Course Code	Course Name	Specialization	Category	Hours/ Week			Credit	Maximum Marks		
					L	T	P	C	CA	ES	Total
1.	20CS861	Blockchain Technologies	S1	PEC	3	0	0	3	40	60	100
2.	20CS862	Ethical Hacking	S3	PEC	3	0	0	3	40	60	100
3.	20CS863	Software Project Management	S5	PEC	3	0	0	3	40	60	100
4.	20CS864	Knowledge Based Decision Support System	S5	PEC	3	0	0	3	40	60	100
5.	20CS865	Pervasive Computing	S1	PEC	3	0	0	3	40	60	100
6.	20CS866	Ad hoc and Sensor Networks	S3	PEC	3	0	0	3	40	60	100

B.E./B.TECH. HONOURS (SPECIALIZATION IN THE SAME DISCIPLINE): VERTICALS
Emerging Areas: Computer science and Engineering

(i) 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.

Vertical Courses

VERTICAL – I: FULL STACK DEVELOPMENT											
Sl.No.	Course Code	Course Name	Specialization	Category	Hours/ Week			Credit	Maximum Marks		
					L	T	P	C	CA	ES	Total
1.	20CS567	Fundamentals of DevOps	S1	PEC	3	0	0	3	40	60	100
2.	20CS568	Augmented Reality and Virtual Reality	S1	PEC	3	0	0	3	40	60	100
3.	20CS664	Android Application Development	S1	PEC	3	0	0	3	40	60	100
4.	20CS665	Application Frameworks	S1	PEC	3	0	0	3	40	60	100
5.	20CS774	R Programming	S1	PEC	3	0	0	3	40	60	100
6.	20CS775	Web Application Security	S1	PEC	3	0	0	3	40	60	100
7.	20CS867	UI and UX Design	S1	PEC	3	0	0	3	40	60	100
8.	20CS868	Principles of Programming Languages	S1	PEC	3	0	0	3	40	60	100

VERTICAL – 2: CLOUD COMPUTING AND SECURITY											
Sl.No.	Course Code	Course Name	Specialization	Category	Hours/ Week			Credit	Maximum Marks		
					L	T	P	C	CA	ES	Total
1.	20CS563	Data Warehousing and Data Mining	S2	PEC	3	0	0	3	40	60	100
2.	20CS667	Cloud Services Management	S4	PEC	3	0	0	3	40	60	100
3.	20CS768	Cyber Security	S3	PEC	3	0	0	3	40	60	100
4.	20CS773	Data science	S2	PEC	3	0	0	3	40	60	100
5.	20CS776	Storage Technologies	S3	PEC	3	0	0	3	40	60	100
6.	20CS861	Blockchain Technologies	S2	PEC	3	0	0	3	40	60	100
7.	20CS862	Ethical Hacking	S3	PEC	3	0	0	3	40	60	100
8.	20CS869	Security and Privacy in Cloud	S3	PEC	3	0	0	3	40	60	100

S1 - Recent Technologies and Computing
S2 - Data and Knowledge Engineering
S3 - Computer Networks and Security
S4 - Systems and Software Engineering
S5 - Entrepreneurship and Managerial Skills

OPEN ELECTIVE COURSES

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

Sl.No.	Course Code	Course Name	Specialization	Category	Hours/ Week			Credit	Maximum Marks		
					L	T	P	C	CA	ES	Total
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
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											

Sl.No.	Course Code	Course Name	Specialization	Category	Hours/ Week			Credit	Maximum Marks		
					L	T	P	C	CA	ES	Total
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 Intelligenc	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
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 Agricultura 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

Sl.No.	Course Code	Course Name	Specialization	Category	Hours/ Week			Credit	Maximum Marks		
					L	T	P	C	CA	ES	Total
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

LIST OF VALUE ADDED COURSES

Sl. No.	Course Code	Course Name	Number of Hours	Offered by Internal / External
1	VACCS01	Core Java	15 Hours	CSE/KSRCE
2	VACCS02	Full Stack Development	15 Hours	CSE/KSRCE
3	VACCS03	C# and .Net	15 Hours	CSE/KSRCE
4	VACCS04	App Development	15 Hours	CSE/KSRCE
5	VACCS05	Python Programming in Machine Learning	15 Hours	CSE/KSRCE
6	VACCS06	Advanced C Programming	15 Hours	CSE/KSRCE
7	VACCS07	Website Design and Development	15 Hours	CSE/KSRCE
8	VACCS08	Service Now	15 Hours	CSE/KSRCE
9	VACCS09	Salesforce Developers	15 Hours	CSE/KSRCE
10	VACCS10	Digital Marketing	15 Hours	CSE/KSRCE
11	VACCS11	Intellectual Property Rights	15 Hours	EXTERNAL
12	VACCS12	General Physiology	15 Hours	EXTERNAL
13	VACCS13	Disaster Management	15 Hours	EXTERNAL
14	VACCS14	Basic Knowledge about Grooming	15 Hours	EXTERNAL
15	VACCS15	Yoga and Fitness Practical	15 Hours	EXTERNAL

COURSE COMPONENT SUMMARY

S. No.	Subject Area	Credits Per Semester								Credits Total	Percentage Credits
		I	II	III	IV	V	VI	VII	VIII		
1.	**HSMC**	3	3	-	-	3	3	-	-	12	7.40
2.	**BSC**	8	8	4	4	-	-	-	-	24	14.8
3.	**ESC**	8	5	-	4	-	-	-	-	17	10.49
4.	**PCC**	-	4	18	16	15	10	11	-	74	45.67
5.	**PEC**	-	-	-	-	3	3	6	3	15	9.25
6.	**OEC**	-	-	-	-	-	3	3	3	9	5.55
7.	**PROJ**	-	-	-	-	-	3	-	6	9	5.55
8.	**MC**	1	1	-	-	-	-	-	-	2	1.23
TOTAL		**20**	**21**	**22**	**24**	**21**	**22**	**20**	**12**	**162**	**100**

HSMC - Humanities and Social Sciences including Management courses
BSC - Basic Science Courses
ESC - Engineering Science Courses
PCC - Professional core courses
PEC- Professional Elective courses
OEC - Open Elective courses
MC - Mandatory courses
PROJ – Project

Total No. of Credits = 162

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 Outcomes: On Completion of this 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 **[9]**

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 **[9]**

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 **[9]**

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 **[9]**

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 **[9]**

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 Newspaper – Drills using Minimal pairs – Presentation Skills.

Total = 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

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DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING
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. – Calculas vol I and Vol II, S.chand & Co, Sixth Edition, 2014.

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DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING
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
20CH051	**ENGINEERING CHEMISTRY** (Common to All Branches)	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:	*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.

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DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING
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**	**-**	**-**	**-**	**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
20EE041	**BASCIS OF ELECTRICAL AND ELCTRONICS ENGINEERING** (Common To AU, CE, CS, CSD, IOT, IT, ME & SF)	3	0	0	3

Prerequisite: *Engineering Mathematics, Engineering Physics*

Course Outcomes: On Completion of this course, the student will be able to		***Cognitive Level***
CO1:	*Solve the electric circuits by applying basic circuital laws for various combinations of circuit elements.*	*Apply*
CO2:	*Explain the construction, operating principle and application of DC motor and transformers.*	*Understand*
CO3:	*Enlighten the construction, operating principle and application of AC motors and Special Machines.*	*Understand*
CO4:	*Illustrate the function of various measuring instruments.*	*Understand*
CO5:	*Discuss the characteristics of Diodes, BJT and Digital systems.*	*Understand*

UNIT – I ELECTRICAL CIRCUITS [9]

Structural of Electrical Power System – Ohm's Law – Kirchhoff's Laws –circuit Analysis – Introduction to AC Circuits: R, RL & RLC series circuits, Average and RMS Value – Power and Power factor for single phase Circuits – Three Phase Star and Delta Connections – Electrical safety.

UNIT – II DC MOTOR AND TRANSFORMERS [9]

Faraday's Law – Lenz's Law-Fleming's left hand and right hand rule, DC Motor: Construction – Operation-series and shunt motor Characteristics Applications. Single Phase Transformer: Construction – Operation – EMF Equation – Types – Applications.

UNIT – III AC MOTORS & SPECIAL MACHINES [9]

Single Phase Induction Motor: Construction – Operation – Split Phase Induction Motor and Capacitor Start Induction Run Motor – Applications, Three Phase Induction Motor: Construction – Operation – Types – Applications. Special Machines: Stepper Motor.

UNIT– IV MEASURING INSTRUMENTS [9]

Basic Methods of Measurements: Direct and Indirect, Functional elements of an instrument – Errors in measurements– Analog and Digital Instruments – Basic Principle of Indicating Instruments – Moving Coil and Moving Iron Ammeter and Voltmeter. Dynamometer type Wattmeter – Induction type Energy Meter – Cathode Ray Oscilloscope.

UNIT – V ANALOG AND DIGITAL ELECTRONICS [9]

Semiconductor devices: PN Junction Diode, Zener diode: Operation and Characteristics – Bipolar Junction Transistor – CE Configurations and its Characteristics. Review of number systems – Digital logic gates – Introduction to Microprocessors.

Total = 45 Periods

Text Books :

1 Smarajit Ghosh, Fundamentals of Electrical and Electronics Engineering, PHI Learning Private Limited, New Delhi, Second Edition, 2007.
2 Jegathesan, V., VinothKumar, K., Saravanakumar, R., Basic Electrical and Electronics Engineering, Wiley India, New Delhi, First Edition, 2012.

Reference Books :

1 Muthusubramanian, R., Salivahanan, S., and Muraleedharan, K.A., Basic Electrical, Electronics and Computer Engineering, Tata McGraw Hill, New Delhi, Second Edition, 2006.
2 Nagsarkar, T.K., and Sukhija M.S., Basics of Electrical Engineering, Oxford University press, New Delhi, Ninth Edition, 2005.
3 Mehta, V.K and Rohit Mehta, Principle of Electrical Engineering, S Chand & Company, New Delhi, Second Edition, 2008.
4 Mahmood Nahvi and Joseph A. Edminister, Electric Circuits, Schaum Outline Series, McGraw Hill, New Delhi, Fifth Edition, 2002.

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DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING
CO-PO MAPPING

Regulation: **R 2020**

Course Code: **20EE041** **Course Name:** **BASCIS OF ELECTRICAL AND ELCTRONICS ENGINEERING**

CO	Course Outcomes	Programme Outcomes													
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	*Solve the electric circuits by applying basic circuital laws for various combinations of circuit elements.*	3	2	2	-	-	-	-	-	-	-	-	1	-	-
CO2	*Explain the construction, operating principle and application of DC motor and transformers.*	3	3	2	-	-	2	1	1	-	-	-	1	-	-
CO3	*Enlighten the construction, operating principle and application of AC motors and Special Machines.*	3	2	2	-	-	2	1	1	-	-	-	1	-	-
CO4	*Illustrate the function of various measuring instruments.*	3	3	2	-	-	2	1	1	-	-	-	1	-	-
CO5	*Discuss the characteristics of Diodes, BJT and Digital systems.*	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
20CS142	**PROBLEM SOLVING TECHNIQUES** (Common To CS & EC)	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. Neeharika Adabala and V. Rajaraman, Fundamentals of Computers, PHI Learning, 6th Revised edition, 2014.

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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
20MC151	**INDUCTION PROGRAMME** (Common To All Branches)	0	0	0	0

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:	*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 choose 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 COMPUTER SCIENCE AND ENGINEERING
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	-	-	-	-
	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

		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:	*Insightthinai 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, VilluPattu, KaniyanKoothu, 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)

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DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

CO-PO MAPPING

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:	*Insight thinai 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 மருத்தவம் 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).

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DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

CO-PO MAPPING

Regulation: **R 2020**

Course Code: **20GE051** **Course Name:** **தமிழர்மரபு/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 – I

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

Prerequisite: *Knowledge of Engineering Chemistry*

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, New York, 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 COMPUTER SCIENCE AND ENGINEERING
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 – 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
20AU127	**ENGINEERING GRAPHICS LABORATORY** (Common To CE,CS,CSD,EC,EE & IT)	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:	*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 COMPUTER SCIENCE AND 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 – 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 Outcomes: On Completion of this 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 **[9]**

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 **[9]**

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 **[9]**

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 **[9]**

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 **[9]**

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 = 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

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DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING
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
20MA232	**DISCRETE MATHEMATICS** (Common To CS,CSD,IOT & IT)	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:	*Solve logical problems.*	*Understand*
CO2:	*Construct algorithms and derive complexities.*	*Understand*
CO3:	*Acquire the knowledge of sets that are required for developing computational models.*	*Remember*
CO4:	*Solving computational operations associated with functions.*	*Understand*
CO5:	*Apply the concepts of Graph theory and Combinatory in network algorithms.*	*Apply*

UNIT – I **PROPOSITIONAL CALCULUS** **[12]**

Propositions – Logical connectives – Compound propositions – Conditional and biconditional propositions – Truth tables – Tautologies and contradictions – Contra positive – Logical equivalences and implications – Normal forms – Principal conjunctive and disjunctive normal forms – Rules of inference Theory.

UNIT – II **PREDICATE CALCULUS** **[12]**

Predicates – Statement functions – Variables – Free and bound variables – Quantifiers – Universe of discourse – Logical equivalences and implications for quantified statements – Theory of inference – The rules of universal specification and generalization.

UNIT – III **SET THEORY** **[12]**

Cartesian product of sets – Relation on sets – Types of relations and their properties – Relational matrix and the graph of a relation – Equivalence relations – Partial ordering – Poset – Hasse diagram.

UNIT – IV **FUNCTIONS** **[12]**

Definition – Classification of functions – Composition of functions – Inverse functions – Binary and n-ary operations – Characteristic function of set – Permutation functions.

UNIT – V **GRAPH THEORY AND COMBINATORICS** **[12]**

Graphs: Graph terminology and special types of graphs – Representing graphs and graph isomorphism – connectivity – Euler and Hamilton paths – Matching. Combinatorics: Mathematical Induction – The Basics of Counting – Pigeonhole Principle – Recurrence Relations – Generating Functions.

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

Text Books :

1 Trembly J.P, and Manohar R, Discrete Mathematical Structures with Applications to Computer Science, Tata McGraw–Hill Publishing Co. Ltd, New Delhi, Forty third Re-print ,2014.

2 Venkatraman M.K, Sridharan. N and Chandrasekaran N. Discrete Mathematics, The National Publishing Company, Chennai, Fourth edition, 2014.

Reference Books :

1 Kenneth. H. Rosen, Discrete Mathematics and its Applications, Tata McGraw Hill P.Co, New Delhi, Seventh Edition, 2014.

2 Bernard Kolman, Robert C. Busby, Sharan Cutler Ross, Discrete Mathematical Structures, Pearson Education Pvt Ltd ,New Delhi, Sixth Edition, 2013.

3 Seymour Lipschutz, Discrete Mathematics, Schaum'soulines series, Tata McGraw Hill P.Co, New Delhi, Second Edition, 2012.

4 N. Subramanian, Discrete Mathematics, SCM Publications, Erode, 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: 20MA232 **Course Name: DISCRETE MATHEMATICS**

CO	Course Outcomes	Programme Outcomes													
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	*Solve logical problems.*	3	3	3	3	-	-	-	-	-	-	-	-	-	-
CO2	*Construct algorithms and derive complexities.*	3	3	3	3	-	-	-	-	-	-	-	-	-	-
CO3	*Developing computational models.*	3	3	3	3	-	-	-	-	-	-	-	-	-	-
CO4	*Solving computational operations associated with functions.*	3	3	3	3	-	-	-	-	-	-	-	-	-	-
CO5	*Apply the concepts of Graph theory and Combinatory in network algorithms.*	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 – II

		L	T	P	C
20PH051	**ENGINEERING PHYSICS** (Common to All Branches)	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:	*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, ninth 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, ninth edition, Cengage Learning, USA, 2013.

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

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DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING
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 – II

20EE231	DIGITAL PRINCIPLES AND COMPUTER DESIGN	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 various methods used for the simplification of boolean functions.*	*Understand*
CO2:	*Design and analyze the combinational circuits.*	*Analyze*
CO3:	*Construct and analyze the sequential circuits.*	*Analyze*
CO4:	*Apply the knowledge to design the processor unit.*	*Apply*
CO5:	*Summarize the simple computer design and HDL.*	*Remember*

UNIT – I BOOLEAN ALGEBRA AND LOGIC GATES [9]

Review of Number Systems – Arithmetic Operations – Binary Codes – Boolean Algebra and Theorems – Boolean Functions – Simplification of Boolean Functions using Karnaugh Map and Tabulation Methods – Logic Gates.

UNIT – II COMBINATIONAL LOGIC [9]

Combinational Circuits – Analysis and Design Procedures – Adder and Subtractor – Magnitude Comparator – Code Conversions – Decoders and Encoders – Multiplexers and Demultiplexers.

UNIT – III SYNCHRONOUS SEQUENTIAL LOGIC [9]

Sequential Circuits – Latches and Flip Flops – Analysis and Design Procedures – State Reduction and State Assignment – Shift Registers – Counters.

UNIT – IV PROCESSOR DESIGN [9]

Processor Organization – Design of ALU: Arithmetic Circuits – Logic Circuits – Arithmetic Logic Unit –Status Register – Design of Shifter – Processor Unit.

UNIT – V SIMPLE COMPUTER DESIGN AND HDL [9]

Inter Register Transfer – Conditional Control Statements – Instruction Codes – Design of a Simple Computer – Hardware Description Language (HDL) for Combinational Circuits and Sequential Logic Circuits.

Total = 45 Periods

Text Books :

1 Morris Mano, M., Digital Logic and Computer Design, Prentice-hall of India private limited, New Delhi, First Edition, 2016.

2 John F. Wakerly, Digital Design Principles and Practices, Pearson Education, Noida, Fourth Edition, 2008.

Reference Books :

1 Charles H. Roth Jr, Fundamentals of Logic Design, Jaico Publishing House, Mumbai, Fifth Edition, 2003.

2 Kharate, G.K., Digital Electronics, Oxford University Press, USA, 2012.

3 Morris Mano, M., and Michael D. Ciletti, Digital Design, Pearson Education, New Delhi, Fifth Edition, 2013.

4 Donald D. Givone, Digital Principles and Design, Tata Mcgraw Hill, Noida, First Edition, 2003.

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DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING
CO-PO MAPPING

Regulation: **R 2020**

Course Code: **20EE231** **Course Name:** **DIGITAL PRINCIPLES AND COMPUTER DESIGN**

CO	Course Outcomes	Programme Outcomes													
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	*Identify the various methods used for the simplification of boolean functions.*	3	2	3	-	-	-	-	-	-	-	-	2	-	-
CO2	*Design and analyze the combinational circuits.*	3	2	3	-	-	-	-	-	-	-	-	2	-	-
CO3	*Construct and analyze the sequential circuits.*	3	2	3	-	-	-	1	-	-	-	-	2	-	-
CO4	*Apply the knowledge to design the processor unit.*	3	2	3	-	-	-	1	-	-	-	-	2	-	-
CO5	*Summarize the simple computer design and HDL.*	3	2	3	-	-		1	-	-	-	-	2	-	-
	Average	**3**	**2**	**3**	-	-	-	**1**		-	-	-	**2**	**-**	-

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

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

SEMESTER – II

20CS211	**C PROGRAMMING**	L	T	P	C
		3	0	0	3

Prerequisite: *Fundamental knowledge in problem solving techniques.*

Course Outcomes: On Completion of this course , the student will be able to		***Cognitive level***
CO1:	*Choose the right data representation formats based on the requirements of the problem*	*Understand*
CO2:	*Categorize and abstract the programming task involve for given computational problem.*	*Analyze*
CO3:	*Use the comparison and limitations of the various programming construct and choose the right one for the task in hand.*	*Evaluate*
CO4:	*Identify the situation where the computational methods would be useful.*	*Apply*
CO5:	*Evaluate the task in which the file concepts are applicable and apply them to write programs.*	*Apply*

UNIT – I FUNDAMENTALS OF C PROGRAMMING [9]

History of C: Middle level language – Structured language – Programmer's language – Compilers Vs. Interpreters – Library and Linking – Expressions: Basic Data Types – Variables – C scopes –Type qualifiers –Storage class specifiers – Variable initialization – Constants – Operators – Expressions.

UNIT – II STATEMENTS, ARRAY AND STRING [9]

Statements: Selection Statements – Iteration statements – Jump statements – Expression statements – Block statements. Array: Single-Dimension arrays –Two-Dimensional arrays – Multidimensional arrays – String: Declaring and Initializing String Variables – String Handling Functions and Operations.

UNIT–III FUNCTIONS AND POINTERS [9]

Function: General form of function – Understanding the scope of a function – Function arguments – Recursion. Pointers: Pointer variables – Pointer Operators – Pointer expressions – Pointers and Arrays – Indexing pointer – Multiple indirections – Initializing pointers – Pointers to functions.

UNIT – IV STRUCTURES, UNIONS AND CONSOLE I/O [9]

Accessing Structure Members – Structure Assignments – Arrays of Structures – Passing Structures to Functions – Structure pointers – Arrays and Structures within structures. Unions – Console I/O: Reading and Writing Characters – Reading and Writing Strings – Formatted Console I/O: printf() and scanf().

UNIT – V FILES AND PREPROCESSORS [9]

Files: Streams and Files – File System Basics – fread () and fwrite () – fseek () and Random-Access I/O – fprintf () and fscanf () – Command line arguments. Preprocessor**:** #define, #error, #include, Conditional Compilation Directives, #undef.

Total = 45 Periods

Text Books :

1 Herbert Schildt, C - The Complete Reference, Tata McGraw-Hill, New Delhi, Fourth Edition, 2013.

2 Ashok N.Kamathane, Computer Programming, Pearson Education, New Delhi, Second Edition, 2014.

References :

1 Pradip Dey and Manas Ghosh, Fundamentals of Computing and Programming in C, Oxford University Press, Bengaluru, First Edition, 2013.

2 E. Balagurusamy, Programming in ANSI C, Tata McGraw-Hill, New Delhi, Sixth Edition, 2012.

3 Yashavant P. Kanetkar, Let Us C, BPB Publications, New Delhi, Seventeenth Edition, 2011.

4 Brian W. Kernighan, Dennis M. Ritchie, C Programming Language, Person Education, India, Second Edition, 2015.

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DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING
CO-PO MAPPING

Regulation: R 2020

Course Code: 20CS211 **Course Name: C PROGRAMMING**

CO	Course Outcomes	Programme Outcomes													
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	*Choose the right data representation formats based on the requirements of the problem*	3	3	1	3	1	-	-	-	1	-	-	1	2	2
CO2	*Categorize and abstract the programming task involve for given computational problem.*	3	3	1	3	2	-	-	-	1	-	-	1	3	3
CO3	*Use the comparison and limitations of the various programming construct and choose the right one for the task in hand.*	3	3	2	2	1	-	-	-	1	-	-	1	3	2
CO4	*Identify the situation where the computational methods would be useful.*	3	2	2	2	2	-	-	-	1	-	-	1	3	2
CO5	*Evaluate the task in which the file concepts are applicable and apply them to write programs.*	2	2	2	2	2	-	-	-	1	-	-	1	2	1
	Average	3	3	2	2	2	-	-	-	1	-	-	1	3	2

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

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

SEMESTER – II

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

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 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.

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DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING
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 - 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)

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DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING
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 மற்றும் 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 அம்மன்ஆலயம் மற்றும் 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 உருவாக்கும் தொழிற்சாலைகள் – கல் மணிகள் – கண்ணாடி மணிகள் – சுடு மண்மணிகள் – 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 மற்றும் 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- மக்களும் பண்பாடும்- கேகேபிள்ளை (வெளியீடு தமிழ்நாடு

பாடநூல் மற்றும் கல்வியில் பணிகள் கழகம்)

2 கணினித்தமிழ் - முனைவர் இல. சுந்தரம் (விகடன் பிரசுரம்)

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CO-PO MAPPING

Regulation: R 2020

Course Code: 20GE052 **Course Name: தமிழரும் தொழில் நுட்பமும்/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 – II

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

Prerequisite: *Knowledge in Engineering Physics*

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, Twelfth 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.

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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 – II

20EE225	**DIGITAL SYSTEMS LABORATORY**	L	T	P	C
		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:	*Outline basic Boolean theorems and verify their functionalities.*	*Understand*
CO2:	*Implement combinational circuits using logic gates.*	*Understand*
CO3:	*Design combinational circuits using MSI devices.*	*Apply*
CO4:	*Construct sequential circuits using MSI devices.*	*Apply*
CO5:	*Develop HDL models for combinational and sequential circuits.*	*Understand*

LIST OF EXPERIMENTS:

1. Verification of boolean theorems using logic gates.
2. Design and implementation of combinational circuits using logic gates for arbitrary functions, code converters.
3. Design and implementation of combinational circuits using MSI devices:
   a) 4 - bit binary adder / subtractor
   b) Parity generator / checker
   c) Multiplexers and De-Multiplexers
4. Design and implementation of sequential circuits:
   a) Shift-registers
   b) Synchronous counter
5. Coding combinational / sequential circuits using HDL.
6. Design and implementation of a simple digital system.

Total : 45 Periods

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CO-PO MAPPING

Regulation: **R 2020**

Course Code: **20EE225** **Course Name:** **DIGITAL SYSTEMS LABORATORY**

CO	Course Outcomes	Programme Outcomes													
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	*Outline basic Boolean theorems and verify their functionalities.*	1	-	3	-	-	-	-	2	2	-	-	1	-	-
CO2	*Implement combinational circuits using logic gates.*	1	-	3	-	-	-	-	2	2	-	-	1	-	-
CO3	*Design combinational circuits using MSI devices.*	1	-	3	-	-	-	-	2	2	-	-	1	-	-
CO4	*Construct sequential circuits* using *MSI devices.*	1	-	3	-	-	-	-	2	2	-	-	1	-	-
CO5	*Develop VHDL models for combinational and sequential circuits.*	1	-	3	-	-	-	-	2	2	-	-	1	-	-
	Average	**1**	**-**	**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
20CS221	**C PROGRAMMING LABORATORY**	0	0	3	1

Prerequisite: *Fundamental knowledge in problem solving techniques*

Course Outcomes: On Completion of this course , the student will be able to		***Cognitive level***
CO1:	*Apply the knowledge of programming using I/O Statements and expressions.*	*Apply*
CO2:	*Build code segments for handling control and looping statements.*	*Create*
CO3:	*Identify the allocation of static & dynamic memory and its utilization.*	*Evaluate*
CO4:	*Consume the knowledge of string handling functions.*	*Apply*
CO5:	*Demonstrate use files and command line arguments.*	*Understand*

LIST OF EXPERIMENTS:

1. I/O statements and expression.
2. Operators and Precedence of the operator.
3. Controls statements.
4. Decision making constructs.
5. Single and Multidimensional array.
6. String and String handling functions.
7. Functions and its types.
8. Recursion, call by value and call by reference.
9. Pointers.
10. Structures and unions.
11. Files & File handling functions.
12. Command line arguments.

Total : 45 Periods

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DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING
CO-PO MAPPING

Regulation: R 2020

Course Code: 20CS221 **Course Name: C PROGRAMMING LABORATORY**

CO	Course Outcomes	Programme Outcomes													
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	*Apply the knowledge of programming using I/O Statements and expressions.*	3	3	3	2	3	-	-	-	1	-	-	1	2	1
CO2	*Build code segments for handling control and looping statements.*	3	2	3	1	3	-	-	-	1	-	-	1	2	1
CO3	*Identify the allocation of static & dynamic memory and its utilization.*	3	3	3	2	3	-	-	-	1	-	-	1	3	2
CO4	*Consume the knowledge of string handling functions.*	3	3	3	1	3	-	-	-	1	-	-	1	2	1
CO5	*Demonstrate use files and command line arguments.*	3	3	2	2	3	-	-	-	1	-	-	1	1	2
	Average	**3**	**3**	**3**	**2**	**3**	**-**	**-**	**-**	**1**	**-**	**-**	**1**	**2**	**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
20GE028	**MANUFACTURING PRACTICES LABORATORY** (Common to All Branches)	0	0	3	1

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

GROUP A (CIVIL & MECHANICAL)

Course Outcomes: On Completion of this 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*

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.
   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.

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CO-PO MAPPING

Regulation: **R 2020**

Course Code: **20GE028** **Course Name:** **MANUFACTURING PRACTICES LABORATORY**

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	-	-
CO2	*Perform welding practice to join simple structures.*	2	-	-	3	-	-	-	3	1	-	-	3	-	-
CO3	*Practice simple operations in lathe and drilling machine.*	2	-	-	3	-	-	-	3	1	-	-	3	-	-
	Average	**2**	**-**	**-**	**3**	**-**	**-**	**-**	**3**	**1**	-	-	**3**	**-**	-

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

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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

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Regulation: **R 2020**

Course Code: **20GE028** **Course Name:** **MANUFACTURING PRACTICES LABORATORY**

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)

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SEMESTER – III

		L	T	P	C
20MA343	**NUMERICAL COMPUTATIONAL TECHNIQUES** (Common To CS,CSD, IOT & IT)	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:	*Solve polynomial, transcendental equations, simultaneous linear equations numerically.*	*Understand*
CO2:	*Predict the unknown values by using Interpolation techniques.*	*Apply*
CO3:	*Evaluate the problems in differentiation and integration by using numerical techniques.*	*Evaluate*
CO4:	*Solving the initial value problems for ordinary differential equations.*	*Remember*
CO5:	*Determine the numerical solutions to boundary value problems.*	*Remember*

UNIT – I **SOLUTIONS OF EQUATIONS AND EIGEN VALUE PROBLEMS** **[12]**

Solutions to polynomial and transcendental equations **–** Newton Raphson Method **–** Solutions to simultaneous linear system of equations by Gauss Elimination Method **–** Gauss Seidel Method - Inverse of a matrix by Gauss Jordan Method **–** Eigen value of a matrix by power method.

UNIT – II **INTERPOLATION AND APPROXIMATION** **[12]**

Interpolation **–** Newton's Forward and Backward difference interpolation Techniques **–** Newton's divided difference method **–** Lagrange's interpolation and Inverse Lagrange's interpolation methods.

UNIT – III **NUMERICAL DIFFERENTIATION AND INTEGRATION** **[12]**

Numerical differentiation using Newton's Forward and Backward difference interpolation methods **–** Numerical integration by Trapezoidal rule **–** Simpson's 1/3rd rule and 3/8th rule **–** Double integration using Trapezoidal and Simpson's rules.

UNIT – IV **INITIAL VALUE PROBLEMS FOR ORDINARY DIFFERENTIAL EQUATIONS** **[12]**

Solving ODE by Taylor's Series Method **–** Euler's Method for first order equation **–** Modified Euler's Method for first order equation **–** Fourth order Runge-Kutta method for solving first order equations – Adams and Milne's Predictor and Corrector Method.

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

Classification of PDE **–** One dimension heat equation by Crank Nicolson method **–** One dimensional wave equation **–** 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, Twelfth Edition, 2016.

2 Dr. M.K. Venkataraman, Numerical Methods in Science and Engineering, National Publishing Company, Chennai, Fourth Edition, 2012.

References :

1 SukhenduDey and Shishir Gupta, Numerical Methods, Tata McGraw Hill Publishing Company, New Delhi, First Edition, 2013.

2 Gerald.V, Applied Numerical Analysis, Pearson Education, New Delhi, Sixth Edition, 2013.

3 P. Kandasamy, K. Thilagavathy, K. Gunavathy Numerical Methods , S. Chand Company, New Delhi, Fifth Edition, 2016.

4 S.R.K. Iyengar, R.K.Jain, Numerical Methods, New Age International Publishers, New Delhi, First Edition, 2014.

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CO-PO MAPPING

Regulation: **R 2020**

Course Code: **20MA343** **Course Name:** **NUMERICAL COMPUTATIONAL TECHNIQUES**

CO	Course Outcomes	Programme Outcomes													
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	*Solve polynomial, transcendental equations, simultaneous linear equations numerically.*	3	3	3	3										
CO2	*Predict the unknown values by using Interpolation techniques.*	3	3	3	3										
CO3	*Evaluate the problems in differentiation and integration by using numerical techniques.*	3	3	3	3										
CO4	*Solving the initial value problems for ordinary differential equations.*	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

20CS311	**PYTHON PROGRAMMING**	L	T	P	C
		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:	*Illustrate basic concepts of python programming.*	*Understand*
CO2:	*Apply the necessary data structures includes list, tuple and dictionary in the required fields and exception handling.*	*Apply*
CO3:	*Analyze, design and implement the problems using OOP concepts.*	*Analyze*
CO4:	*Demonstrate the simple file operations and data manipulation techniques.*	*Understand*
CO5:	*Design web site using python 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 **HANDLING STRINGS AND EXCEPTIONS** **[9]**

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

UNIT – III **OBJECT ORIENTED PROGRAMMING CONCEPTS** **[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 PROGRAMING USING PYTHON** **[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, California, Fifth Edition, 2013

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

References :

1 Allen B. Downey, Think Python, O'Reilly Media, California, Second Edition 2016.

2 Bill Lubanovic, Introducing Python Modern Computing in Simple Packages, O'Reilly Media, California, First Edition, 2014

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

4 Mark Lutz, Python Pocket Reference, O'Reilly Media, California, Fifth Edition, 2014

5 www.python.org

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DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING
CO-PO MAPPING

Regulation: R 2020

Course Code: 20CS311 **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	-	-	-	1	-	-	3	3	2
CO2	*Apply the necessary data structures includes list, tuple and dictionary in the required fields and exception handling.*	3	3	3	2	2	-	-	-	1	-	-	3	3	2
CO3	*Analyze, design and implement the problems using OOP concepts.*	3	3	3	2	2	-	-	-	1	-	-	3	3	2
CO4	*Demonstrate the simple file operations and data manipulation techniques.*	3	3	3	3	2	-	-	-	1	-	-	2	3	3
CO5	*Design web site using python GUI.*	3	3	3	3	2	-	-	-	1	-	-	2	3	3
	Average	**3**	**3**	**3**	**2**	**2**	**-**	**-**	**-**	**1**	**-**	**-**	**3**	**3**	**2**

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

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

SEMESTER – III

20CS312	**DATA STRUCTURES**	L	T	P	C
		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:	*Construct the different linear data structure to solve simple problems.*	*Understand*
CO2:	*Build the various tree structures with its operations.*	*Create*
CO3:	*Analyze the concept of AVL tree, splay tree, B tree and B+ tree.*	*Analyze*
CO4:	*Apply graph data structure to solve real time problems.*	*Apply*
CO5:	*Evaluate various sorting, hashing and searching techniques.*	*Evaluate*

UNIT– I LINEAR DATA STRUCTURES-ARRAY AND LINKED LIST [9]

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 LINEAR DATA STRUCTURES-STACK AND QUEUE [9]

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-Circular Queue – Applications of Queues

UNIT – III NON LINEAR DATA STRUCTURES-TREE STRUCTURES [9]

Tree ADT – Binary Tree ADT – Binary Tree Traversal – Expression Trees – Applications of Trees – Binary Search Tree – AVL Trees – B Tree – B+ Tree – Binary Heaps – Applications of Priority Queues.

UNIT – IV NON LINEAR DATA STRUCTURES -GRAPHS [9]

Introduction to Graphs and its Types – Breadth First Traversal – Depth First Traversal – Topological Sort – Biconnectivity – Minimum Spanning Tree: Prim's and Kruskal's algorithms –- Shortest Path Algorithms : Dijkstra's Algorithm – Applications of Graphs.

UNIT – V SEARCHING,HASHING AND SORTING [9]

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

Total = 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

References :

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. Robert Sedgewick and Kevin Wayne, Algorithms, Pearson Education, India, Fourth Edition, 2017.

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DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING
CO-PO MAPPING

Regulation: R 2020

Course Code: 20CS312 **Course Name: DATA STRUCTURES**

CO	Course Outcomes	Programme Outcomes													
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	*Construct the different linear data structure to solve simple problems.*	3	2	3	2	2	-	-	-	-	-	3	2	3	2
CO2	*Build the various tree structures with its operations.*	3	2	3	2	2	-	-	-	-	-	3	2	**3**	**2**
CO3	*Analyze the concept of AVL tree, splay tree, B tree and B+ tree.*	3	3	2	2	2	-	-	-	-	-	3	2	**3**	**2**
CO4	*Apply graph data structure to solve real time problems.*	3	2	2	2	2	-	-	-	-	-	3	2	**3**	**2**
CO5	*Evaluate various sorting, hashing and searching techniques.*	3	2	2	2	2	-	-	-	-	-	3	2	3	2
	Average	**3**	**2**	**2**	**2**	**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

20CS313	OPERATING SYSTEMS	L	T	P	C
		3	0	0	3

Prerequisite: *Basic knowledge of computer architecture.*

Course Outcomes: On Completion of this course , the student will be able to		***Cognitive level***
CO1:	*Identify the components and their functionalities in the operating system.*	*Remember*
CO2:	*Apply various CPU scheduling algorithms and synchronization Techniques.*	*Apply*
CO3:	*Examine the performance of various memory management techniques.*	*Understand*
CO4:	*Summarize the virtual memory concepts and file access methods.*	*Understand*
CO5:	*Study the performance of disk management and file system.*	*Analyze*

UNIT– I OPERATING SYSTEMS CONCEPTS [9]

Introduction to Operating Systems –Time sharing systems – Multiprocessor systems – Distributed systems – Real-Time systems – Operating System Structures: Operating System Services – System Calls- System Programs – Process: Process Concept – Process Scheduling – Operation on Processes – Cooperating Process – Inter Process Communication.

UNIT– II PROCESS SCHEDULING [9]

Threads: Overview – Multithreading Models. CPU Scheduling: Basic Concepts – Scheduling Criteria – Scheduling Algorithms: FCFS – SJF – Priority – Round Robin – Algorithm Evaluation. Process Synchronization: The critical Section Problem – Synchronization Hardware – Semaphores – Classic Problems of Synchronization.

UNIT – III DEADLOCK AND MEMORY MANAGEMENT [9]

Deadlock : Deadlock Characterization – Methods for Handling Deadlocks – Deadlock Prevention – Deadlock Avoidance – Deadlock Detection – Recovery from Deadlock – Memory Management: Swapping – Contiguous memory Allocation – Segmentation – Paging – Structure of the Page Table.

UNIT – IV VIRTUAL MEMORY AND FILE SHARING INTERFACE [9]

Virtual Memory: Demand Paging – Copy-on-Write – Page Replacement – Allocation of Frames – Thrashing – File Concepts: Access Methods – Directory Structure – File System Mounting – File Sharing – Protection.

UNIT – V FILE SYSTEM STRUCTURE AND STORAGE STRUCTURE [9]

File System Structure – File System Implementation: Directory Implementation – Allocation Methods – Free space Management – Mass Storage Structure : Disk Structure – Disk Scheduling – Disk Management – Swap-Space Management – RAID structure – I/O Systems: I/O Hardware – Kernel I/O Subsystem – Case Study: The Linux System.

Total = 45 Periods

Text Books :

1. Abraham Silberschatz, Peter Baer Galvin and Greg Gagne, Operating System Concepts, John Wiley & Sons, United States, 2013.
2. Andrew S. Tanenbaum, Modern Operating Systems, Prentice Hall, United States, Third Edition, 2007

References :

1. D. M. Dhamdhere, Operating Systems, Tata McGraw-Hill Education India, Second Edition, 2006.
2. Paul J. Deitel and David R. Choffnes, Operating Systems, Prentice Hall, United States, Third Edition, 2003.
3. Richard Fox, Linux with Operating System Concepts, Taylor & Francis Limited, United States, Second Edition, 2014.
4. Tanenbaum, Modern Operating Systems, Pearson Education, India, Fourth Edition, 2016.

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

Regulation: R 2020

Course Code: 20CS313 **Course Name: OPERATING SYSTEMS**

CO	Course Outcomes	Programme Outcomes													
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	*Identify the components and their functionalities in the operating system.*	3	2	2	1	1	-	-	-	-	1	-	1	3	2
CO2	*Apply various CPU scheduling algorithms and synchronization Techniques.*	3	2	2	1	1	-	-	-	-	1	-	1	3	2
CO3	*Examine the performance of various memory management techniques.*	3	2	1	1	1	-	-	-	-	1	-	1	3	2
CO4	*Summarize the virtual memory concepts and file access methods.*	3	2	1	1	1	-	-	-	-	1	-	1	3	2
CO5	*Study the performance of disk management and file system.*	3	2	1	1	1	-	-	-	-	1	-	1	3	2
	Average	**3**	**2**	**1**	**1**	**1**	**-**	**-**	**-**	**-**	**1**	**-**	**2**	**3**	**2**

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

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

SEMESTER – III

20CS314	COMPUTER ORGANIZATION AND ARCHITECTURE	L	T	P	C
		3	0	0	3

Prerequisite: *Basic knowledge of digital computer operations*

	Course Outcomes: On Completion of this course , the student will be able to	***Cognitive level***
CO1:	*Identify the basics structure of computers, operations and instructions.*	*Remember*
CO2:	*Outline the arithmetic operations and working of hardwired micro programmed control.*	*Understand*
CO3:	*Comprehend pipelined execution and design control unit.*	*Apply*
CO4:	*Recognize the hierarchical memory system including cache memory and virtual memory*	*Understand*
CO5:	*Analyze the different ways of communicating with I/O devices and standard I/O interfaces.*	*Analyze*

UNIT – I BASIC STRUCTURE AND ARITHMETIC OPERATIONS [9]

Functional Units – Basic Operational Concepts – Performance – Instruction Set Architecture: Instructions and Instruction sequencing – Addressing Modes – RISC and CISC – Fixed Point and Floating Point Operations.

UNIT – II BASIC PROCESSING UNIT [9]

Fundamental Concepts – Instruction Execution – Hardware Components – Instruction Fetch and Execution Steps – Hardwired Control – Micro Programmed Control – Nano Programming.

UNIT – III PIPELINING EXECUTION [9]

Basic Concepts – Pipeline Organization – Pipelining Issues – Data Dependencies – Memory Delays – Branch Delays – Resource Limitations – Performance Evaluation – Superscalar Operation.

UNIT – IV MEMORY SYSTEM AND STORAGES [9]

Basic Concepts – Semiconductor RAM Memories – Read Only Memories – Memory Hierarchy – Cache Memories – Performance Considerations – Virtual Memory – Memory Management Requirements – Secondary Storage Devices.

UNIT – V I/O ORGANIZATION [9]

Accessing I/O Devices – Programmed I/O – Interrupt Initiated I/O – Direct Memory Access – Buses – Bus Arbitration – Interconnection Standards: SCSI – USB – SATA – I/O Devices and Processors.

Total = 45 Periods

Text Books :

1 Carl Hamacher, ZvonkoVranesic, SafwatZaky and Naraig Manjikian, Computer Organization and Embedded Systems, McGraw Hill, US, Sixth Edition, 2012.

2 M.Morris Mano, Computer System Architecture, McGraw Hill, United states, Third Edition, 2012.

References :

1 William Stallings, Computer Organization and Architecture - Designing for Performance, Prentice Hall, United states, Eighth Edition, 2010.

2 David A. Patterson and John L. Hennessy, Computer Organization and Design: The Hardware/Software interface, University of California, Berkeley, Fifth Edition, 2014.

3 Carpinelli, Computer Systems Organization & Architecture, Pearson Education, India, First Edition, 2001.

4 T.K Ghosh, Computer Organization and Architecture, Haldia Institute of Technology, West Bengal, Third Edition, 2011.

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CO-PO MAPPING

Regulation: **R 2020**

Course Code: **20CS314** **Course Name:** **COMPUTER ORGANIZATION AND ARCHITECTURE**

CO	Course Outcomes	Programme Outcomes													
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	*Identify the basics structure of computers, operations and instructions.*	3	2	2	1	1	-	-	-	2	2	2	2	3	1
CO2	*Outline the arithmetic operations and working of hardwired micro programmed control.*	3	3	3	2	1	-	-	-	2	1	2	3	**3**	**1**
CO3	*Comprehend pipelined execution and design control unit.*	3	2	3	2	2	-	-	-	1	1	2	3	**3**	**2**
CO4	*Recognize the hierarchical memory system including cache memory and virtual memory*	3	3	2	1	1	-	-	-	2	1	1	3	**3**	**2**
CO5	*Analyze the different ways of communicating with I/O devices and standard I/O interfaces.*	3	3	3	2	1	-	-	-	1	1	1	3	3	2
	Average	**3**	**3**	**3**	**2**	**1**	**-**	**-**	**-**	**2**	**1**	**2**	**3**	**3**	**2**

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

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

SEMESTER – III

20CS315	**SOFTWARE ENGINEERING**	L	T	P	C
		3	0	0	3

Prerequisite: *Fundamental knowledge in problem solving techniques*

Course Outcomes: On Completion of this course , the student will be able to		***Cognitive level***
CO1:	*Outline the concepts behind SDLC software engineering practices.*	*Understand*
CO2:	*Identify the customer requirement and determine the appropriate life cycle model.*	*Understand*
CO3:	*Apply the design methods for software development.*	*Apply*
CO4:	*Evaluate the various testing techniques.*	*Analyze*
CO5:	*Ensure the quality of software product.*	*Understand*

UNIT – I FUNDAMENTALS OF SOFTWARE ENGINEERING [9]

The nature of Software – Software Engineering – Software Process – Software Engineering Practice – Generic Process Model– Process Assessment and Improvement – Prescriptive Process models – Specialized Process Model – Process Technology – Product and Process – Agile Development

UNIT – II REQUIREMENT ENGINEERING [9]

Requirement Engineering – Establishing Groundwork – Eliciting Requirements – Developing Use cases – Building the Requirements Model – Requirements Analysis – Requirements Modeling Strategies – Flow Oriented Modeling – Creating a Behavioral Model.

UNIT – III DESIGN CONCEPTS AND ARCHITECTURAL DESIGN [9]

Design within the context of Software Engineering – Design Process – Design Concepts – Design Model – Architectural Design: Software Architecture – Architectural Genres – Architectural Styles – Architectural Design – Architecture Mapping using Dataflow

UNIT – IV TESTING TECHNIQUES [9]

A strategic Approach for Software Testing – Test Strategies for Conventional Software – Validation Testing – System Testing – Art of Debugging – Testing Conventional Applications : Software testing Fundamentals – Internal and External Views Testing – White Box Testing – Basis Path Testing – Control Structure Testing – Black Box Testing – Model Based Testing – Testing for Specialized Environments – Architectures and Applications – Patterns for Software Testing.

UNIT – V PROJECT AND QUALITY MANAGEMENT [9]

Quality Concepts: Software Quality – The Software Quality Dilemma – Achieving Software Quality – Formal Technical Review – Software Quality Assurance – Process and Project Metrics – Emerging Trends in Software Engineering.

Total = 45 Periods

Text Books :

1 Roger S. Pressman, Software Engineering: A Practitioner Approach, McGraw-Hill, New Delhi, Eighth Edition, 2019

2 Ian Sommerville, Software Engineering, Pearson Education, India, Ninth Edition, 2013

References :

1 David Gustafson, Software Engineering, Schaum's Outlines, Tata McGraw-Hill, New Delhi, Third Edition, 2004.

2 Shari Lawrence Pfleeger, Joanne M.Atlee, Software Engineering Theory and Practice, Pearson Education, New Delhi, Fourth Edition, 2009.

3 Richard Schmidt, Software Engineering: Architecture-driven Software Development, Elsevier Science, Netherlands, Fourth Edition, 2013.

4 Hans van Vliet, Software Engineering: Principles and Practice, John Wiley & Sons, USA, Third Edition,2008

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DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING
CO-PO MAPPING

Regulation: R 2020

Course Code: 20CS315 **Course Name: SOFTWARE ENGINEERING**

CO	Course Outcomes	Programme Outcomes													
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	*Outline the concepts behind SDLC software engineering practices.*	3	3	3	3	2	-	-	-	-	3	3	3	3	2
CO2	*Identify the customer requirement and determine the appropriate life cycle model.*	3	3	3	3	2	-	-	-	-	3	3	3	**3**	**2**
CO3	*Apply the design methods for software development.*	3	3	3	3	2	-	-	-	-	3	3	3	**3**	**2**
CO4	*Evaluate the various testing techniques.*	3	3	3	3	2	-	-	-	-	2	3	3	**3**	**2**
CO5	*Ensure the quality of software product.*	3	3	3	3	2	-	-	-	-	3	3	3	3	2
	Average	**3**	**3**	**3**	**3**	**2**	**-**	**-**	**-**	**-**	**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

		L	T	P	C
20CS321	**PYTHON PROGRAMMING 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:	*Design simple programs using conditional statements and loops.*	*Apply*
CO2:	*Using python list, tuples and dictionaries.*	*Apply*
CO3:	*Detecting the exception handling mechanism in python.*	*Analyze*
CO4:	*Construct GUI applications using python programming.*	*Create*
CO5:	*Demonstrate the use of files in python.*	*Create*

LIST OF EXPERIMENTS:

1. Write a simple program to display a single level and multilevel string.
2. Write a function to compute the GCD of two numbers
3. Write a program to display the largest number among three numbers.
4. Create a program to change, delete, add and remove elements in Dictionary.
5. Develop a program to perform operations on list.
6. Write a program to display the Fibonacci series and multiplication table by using looping constructs.
7. Create a Python program to demonstrate inheritance.
8. Write a python program to implement polymorphism with inheritance.
9. Display a simple calendar in python program without using the calendar module using string array or list.
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: **20CS321** **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 conditional statements and loops.*	2	3	3	2	2	-	-	-	1	-	-	1	3	1
CO2	*Using python list, tuples and dictionaries.*	3	3	3	2	2	-	-	-	1	-	-	1	**3**	**1**
CO3	*Detecting the exception handling mechanism in python.*	3	3	3	2	2	-	-	-	1	-	-	1	**3**	**1**
CO4	*Construct GUI applications using python programming.*	3	3	3	1	3	-	-	-	1	-	-	1	**3**	**1**
CO5	*Demonstrate the use of files in python.*	3	3	3	1	3	-	-	-	1	-	-	1	3	1
	Average	**3**	**3**	**3**	**2**	**2**	**-**	**-**	**-**	**1**	**-**	**-**	**1**	**3**	**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
20CS322	**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 singly and doubly linked lists.*	*Apply*
CO2:	*Implement the applications of stack and queue.*	*Create*
CO3:	*Design the balanced tree concepts.*	*Create*
CO4:	*Demonstrate the sorting algorithm techniques.*	*Create*
CO5:	*Construct the minimum spanning tree.*	*Create*

LIST OF EXPERIMENTS:

1. Implementation of Singly Linked List.
2. Implementation of Doubly linked list
3. Develop a program for Polynomial manipulation.
4. Array implementation of Stack and Queue
5. Linked list implementation of Stack and Queue
6. Write a program that uses stack operations to convert a given infix expression into its postfix equivalent and Evaluation of Arithmetic expression, implement the stack using an array.
7. Design and develop a program for applications of Queue.
8. Develop a program to generate expression tree and display it in the following order: i) Preorder ii) Postorder iii) Inorder
9. Implementation of Binary Search Tree.
10. Implementation of AVL Tree.
11. Write programs for implementing the following graph traversal and MST algorithms: a) DFS Algorithm b) Prims Algorithm.
12. Write programs for implementing the following sorting methods to arrange a list of integers in ascending order: a) Insertion sort b) Merge sort
13. Implementation of Hashing.

Total : 45 Periods

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DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING
CO-PO MAPPING

Regulation: R 2020

Course Code: 20CS322 **Course Name: 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 singly and doubly linked lists.*	2	3	3	2	2	-	-	-	-	-	2	2	3	2
CO2	*Implement the applications of stack and queue.*	2	3	3	2	2	-	-	-	-	-	2	2	3	2
CO3	*Design the balanced tree concepts.*	2	3	3	2	2	-	-	-	-	-	2	2	3	2
CO4	*Demonstrate the sorting algorithm techniques.*	2	3	3	2	2	-	-	-	-	-	2	2	3	2
CO5	*Construct the minimum spanning tree.*	2	2	3	2	2	-	-	-	-	-	2	2	3	2
	Average	**2**	**2**	**3**	**2**	**2**	**-**	**-**	**-**	**-**	**-**	**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
20CS323	**OPERATING SYSTEMS LABORATORY**	0	0	3	1

Prerequisite: *Basic knowledge about the C Programming.*

Course Outcomes: On Completion of this course , the student will be able to		***Cognitive level***
CO1:	*Implement the commands in Linux OS.*	*Create*
CO2:	*Evaluate the performance of various CPU scheduling algorithms.*	*Evaluate*
CO3:	*Create process and Implement IPC, deadlock avoidance and detection Algorithms.*	*Create*
CO4:	*Analyze the performance of the various page replacement Algorithms.*	*Analyze*
CO5:	*Examine file organization and file allocation strategies.*	*Understand*

List of Experiments:

1. Implementations of basic Linux commands and shell programming.
2. Write programs using the following system calls of Linux operating system fork, exec, getpid, exit, wait, close, stat, opendir, readdir, open, read and write.
3. Write a C program to simulate ls, grep and cp.
4. Write a C program to simulate shared memory and IPC
5. Write a C program to implement CPU scheduling algorithms.
6. Write a C program to implement producer consumer problem using semaphores.
7. Write a C program to implement banker‘s algorithm
8. Write a C program to implement page replacement algorithms
9. Write a C program to implement memory management schemes (first fit, worst fit and best fit)
10. Write a C program to implement File allocation strategies(Sequential, Indexed and Linked list)

Total : 45 Periods

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DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING
CO-PO MAPPING

Regulation: **R 2020**

Course Code: **20CS323** **Course Name:** **OPERATING SYSTEMS LABORATORY**

CO	Course Outcomes	Programme Outcomes													
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	*Implement the commands in Linux OS.*	2	3	2	1	1	-	-	-	-	1	-	1	2	1
CO2	*Evaluate the performance of various CPU scheduling algorithms.*	2	3	2	1	1	-	-	-	-	1	-	1	2	1
CO3	*Create process and Implement IPC, deadlock avoidance and detection Algorithms.*	2	3	2	1	1	-	-	-	-	1	-	1	3	2
CO4	*Analyze the performance of the various page replacement Algorithms.*	2	3	1	1	1	-	-	-	-	1	-	1	3	2
CO5	*Examine file organization and file allocation strategies.*	2	3	1	1	1	-	-	-	-	1	-	1	3	1
	Average	**2**	**3**	**2**	**1**	**1**	**-**	**-**	**-**		**1**	**-**	**1**	**3**	**1**

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

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

SEMESTER – III

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

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:	*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** **[6]**

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** **[6]**

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** **[6]**

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** **[6]**

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** **[6]**

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

Total =30Periods

Text Books :

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

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

References :

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.

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DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING
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

		L	T	P	C
20MA441	**PROBABILITY AND DECISION MODELS** (Common To CS,CSD, IOT & IT)	3	1	0	4

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 importance of one dimensional random variables discrete and continuous distribution.*	*Understand*
CO2:	*Develop their skills in joint, marginal and conditional distributions and knowing the concept of covariance correlation &regression.*	*Apply*
CO3:	*Analyze the theory of stationary process, Markov Process and transition probabilities, and Poisson Process.*	*Analyze*
CO4:	*Illustrate the basic concept of single server and multi-server queuing models.*	*Understand*
CO5:	*Estimate Critical Path in PERT and CPM.*	*Evaluate*

UNIT – I **ONE DIMENSIONAL RANDOM VARIABLE** **[12]**

Discrete and Continuous Random Variable – Moments – Moment Generating Functions and their Properties– Standard Distributions: Binomial, Poisson, Exponential and Normal Distributions.

UNIT – II **TWO DIMENSIONAL RANDOM VARIABLES** **[12]**

Joint Distributions – Marginal and Conditional Distributions – Covariance – Correlation and Regression analysis and their Properties.

UNIT – III **RANDOM PROCESSES** **[12]**

Classification – Stationary Process – Markov Process – Markov Chain – Transition Probabilities – Limiting Distributions – Poisson Process and their Properties.

UNIT – IV **QUEUEING MODELS** **[12]**

Markovian Queues – Little's formula – Single Server Models : (M/M/1):(∞/FIFO) and (M/M/1):(N/FIFO) – Multi Server Models : (M/M/C):(∞/FIFO) and (M/M/C):(N/FIFO).

UNIT – V **NETWORK MODELS** **[12]**

Network Construction – Critical Path Method (CPM) – Computations of total, free and independent floats – PERT Analysis– Computation of expected time and standard deviation.

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

Text Books :

1 P.Kandasamy, K.Thilagavathi and K.Gunavathi, Probability and Queueing Theory, S. Chand Publishers, New Delhi, Third Edition, 2016.

2 Hamdy. A.Taha, Operations Research, Pearson Education, New Delhi, Tenth Edition, 2015.

Reference Books :

1 Oliver C. Ibe, Fundamentals of Applied Probability and Random Processes, Elsevier, Third Indian Reprint, 2016.

2 M.B.K.Moorthy, K.Subramani and A. Santha, Probability and Queueing Theory, Scitech Publishers, Chennai, Fifth Edition, 2015.

3 Veerarajan. T., Probability, Statistics and Random Processes, Tata McGraw-Hill, New Delhi, Tenth Edition, 2015,

4 https://www.youtube.com/watch?v=J70dP_AECzQ

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CO-PO MAPPING

Regulation: **R 2020**

Course Code: **20MA441** **Course Name:** **PROBABILITY AND DECISION MODELS**

CO	Course Outcomes	Programme Outcomes													
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	*Explain the importance of one dimensional random variables discrete and continuous distribution.*	*3*	3	3	3	-	-	-	-	-	-	-	-	-	-
CO2	*Develop their skills in joint, marginal and conditional distributions and knowing the concept of covariance correlation &regression.*	*3*	3	3	3	-	-	-	-	-	-	-	-	-	-
CO3	*Analyze the theory of stationary process, Markov Process and transition probabilities, and Poisson Process.*	*3*	3	3	3	-	-	-	-	-	-	-	-	-	-
CO4	*Illustrate the basic concept of single server and multi-server queuing models.*	*3*	3	3	3	-	-	-	-	-	-	-	-	-	-
CO5	*Estimate Critical Path in PERT and CPM.*	*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
20CS411	**THEORY OF COMPUTATION**	3	1	0	4

Prerequisite: *Basic concepts of discrete mathematics.*

Course Outcomes: On Completion of this course, the student will be able to		***Cognitive level***
CO1:	*Compare and analyze various finite automata and convert NFA to DFA.*	*Evaluate*
CO2:	*Construct finite automata to regular expression and identify the properties of regular language.*	*Analyze*
CO3:	*Construct context free grammars to generate strings from a context free language and convert them into normal forms.*	*Evaluate*
CO4:	*Construct pushdown automata and convert pushdown automata to context-free grammar.*	*Apply*
CO5:	*Design turing machines for various problems and analyze the undecidability of languages.*	*Apply*

UNIT– I **INTRODUCTION TO AUTOMATA THEORY** **[12]**

Mathematical preliminaries Finite Automata (FA) – Central Concepts of Automata Theory – Deterministic Finite Automata (DFA) – Non-Deterministic Finite Automata (NFA) – Equivalence of NFA and DFA – Finite Automata with Epsilon Transition – Applications of Finite Automata.

UNIT– II **REGULAR EXPRESSIONS AND LANGUAGES** **[12]**

Regular Expressions: Definitions – Equivalence of Regular Expression and Finite Automata: Thomson Method – Basic Method (R_{ij}^k method) – State Elimination Method – Arden's Theorem. Proving languages not to be regular – Closure Properties of Regular Language – Equivalence and Minimization of Automata (DFA).

UNIT – III **CONTEXT-FREE GRAMMAR AND LANGUAGES** **[12]**

Context-Free Grammar (CFG): Definition – Derivations – Parse Trees – Ambiguity – Simplification of Grammars – Conversion to Normal Forms: Chomsky (CNF) – Greibach (GNF). Pumping Lemma for Context –Free Languages – Applications of Pumping Lemma – Closure Properties of CFL.

UNIT – IV **PUSHDOWN AUTOMATA** **[12]**

Pushdown Automata (PDA): Introduction – Definition – Instantaneous Description of Pushdown Automata – Design Examples – The Languages of Pushdown Automata – The Language acceptance by Final State and Empty Stack. Equivalence of PDA and CFG: Construction of PDA from CFG – Construction of CFG from PDA – Deterministic Pushdown Automata.

UNIT–V **TURING MACHINE AND UNDECIDABLITY** **[12]**

Definition – Notation – Instantaneous Description and Languages – Design of TM – Programming Techniques for TM: Storage in State – Multiple Tracks – Subroutines. Variants of TM: Multitape – Nondeterministic – Enumerators. Universal Turing Machine – A language that is not Recursively Enumerable (RE) – Undecidable problems about Turing machine – Rice Theorem- Post correspondence problem.

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

Text Books:

1 John E. Hopcroft, Rajeev Motwani and Jeffrey D. Ullman, Introduction to Automata Theory, Languages and Computation, Pearson Education, New Delhi, Third Edition, 2014.

2 Michael Sipser, Introduction to the Theory of Computation, Thompson Course Technology, Cengage Learning India Pvt. Ltd., India, Third Edition, 2014.

References:

1 John C Martin, Introduction to Languages and Automata Theory, Tata McGraw-Hill, New Delhi, Third Edition, 2007.

2 K.L. P Misra and N. Chandrasekharan, Theory of Computer Science, Automata, Languages and Computation, Prentice Hall, India, Third Edition, 2010.

3 Adesh K. Pandey, An introduction to automata theory and formal languages, S.K. Kataria & Sons, New Delhi, First Edition, 2009.

4 Sipser, Michael, Theory of computation, Cengage Learning, India, First Edition,2007.

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CO-PO MAPPING

Regulation: R 2020

Course Code: 20CS411 **Course Name: THEORY OF COMPUTATION**

CO	Course Outcomes	Programme Outcomes													
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	*Compare and analyze various finite automata and convert NFA to DFA.*	3	3	3	3	2	1	-	-	-	-	-	2	3	2
CO2	*Construct finite automata to regular expression and identify the properties of regular language.*	3	3	3	3	3	2	-	-	-	-	-	2	**3**	**3**
CO3	*Construct context free grammars to generate strings from a context free language and convert them into normal forms.*	3	3	3	3	3	2	-	-	-	-	-	2	**3**	**3**
CO4	*Construct pushdown automata and convert pushdown automata to context-free grammar.*	3	3	3	3	3	1	-	-	-	-	-	2	**3**	**2**
CO5	*Design turing machines for various problems and analyze the undecidability of languages.*	3	3	3	3	2	1	-	-	-	-	-	2	3	3
	Average	**3**	**3**	**3**	**3**	**3**	**1**	**-**	**-**	**-**	**-**	**-**	**2**	**3**	**3**

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

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

SEMESTER – IV

20CS412	JAVA PROGRAMMING	L	T	P	C
		3	0	0	3

Prerequisite: *Fundamentals of C programming and object-oriented concepts*

	Course Outcomes: On Completion of this course, the student will be able to	***Cognitive level***
CO1:	*Apply java programming fundamentals to solve real world problem.*	*Apply*
CO2:	*Implement the concept of overloading and inheritances.*	*Apply*
CO3:	*Examine important features of java like packages, interfaces and exception handling.*	*Understand*
CO4:	*Illustrate the features of multithreaded programming and I/O operations.*	*Understand*
CO5:	*Demonstrate the concepts of string manipulations and database connectivity.*	*Analyze*

UNIT – I JAVA FUNDAMENTALS [9]

The Java Buzzwords – Data Types – Variables – Arrays – Operators – Control Statements – Class Fundamentals – Declaring Objects – Methods – Method Overloading – Objects as Parameters – Returning Objects – Recursion –this keyword – Garbage Collection.

UNIT – II CONSTRUCTORS AND INHERITANCE [9]

Constructors – Constructor Overloading – Access Control – static – final – Nested and Inner Class – Inheritance: Basics – Super – Multilevel – Hierarchical – Method Overriding – Abstract class –Final with Inheritance.

UNIT–III PACKAGES, INTERFACES AND EXCEPTION HANDLING [9]

Packages – Access Protection – Importing Packages – Interfaces – Default Interface Methods – Static Methods in Interface – Exception Handling Fundamentals – Types – Uncaught Exceptions –Try and Catch – Multiple Catch – Nested Try – Throw – Throws – Finally – Array List-Wrapper Classes.

UNIT – IV MULTITHREADED PROGRAMMING AND I/O OPERATIONS [9]

Java Thread Model – Main Thread – Creating a Thread – Creating Multiple Threads – isAlive and join Methods – Thread Priorities - Synchronization – Interthread Communication – Suspending, Resuming, and Stopping Threads – Obtaining a Thread's State – Using Multithreading – I/O Basics – Reading Console Input – Writing Console Output – The PrintWriter Class – Reading and Writing Files – Automatically Closing a File – Scanner class.

UNIT – V STRING AND DATABASE CONNECTIVITY [9]

The String Constructors – String Length – Character Extraction – String Comparison – Searching Strings – Modifying a String – Data Conversion using valueOf method – Methods in StringBuffer – JDBC Product Components – JDBC API – JDBC Driver Manager – JDBC Test Suite – JDBC-ODBC Bridge – JDBC Architecture – Establishing Connection – Handling SQL Exceptions.

Total = 45 Periods

Text Books:

1 Herbert Schildt, Java - The Complete Reference, Oracle Press, McGraw-Hill Education, New Delhi, Tenth Edition, 2018.

2 Cay S. Horstmann, Core Java Volume 1 – Fundamentals, Prentice Hall, India, Tenth Edition, 2015.

References:

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 D.T. Editorial Services, Java 8 Programming Black Book, Dreamtech Press, Delhi, First Edition, 2015.

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CO-PO MAPPING

Regulation: R 2020

Course Code: 20CS412 **Course Name: JAVA PROGRAMMING**

CO	Course Outcomes	Programme Outcomes													
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	*Apply java programming fundamentals to solve real world problem.*	3	3	2	3	3	-	-	-	-	-	2	3	3	3
CO2	*Implement the concept of overloading and inheritances.*	3	3	2	3	2	-	-	-	-	-	2	3	3	**3**
CO3	*Examine important features of java like packages, interfaces and exception handling.*	3	3	1	3	2	-	-	-	-	-	3	2	3	2
CO4	*Illustrate the features of multithreaded programming and I/O operations.*	3	3	2	2	3	-	-	-	-	-	2	3	3	**3**
CO5	*Demonstrate the concepts of string manipulations and database connectivity.*	3	3	2	3	1	-	-	-	-	-	2	3	3	3
	Average	**3**	**3**	**2**	**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 – IV

20CS413	DATABASE MANAGEMENT SYSTEMS	L	T	P	C
		3	0	0	3

Prerequisite: *Basic Knowledge about data structures and computer systems.*

Course Outcomes: On Completion of this course, the student will be able to		***Cognitive level***
CO1:	*Be aware of database architecture and the relational algebra.*	*Understand*
CO2:	*Apply Structured query language to create and manipulate a relational database.*	*Apply*
CO3:	*Create functions, triggers, recursive queries and indexing.*	*Apply*
CO4:	*Demonstrate the purpose of ER Model and normalization.*	*Analyze*
CO5:	*Discover about transaction, query processing and advanced database concepts.*	*Understand*

UNIT – I BASIC CONCEPTS AND RELATIONAL MODEL [9]

Database System Applications – Purpose of Database Systems – Views of Data – Database Languages – Database and Application Architecture. Introduction to Relational Model: Structure of Relational Databases – Database Schema – Keys – Schema Diagrams – Relational Algebra.

UNIT – II SQL FUNDAMENTALS AND INTERMEDIATE SQL [9]

Overview of the SQL Query Language – SQL Data Definition – Basic Structure of SQL Queries – Additional Basic Operations – Set operations – Null values – Aggregate functions – Nested Sub Queries – Modification of the Database – Join Expressions – Views – Transactions – Integrity Constraints – Authorization.

UNIT– III ADVANCED SQL, INDEXING AND HASHING [9]

Accessing SQL from Programming Language – Functions and Procedures – Triggers – Recursive Queries – Indexing: Basic Concepts – Ordered Indices – B+ Tree Index Files – Hash Indices – Multiple-Key Access – Creation of Indices – Bitmap Indices.

UNIT – IV DATABASE DESIGN [9]

Overview of the Design Process – The Entity-Relationship model – Complex Attributes – Mapping Cardinalities – Primary key – 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, QUERY PROCESSING AND ADVANCED DATABASE CONCEPTS [9]

Transaction Concept – A Simple Transaction Model – Storage Structure – Transaction Atomicity and Durability – Transaction Isolation – Serializability – Concurrency Control – Lock-Based protocols – Query Processing overview – Spatial Database Concepts – Multimedia Database Concepts – Introduction to Deductive Databases.

Total = 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 Ramez Elmasri and Shamkant B. Navathe, Fundamentals of Database Systems, Pearson Education, New Delhi, Seventh Edition, 2016.

References:

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 Delhi Eighth Edition, 2006.
4 K. Prema, A. Gowri Shankar Reddy, et al, Database Management System Concepts, Notion Press, India, First Edition, 2020.

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DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING
CO-PO MAPPING

Regulation: **R 2020**

Course Code: **20CS413** **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	*Be aware of database architecture and the relational algebra.*	3	3	3	3	2	2	-	-	2	-	-	2	3	3
CO2	*Apply Structured query language to create and manipulate a relational database.*	3	3	3	3	2	2	-	-	2	-	-	2	**3**	**3**
CO3	*Create functions, triggers, recursive queries and indexing.*	3	3	3	3	2	2	-	-	2	-	-	2	**3**	**3**
CO4	*Demonstrate the purpose of ER Model and normalization.*	3	3	3	3	2	2	-	-	2	-	-	2	**3**	**3**
CO5	*Discover about transaction, query processing and advanced database concepts.*	3	3	3	3	2	2	-	-	2	-	-	2	3	3
	Average	**3**	**3**	**3**	**3**	**2**	**2**	**-**	**-**	**2**	**-**	**-**	**2**	**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
20CS414	**DESIGN AND ANALYSIS OF ALGORITHMS**	3	1	0	4

Prerequisite: *Basic Knowledge about data structures*

Course Outcomes: On Completion of this course, the student will be able to		***Cognitive level***
CO1:	*Analyze the efficiency of algorithms.*	*Analyze*
CO2:	*Design and analyze problems using decrease, transform and conquer techniques.*	*Understand*
CO3:	*Identify optimal solution by applying dynamic techniques.*	*Understand*
CO4:	*Evaluate various backtracking, branch and bound techniques.*	*Evaluate*
CO5:	*Summarize the knowledge about P and NP problems.*	*Understand*

UNIT – I DIVIDE AND CONQUER TECHNIQUE [12]

Algorithm Analysis Framework – Asymptotic Notations and Basic Efficiency Classes – Analysis of Non-recursive and Recursive Algorithms – Divide and Conquer: Merge Sort – Quick Sort – Strassen's Matrix Multiplication.

UNIT – II DECREASE AND CONQUER TECHNIQUE [12]

Depth First Search and Breadth First Search – Decrease and Conquer: Insertion sort – Binary Search – Selection Problem – Transform and Conquer: Presorting – Balanced Search Trees: AVL tree – 2-3 Tree.

UNIT– III DYNAMIC PROGRAMMING AND GREEDY TECHNIQUE [12]

Dynamic Programming: Knapsack Problem – Optimal Binary Search Trees – Warshall's Algorithm – Floyd's Algorithm – Greedy Technique: Prim's Algorithm – Kruskal's Algorithm – Dijkstra's Algorithm – Huffman Trees and Codes.

UNIT – IV BACKTRACKING, BRANCH AND BOUND TECHNIQUES [12]

Backtracking: 8-Queens – Hamiltonian Circuit – Sum of Subset – Graph Coloring – Branch and Bound: Assignment Problem – Knapsack Problem – Traveling Salesman Problem.

UNIT – V NP PROBLEMS AND APPROXIMATION ALGORITHMS [12]

P and NP Problems – NP Complete Problems – Approximation Algorithms for NP Hard Problems –Travelling Salesman Problem: Nearest Neighbor Algorithm – Multifragment Heuristic Algorithm – Knapsack Problem.

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

Text Books:

1 Anany Levitin, Introduction to The Design and Analysis of Algorithms, Pearson Education, India, Third Edition, 2017.
2 A.V. Aho, J.E. Hopcroft and J.D. Ullman, The Design and Analysis of Computer Algorithms, Pearson Education Asia, India, Fourth Edition, 2010.

References:

1 Thomas H Cormen, Charles E Leiserson, Ronald L Rivest and Clifford Stein, Introduction to Algorithms, Prentice Hall of India, India, Second Edition, 2007.
2 Sara Baase and Allen Van Gelder, Computer Algorithms - Introduction to Design and Analysis, Pearson Education, India, Third Edition, 2010.
3 Robert Sedgewick, Philippe Flajolet, An Introduction to the Analysis of Algorithms, Addison-Wesley, USA, Second Edition, 2013.
4 http://www.nptelvideos.in/2012/11/design-analysis-of-algorithms.html

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DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING
CO-PO MAPPING

Regulation: **R 2020**

Course Code: **20CS414** **Course Name:** **DESIGN AND ANALYSIS OF ALGORITHMS**

CO	Course Outcomes	Programme Outcomes													
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	*Analyze the efficiency of algorithms.*	3	3	2	3	2	-	-	-	1	-	-	1	3	2
CO2	*Design and analyze problems using decrease, transform and conquer techniques.*	3	3	3	3	2	-	-	-	1	-	-	1	3	2
CO3	*Identify optimal solution by applying dynamic techniques.*	3	3	3	3	1	-	-	-	1	-	-	1	3	2
CO4	*Evaluate various backtracking, branch and bound techniques.*	3	3	3	3	1	-	-	-	1	-	-	1	3	1
CO5	*Summarize the knowledge about P and NP problems.*	3	3	2	3	1	-	-	-	1	-	-	1	3	1
	Average	**3**	**3**	**3**	**3**	**1**	**-**	**-**	**-**	**1**	**-**	**-**	**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
20EE431	**MICROPROCESSORS AND MICROCONTROLLERS**	3	0	0	3

Prerequisite: Basic knowledge in Digital Electronics

Course Outcomes: On successful completion of the course, the student will be able to		***Cognitive Level***
CO1:	*Explain the programs based on 8085 microprocessors.*	*Understand*
CO2:	*Practice the use of 8086 microprocessor for simple applications.*	*Understand*
CO3:	*Illustrate the concepts of multiprocessors.*	*Understand*
CO4:	*Design and interface devices with microprocessors.*	*Understand*
CO5:	*Design and implement 8051 microcontroller-based systems.*	*Understand*

UNIT - I 8085 MICROPROCESSORS [9]

Introduction – Address, data and control bus – 8085: Hardware architecture, pin diagram, addressing modes, instruction set, assembly language programming.

UNIT - II 8086 MICROPROCESSORS [9]

.8086: Hardware architecture, Pin diagram, Addressing modes, Instruction set, Interrupts and Interrupt service routines, Assembly language programming – Assembler directives – Procedures – Macros – BIOS DOS function calls.

UNIT - III MULTIPROCESSOR CONFIGURATIONS [9]

Coprocessor configuration – Closely coupled configuration – Loosely coupled configuration – Numeric data processor (8087) architecture and data types – I/O processor architecture (8089).

UNIT - IV PERIPHERAL INTERFACING [9]

Memory and I/O interfacing – Parallel communication interface (8255) – Serial communication interface (8251) – Programmable interval timer (8253) – Keyboard / display controller (8279) – Interrupt controller (8259) – DMA controller (8237) – ADC and DAC.

UNIT - V 8051 MICROCONTROLLERS [9]

8051: Hardware architecture, special function register, I/O ports, external memory, addressing modes, instruction set, timers and counters, serial data I/O, interrupts – Interfacing: Keyboard, LCD, stepper motor.

Total = 45 Periods

Text Books:

1 Ramesh S. Gaonkar, Microprocessor - Architecture, programming and applications with 8085, Penram International Publisher, Sixth Edition, 2013

2 A.K. Ray, K.M. Bhurchandi, Advanced Microprocessors and Peripherals, Tata McGraw Hill, New Delhi, Third Edition, 2012.

Reference Books:

1 Kenneth J. Ayala, The 8051 Microcontroller Architecture, Programming and Applications, Penram International, Mumbai, Second Edition, 2007.

2 Doughlas V. Hall, Microprocessors and Interfacing, Programming and Hardware, Tata McGraw Hill Education, NewDelhi, Second Edition,2012.

3 Yu-Cheng Liu, Glenn A. Gibson, Microcomputer Systems: The 8086 / 8088 Family -Architecture, Programming and Design, Prentice Hall of India, New Delhi, Second Edition, 2007.

4 Mohamed Ali Mazidi, Janice Gillispie Mazidi, Rolin Mc Kinlay, The 8051 Microcontroller and Embedded Systems: Using Assembly and C, Pearson education, New Delhi, Second Edition, 2011.

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

Regulation: **R 2020**

Course Code: **20EE431** **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	*Explain the programs based on 8085 microprocessors.*	3	3	-	-	-	-	-	-	1	-	-	-	-	-
CO2	*Practice the use of 8086 microprocessor for simple applications*	3	3	-	-	-	-	-	-	1	-	-	-	-	-
CO3	*Illustrate the concepts of multiprocessors*	3	3	2	-	3	-	-	-	1	-	-	2	-	-
CO4	*Design and interface devices with microprocessors.*	3	3	2	-	1	-	-	-	1	-	-	2	-	-
CO5	*Design and implement 8051 microcontroller-based systems*	3	3	2	-	3	-	-	-	1	-	-	2	-	-
	Average	**3**	**3**	**3**	**2**	3	**-**	-	-	1	**-**	-	2	**-**	-

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

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

SEMESTER – IV

20CS421	**JAVA PROGRAMMING LABORATORY**	L	T	P	C
		0	0	3	1

Prerequisite: *Basic knowledge of object-oriented concepts*

Course Outcomes: On Completion of this course, the student will be able to		***Cognitive level***
CO1:	*Apply the features of java to find optimal solution for the real-world problems.*	*Apply*
CO2:	*Practically implement the concept of arrays, constructors, inheritance and overloading.*	*Apply*
CO3:	*Recall interface, abstract class and packages concepts.*	*Understand*
CO4:	*Outline the features of exception handling, string handling, threads and command line arguments practically.*	*Understand*
CO5:	*Examine the concept of database connectivity and to implement.*	*Analyze*

List of Experiments:

1. Write a program to get n numbers in an array. Display the elements in ascending and descending order.
2. Write a program for student management system. Initialize the register number of the student through constructors.
3. Write a program for the following using inheritances
   a) Finding area of sphere using single inheritance
   b) Calculating performance of the students using multi-level inheritance
   c) Students' information manipulation using hierarchical inheritance
4. Write a program for calculating area of rectangle and triangle using interface
5. Write a program for employee management using packages.
6. Write a program for calculator operations and handle the exceptions
7. Write a program for manipulating strings.
8. Write a program using the concept of command line arguments
9. Write a program for threads (extending Threads class and implementing runnable interface)
10. Write a program to read and display the student details from the database using database connectivity

Total : 45 Periods

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DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING
CO-PO MAPPING

Regulation: **R 2020**

Course Code: **20CS421** **Course Name:** **JAVA PROGRAMMING LABORATORY**

CO	Course Outcomes	Programme Outcomes													
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	*Apply the features of java to find optimal solution for the real world problems.*	3	3	2	3	3	-	-	-	2	-	2	3	3	3
CO2	*Practically implement the concept of arrays, constructors, inheritance and overloading.*	3		2	3	2	-	-	-	2	-	2	3	3	**3**
CO3	*Recall interface, abstract class and packages concepts.*	3	3	1	3	2	-	-	-	1	-	3	2	3	2
CO4	*Outline the features of exception handling, string handling, threads and command line arguments practically.*	3	3	2	2	3	-	-	-	2	-	2	3	3	**3**
CO5	*Examine the concept of database connectivity and to implement.*	3	3	2	3	3	-	-	-	2	-	2	3	3	3
	Average	**3**	**3**	**2**	**3**	**2**	**-**	**-**	**-**	**2**	**-**	**2**	**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
20CS422	**DATABASE MANAGEMENT SYSTEMS LABORATORY**	0	0	3	1

Prerequisite: *Basic Knowledge in Data Structures.*

Course Outcomes: On Completion of this course , the student will be able to		***Cognitive level***
CO1:	*Design and implement a database schema for real time applications.*	*Apply*
CO2:	*Populate and query a database.*	*Apply*
CO3:	*Create and maintain tables using PL/SQL.*	*Apply*
CO4:	*Utilize function and procedures on any application.*	*Apply*
CO5:	*Apply trigger and generate report.*	*Apply*

List of Experiments:

1. Create and apply DDL (SQL) statements for employee /student /bank /online shopping detail sets.
2. Perform data manipulation using DML (SQL) statements for employee /student /bank /online shopping detail sets.
3. Verify DCL and TCL (SQL) statements for employee /student /bank /online shopping detail sets.
4. Perform all the nested, join queries and set oriented operations for employee /student /bank /online shopping detail sets.
5. Create and apply view for employee /student /bank /online shopping detail sets. (create, insert, update and drop)
6. Write PL/SQL code to display employee details using explicit cursors, implicit cursors and cursor loop.
7. Write a PL/SQL function to find the sum, average, minimum and maximum salary of the employee and count the number of employees in a given company name.
8. Write a PL/SQL procedure to calculate for the following i) factorial ii) prime or not iii) biggest of three number.
9. Write and implement before and after insert, update and delete triggers for employee details.
10. Design and implement employee payroll system form design using visual basic and generate report.

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: **20CS422** **Course Name:** **DATABASE MANAGEMENT SYSTEMS LABORATORY**

CO	Course Outcomes	Programme Outcomes													
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	*Design and implement a database schema for real time applications.*	3	3	3	3	3	1	-	-	2	-	-	3	3	3
CO2	*Populate and query a database.*	3	3	3	3	3	1	-	-	2	-	-	3	3	3
CO3	*Create and maintain tables using PL/SQL.*	3	3	3	3	3	1	-	-	2	-	-	3	3	3
CO4	*Utilize function and procedures on any application.*	3	3	3	3	3	1	-	-	2	-	-	3	3	3
CO5	*Apply trigger and generate report.*	3	3	3	3	3	1	-	-	2	-	-	3	3	3
	Average	**3**	**3**	**3**	**3**	**3**	**1**	**-**	**-**	**2**	**-**	**-**	**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
20EE425	**MICROPROCESSORS AND MICROCONTROLLERS LABORATORY**	0	0	3	1

Prerequisite: Digital Systems Laboratory

Course Outcomes: On successful completion of the course, the student will be able to		***Cognitive Level***
CO1:	*Develop assembly language programming for 8085 microprocessors.*	*Understand*
CO2:	*Build assembly language programming for 8086 microprocessors.*	*Understand*
CO3:	*Illustrate programming concepts with 8051 microcontrollers.*	*Understand*
CO4:	*Analyze the program for Peripheral interfacing using 8085*	*Understand*
CO5:	*Design the control word and develop the program for interface peripherals using 8051*	*Understand*

LIST OF EXPERIMENTS

8085 Microprocessor

1. Arithmetic operations
2. Array processing
3. Code conversion.

8086 Microprocessor

4. Arithmetic operations
5. Sorting and searching and String manipulation
6. BIOS/DOS Calls: Keyboard control, Display control, File Manipulation

8051 Microcontroller

7. Perform Arithmetic & Logical and bit manipulation operations using 8051

Peripheral interfacing using 8085/8051

8. Programmable peripheral interface (8255)
9. Keyboard and display controller (8279)
10. Stepper motor

Total = 45 Periods

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CO-PO MAPPING

Regulation: **R 2020**

Course Code: **20EE425** **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	*Develop assembly language programming for 8085 microprocessor.*	3	3	-	-	-	-	-	-	3	-	-	2	-	-
CO2	*Build assembly language programming for 8086 microprocessor.*	3	3	-	-	-	-	-	-	3	-	-	2	-	-
CO3	*Illustrate programming concepts with 8051 microcontrollers.*	3	3	-	-	-	-	-	-	3	-	-	2	-	-
CO4	*analyze the program for Peripheral interfacing using 8085*	3	3	-	-	3	-	-	-	3	-	-	2	-	-
CO5	*Design the control word and develop the program for interface peripherals using 8051*	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**

SEMESTER - IV

		L	T	P	C
20HR432	**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

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DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING
CO-PO MAPPING

Regulation: R 2020

Course Code 20HR432 **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	-	-
CO2	*Demonstrate various principles involved in solving mathematical problems and thereby reducing the time taken for performing job functions*	-	-	-	-	-	-	-	-	2	3	-	3	-	-
CO3	*Enhance their skills on quantitative aptitude*	-	-	-	-	-	-	-	-	2	3	-	3	-	-
CO4	*Speak and write appropriately by understanding and applying the basic grammatical rules*	-	-	-	-	-	-	-	-	2	3	-	3	-	-
CO5	*Critically evaluate problems related to quantitative aptitude*	-	-	-	-	-	-	-	-	2	3	-	3	-	-
	Average	-	-	-	-	-	-	-	-	**2**	**3**	**-**	**3**	**-**	-

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

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

SEMESTER – V

		L	T	P	C
20CS511	**PRINCIPLES OF COMPILER DESIGN**	3	1	0	4

Prerequisite: *Basic knowledge about Theory of Computation.*

Course Outcomes: On successful completion of the course, the student will be able to		***Cognitive Level***
CO1:	*Infer the knowledge about how to implement system software like assembler, loader and linker.*	Understand
CO2:	*Analyze the output generated in each phase of the compiler and Construct Finite Automata and apply minimization techniques.*	Analyze
CO3:	*Develop and analyze various top down and bottom-up parsers.*	Apply
CO4:	*Construct intermediate code for programming constructs.*	Apply
CO5:	*Design and analyze code generation schemes and optimized compilers.*	Create

UNIT – I ASSEMBLER, LINKER AND LOADER [12]

Overview of Language Processors – SIC architecture – Assemblers: Functions – Data Structures – Design of Two Pass Assembler. Loaders and Linkers: Basic Loader Functions – Types of Loaders – Design of Absolute Loader – Simple Bootstrap Loader – Design of Dynamic Linking Loader.

UNIT – II COMPILER AND LEXICAL ANALYSIS [12]

The Phases of Compiler – Cousins of Compiler – The Grouping of Phases – Compiler Construction Tools – Need and Role of Lexical Analyzer – Specification and Recognition of Tokens – Lex – Converting Regular Expression to DFA(Direct and Indirect method) – Minimization of DFA.

UNIT – III SYNTAX ANALYSIS [12]

Need and Role of the Parser – Context Free Grammar – Top Down Parsing: Recursive Descent Parser – Predictive Parser – LL(1) Parser – Bottom up parsing: Shift Reduce Parser – Operator Precedence Parser – LR Parser –Construction of SLR Parsing Table – CLR Parser – LALR Parser – Error Handling and Recovery in Syntax Analyzer –YACC.

UNIT – IV INTERMEDIATE CODE AND RUN TIME ENVIRONMENT [12]

Intermediate Languages: Postfix Notation – Syntax tree –Three Address Code. Implementation of Three Address Code – Declarations – Assignment statements – Boolean Expressions – Case statements – Back patching – Procedure Calls. Run time environment: Source Language Issues –Storage Organizations – Storage Allocation Strategies.

UNIT – V CODE OPTIMIZATION AND CODE GENERATION [12]

Principal Sources of Optimization – Peephole Optimization – Basic Blocks and Flow Graphs – DAG Representation of Basic Blocks – Optimization of Basic Blocks – Global Data Flow Analysis – Code Improving Transformations – Issues in a Design of Code Generator – Simple Code Generator Algorithm.

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

Text Books:

1 Alfred V Aho, Monica S Lam, Ravi Sethi and Jeffrey D Ullman, Compilers – Principles, Techniques and Tools, Pearson Education, India, Second Edition, 2014.

2 Leland L. Beck, System Software -An Introduction to Systems Programming, Pearson Education, Asia, Fifth Edition, 2006.

Reference Books:

1 Steven S. Much nick, Advanced Compiler Design and Implementation, Morgan Kaufmann Publishers - Elsevier Science, India, Seventh Edition Reprint 2012.

2 Randy Allen, Ken Kennedy, Optimizing Compilers for Modern Architectures: A Dependence-based Approach, Morgan Kaufmann Publishers, United States, Second Edition, 2008

3 Keith D Cooper and Linda Torsion, Engineering a Compiler, Morgan Kaufmann Publishers Elsevier Science, Pearson Education, New Delhi, Third Edition, 2008.

4 Mahesh Kumar N B, Introduction to Compilers and Language Desig, Lulu.com, United States, Second Edition, 2023

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CO-PO MAPPING

Regulation: R 2020

Course Code: 20CS511 **Course Name: PRINCIPLES OF COMPILER DESIGN**

CO	Course Outcomes	Programme Outcomes													
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	*Infer the knowledge about how to implement system software like assembler, loader and linker.*	3	3	3	3	3	1	1	-	1	-	-	3	3	3
CO2	*Analyze the output generated in each phase of the compiler and Construct Finite Automata and apply minimization techniques.*	3	3	3	3	3	2	1	-	1	-	-	3	**3**	**3**
CO3	*Develop and analyze various top down and bottom up parsers.*	3	3	3	3	3	2	1	-	1	-	-	3	**3**	**3**
CO4	*Construct intermediate code for programming constructs.*	3	3	3	3	3	2	1	-	1	-	-	3	**3**	**3**
CO5	Design and analyze code generation schemes and optimized compilers.	3	3	3	3	3	2	1	-	1	-	-	3	3	3
	Average	**3**	**3**	**3**	**3**	**3**	**2**	**1**	**-**	1	**-**	-	**3**	**3**	**3**

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

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

SEMESTER – V

20CS512	**WEB PROGRAMMING**	L	T	P	C
		3	0	0	3

Prerequisite: *Basic knowledge about problem solving techniques.*

Course Outcomes : On successful completion of the course, the student will be able to		***Cognitive Level***
CO1:	*Outline the technologies around the internet.*	*Understand*
CO2:	*Construct the idea of web designing at user interface.*	*Apply*
CO3:	*Inference the knowledge of data processing on client and server side.*	*Analyze*
CO4:	*Create the web oriented response at server side.*	*Create*
CO5:	*Design and handle the online database and web service.*	*Create*

UNIT–I INTRODUCTION TO WEB [9]

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 [9]

HTML: An Introduction to HTML History and Version - Structure of HTML Page – HTML tags for data formatting – Tables – Links – Images – List – Frames – Forms – Media – 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. Animations – Tool tips – Wildcard Selectors in CSS – Basics of frameworks like Bootstrap.

UNIT – III CLIENT-SIDE SCRIPTING [9]

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. JQuery: Introduction – Syntax – Selectors – Events – Effects.

UNIT– IV SERVER SIDE SCRIPTING [9]

NODE: Getting Started – Modules – File System – Debugger – Automation and Deployment. Servlet: Servlet API – Interface – Classes – Life Cycle – Servlet Request – Request Dispatcher – ServletConfig – ServletContext – Attribute – Session Tracking. JSP: Introduction – Life Cycle – Scriptlet – Expression – Declaration – Implicit Objects – Directive Elements – JSP Exceptions – Action Elements.

UNIT –V WEB SERVICE AND DATABASE [9]

AJAX: Introduction – XMLHttp: Request – Response – AJAX XML File. JSON: Introduction – Syntax – JSON Vs XML – JDBC: Introduction – Drivers – Driver Manager – Connection – Statement – Result Set. MongoDB: Introduction – Advantages – Database – Collection – Data Types.

Total = 45 Periods

Text Books :

1 Randy Connolly and Ricardo Hoar, Fundamentals of Web Development, Pearson Education, New Delhi, Third Edition, 2022.

2 Paul Deitel, Harvey Deitel and Abbey Deitel, Internet and World Wide Web – How to Program, Pearson Education, New Delhi, Fifth Edition, 2018.

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, 2018.

3 Jon Duckett, Beginning Web Programming with HTML, XHTML and CSS, Wiley Publishing Inc, India, Second Edition, 2008.

4 Marijn Haverbeke, Eloquent JavaScript, 3rd Edition: A Modern Introduction to Programming, No Starch Press, Third Edition, 2018.

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DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING
CO-PO MAPPING

Regulation: R 2020

Course Code: 20CS512 **Course Name: WEB PROGRAMMING**

CO	Course Outcomes	Programme Outcomes													
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	*Outline the technologies around the internet.*	3	3	3	3	3	2	-	-	-	-	3	3	3	3
CO2	*Construct the idea of web designing at user interface.*	3	3	3	3	3	2	-	-	-	-	2	3	3	2
CO3	*Inference the knowledge of data processing on client and server side.*	3	3	3	3	3	1	-	-	-	-	2	2	3	3
CO4	*Create the web oriented response at server side.*	3	3	3	2	3	2	-	-	-	-	1	2	3	2
CO5	*Design and handle the online database and web service.*	3	2	3	3	3	2	-	-	-	-	2	3	3	2
	Average	**3**	**3**	**3**	**3**	**3**	**2**	**-**	**-**	**-**	**-**	**2**	**3**	**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
20CS513	**OBJECT ORIENTED ANALYSIS AND DESIGN**	3	0	0	3

Prerequisite: *Basic knowledge about Software Engineering.*

Course Outcomes : On successful completion of the course, the student will be able to		***Cognitive Level***
CO1:	*Aware of the object model for System development.*	*Understand*
CO2:	*Express software design with UML diagrams.*	*Understand*
CO3:	*Identify the concept of Relationships.*	*Understand*
CO4:	*Acquire knowledge in object oriented design and* protocols.	*Create*
CO5:	*Obtain information about software quality assurance and system usability.*	*Apply*

UNIT – I OVERVIEW OF OBJECT ORIENTED ANALYSIS AND DESIGN [9]

An Overview of Object Oriented Systems Development – Object Basics – Object Oriented System Development Life Cycle – The software development process – Building high quality software and Reusability.

UNIT – II OBJECT ORIENTED METHODOLOGIES AND MODELLING [9]

Rum Baugh Methodology – Booch Methodology – Jacobson Methodology – Patterns – Frameworks – Unified Approach – Unified Modelling Language – Class diagram – Use case diagram – Interaction Diagram – State chart Diagram – Activity diagram – Package Diagram – Implementation Diagram.

UNIT – III OBJECT ORIENTED ANALYSIS [9]

Identifying use cases – Use case model – Classification – Approaches for Identifying Classes: Noun Phrase Approach – Common Class Patterns Approach – Use case Driven approach – Classes, Responsibilities and Collaborators – Identifying Object Relationships, Attributes and Methods.

UNIT – IV OBJECT ORIENTED DESIGN [9]

Object Oriented Design Axioms – Designing Classes – Refining attributes – Designing methods and protocols – Access Layer – Object Storage and Object Interoperability.

UNIT – V SOFTWARE QUALITY AND SYSTEM USABILITY [9]

Designing Interface Objects – Software Quality Assurance – System usability – Measuring User Satisfaction.

Total = 45 Periods

Text Books :

1 Ali Bahrami, Object Oriented Systems Development, Tata McGraw-Hill, New Delhi, Fifth Edition, 2015

2 Mahesh P.Matha, Object Oriented Analysis and Design Using UML, PHI, India, Second Edition, 2010.

Reference Books :

1 Cay Horstmann, Object Oriented Design & Patterns, Wiley India, New Delhi, Fifth Edition, 2015.

2 Martin Fowler, UML Distilled, PHI/Pearson Education, Bangalore, Third Edition, 2011.

3 Srinivasan Desikan, Gopalaswamy Ramesh, Software Testing, Pearson Education, New Delhi, Sixth Edition, 2008.

4 Booch, Object-Oriented Analysis and Design with Applications, Pearson Education India, Third Edition, 2009.

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DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING
CO-PO MAPPING

Regulation: **R 2020**

Course Code: **20CS513** **Course Name:** **OBJECT ORIENTED ANALYSIS AND DESIGN**

CO	Course Outcomes	Programme Outcomes													
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	*Aware of the object model for System development.*	3	3	3	3	3	-	-	-	2	-	2	3	3	3
CO2	*Express software design with UML diagrams.*	3	2	2	3	3	-	-	-	2	-	2	3	**3**	**3**
CO3	*Identify the concept of Relationships*	3	3	2	3	3	-	-	-	1	-	3	3	**3**	**3**
CO4	*Acquire knowledge in object oriented design and* protocols.	3	3	3	2	3	-	-	-	2	-	2	3	**3**	**3**
CO5	*Obtain information about software quality assurance and system usability.*	3	3	3	3	3	-	-	-	2	-	2	3	**3**	**3**
	Average	**3**	**3**	**3**	**3**	**3**	**-**	**-**	**-**	**2**	**-**	**2**	**3**	**3**	**3**

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

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

SEMESTER – V

20CS514	**COMPUTER NETWORKS**	L	T	P	C
		3	0	0	3

Prerequisite: *Basic knowledge about computer organization and architecture.*

Course Outcomes : On successful completion of the course, the student will be able to		***Cognitive Level***
CO1:	*Demonstrate the key concepts and functions of physical layer.*	*Remember*
CO2:	*Analyze the various flow and error control techniques and identify the best method for data transmission.*	*Analyze*
CO3:	*Design the network layer packet delivery using appropriate routing algorithms.*	*Create*
CO4:	*Apply transport layer services using TCP or UDP protocols.*	*Apply*
CO5:	*Identify the suitable network services for the given network applications.*	*Analyze*

UNIT – I DATA COMMUNICATIONS [9]

Data Communication: Data Representation – Data Flow-Networks: Topology – Types – Protocols and Standards – Network Models: TCP/IP – OSI Model – Transmission Media – Wired LANs: Ethernet – Standard Ethernet – Fast Ethernet – Gigabit Ethernet – Wireless LAN – IEEE 802.11 – Connecting Devices.

UNIT – II DATA LINK LAYER [9]

Introduction – Link Layer Addressing – Error Detection and Correction – Block Coding – Cyclic Codes – Checksum – Hamming Code – Data Link Control – Stop and Wait Protocol – Go Back N Protocol – Selective Repeat Protocol – Piggybacking – Medium Access Control.

UNIT – III NETWORK LAYER [9]

Network Layer Services – Packet Switching – Internet Protocol – Forwarding of IP Packets – Logical Addressing:IPv4 Addressing – IPv6 Addressing – Unicast Routing: RIP,OSPF and BGP – Multicast Routing: IGMP

UNIT – IV TRANSPORT LAYER [9]

Process to Process Communication – Transport layer Protocols: User Datagram Protocol: Datagram – Services – Applications – Transmission Control Protocol: Services – Features – Segment – Connections – Congestion control – Timers.

UNIT – V APPLICATION LAYER AND NETWORK MANAGEMENT [9]

DNS – FTP – E-MAIL: SMTP, MIME, POP3, IMAP, Web Mail – TELNET – SSH – WWW and HTTP – SNMP.

Total = 45 Periods

Text Books :

1 Behrouz A.Forouzan, Data Communications and Networking, Tata McGraw Hill Education, USA, Sixth Edition, 2018.

2 William Stallings, Data and Computer Communications, Pearson Education, New Delhi, Tenth Edition, 2013.

Reference Books :

1 Larry L. Peterson and Bruce S. Davie, Computer Networks: A Systems Approach, Morgan Kauffmann Publishers Inc., United States, Sixth Edition, 2021.

2 Andrew S. Tanenbaum, David J. Wetherall, Computer Networks, Prentice Hall, Delhi, Sixth Edition, 2021.

3 James F. Kurose, Keith W. Ross, Computer Networking, Pearson Education, Delhi, Eighth Edition, 2021.

4 Narasimha Karumanchi, Dr Damodaram A, Dr Sreenivasa Rao M**,** Elements of Computer Networking: An Integrated Approach, Careermonk, First Edition, 2014.

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DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING
CO-PO MAPPING

Regulation: R 2020

Course Code: 20CS514 **Course Name: COMPUTER NETWORKS**

CO	Course Outcomes	Programme Outcomes													
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	*Demonstrate the key concepts and functions of physical layer.*	2	3	2	2	3	-	-	-	2	2	1	2	3	2
CO2	*Analyze the various flow and error control techniques and identify the best method for data transmission.*	2	3	2	2	3	-	-	-	2	2	1	2	3	2
CO3	*Design the network layer packet delivery using appropriate routing algorithms.*	2	3	2	2	3	-	-	-	2	2	1	2	3	2
CO4	*Apply transport layer services using TCP or UDP protocols.*	2	3	2	2	3	-	-	-	2	2	1	2	3	2
CO5	*Identify the suitable network services for the given network applications.*	2	3	2	2	3	-	-	-	2	2	1	2	3	2
	Average	**2**	**3**	**2**	**2**	**3**	**-**	**-**	**-**	**2**	**2**	**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
20CS515	**ENTREPRENEURSHIP DEVELOPMENT**	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 fundamentals of entrepreneurial activities.*	*Understand*
CO2:	*Describe the various practical exposure about the preparation of the business plan*	*Analyze*
CO3:	*Discuss the various supports from Government and other non-governmental organizations while starting an enterprise.*	*Understand*
CO4:	*Explain the fundamental concepts in the management of small Enterprises.*	*Understand*
CO5:	*Illustrate various Entrepreneurial Development Strategies*	*Apply*

UNIT – I INTRODUCTION [9]

Entrepreneur – Entrepreneurship – Women Entrepreneurs, Social Entrepreneurship – Family Business – Entrepreneurial Motivation – Entrepreneurial Competencies – Entrepreneurship Development programs

UNIT – II STARTUP ENTREPRENEURSHIP [9]

Micro and Small Enterprises – Opportunity Identification and Selection – Formulations of Business Plans – Project Appraisal – Financing of Enterprise – Forms of Business Ownership.

UNIT – III SUPPORT TO ENTREPRENEURS [9]

Institutional Finance to Entrepreneurs – Lease Financing and Hire Purchase – Institutional Support to Entrepreneurs – Taxation Benefits to Small-Scale Enterprises – Government Policy for Small-Scale Enterprises.

UNIT – IV ENTRPRENUERSHIP MANAGEMENT [9]

Fundamentals of Management – Working Capital Management – Inventory Management – Production Management – Marketing Management – Human Resources Management – Total Quality Management for Small-Scale Enterprises.

UNIT – V DEVELOPMENT OF ENTERPRISES [9]

Intellectual Property Rights – Growth Strategies – Sickness in Small Enterprise – E-commerce – Franchising – Social Responsibility of Business – Case Studies.

Total = 45 Periods

Text Books :

1 S.S. Khanka, Entrepreneurial Development, S.Chand and Company Limited, New Delhi, First Edition (Reprint), 2020.

2 Vasant Desai, The Dynamics of Entrepreneurial Development and Management, Himalaya Publishing House, Mumbai, Sixth Edition, 2018.

Reference Books :

1 M.B. Shukla, Entrepreneurship & Small Business Management, KitabMahal, New Delhi, Second Edition, 2015.

2 Madhurimalall, Entrepreneurship, Excel Books, New Delhi, First Edition, 2016

3 Rajshankar, Entrepreneurship theory and practice, McGraw Hill, New Delhi , First Edition 2017

4 https://onlinecourses.swayam2.ac.in/ntr22_ed08/preview

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CO-PO MAPPING

Regulation: **R 2020**

Course Code: **20CS515** **Course Name:** **ENTREPRENEURSHIP DEVELOPMENT**

CO	Course Outcomes	Programme Outcomes													
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	*Explain the fundamentals of entrepreneurial activities.*	2	2	1	-	1	-	1	1	-	3	1	1	2	2
CO2	*Describe the various practical exposure about the preparation of the business plan*	2	2	3	-	2	-	2	1	-	3	1	1	**3**	**3**
CO3	*Discuss the various supports from Government and other non-governmental organizations while starting an enterprise.*	1	1	2	-	1	-	1	2	-	2	3	2	**3**	**2**
CO4	*Explain the fundamental concepts in the management of small Enterprises.*	2	2	2	-	2	-	2	2	-	3	1	2	**2**	**2**
CO5	*Illustrate various Entrepreneurial Development Strategies*	2	2	2	-	2	-	2	2	-	3	1	2	3	3
	Average	**2**	**2**	**2**	**-**	**2**	**-**	**2**	**2**	**-**	**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
20CS521	**WEB PROGRAMMING LABORATORY**	0	0	3	1

Prerequisite: *Basic knowledge about problem solving techniques.*

Course Outcomes: On Completion of this course, the student will be able to		***Cognitive level***
CO1:	*Design simple web pages using markup languages like HTML and XHTML.*	*Create*
CO2:	*Create dynamic web pages using DHTML and java script that is easy to navigate and use.*	*Create*
CO3:	*Program Server side web pages that have to process request from client web pages.*	*Create*
CO4:	*Represent web data using XML and develop web pages using JSP.*	*Create*
CO5:	*Deploy various web services and how these web services interact,*	*Analyze*

LIST OF EXPERIMENTS:

1. Create a web page with the following using HTML.
    a. To embed an image in a web page.
    b. To fix the hot spot.
    c. Show all the related information when the hot spots are clicked.
2. Create a web page with all types of cascading style sheets.
3. Develop Client Side Scripts for Validating Web Form Controls using DHTML.
4. Installation of Apache Tomcat Web Server.
5. Write Programs in Java using Servlets.
    a. To invoke servlets from HTML forms.
    b. Session Tracking.
6. Write programs in java to create three-tier applications using JSP and Databases
    a. For conducting on-line examination.
    b. For displaying mark list. Assume that student information is available in a database which has been stored in a database server.
7. Program using XML – Schema – XSLT/XSL.
8. Program using DOM and SX Parsers.
9. Program using AJAX.
10. Consider a case where we have two web services – an airline service and a travel agent. The travel agent is searching for an airline. Implement this scenario using Web Service and Database.

Total : 45 Periods

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CO-PO MAPPING

Regulation: **R 2020**

Course Code: **20CS521** **Course Name:** **WEB PROGRAMMING LABORATORY**

CO	Course Outcomes	Programme Outcomes													
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	*Design simple web pages using markup languages like HTML and XHTML.*	3	3	3	1	1	-	-	-	1	-	-	1	3	2
CO2	*Create dynamic web pages using DHTML and java script that is easy to navigate and use.*	3	3	3	2	2	-	-	-	1	-	-	1	3	2
CO3	*Program Server side web pages that have to process request from client web pages.*	3	3	2	2	1	-	-	-	2	-	-	1	3	2
CO4	*Represent web data using XML and develop web pages using JSP.*	3	3	2	1	2	-	-	-	1	-	-	1	3	1
CO5	*Deploy various web services and how these web services interact,*	3	3	3	2	2	-	-	-	2	-	-	1	3	2
	Average	**3**	**3**	**3**	**2**	**2**	**-**	**-**	**-**	**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
20CS522	**COMPUTER NETWORKS LABORATORY**	0	0	3	1

Prerequisite: *Basic Knowledge about Java Programming*

Course Outcomes: On Completion of this course, the student will be able to		***Cognitive level***
CO1:	*Demonstrate the various network topologies.*	*Remember*
CO2:	*Implement the performance of error control and data link layer protocols.*	*Evaluate*
CO3:	*Create and analyze the routing algorithms and congestion control mechanism.*	*Analyze*
CO4:	*Apply TCP and UDP to Infer network security and communication.*	*Apply*
CO5:	*Be aware of the simulation of Network simulator.*	*Understand*

LIST OF EXPERIMENTS:

1. Study of Network topology configuration and Network Devices in detail.
2. Connect the computers in Local Area Network.
3. Simulation of error detecting code using CRC.
4. Simulation of Stop and wait protocol.
5. Simulation of Go Back-N and selective repeat protocols.
6. Simulation of Distance vector routing algorithm.
7. Simulation of Link state routing algorithm.
8. Apply Caesar cipher security algorithm for network security.
9. Apply TCP program for date/time server.
10. Simple UDP socket program for echo server client chat.
11. Develop a program for congestion control using Leaky bucket algorithm.
12. Study the simulation of Network Simulator

Total : 45 Periods

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DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING
CO-PO MAPPING

Regulation: **R 2020**

Course Code: **20CS522** **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	*Demonstrate the various network topologies.*	2	3	2	2	3	-	-	-	2	2	1	2	3	2
CO2	*Implement the performance of error control and data link layer protocols.*	2	3	2	2	3	-	-	-	2	2	1	2	3	2
CO3	*Create and analyze the routing algorithms and congestion control mechanism.*	2	3	2	2	3	-	-	-	2	2	1	2	3	2
CO4	*Apply TCP and UDP to Infer network security and communication.*	2	3	2	2	3	-	-	-	2	2	1	2	3	2
CO5	*Be aware of the* simulation of Network simulator.	2	3	2	2	3	-	-	-	2	2	1	2	3	2
	Average	**2**	**3**	**2**	**2**	**3**	**-**	**-**	**-**	**2**	**2**	**1**	**2**	**3**	**2**

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

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

SEMESTER - V

20HR533	**CAREER DEVELOPMENT SKILLS - III**	L	T	P	C
		2	0	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 [6]

Reading Comprehension Level 3 – Self-Introduction – News Paper Review – Self-Marketing – Debate – Structured and Unstructured GDs Psychometric Assessment – Types and strategies to answer the questions – Practices : Sentence Completion – Sentence Correction – Jumbled Sentences – Synonyms and Antonyms – Using the same word as different parts of speech – Interpretation of Pictorial Representations – Editing.

UNIT – II VERBAL AND LOGICAL REASONING – PART 2 [6]

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 and Conclusions.

UNIT – III QUANTITATIVE APTITUDE – PART 3 [6]

Probability – Calendar – Clocks – Logarithms – Permutations and Combinations.

UNIT – V QUANTITATIVE APTITUDE – PART 4 [6]

Algebra – Linear Equations – Quadratic Equations – Polynomials – Problem on Numbers – Ages – Train –Time and Work – Sudoku – Puzzles.

UNIT – V DOMAIN PROFICIENCY [6]

C Language – Control Structures – Data Types – Arrays – Operators – Functions – Structures – Pointers – Files.

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

5 Herbert Schildt, C - The Complete Reference, Tata McGraw-Hill, New Delhi, Fourth Edition, 2013.

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DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

CO-PO MAPPING

Regulation: R 2020

Course Code: 20HR533 **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	-	-	-	-
CO2	*Perform well in verbal and logical reasoning.*	-	-	-	-	-	-	-	1	3	3	-	2	-	-
CO3	*Understand and develop the etiquette necessary to present oneself in a professional setting.*	-	-	-	-	-	-	-	1	3	3	-	1	-	
CO4	*Demonstrate various principles involved in solving mathematical problems and thereby reducing the time taken for performing job functions.*	-	-	-	-	-	-	-	1	3	3	-	2	-	-
CO5	*Enhance the comprehension Skills in core subjects.*	-	-	-	-	-	-	-	1	3	3	-	-	-	-
	Average	-	-	-	-	-	-	-	1	**3**	**3**	**-**	**2**	**-**	**-**

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

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

SEMESTER – VI

20HS051	**UNIVERSAL HUMAN VALUES AND UNDERSTANDING HARMONY**	L	T	P	C
		3	0	0	3

Prerequisite: *Basic knowledge about operating systems*

Course Outcomes: On successful completion of the course, the student will be able to		***Cognitive Level***
CO1:	*Explain the basic concepts of value education.*	*Understanding*
CO2:	*Distinguish between the self and the body, implement the meaning of harmony in the Co–existence of Self and the Body.*	*Understanding*
CO3:	*Explain the value of harmonious relationship based on trust, respect and other naturally acceptable feelings in human–human relationships.*	*Understanding*
CO4:	*Describe the harmony in nature and existence, and work out their mutually fulfilling participation in the nature.*	*Understanding*
CO5:	*Explain the ethical and unethical practices in work environment.*	*Understanding*

UNIT - I INTRODUCTION TO VALUE EDUCATION [9]

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 Fulfillment of Human Aspirations – Relationships – Physical Facilities – Right Understanding.

UNIT – II HARMONY IN THE HUMAN BEING [9]

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 [9]

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 [9]

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 [9]

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 = 45 Periods

Text Books :

1 Gaur R.R., Sangal, R., Bagaria, G.P., A Foundation Course in Human Values and Professional Ethics, Excel 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 Banerjee, B.P., Foundations of Ethics and Management, Excel Book, 2005.

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DEPARTMENT OF COMPUTER SCIENCE AND 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
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 Datatypes – 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
20CS611	**CRYPTOGRAPHY AND NETWORK SECURITY**	3	0	0	3

Prerequisite: *Basics of computer Networks and Mathematical Function*

Course Outcomes : On successful completion of the course, the student will be able to		***Cognitive Level***
CO1:	*Interpret OSI security architecture and classical encryption techniques.*	*Understand*
CO2:	*Illustrate fundamental knowledge on the concepts of finite fields and number theory.*	*Understand*
CO3:	*Identify various block cipher and stream cipher models.*	*Apply*
CO4:	*Inspect public key cryptosystems, hash functions and digital signature.*	*Understand*
CO5:	*Prioritize system security, e-mail, IP and web security.*	*Understand*

UNIT - I ENCRYPTION TECHNIQUES AND NUMBER THEORY [9]

Services, Mechanisms and Attacks − OSI Security Architecture - Network Security Model − Classical Encryption Techniques. Finite Fields and Number Theory: Groups − Rings − Fields − Modular Arithmetic − Euclid's Algorithm − Finite Fields − Prime Numbers − Fermat's and Euler's Theorem −Testing for Primarily − Chinese Remainder Theorem.

UNIT - II BLOCK CIPHERS AND PUBLIC KEY CRYPTOGRAPHY [9]

Data Encryption Standard − Block Cipher Principles − Block Cipher Modes of Operation − Advanced Encryption Standard (AES) − Triple DES − Blowfish − RC5 Algorithm. Public Key Cryptography: Principles of Public Key Cryptosystems − RSA Algorithm − Key Management – Diffie Hellman Key Exchange − Elliptic Curve Arithmetic − Elliptic Curve Cryptography.

UNIT - III HASH FUNCTIONS AND DIGITAL SIGNATURES [9]

Authentication Requirement − Authentication Function − MAC − Hash Function − Security of Hash Function and MAC − MD5 − SHA − HMAC − CMAC − Digital Signature and Authentication Protocols − DSS.

UNIT - IV SECURITY PRACTICE AND SYSTEM SECURITY [9]

Kerberos − X.509 Authentication Services − Internet Firewalls for Trusted System: Roles of Firewalls − Firewall Related Terminology − Types of Firewalls − Firewall Designs – Intruder − Intrusion Detection System − Virus and Related Threats − Countermeasures − Firewalls Design Principles − Trusted Systems.

UNIT - V WEB SECURITY SERVICES [9]

E-mail Security: Pretty Good Privacy − S/MIME - IP Security: Overview of IPSec − IP Security Policy − Encapsulating Security Payload − Internet Key Exchange – Transport − Level Security − Web Security Considerations − Secure Socket Layer − Transport Layer Security – HTTPS – DNS

Total = 45 Periods

Text Books :

1 William Stallings, Cryptography and Network Security Principles and Practices, Pearson Education, India, Seventh Edition, 2019.

2 Behrouz A. forouzan, Cryptography and Network Security, Tata McGraw Hill, New Delhi, Fifth Edition, 2014.

Reference Books :

1 Ajay Kumar and S. Bose, Cryptography and Network Security, Pearson Education, India, Fourth Edition, 2016.

2 Man Young Rhee, Internet Security: Cryptography Principles, Algorithms and Protocols, Wiley Publications, India, Second Edition, 2003

3 Charlie Kaufman, Radia Perlman and Mike Spicier, Network Security, Prentice Hall of India, Bangalore, Second Edition, 2002.

4 Atul Kahate, Cryptography and Network Security, McGraw-Hill, India, Fourth Edition, 2019.

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DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING
CO-PO MAPPING

Regulation: **R 2020**

Course Code: **20CS611** **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	*Interpret OSI security architecture and classical encryption techniques.*	3	2	2	-	2	3	3	-	-	-	1	3	3	1
CO2	*Illustrate fundamental knowledge on the concepts of finite fields and number theory.*	3	3	1	-	2	3	3	-	-	-	1	3	3	1
CO3	*Identify various block cipher and stream cipher models.*	3	3	1	-	2	3	3	-	-	-	1	3	3	1
CO4	*Inspect public key cryptosystems, hash functions and digital signature.*	3	3	1	-	2	3	3	-	-	-	2	3	3	1
CO5	*Prioritize system security, e-mail, IP and web security.*	3	3	1	-	2	3	3	-	-	-	2	3	3	1
	Average	**3**	**3**	**1**	**-**	**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 – VI

		L	T	P	C
20CS612	**SOFTWARE TESTING**	3	0	0	3

Prerequisite: *Basic knowledge about Software Engineering.*

Course Outcomes : On successful completion of the course, the student will be able to		***Cognitive Level***
CO1:	*Design test cases suitable for a software development for different domains.*	Understand
CO2:	*Identify suitable tests to be carried out.*	Understand
CO3:	*Prepare test planning based on the document.*	Understand
CO4:	*Document test plans and test cases designed.*	Understand
CO5:	*Use automated testing tools and* Selenium.	Apply

UNIT – I BASIC CONCEPTS OF SOFTWARE TESTING [9]

Testing as an Engineering Activity – Testing as a Process – Testing Maturity Model –Testing Axioms – Basic Definitions – Software Testing Principles – Tester's Role in a Software Development Organization – Origins of Defects – Cost of defects – Defect Classes .

UNIT – II TEST CASE DESIGN STRATEGIES [9]

Test case Design Strategies – Using Black Box Approach to Test Case Design – Boundary Value Analysis – Equivalence Class Partitioning – State Based Testing – Cause-Effect Graphing – Compatibility Testing – User Documentation Testing - Requirements Based Testing – Using White Box Approach to Test Design – Test Adequacy Criteria – Static Testing vs. Structural Testing – Code Functional Testing – Coverage and Control Flow Graphs – Covering Code Logic – Paths – Code Complexity Testing.

UNIT – III LEVELS OF TESTING [9]

Need for Levels of Testing – Unit Test – Unit Test Planning – Designing the Unit Tests – The Test Harness – Running the Unit tests and Recording Results – Integration Tests – Designing Integration Tests – Integration Test Planning – Scenario Testing – Defect Bash Elimination System Testing – Acceptance Testing – Performance Testing – Regression Testing – Internationalization Testing – Alpha, Beta Tests – Usability and Accessibility Testing – Configuration Testing.

UNIT – IV TEST MANAGEMENT [9]

People and Organizational Issues in Testing – Organization Structures for Testing Teams – Testing Services – Test Planning – Test Plan Components – Test Plan Attachments – Locating Test Items – Test Management – Test Process – Reporting Test Results – Introducing the Test Specialist – Skills Needed by a Test Specialist – Building a Testing Group – Structure of Testing Group.

UNIT– V TEST AUTOMATION AND SELENIUM [9]

Software Test Automation – Skills Needed for Automation – Scope of Automation – Design and Architecture for Automation – Requirements for a Test Tool – Challenges in Automation – Test Metrics and Measurements – Project, Progress and Productivity Metrics – Introduction to Selenium – Using Selenium IDE for Automation Testing – Using Selenium Web Driver for Automation Testing – Understanding Testing Framework with Selenium Web Driver for Automation Testing.

Total = 45 Periods

Text Books:

1 Srinivasan Desikan and Gopalaswamy Ramesh, Software Testing, Principles and Practices, Pearson Education, New Delhi, Second Edition, 2007

2 Ron Patton, Software Testing, Sams Publishing, Pearson Education, New Delhi, Second Edition, 2007.

Reference Books:

1 Elfriede Dustin, Implementing Automated Software Testing: How to Save Time and Lower Costs While Raising Quality, Addison Wesley, New Delhi, First Edition, 2009.

2 Glenford J. Myers , Tom Badgett, Corey Sandler, The Art of Software Testing, Wiley & New Jersey, India, Third Edition, 2015

3 Selenium.org - http://docs.seleniumhq.org/docs/

4 Dorothy Graham, Foundation of Software Testing: ISTQB Certification, Cengage, First Edition, 2012

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DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING
CO-PO MAPPING

Regulation: R 2020

Course Code: 20CS612 **Course Name: SOFTWARE TESTING**

CO	Course Outcomes	Programme Outcomes													
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	*Design test cases suitable for a software development for different domains.*	3	3	3	3	3	-	-	-	-	1	3	3	3	3
CO2	*Identify suitable tests to be carried out.*	3	3	3	3	3	-	-	-	-	2	3	3	2	3
CO3	*Prepare test planning based on the document.*	3	3	2	3	3	-	-	-	-	2	3	2	2	3
CO4	*Document test plans and test cases designed.*	3	3	3	3	3	-	-	-	-	2	3	3	2	3
CO5	*Use automated testing tools and* Selenium.	3	3	3	2	3	-	-	-	-	2	3	3	3	3
	Average	**3**	**3**	**3**	**3**	**3**		-	-	-	2	**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
20CS621	**C# AND .NET FRAMEWORK LABORATORY**	0	0	3	1

Prerequisite: *Basic knowledge of Java programming.*

Course Outcomes: On Completion of this course, the student will be able to		***Cognitive level***
CO1:	*Recognize the use of C#.*	*Understand*
CO2:	*Build simple programming concepts using .Net.*	*Understand*
CO3:	*Demonstrate the use of various controls in .Net.*	*Apply*
CO4:	*Develop simple applications using ASP.Net.*	*Apply*
CO5:	*Create and deploy a simple online application.*	*Apply*

LIST OF EXPERIMENTS:

1. Write a C# Program for the Following in Console Application
   a. Inheritance
   b. Interface
   c. Polymorphism
2. Write a C # for String Handling in Console Application
3. Implement a C# Program to Find Volume of Cube and Cuboid Using Delegates.
4. Write a Program in C# to demonstrate Operator overloading.
5. Write a program in C# to demonstrate the usage of object and class.
6. Create a webpage to implement all validation controls in ASP.Net.
7. Program with ASP.Net by Connecting With SQL.
   a. Create Login Form to Enter into Website.
   b. Building Web Form that Displays Data from a Database.
8. Create a Website Using Master Page Concept in ASP.Net.
9. Create a Webpage to implement Application and Session States in ASP.Net.
10. Create a Website for Online Movie Ticket Reservation System Using Session Concept.

Total : 45 Periods

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DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING
CO-PO MAPPING

Regulation: R 2020

Course Code: 20CS621 **Course Name: C# AND .NET FRAMEWORK LABORATORY**

CO	Course Outcomes	Programme Outcomes													
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	*Recognize the use of C#.*	3	3	3	2	2	-	-	2	2	-	1	1	3	2
CO2	*Build simple programming concepts using .Net.*	3	3	2	1	2	-	-	2	1	-	1	1	3	1
CO3	*Demonstrate the use of various controls in .Net.*	3	3	2	2	1	-	-	2	2	-	1	1	3	2
CO4	*Develop simple applications using ASP.Net.*	3	3	3	1	2	-	-	2	2	-	1	1	3	1
CO5	*Create and deploy a simple online application.*	3	3	3	2	1	-	-	2	2	-	1	1	3	1
	Average	**3**	**3**	**2**	**2**	**2**	**-**	**-**	**2**	**2**	**-**	**1**	**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
20CS622	**MINI PROJECT**	0	0	6	3

Prerequisite: *Basic knowledge of Java programming.*

Course Outcomes: On Completion of this course, the student will be able to		***Cognitive level***
CO1:	*Formulate a real-world problem, identify the requirement and develop the design solutions.*	*Understand*
CO2:	*Identify technical ideas, strategies and methodologies.*	*Understand*
CO3:	*Utilize the new tools, algorithms, techniques that contribute to obtain the solution of the project.*	*Analyze*
CO4:	*Test and validate through conformance of the developed prototype and analysis the cost effectiveness.*	*Apply*
CO5:	*Prepare report and present oral demonstrations.*	*Create*

GUIDELINES:

1. Each Student can undergo project work, either Individual / Group, based on Society, Application, Software, Hardware, Research, Innovation, Industry, etc., with the guidance of reputed Journals and Articles.
2. Project Team will be supervised by subject / industrial experts based on their Area of specialization.
3. Each student will undertake a sizeable project involving survey of literature.
4. Contact Hours shall be allotted in the timetable and this time shall be utilized by the students to receive the directions from the guide, on library reading, laboratory work, and computer analysis of field work as assigned by the guide and also to presenting periodical seminars on the progress made in the project.
5. The aim of the project work is to deepen comprehension of principles by applying them to a new problem which may be the design and manufacture of a device, a research investigation, a computer or management project or a design problem.
6. The student should implement and develop systems by selecting appropriate techniques based on its performance.
7. The progress of the project is evaluated based on a minimum of three reviews.
8. The student should have to write the reports under respective regulation along with the guidance of faculty members / industry experts.
9. Project Report + Number of Project report to be submitted = No. of Students in the Batch + Guide + Department Library + College Library

Total : 45 Periods

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DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING
CO-PO MAPPING

Regulation: R 2020

Course Code: 20CS622 **Course Name: MINI PROJECT**

CO	Course Outcomes	Programme Outcomes													
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	*Formulate a real-world problem, identify the requirement and develop the design solutions.*	1	2	3	2	2	1	-	2	2	-	1	1	3	2
CO2	*Identify technical ideas, strategies and methodologies.*	1	2	2	1	2	1	-	2	1	-	1	1	3	1
CO3	*Utilize the new tools, algorithms, techniques that contribute to obtain the solution of the project.*	1	2	2	2	1	1	-	2	2	-	1	1	3	2
CO4	*Test and validate throu gh conformance of the developed prototype and analysis the cost effectiveness.*	1	2	3	1	2	1	-	2	2	-	1	1	3	1
CO5	*Prepare report and present oral demonstrations.*	1	2	3	2	1	1	-	2	2	-	1	1	3	1
	Average	**1**	**2**	**2**	**2**	**2**	**1**	**-**	**2**	**2**	**-**	**1**	**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
20HR634	**CAREER DEVELOPMENT SKILLS – IV**	2	0	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:	*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:	*Enhance the comprehension Skills in core subjects.*	*Apply*

UNIT - I WRITTEN AND ORAL COMMUNICATION – PART 2 [6]

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 [6]

Geometry – Straight Line – Triangles – Quadrilaterals – Circles – Co-ordinate Geometry – Cube – Cone – Sphere.

UNIT - III DATA INTERPRETATION AND ANALYSIS [6]

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 [6]

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 [6]

JAVA: Java Buzzwords – Access Control – Inheritance – Packages – Exceptions – String – Threads.

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 V.K. Mehta & Rohit Mehta, Objective Electrical Technology, S Chand publications, First Edition, 2012.

5 Herbert Schildt, Java - The Complete Reference, Oracle Press, McGraw-Hill Education, New Delhi, Tenth Edition, 2018.

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DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING
CO-PO MAPPING

Regulation: R 2020

Course Code: 20HR634 **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	*Employ critical thinking in personal interviews type situations.*	-	-	-	-	2	-	-	-	1	3	-	2	-	-
CO2	*Understand the Quantitative Aptitude problems in geometry.*	-	-	-	-	2	-	-	-	1	3	-	2	-	-
CO3	*Understand the data interpretation and analysis by using various graphs.*	-	-	-	-	2	-	-	-	1	3	-	2	-	-
CO4	*Enhance the skills in resume writing and presentation.*	-	-	-	-	2	-	-	-	1	3	-	2	-	-
CO5	*Enhance the comprehension Skills in core subjects.*	-	-	-	-	2	-	-	-	1	3	-	2	-	-
	Average	-	-	-	-	2	-	-	-	**1**	**3**	**-**	**2**	**-**	-

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

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

SEMESTER – VII

20CS711	**MOBILE COMPUTING**	L	T	P	C
		3	0	0	3

Prerequisite: *Basic knowledge of Computer Networks.*

Course Outcomes : **Upon Completion of the course, the students should be able to**		***Cognitive Level***
CO1:	*Explain the basics of mobile telecommunication system.*	*Understand*
CO2:	*Illustrate the generation of telecommunication systems in wireless network.*	*Understand*
CO3:	*Determine the functionality of MAC, network layer and Identify a routing protocol for a given Ad hoc network.*	*Apply*
CO4:	*Explain the functionality of mobile adhoc wireless networks.*	*Understand*
CO5:	*Develop a mobile application using android, blackberry, iOS and Windows***.**	*Apply*

UNIT – I FUNDAMENTALS OF MOBILE COMPUTING [9]

Introduction to Mobile Computing – Mobile Computing Vs Wireless Networking – Mobile Computing Applications – Characteristics of Mobile computing – Structure of Mobile Computing Application – Mobile Wireless Transmission – MAC: SDMA – FDMA – TDMA – CDMA.

UNIT – II MOBILE TELECOMMUNICATION SYSTEM [9]

Introduction to Cellular Systems – GSM – Services and Architecture – Protocols – Connection Establishment – Frequency Allocation – Routing – Mobility Management – Security – GPRS – UMTS – Architecture – Handover – Security – 3G wireless systems

UNIT– III MOBILE NETWORK AND TRANSPORT LAYER [9]

Infra-Red Vs. Radio Transmission – Infrastructure and Adhoc Network – Mobile IP – Mobile Adhoc Networks –Traditional TCP and classical TCP improvements.

UNIT – IV MOBILE ADHOC WIRELESS NETWORKS [9]

Adhoc Basic Concepts – Characteristics – Applications – Design Issues – Routing – Essential of Traditional Routing Protocols – Popular Routing Protocols – Vehicular Ad Hoc networks (VANET) – MANET Vs VANET – Security.4G Vision – 4G Features and Challenges – Applications of 4G. 4G Technologies – LTE FDD Vs TDD comparison – 5G wireless systems.

UNIT – V MOBILE PLATFORMS AND APPLICATIONS [9]

Mobile Device Operating Systems – Special Constrains and Requirements – Commercial Mobile Operating Systems – Software Development Kit: Android, BlackBerry, Windows Phone – M-Commerce – Structure – Pros and Cons – Mobile Payment System – Security Issues.

Total = 45 Periods

Text Books :

1 Prasant Kumar Pattnaik, Rajib Mall, Fundamentals of Mobile Computing, PHI Learning Pvt. Ltd, New Delhi, Second Edition, 2016.

2 Jochen H. Schller, Mobile Communications, Pearson Education, New Delhi, Second Edition, 2012.

Reference Books :

1 Hassan & Mahbub, wireless and mobile networking, Taylor and Francis Ltd, Oxford shire, United Kingdom, First Edition, 2022.

2 Samson Colon, Wireless Networks and Communications, Willford Press, USA, First Edition, 2019

3 Iti Saha Misra, Wireless Communication and Networks – 3G and Beyond, Mc Graw Hill Education, New Delhi, Second Edition, 2013.

4 Asoke K Talukder, Hasan Ahmed, et al, Mobile Computing: Technology Applications and Service Creation, Mc Graw Hill Education, New Delhi, Second Edition, 2013.

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DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING
CO-PO MAPPING

Regulation: R 2020

Course Code: 20CS711 **Course Name: MOBILE COMPUTING**

CO	Course Outcomes	Programme Outcomes													
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	*Explain the basics of mobile telecommunication system.*	3	3	3	3	3	-	-	-	2	-	2	3	3	3
CO2	*Illustrate the generation of telecommunication systems in wireless network.*	3	2	2	3	3	-	-	-	2	-	2	3	**3**	**3**
CO3	*Determine the functionality of MAC, network layer and Identify a routing protocol for a given Ad hoc network.*	3	3	2	3	3	-	-	-	1	-	3	3	**3**	**3**
CO4	*Explain the functionality of mobile adhoc wireless networks.*	3	3	3	2	3	-	-	-	2	-	2	3	**3**	**3**
CO5	*Develop a mobile application using android, blackberry, iOS and Windows*.	3	3	3	3	3	-	-	-	2	-	2	3	**3**	**3**
	Average	**3**	**3**	**3**	**3**	**3**	**-**	**-**	**-**	**2**	**-**	**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
20CS712	**GRAPHICS AND MULTIMEDIA**	3	0	0	3

Prerequisite: *Basic C language, linear algebra, geometry and calculus.*

Course Outcomes : On successful completion of the course, the student will be able to		***Cognitive Level***
CO1:	*Comprehend the basic about graphics and different display systems*	*Remember*
CO2:	*Examine algorithms for generating different 2-D graphical objects like circle, line, ellipse and polygon filling.*	*Understand*
CO3:	*Apply two dimensional transformations and clipping techniques.*	*Apply*
CO4:	*Apply three dimensional transformations and surface detection and rendering methods.*	*Apply*
CO5:	*Analyze about overview of multimedia systems.*	*Understand*

UNIT – I OVERVIEW OF GRAPHICS SYSTEMS [9]

Introduction of Computer Graphics and its Applications − Video Display Devices: Refresh Cathode − Ray Tubes − Raster Scan Displays − Random Scan Displays − Color CRT Monitor − Direct-View Storage Tubes − Flat Panel Displays − Raster Scan Systems − Random-Scan Systems − Input Devices − Hard-Copy Devices − Graphics Software.

UNIT – II GEOMETRIC DISPLAY PRIMITIVES AND ATTRIBUTES [9]

Points and Lines − Line Drawing Algorithms: Line Equations − DDA Algorithm − Bresenham's Line Algorithm − Loading the Frame Buffer − Line Function − Circle Generating Algorithms: Properties of Circles − Mid-Point Circle Algorithm − Ellipse Generating Algorithms: Properties of Ellipses − Midpoint Ellipse Algorithm − Filled-Area Primitives.

UNIT – III **2D TRANSFORMATION AND CLIPPING [9]**

Two-Dimensional Geometric Transformations − Basic Transformations − Matrix Representations and Homogeneous Coordinates − Composite Transformations: Translations − Rotations – Scalings − General Pivot-Point Rotation − General Fixed-Point Scaling. Two Dimensional Viewing: The Viewing Pipeline − Clipping Operations: Point Clipping – Line Clipping: Cohen-Sutherland Line Clipping − Liang-Barsky Line Clipping – Polygon Clipping: Sutherland − Hodgman Polygon Clipping − Curve Clipping.

UNIT – IV 3D TRANSFORMATION AND RENDERING [9]

Three-Dimensional Transformation: Translation – Rotation: Coordinate − Axis Rotations – Scaling. Three-Dimensional Viewing: The Viewing Pipeline. Visible Surface Detection Methods: Classification of Visible − Surface Detection Algorithms − Back Face Detection, Depth Buffer Method. Illumination Models: Light Sources − Basic Illumination Models: Ambient Light − Diffuse Reflection − Specular Reflection and the Phong Model − Polygon Rendering Methods.

UNIT - V MULTIMEDIA SYSTEMS [9]

Multimedia Elements − Multimedia Applications − Multimedia System Architecture − Evolving Technologies for Multimedia Systems − Defining Objects for Multimedia Systems − Multimedia Databases − Multimedia input/output technologies – Digital voice and Audio − Video images and animation.

Total = 45 Periods

Text Books :

1 Donald Hearn and M. Pauline Baker, Computer Graphics C version, Pearson Education, India, Second Edition, 2014.

2 Prabhat K. Andleigh, Kiran Thakra, Multimedia Systems Design Always Learning, Pearson Education, India, First Edition, 2015.

Reference Books :

1 Hearn, Baker and Carithers, Computer Graphics with Open GL, Pearson Education Limited, India, Fourth Edition, 2014.

2 Roger, Mathematical Elements for Computer Graphics Tata McGraw Hill, New Delhi, Second Edition, 2012.

3 Prabat K Andleigh and Kiran Thakrar, Multimedia Systems and Design, Prentice Hall, New Delhi, Second Edition, 2007.

4 Anirban Mukhopadhyay and Arup Chattopadhyay, Introduction to Computer Graphics and Multimedia, Vikas Publishing House, Second Edition, 2007.

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

Regulation: R 2020

Course Code: 20CS712 **Course Name: GRAPHICS AND MULTIMEDIA**

CO	Course Outcomes	Programme Outcomes													
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	*Comprehend the basic about graphics and different display systems*	3	3	3	-	3	2	-	-	1	-	-	2	3	3
CO2	*Examine algorithms for generating different 2-D graphical objects like circle, line, ellipse and polygon filling.*	3	3	3	-	2	3	-	-	1	-	-	2	3	3
CO3	*Apply two dimensional transformations and clipping techniques.*	3	3	3	-	3	3	-	-	1	-	-	2	3	3
CO4	*Apply three dimensional transformations and surface detection and rendering methods.*	3	3	3	-	3	2	-	-	1	-	-	2	3	3
CO5	*Analyze about overview of multimedia systems.*	3	3	3	-	2	3	-	-	1	-	-	2	3	3
	Average	**3**	**3**	**3**	**-**	**3**	**3**		**-**	**1**	**-**	**-**	**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
20CS713	**CLOUD AND BIG DATA ANALYTICS**	3	0	0	3

Prerequisite: *Basic knowledge in database management and distributed systems.*

Course Outcomes : On successful completion of the course, the student will be able to		***Cognitive Level***
CO1:	*Infer about Cloud Basics*	*Remember*
CO2:	*Brief roughly cloud programming and security*	*Understand*
CO3:	*Summarize about big data and its concepts*	*Remember*
CO4:	*Capable to sum-up Big data analytics*	*Apply*
CO5:	*Identify the concept of clustering*	*Understand*

UNIT – I ERA OF CLOUD COMPUTING [9]

Motivations for Cloud – Elastic Computing – Cloud Types – Cloud infrastructure and Virtualization – Data centre Infrastructure and Equipment

UNIT – II CLOUD PROGRAMMING PARADIGMS [9]

Map Reduce Paradigm – Microservices – Controller-Based Management Software – DevOps – Cloud Security and Privacy.

UNIT – III OVERVIEW OF BIG DATA AND ITS CONCEPTS [9]

Understanding Big Data – 3Vs of Big Data - Big Data Infrastructure – Big Data Storage Concepts – NoSQL Database – Big Data Processing and Management Concepts – Apache Hadoop – HBASE – SQOOP – Hive Architecture – Hadoop Distributions

UNIT – IV BIG DATA ANALYTICS [9]

Terminology of Big Data Analytics – Big Data Analytics Techniques – Big Data Real-Time Analytics Processing – Big Data Analytics with Machine Learning – Mining Data Streams and Frequent Itemset.

UNIT – V CLUSTER ANALYSIS AND VISUALIZATION [9]

Clustering – Expectation Maximization Clustering Algorithm – Optimization Algorithm – Fuzzy Clustering – Big Data Visualization – Tableau – R.

Total = 45 Periods

Text Books :

1 Douglas Comer, The Cloud Computing Book The Future of Computing Explained, CRC Press, United States, First Edition,2021.

2 Balamurugan Balusamy, Nandhini Abirami R, Seifedine Kadry, Amir H and Gandomi, Big Data: Concepts, Technology, and Architecture, Wiley Publication, India, First Edition 2021.

Reference Books:

1 Michael Kavis, Architecting the Cloud Design Decisions for Cloud Computing Service Models (SaaS, PaaS, and IaaS) Wiley Publication, India, First Edition, 2014

2 Subhashini Chellappan, Seema Acharya, Big Data and Analytics, Wiley Publication, India, Second Edition 2019

3 John J. "Jack" McGowan CEM, Energy and Analytics: BIG DATA and Building Technology Integration, River Publishers, USA, First Edition, 2015

4 Marcello Trovati et al., Big-Data Analytics and Cloud Computing: Theory, Algorithms and Applications, Springer International Publishing AG, First Edition,2015.

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DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING
CO-PO MAPPING

Regulation: R 2020

Course Code: 20CS713 **Course Name: CLOUD AND BIG DATA ANALYTICS**

CO	Course Outcomes	Programme Outcomes													
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	*Infer about Cloud Basics*	2	2	-	1	2	-	-	-	-	-	2	2	3	1
CO2	*Brief roughly cloud programming and security*	2	2	3	1	2	-	-	-	-	-	2	2	3	1
CO3	*Summarize about big data and its concepts*	2	2	-	1	2	-	-	-	-	-	2	2	3	1
CO4	*Capable to sum-up Big data analytics*	2	2	-	1	2	-	-	-	-	-	2	2	3	1
CO5	*Identify the concept of clustering*	2	2	3	1	2	-	-	-	-	-	2	2	3	1
	Average	**2**	**2**	**3**	**1**	**2**	**-**	**-**	**-**	**-**	**-**	**2**	**2**	**3**	**1**

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

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

SEMESTER - VII

20CS721	**GRAPHICS AND MULTIMEDIA LABORATORY**	L	T	P	C
		0	0	3	1

Prerequisite: : *Basic C language, linear algebra, geometry and calculus.*

Course Outcomes : On successful completion of the course, the student will be able to		***Cognitive Level***
CO1:	*Apply geometric, mathematical and algorithmic concepts necessary for programming computer graphics.*	*Apply*
CO2:	*Apply various line Drawing and clipping algorithms.*	*Apply*
CO3:	*Identify the Concepts of 2D and 3D object representation.*	*Understand*
CO4:	*Apply different realizations of multimedia tools.*	*Apply*
CO5:	*Develop interactive animations using multimedia tools.*	*Apply*

List of Experiments:

1. Implementation of line drawing algorithm. a) DDA b) Bresenham's Line Algorithm.
2. Implementation of Mid-Point Circle Algorithm for drawing circle.
3. Implementation of Mid-Point Ellipse Algorithm for drawing ellipse.
4. Implementation of 2D transformations: Translation, Rotation and Scaling.
5. Implementation of Cohen - Sutherland line clipping algorithm.
6. Implementation of Liang - Barsky Line Clipping.
7. Implementation of 3D transformations: Translation, Rotation and Scaling.
8. Create a UI design using Adobe Photoshop.
9. Create a logo design using Adobe Illustrator.
10. Create a Bouncing Ball using Key frame animation and path Animation.

Total 45 Periods

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CO-PO MAPPING

Regulation: **R 2020**

Course Code: **20CS721** **Course Name:** **GRAPHICS AND MULTIMEDIA LABORATORY**

CO	Course Outcomes	Programme Outcomes													
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	*Apply geometric, mathematical and algorithmic concepts necessary for programming computer graphics.*	3	3	3	-	3	2	-	-	1	-	-	2	3	3
CO2	*Apply various line Drawing and clipping algorithms.*	3	3	3	-	2	3	-	-	1	-	-	2	3	3
CO3	*Identify the Concepts of 2D and 3D object representation.*	3	3	3	-	3	3	-	-	1	-	-	2	3	3
CO4	*Apply different realizations of multimedia tools.*	3	3	3	-	3	2	-	-	1	-	-	2	3	3
CO5	*Develop interactive animations using multimedia tools.*	3	3	3	-	2	3	-	-	1	-	-	2	3	3
	Average	**3**	**3**	**3**	**-**	**3**	**3**		**-**	**1**	**-**	**-**	**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
20CS722	**CLOUD AND BIG DATA LABORATORY**	3	0	0	3

Prerequisite: *Basic knowledge of database management system, data warehousing and data mining.*

Course Outcomes : On successful completion of the course, the student will be able to		***Cognitive Level***
CO1:	*Identify the working of various working environment and web applications.*	*Apply*
CO2:	*Work on cluster concepts.*	*Apply*
CO3:	*Write program on Hadoop concepts.*	*Create*
CO4:	*Compose file management tasks.*	*Create*
CO5:	*Create database using HIVE and working of R packages.*	*Create*

List of Experiments

1. Install Virtual box/VMware Workstation with different flavors of Linux or windows OS on top of windows 10.
2. Install Google App Engine. Create hello world app and other simple web applications using python/java.
3. Find a procedure to transfer the files from one virtual machine to another virtual machine.
4. Install Hadoop single node cluster and run simple applications like word count.
5. Word Count Map Reduce program to understand Map Reduce Paradigm.
6. Implementing Matrix Multiplication with Hadoop Map Reduce.
7. a. Run the Pig Latin Scripts to find Word Count

   b. Run the Pig Latin Scripts to find a max temp for each and every year.
8. Implement the following file management tasks in Hadoop:

   i. Adding files and directories

   ii. Retrieving files

   iii. Deleting files

   Hint: A typical Hadoop workflow creates data files (such as log files) elsewhere and copies them into HDFS using one of the above command line utilities.
9. a. Installation of HIVE

   b. Use Hive to create, alter, and drop databases, tables, views, functions, and indexes.
10. a. Installing R and packages in R

    b. Creating matrix and manipulating matrix in R.

Total = 45 Periods

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CO-PO MAPPING

Regulation: **R 2020**

Course Code: **20CS722** **Course Name:** **CLOUD AND BIG DATA LABORATORY**

CO	Course Outcomes	Programme Outcomes													
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	*Identify the working of various working environment and web applications.*	3	3	3	3	2	2	-	-	2	-	2	2	3	2
CO2	*Work on cluster concepts.*	3	3	3	3	2	2	-	-	2	-	2	2	**3**	**2**
CO3	*Write program on Hadoop concepts.*	3	3	3	3	2	2	-	-	2		2	2	**3**	**2**
CO4	*Compose file management tasks.*	3	3	3	3	2	2	-	-	2	-	2	2	**3**	**2**
CO5	*Create database using HIVE and working of R packages.*	3	3	3	3	2	2	-	-	2	-	2	2	3	2
	Average	**3**	**3**	**3**	**3**	**2**	**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

		L	T	P	C
20CS821	**PROJECT WORK**	0	0	12	6

Prerequisite: *Basic knowledge of programming and computer engineering concepts..*

Course Outcomes: On Completion of this course, the student will be able to		***Cognitive level***
CO1:	*Formulate a real world problem, identify the requirement and develop the design solutions.*	*Understand*
CO2:	*Identify technical ideas, strategies and methodologies.*	*Understand*
CO3:	*Utilize the new tools, algorithms, techniques that contribute to obtain the solution of the project.*	*Analyze*
CO4:	*Test and validate through conformance of the developed prototype and analysis the cost effectiveness.*	*Apply*
CO5:	*Prepare report and present oral demonstrations.*	*Create*

GUIDELINES:

1. Each Student can undergo project work, either Individual / Group, based on Society, Application, Software, Hardware, Research, Innovation, Industry, etc., with the guidance of reputed Journals and Articles.
2. Project Team will be supervised by subject / industrial experts based on their Area of specialization
3. Each student will undertake a sizeable project involving survey of literature.
4. Contact Hours shall be allotted in the timetable and this time shall be utilized by the students to receive the directions from the guide, on library reading, laboratory work, and computer analysis of field work as assigned by the guide and also to presenting periodical seminars on the progress made in the project.
5. The aim of the project work is to deepen comprehension of principles by applying them to a new problem which may be the design and manufacture of a device, a research investigation, a computer or management project or a design problem.
6. The student should implement and develop systems by selecting appropriate techniques based on its performance.
7. The progress of the project is evaluated based on a minimum of three reviews.
8. The student should have to write the reports under respective regulation along with the guidance of faculty members / industry experts.
9. Project Report + Number of Project report to be submitted = No. of Students in the Batch + Guide + Department Library + College Library

Total : 45 Periods

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DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

CO-PO MAPPING

Regulation: R 2020

Course Code: 20CS821 **Course Name: PROJECT WORK**

CO	Course Outcomes	Programme Outcomes													
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	*Formulate a real world problem, identify the requirement and develop the design solutions.*	1	2	3	2	2	1	-	2	2	-	1	1	3	2
CO2	*Identify technical ideas, strategies and methodologies.*	1	2	2	1	2	1	-	2	1	-	1	1	3	1
CO3	*Utilize the new tools, algorithms, techniques that contribute to obtain the solution of the project.*	1	2	2	2	1	1	-	2	2	-	1	1	3	2
CO4	*Test and validate through conformance of the developed prototype and analysis the cost effectiveness.*	1	2	3	1	2	1	-	2	2	-	1	1	3	1
CO5	*Prepare report and present oral demonstrations.*	1	2	3	2	1	1	-	2	2	-	1	1	3	1
	Average	**1**	**2**	**2**	**2**	**2**	**1**	**-**	**2**	**2**	**-**	**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
20CS561	**DISTRIBUTED SYSTEMS (PROFESSIONAL ELECTIVE - I)**	3	0	0	3

Prerequisite: *Basic knowledge about operating systems*

Course Outcomes : On successful completion of the course, the student will be able to		***Cognitive Level***
CO1:	*Identify the problems in developing distributed applications.*	*Understand*
CO2:	*Discover feasibilities and impossibilities in managing resources.*	*Apply*
CO3:	*Analyze the necessity of consistency and replication.*	*Analyze*
CO4:	*Attain information about transactions concurrency control and distributed transactions*	*Understand*
CO5:	*Acquire knowledge about distributed* object and file systems**.**	*Understand*

UNIT – I OVERVIEW OF DISTRIBUTED SYSTEMS [9]

Introduction – Examples of Distributed Systems – Resource Sharing and Web – Challenges – API for Internet Protocol – External Data Representation and Marshalling – Remote Procedure Call – Communication Between Distributed Objects – Client Server Communication – Group Communication.

UNIT – II PROCESS AND SYNCHRONIZATION [9]

Processes – Threads – Communication and Invocation – Clocks, Events and Process States – Synchronization: Physical Clocks – Logical Time and Logical Clocks – Global States – Distributed Mutual Exclusion – Elections – Distributed Transactions.

UNIT – III CONSISTENCY AND REPLICATION [9]

Introduction – Data Centric Consistency Models – Client Centric Consistency Models – Distribution Protocols – Consistency Protocols – Casually Consistent – Lazy Replication.

UNIT – IV CONCURRENCY CONTROL AND DISTRUBUTED TRANSACTIONS [9]

Transactions and Concurrency Control: Introduction –Transactions – Nested Transactions – Locks – Optimistic Concurrency Control –Timestamp Ordering – Comparison of Methods for Concurrency Control. Distributed Transactions: Introduction – Flat and Nested Distributed Transactions – Atomic Commit Protocols – Concurrency Control in Distributed Transactions – Distributed Deadlocks –Transaction Recovery.

UNIT – V DISTRIBUTED OBJECT AND FILE SYSTEMS [9]

Distributed Object Based System – CORBA – COM+ – Distributed File System – Sun NFS – Andrew File System – Distributed Coordination Based System – JINI.

Total = 45 Periods

Text Books :

1 George Coulouris, Jean Dollimore, Tim Kindberg, Gordon Blair, Distributed Systems: Concepts and Design, Pearson Education, Fifth Edition, New Delhi, 2017.

2 Andrew S. Tanenbaum, Maarten Van Steen, Distributed Systems, Pearson Education, New Delhi, Third Edition, 2017.

Reference Books :

1 Sunita Mahajan and Seema Shah, Distributed Computing, Oxford Higher Education, UK, Second Edition, 2013.

2 A.S. Tanenbaum, Distributed Operating Systems, Pearson Education, New Delhi, 2011.

3 Ajay D. Kshemkalyani and Mukaeshsinghal, Distributed Computing Principles Algorithms & Systems, Cambridge University press, UK, 2017

4 Andrew S. Tanenbaum and Maarten Van Steen, Distributed Systems: Principles and Paradigms, Pearson Education, New Delhi, Third Edition, 2016.

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DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING
CO-PO MAPPING

Regulation: R 2020

Course Code: 20CS561 **Course Name: DISTRIBUTED SYSTEMS**

CO	Course Outcomes	Programme Outcomes													
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	*Identify the problems in developing distributed applications.*	3	3	2	2	2	1	-	-	-	2	-	2	-	-
CO2	*Discover feasibilities and impossibilities in managing resources.*	3	3	3	2	2	1	-	-	-	1	-	2	-	-
CO3	*Analyze the necessity of consistency and replication.*	3	3	1	1	2	1	-	-	-	2	-	2	-	-
CO4	*Attain information about transactions concurrency control and distributed transactions*	3	1	2	2	2	1	-	-	-	2	-	2	-	-
CO5	*Acquire knowledge about distributed* object and file systems**.**	3	3	2	1	2	1	-	-	-	1	-	2	-	-
	Average	**3**	**3**	**2**	**2**	**2**	1	-	-	-	**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
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 works.*	*Understand*
CO2:	*Apply the procedures to achieve a safe working environment in line with health and safety regulation.*	*Apply*
CO3:	*Outline the Key Concepts of Service Management of IT-enabled services*	*Understand*
CO4:	*Recognize an IT Infrastructure and Security mechanism*	*Understand*
CO5:	*Implement the policies in Microsoft 365.*	*Apply*

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/

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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
20CS563	**DATA WAREHOUSING AND DATA MINING (PROFESSIONAL ELECTIVE - I)**	3	0	0	3

Prerequisite: *Basic knowledge of Database Management Systems.*

Course Outcomes: *On successful completion of the course, the student will be able to*		***Cognitive Level***
CO1:	*Demonstrate a Data warehouse system to perform business analysis with OLAP tools*	*Understand*
CO2:	*Decide suitable pre-processing and visualization techniques for data analysis*	*Evaluate*
CO3:	*Apply frequent pattern and association rule mining techniques for data analysis*	*Apply*
CO4:	*Apply appropriate classification and clustering techniques for data analysis*	*Apply*
CO5:	*Design a real-time application using recent data mining software*	*Create*

UNIT – I BASICS OF DATA WAREHOUSE [9]

Basic Concepts – Data Warehouse Modeling – Data Warehouse Design and Usage – Data Warehouse Implementation – Data Generalization by Attribute Oriented Induction.

UNIT– II DATA MINING AND DATA PREPROCESSING [9]

Data Mining: Introduction – Kinds of Data – Data Mining Functionalities – Classification of Data Mining Systems – Data Mining Task Primitives – Data Mining Applications – Major Issues in Data Mining – Data Preprocessing – Data Cleaning – Data Integration – Data Reduction – Data Transformation and Data Discretization.

UNIT– III ASSOCIATION RULE MINING [9]

Mining Frequent Patterns, Associations and Correlations: Basic Concepts – Frequent Item set Mining Methods – Pattern Evaluation Methods – Pattern Mining in Multilevel – Multidimensional Space – Constraint Based Frequent Pattern Mining – Mining High Dimensional Data and Colossal Patterns.

UNIT – IV CLASSIFICATION TECHNIQUES [9]

Basic Concepts – Decision Tree Induction – Bayes Classification Methods – Rule Based Classification – Techniques to Improve Classification Accuracy – Classification by Backpropagation – Support Vector Machine – Classification Using Frequent Patterns – Lazy Learners – Other Classification Methods.

UNIT– V CLUSTER ANALYSIS AND DATA MINING TOOLS [9]

Cluster Analysis – Requirements for Cluster Analysis – Clustering Methods – Partitioning Methods – Hierarchical Methods – Density Based Methods – Grid Based Methods – Model Based Clustering Methods – Machine Learning with Open Source and Commercial Software – Machine Learning with WEKA – XLMiner.

Total = 45 Periods

Text Books :

1 Jaiwei Han, Micheline Kamber and Jian Pei, Data Mining Concepts and Techniques, Morgan Kauffman, US, Third Edition, 2012.

2 K.P. Soman, Shyam Diwakar and V. Ajay, Insight into Data mining Theory and Practice, PHI/Eastern Economy, UK, Fifth Edition, 2014.

Reference Books :

1 Alex Berson and Stephen J. Smith, Data Warehousing, Data Mining & OLAP, Tata McGraw – Hill, India, Thirty Fifth Edition, 2016.

2 G. K. Gupta, Introduction to Data Mining with Case Studies, Prentice Hall of India, India, Third Edition, 2014.

3 Ian H. Witten and Eibe Frank, Mark A. Hall, Data Mining: Practical Machine Learning Tools and Techniques, Elsevier, US, Third Edition, 2011.

4 Parteek Bhatia, Data Mining and Data Warehousing: Principles and Practical Techniques, Cambridge University Press, First Edition, 2019.

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DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING
CO-PO MAPPING

Regulation: **R 2020**

Course Code: **20CS563** **Course Name:** **DATA WAREHOUSING AND DATA MINING**

CO	Course Outcomes	Programme Outcomes													
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	*Illustrate a Data warehouse system to perform business analysis with OLAP tools*	3	2	3	3	1	1	-	-	-	-	-	3	3	3
CO2	*Decide suitable pre-processing and visualization techniques for data analysis*	3	3	3	3	3	2	-	-	-	-	-	3	**3**	**3**
CO3	*Apply frequent pattern and association rule mining techniques for data analysis*	3	3	3	3	3	2	-	-	-	-	-	3	**3**	**3**
CO4	*Apply appropriate classification and clustering techniques for data analysis*	3	3	3	3	3	2	-	-	-	-	-	3	**3**	**3**
CO5	*Design a real-time applications using recent data mining software*	3	3	3	3	3	2	-	-	-	-	-	3	3	3
	Average	**3**	**3**	**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 – V

		L	T	P	C
20CS564	**OPEN SOURCE TECHNOLOGIES (PROFESSIONAL ELECTIVE - I)**	3	0	0	3

Prerequisite: *Basic knowledge of Operating Systems and Database management systems.*

Course Outcomes : *On successful completion of the course, the student will be able to*		***Cognitive Level***
CO1:	*Comprehend the need of open source software's.*	*Understand*
CO2:	*Develop skills in analyzing the usability of My SQL.*	*Create*
CO3:	*Generate an application based upon the concepts of PHP.*	*Apply*
CO4:	*Implement python programming to construct small to large scale applications.*	*Create*
CO5:	*Develop hands on experience using Perl concepts.*	*Apply*

UNIT – I INTRODUCTION TO OPEN SOURCES [9]

Introduction to Open Sources – Need of Open Sources – Advantages of Open Sources – Application of Open Sources – Open Source Operating Systems: LINUX: Introduction – General Overview – Kernel Mode and User Mode – Development with Linux.

UNIT – II MYSQL TECHNIQUES [9]

Introduction – Setting up Account – Record Selection Technology – Working with Strings – Date and Time – Sorting Query Results – Generating Summary – Working with Metadata – Using Sequences.

UNIT – III WORKING WITH PHP [9]

Introduction – Programming in Web Environment – Variables – Constants –Data; Types – Operators – Statements – Functions – Arrays – OOP – String Manipulation and Regular Expression – File Handling and Data Storage – PHP and SQL Database – PHP and LDAP – PHP Connectivity – Sending and Receiving E-mails.

UNIT – IV PYTHON CONDITIONS AND FUNCTIONS [9]

Syntax and Style – Python Objects – Numbers – Sequences – Strings – Lists and Tuples – Dictionaries – Conditionals and Loops – Files – Input and Output – Errors and Exceptions – Functions – Modules – Classes and OOP – Execution Environment.

UNIT – V PERL STRUCTURES AND MODULES [9]

Perl Backgrounder – Perl Overview – Perl Parsing Rules – Variables and Data – Statements and Control Structures – Subroutines – Packages and Modules – Working with Files – Data Manipulation.

Total = 45 Periods

Text Books :

1 Martin C. Brown, Perl: The Complete Reference, Tata McGraw-Hill, India, Second Edition, 2015.

2 Remy Card, Eric Dumas and Frank Mevel, The Linux Kernel Book, Wiley Publications, New Jersey, United States, Third Edition, 2003

Reference Books :

1 Steven Holzner, PHP: The Complete Reference, Tata McGraw-Hill, Indian Reprint, Second Edition, 2009

2 Vikram Vaswani, MYSQL: The Complete Reference, Tata McGraw-Hill, Indian Reprint, Second edition, 2009.

3 http://dev.mysql.com.

4. Kailash Vadera and Bhavyesh Gandhi, Open Source Technology, Laxmi Publications, India, First Edition, 2009

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DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING
CO-PO MAPPING

Regulation: R 2020

Course Code: 20CS564 **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	Comprehend the need of open-source software's.	3	3	3	3	3	-	-	-	2	-	2	3	3	3
CO2	Develop skills in analyzing the usability of MySQL.	3	2	2	3	3	-	-	-	2	-	2	3	**3**	**3**
CO3	Generate an application based upon the concepts of PHP.	3	3	2	3	3	-	-	-	1	-	3	3	**3**	**3**
CO4	Implement python programming to construct small to large scale applications.	3	3	3	2	3	-	-	-	2	-	2	3	**3**	**3**
CO5	Develop hands on experience using Perl concepts.	3	3	3	3	3	-	-	-	2	-	2	3	**3**	**3**
	Average	**3**	**3**	**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 –V

		L	T	P	C
20CS565	**ADVANCED DATABASE TECHNOLOGY (PROFESSIONAL ELECTIVE - I)**	3	0	0	3

Prerequisite: *Basic knowledge of database management systems*.

Course Outcomes : *On successful completion of the course, the student will be able to* — ***Cognitive Level***

CO1:	*Design relational database systems using ER and normalization.*	*Analyze*
CO2:	*Apply the concepts of parallel and distributed databases.*	*Apply*
CO3:	*Use object-oriented technologies and XML to design relational databases.*	*Analyze*
CO4:	*Design relational databases using advanced models.*	*Analyze*
CO5:	*Acquire the knowledge in advanced indexing, application development and Blockchain databases.*	*Understand*

UNIT - I RELATIONAL MODEL ISSUES [09]

ER Model: overview of database design process – Entity-Relationship model – Complex Attributes – Mapping Cardinalities – Primary key – Removing Redundant Attributes in Entity Sets Reducing E-R diagrams to Relation Schemas – Extended E-R Feature. Normalization: Features of Good Relational Designs –Decomposition using Functional dependencies – Functional Dependency Theory – INF, 2NF, 3NF & BCNF– Decomposition Using Multivalued Dependencies.

UNIT - II PARALLEL AND DISTRIBUTED DATABASES [09]

Database System Architectures: Centralized and Client-Server Architectures – Server System Architectures – Parallel Systems– Distributed Systems –Transaction processing in parallel and Distributed Systems. Parallel and Distributed Storage: Overview – Data partitioning – Dealing with skew in partitioning – Replication. Parallel and Distributed Transaction Processing: Distributed Transactions – Commit protocols.

UNIT - III OBJECT-RELATIONAL AND XML [09]

Overview of Object Database Concepts – Object Database Extensions to SQL – The ODMG Object Model and the Object Definition Language ODL – Object Database Conceptual Design – The Object Query Language OQL. XML and Internet Databases: Structured, Semi structured, and Unstructured Data – XML Hierarchical (Tree) Data Model – XML Documents, DTD, and XML Schema – Storing and Extracting XML Documents from Databases – XML Languages – Extracting XML Documents from Relational Databases.

UNIT - IV ADVANCED DATABASE MODELS AND APPLICATIONS [09]

Enhanced Data Models for Advanced Applications: Active Database Concepts and Triggers –Temporal Database Concepts – Spatial Database Concepts – Multimedia Database Concepts – Introduction to Deductive Databases. Overview of Data Mining Technology – Applications of Data Mining – Commercial Data Mining Tools – Overview of Data Warehousing – Introduction, Definitions and Terminology – Characteristics of Data Warehouses – Mobile Databases.

UNIT - V ADVANCED INDEXING AND BLOCKCHAIN [09]

Advanced Indexing Techniques: Bloom Filter – Log-Structured Merge Tree and Variants – Bitmap Indices – Indexing of Spatial Data. Advanced Application Development: Performance Tuning – Performance Benchmarks. Blockchain Databases: Overview – Blockchain Properties – Achieving Blockchain Properties via Cryptographic Hash Functions – Consensus – Data Management in a Blockchain – Smart Contracts – Performance Enhancement – Emerging Applications.

Total = 45 Periods

Text Books :

1 Abraham Silberschatz, Henry F. Korth, Sudarshan, Database System Concepts, Tata McGraw Hill, New Delhi, Seventh Edition, 2021.

2 R.Elmasri, S.B.Navathe, Fundamentals of Database Systems, Pearson Education, New Delhi, Seventh Edition, 2017.

Reference Books :

1 Thomas Connolly, Carolyn Begg, Database Systems, A Practical Approach to Design, Implementation and Management, Addison Wesley Person Education, New Delhi, Sixth Edition, 2015

2 Peter Rob and Corlos Coronel, Database Systems - Design, Implementation and Management, Thompson Learning, India, Seventh Edition, 2006

3 Raghu Ramakrishnan, Database Management Systems, Tata McGraw Hill, India, Fourth Edition, 2015.

4 Mario Piattini, dvanced Database Technology and Design, Artech House Publishers, First Edition, 2000.

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DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING
CO-PO MAPPING

Regulation: **R 2020**

Course Code: **20CS565** **Course Name:** **ADVANCED DATABASE TECHNOLOGY**

CO	Course Outcomes	Programme Outcomes													
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	*Design relational database systems using ER and normalization.*	3	3	3	2	1	-	-	-	1	1	-	3	2	2
CO2	*Apply the concepts of parallel and distributed databases.*	3	3	3	2	2	-	-	-	1	1	-	3	**2**	**2**
CO3	*Use object-oriented technologies and XML to design relational databases.*	3	3	3	2	1	-	-	-	1	1	-	3	**2**	**2**
CO4	*Design relational databases using advanced models.*	3	3	3	2	2	-	-	-	1	1	-	3	**2**	**2**
CO5	*Acquire the knowledge in advanced indexing, application development and Blockchain databases.*	3	3	3	2	1	-	-	-	1	1	-	3	2	2
	Average	**3**	**3**	**3**	**2**	**1**		**-**	**-**	**1**	**1**		**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
20CS566	**ARTIFICIAL INTELLIGENCE AND EXPERT SYSTEMS (PROFESSIONAL ELECTIVE - I)**	3	0	0	3

Prerequisite: *Basic knowledge of problem solving techniques.*

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 FUNDAMENTALS 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 – Avoiding repeated states – Searching with partial information

UNIT – II INFORMED SEARCHING TECHNIQUES [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 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 – Resolution – Knowledge representation.

UNIT– IV PLANNING AND LEARNING [9]

Planning Problem – Planning with state – space search – Partial-order planning – Planning graphs – Planning and acting in the real world: Time schedules and resources – 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.

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DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING
CO-PO MAPPING

Regulation: R 2020

Course Code: 20CS566 **Course Name: ARTIFICIAL INTELLIGENCE AND EXPERT SYSTEMS**

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	3	3
CO2	*Illustrate appropriate AI methods to solve a given problem.*	3	3	3	3	3	2	-	-	-	2	-	3	**3**	**3**
CO3	*Explain a problem using first order and predicate logic.*	3	3	3	3	3	2	-	-	-	2	-	3	**3**	**3**
CO4	*Use planning algorithms and illustrate about learning*	3	3	3	3	3	2	-	-	-	2	-	3	**3**	**3**
CO5	*Describe about expert systems*	3	3	3	3	3	2	-	-	-	2	-	3	3	3
	Average	**3**	**3**	**3**	**3**	**3**	**2**	**-**	**-**	**-**	**2**	**-**	**3**	**3**	**3**

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

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

SEMESTER – V

		L	T	P	C
20CS567	**FUNDAMENTALS OF DEVOPS (PROFESSIONAL ELECTIVE - I)**	3	0	0	3

Prerequisite: *Basics of Web Programming*

Course Outcomes: On successful completion of the course, the student will be able to		***Cognitive Level***
CO1:	*Identify different actions performed through Version control tools like Git.*	*Understand*
CO2:	*Perform Continuous Integration and Continuous Testing and Continuous Deployment using Jenkins by building and automating test cases using Maven and Gradle.*	*Apply*
CO3:	*Utilize to Perform Automated Continuous Deployment*	*Apply*
CO4:	*Examine configuration management using Ansible*	*Apply*
CO5:	*Infer to leverage Cloud-based DevOps tools using Azure DevOps*	*Understand*

UNIT – I INTRODUCTION TO DEVOPS [9]

Devops Essentials – Introduction to AWS, GCP, Azure – Version control systems: Git and Github – Gerrit Code review.

UNIT – II COMPILE AND BUILD USING MAVEN, GRADLE AND ANT [9]

Introduction – Installation of Maven – POM files – Maven Build lifecycle – Build phases (compile build, test, package) Maven Profiles – Maven repositories (local, central, global) – Maven plugins – Maven create and build Artificats – Dependency management – Installation of Gradle – Understand build using Gradle – Introduction to ANT– Installation of ANT – Understand and Build using ANT.

UNIT – III CONTINUOUS INTEGRATION USING JENKINS [9]

Install & Configure Jenkins – Jenkins Architecture Overview – Creating a Jenkins Job – Configuring a Jenkins job – Introduction to Plugins – Adding Plugins to Jenkins – Commonly used plugins (Git Plugin, Parameter Plugin, HTML Publisher, Copy Artifact and Extended choice parameters). Configuring Jenkins to work with java – Git and Maven – Creating a Jenkins Build and Jenkins workspace.

UNIT – IV CONFIGURATION MANAGEMENT USING ANSIBLE [9]

Ansible Introduction – Installation – Ansible master/slave configuration –YAML basics – Ansible modules – Ansible Inventory files – Ansible playbooks – Ansible Roles – Adhoc commands in ansible

UNIT– V BUILDING DEVOPS PIPELINES USING AZURE [9]

Create Github Account – Create Repository – Create Azure Organization – Create a new pipeline – Builda sample code – Modify azure – Pipelines – yaml file – Testing and Monitoring – Selenium – Jira – ELK

Total = 45 Periods

Text Books :

1 Roberto Vormittag, A Practical Guide to Git and GitHub for Windows Users: From Beginnerto Expert in Easy Step-By-Step Exercises, Kindle Edition, Second Edition,2016.

2 Jason Cannon, Linux for Beginners: An Introduction to the Linux Operating System and Command Line, Kindle Edition, 2014

Reference Books :

1 Mitesh Soni, Hands-On Azure Devops: Cicd Implementation for Mobile, Hybrid, And Web Applications Using Azure Devops And Microsoft Azure: CICD Implementation for DevOps and Microsoft Azure, BPB Publications, Delhi, First Edition, 2020.

2 Jeff Geerling, Ansible for DevOps: Server and configuration management for humans, Midwestern Mac, LLC, First Edition, 2015.

3 Mariot Tsitoara, Ansible 6. Beginning Git and GitHub: A Comprehensive Guide to VersionControl, Project Management, and Teamwork for the New Developer, Second Edition, 2019.

4 https://www.jenkins.io/user-handbook.pdf, https://maven.apache.org/guides/getting-started/

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DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING
CO-PO MAPPING

Regulation: R 2020

Course Code: 20CS567 **Course Name: FUNDAMENTALS OF DEVOPS**

CO	Course Outcomes	Programme Outcomes													
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	*Identify different actions performed through Version control tools like Git.*	3	3	3	2	3	-	-	-	-	-	-	-	2	2
CO2	*Perform Continuous Integration and Continuous Testing and Continuous Deployment using Jenkins by building and automating test cases using Maven and Gradle.*	3	3	3	2	3	-	-	-	-	-	-	-	2	2
CO3	*Utilize to Perform Automated Continuous Deployment*	3	3	3	2	3	-	-	-	-	-	-	-	2	2
CO4	*Examine configuration management using Ansible*	3	3	3	2	3	-	-	-	-	-	-	-	2	2
CO5	*Infer to leverage Cloud-based DevOps tools using Azure DevOps*	3	3	3	2	3	-	-	-	-	-	-	-	2	2
	Average	**3**	**3**	**3**	**2**	**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
20CS568	**AUGMENTED REALITY AND VIRTUAL REALITY (PROFESSIONAL ELECTIVE - I)**	3	0	0	3

Prerequisite: *Basic knowledge about Graphics and Multimedia*

Course Outcomes: On successful completion of the course, the student will be able to		***Cognitive Level***
CO1:	*Illuminate the basic concepts of VR.*	*Understand*
CO2:	*Elucidate various models using modeling techniques.*	*Understand*
CO3:	*Explain the tools and technologies related to VR.*	*Understand*
CO4:	*Demonstrate VR applications in different domains.*	*Understand*
CO5:	*Describe the basic concepts of AR.*	*Understand*

UNIT – I BASIC CONCEPT OF VIRTUAL REALITY [9]

Introduction – Three I's of Virtual Reality – A Short History of Early Virtual Reality – Early Commercial VR Technology – VR Becomes an Industry – Components of VR System – Input Devices – 3D Position Trackers – Types of Trackers – Navigation and Manipulation Interfaces – Gesture Interfaces – Types of Gesture Input Devices – Output Devices – Graphics Display – Human Visual System – Personal Graphics Displays – Large Volume Displays – Sound Displays – Human Auditory System.

UNIT – II VR MODELING [9]

Modeling – Geometric Modeling – Virtual Object Shape – Object Visual Appearance – Kinematics Modeling – Transformation Matrices – Object Position – Transformation Invariants – Object Hierarchies – Viewing the 3D World – Physical Modeling – Collision Detection – Surface Deformation – Force Computation – Force Smoothing and Mapping – Behavior Modeling – Model Management.

UNIT – III VR PROGRAMMING AND HUMAN FACTORS [9]

VR Programming – Toolkits and Scene Graphs – World ToolKit – Java 3D – Comparison of World ToolKit and Java 3D – Human Factors in VR – Methodology and Terminology – VR Health and Safety Issues – VR and Society.

UNIT – IV TRADITIONAL AND EMERGING APPLICATIONS OF VR [9]

Medical Applications of VR – Education, Arts and Entertainment – Military VR Applications – Emerging Applications of VR – VR Applications in Manufacturing – Applications of VR in Robotics – Information Visualization – VR in Business – VR in Entertainment – VR in Education.

UNIT – V AUGMENTED REALITY [9]

Introduction to Augmented Reality – Computer vision for AR – Interaction-Modelling and Annotation – Authoring – Navigation – Collaboration – Software Architectures.

Total = 45 Periods

Text Books :

1 Grigore C. Burdea and Philippe Coiffet, Virtual Reality Technology, Wiley, New Delhi, Third Edition, 2020.

2 Dieter Schmalstieg and Tobias Hollerer, Augmented Reality: Principles and Practice, Addison Wesley, New Delhi, First Edition, 2016.

Reference Books :

1 Steven M. LaValle, Virtual Reality, Cambridge University Press, New Delhi, First Edition 2023.

2 Charles Palmer, John Williamson, Virtual Reality Blueprints: Create compelling VR experiences for mobile, Packt Publisher, India First Edition, 2018.

3 Allan Fowler, Beginning iOS AR Game Development: Developing Augmented Reality Apps with Unity and C#, A press Publications, India, First Edition, 2018.

4 Grigore C. Burdea and Philippe Coiffet, Virtual Reality Technology, Wiley, New Delhi, Second Edition, 2003.

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DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

CO-PO MAPPING

Regulation: R 2020

Course Code: 20CS568 **Course Name: AUGMENTED REALITY AND VIRTUAL REALITY**

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 VR.*	3	2	1	2	3	1	-	-	1	-	-	3	3	2
CO2	*Illustrate various models using modeling techniques.*	3	2	1	2	3	1	-	-	1	-	-	3	3	2
CO3	*Explain the tools and technologies related to VR.*	3	2	2	2	3	1	-	-	1	-	-	3	3	2
CO4	*Demonstrate VR applications in different domains.*	3	2	1	2	3	2	-	-	1	-	-	3	3	2
CO5	*Explain the basic concepts of AR.*	3	2	2	2	3	1	-	-	1	-	-	3	3	2
	Average	**3**	**2**	**1**	**2**	**3**	**1**		-	1	**-**	**-**	**3**	**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
20CS661	**GREEN COMPUTING (PROFESSIONAL ELECTIVE - II)**	3	0	0	3

Prerequisite: *Basics of Environmental Science and Engineering and Computer Networks.*

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:	*Describe 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:	*Identify various laws, standards and protocols for regulating green IT.*	Apply

UNIT - I BASICS OF GREEN IT [9]

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 [9]

Current Practices – Sustainable Software – Attributes – Metrics – Methodology – Defining Actions – Data Centres: Associated Energy Challenges – IT Infrastructure – Implications for Energy Efficiency – Management – Green Data Centre Metrics – Green Data Storage – Storage Media Power Characteristics – Energy Management Techniques for Hard Disks.

UNIT - III ENTERPRISE GREEN IT STRATEGY [9]

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 – Product, Individual and Functional Level Information – Organizational and Regional/City Level Information.

UNIT - IV GREEN ENTERPRISE READINESS AND THE ROLE OF IT [9]

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 REGULATING THE GREEN IT: LAWS, STANDARDS AND PROTOCOLS [9]

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 – Case Study: IaaS Provider.

Total = 45 Periods

Text Books :

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, 2011.

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 Wu-chun Feng, The Green Computing Book, CRC Press Inc, Florida, First Edition, 2014.

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

Regulation: R 2020

Course Code: 20CS661 **Course Name: GREEN COMPUTING**

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	-	2	-	-	-	-	2	2	2
CO2	*Describe Green data centres and storage along with its green software methodologies.*	3	3	-	-	3	-	2	-	-	-	-	2	2	2
CO3	*Describe the concepts o to manage the green IT with necessary components.*	3	3	-	-	3	-	2	-	-	-	-	3	2	2
CO4	*Recognize various green enterprise activities, functions and their role with IT.*	3	3	-	-	3	-	2	-	-	-	-	1	2	2
CO5	*Identify various laws, standards and protocols for regulating green IT.*	3	3	-	-	3	-	2	-	-	-	-	3	2	2
	Average	**3**	**3**	**-**	**-**	**3**	**-**	**2**	**-**	**-**	**-**	**-**	**2**	**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
20IE691	**AUGMENTED INTELLIGENCE LED MANAGED SERVICES (AIMS) – II (PROFESSIONAL ELECTIVE - II)** (Common to CS, EC, EE & 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 ServiceNow.	*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 ServiceNow – Reporting and Managing Issue – Benefits.

Total = 45 Periods

TEXT BOOKS :

1 Daniel Kirsch, Judith Hurwitz, Cloud Computing for Dummies, John Wiley & Sons, United States, Second Edition, 2020

2 EMC Education Services, Data Science and Big Data Analytics: Discovering, Analyzing, Visualizing and Presenting Data, Wiley, United States, 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, UK, 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**	**-**	**-**	**-**	**1**	**-**	**-**	**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
20CS663	**INTERNET OF THINGS (PROFESSIONAL ELECTIVE - II)**	3	0	0	3

Prerequisite: *Basic knowledge of Microprocessors and Microcontrollers*

Course Outcomes : On Completion of this course, the student will be able to		***Cognitive Level***
CO1:	*Identify the technologies of IoT and applications of IoT.*	*Understand*
CO2:	*Construct IoT platform using design methodology.*	*Apply*
CO3:	*Develop IoT device using Raspberry Pi Board.*	*Apply*
CO4:	*Build up IoT device using Arduino Board.*	*Apply*
CO5:	Explore IoT infrastructure for industrial applications	*Understand*

UNIT - I BASICS OF INTERNET OF THINGS [9]

Definition – Characteristics – Physical Design of IoT– Logical Design of IoT– IoT Enabling Technologies – IoT Levels and Deployment Templates – Domain Specific IoT: Home Automation, Cities, Environment, Energy, Retail, Logistics, Agriculture, Industry, Health and Life style

UNIT - II IoT ARCHITECTURE AND DESIGN METHODOLOGY [9]

M2M high-level ETSI architecture – IETF architecture for IoT – IoT and M2M:M2M – Difference between IoT AND M2M – SDN and NFV for IoT. IoT System Management – Need for System Management – SNMP – Network Operator Requirements – NETCONF –YANG – IoT Systems Management with NETCONF-YANG – IoT Design Methodology.

UNIT - III IoT WITH RASPBERRY Pi [9]

IoT Device – Raspberry Pi Board – Linux on Raspberry Pi – Raspberry Pi interfaces – Programming Raspberry Pi with python – Other IoT devices – Cloud Storage Models and Communication APIs: WAMP – Xively Cloud for IoT– Django – Designing RESTful Web API

UNIT - IV IoT WITH ARDUINO [9]

Arduino Basics: Hardware Requirements – Software Requirements – Arduino Programming. Internet Connectivity: Arduino Uno Wired Connectivity – Arduino Uno Wireless Connectivity – Arduino Yun Wireless Connectivity. Communication Protocols: HTTP – MQTT

UNIT - V INDUSTRIAL APPLICATIONS [9]

Cisco IoT system – IBM Watson IoT Platform – Manufacturing – Converged Plantwide Ethernet Model (CPwE) – Power Utility Industry – GridBlocks Reference Model – Smart and Connected Cities: Layered Architecture, Smart Lighting, Smart Parking Architecture and Smart Traffic Control.

Total = 45 Periods

Text Books :

1 Arshdeep Bahga and Vijay Madisetti, Internet of Things – Hands on approach, university press India 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, Cisco Press, United States, First Edition 2017

Reference Books :

1 Jan Holler, Vlasios Tsiatsis, Catherine Mulligan, Stamatis Karnouskos, Stefan Avesand, David Boyle, From Machine-to-Machine to the Internet of Things - Introduction to a New Age of Intelligence, Elsevier, Mexico, First Edition, 2014

2 Olivier Hersent, David Boswarthick, Omar Elloumi, The Internet of Things - Key applications and Protocols, Wiley, United States, Second Edition, 2012

3 Samuel Greengard, The Internet of Things, The MIT press, Cambridge, First Edition, 2015

4 Dr Kamlesh Lakhwani, Dr Hemant Kumar Gianey, et al., Internet of Things (IoT), First Edition, 2020.

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DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING
CO-PO MAPPING

Regulation: R 2020

Course Code: 20CS663 **Course Name: INTERNET OF THINGS**

CO	Course Outcomes	Programme Outcomes													
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	*Identify the technologies of IoT and applications of IoT.*	3	3	3	2	3	-	-	-	1	-	-	1	3	2
CO2	*Construct IoT platform using design methodology.*	3	3	2	1	2	-	-	-	1	-	-	1	3	1
CO3	*Develop IoT device using Raspberry Pi Board.*	3	3	2	2	3	-	-	-	1	-	-	1	3	2
CO4	*Build up IoT device using Arduino Board.*	3	3	3	1	2	-	-	-	1	-	-	1	3	1
CO5	Explore IoT infrastructure for industrial applications	3	3	3	2	3	-	-	-	1	-	-	1	3	1
	Average	**3**	**3**	**3**	**2**	**3**	**-**	**-**	**-**	**1**	**-**	**-**	**1**	**3**	**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
20CS664	**ANDROID APPLICATION DEVELOPMENT (PROFESSIONAL ELECTIVE - II)**	3	0	0	3

Prerequisite: *Basics of Java Programming.*

Course Outcomes : On successful completion of the course, the student will be able to		***Cognitive Level***
CO1:	*Comprehend the mobile application development trends and Android platform*	*Understand*
CO2:	*Implement adaptive, responsive user interfaces that work across a wide range of devices.*	*Apply*
CO3:	*Demonstrate methods in storing, sharing and retrieving data in Android applications.*	*Apply*
CO4:	*Infer long running tasks and background work in Android applications.*	*Understand*
CO5:	*Analyze the performance of android applications and understand the role of permissions and security.*	*Understand*

UNIT – I ANDROID FUNDAMENTALS [9]

Mobile Application Development and Trends – Android Overview and Versions – Android Open Stack, Features – Setting Up Android Environment (Eclipse, SDK, AVD) – Simple Android Application Development – Anatomy of Android Applications – Activity and Life Cycle – Intents, Services and Content Providers.

UNIT – II ANDROID USER INTERFACE [9]

Layouts: Linear, Absolute, Table, Relative, Frame, Scrollview, Resize and Reposition – Screen Orientation – Views: Textview, EditText, Button, ImageButton, Checkbox, ToggleButton, RadioButton, RadioGroup, ProgressBar, Autocomplete Text, Picker, Listviews and Webview – Displaying Pictures with Views: Gallery and ImageView, ImageSwitcher, Gridview – Displaying Menus: Helper Methods, Option and Context.

UNIT – III DATA PERSISTENCE [9]

Shared User Preferences – File Handling: File System, System Partition, SDcard Partition, User Partition, Security, Internal and External Storage – Managing Data using SQLite – User Defined Content Providers.

UNIT – IV MESSAGING, NETWORKING AND SERVICES [9]

SMS Messaging: Sending and Receiving – Sending Email and Networking – Downloading Binary and Text Data Files – Access Web Services – Developing Android Services: Create your own services – Performing Long Running tAsk in a Service – Performing Repeated Task in a Service.

UNIT – V LOCATION ACCESS AND PUBLISH ANDROID APPLICATION [9]

Location Based Services: Display Map – Zoom Control – View and Change – Marking – Get Coding – Get Location – Publish Android Applications and Deployment.

Total = 45 Periods

Text Books :

1 Wei Meng Lee , Beginning Android Application Development, Wrox Publications, New York, Fifth Edition, 2012.

2 John Horton, Android Programming for Beginners: Build In-depth, Full-featured Android 9 Pie Apps Starting from Zero Programming Experience, Packet publishing limited, Birmingham UK, Second Edition, 2012.

Reference Books :

1 Ed Burnette, Hello Android: Introducing Google's Mobile Development Platform, The Pragmatic Publishers, North Carolina USA, Third Edition, 2010.

2 Reto Meier, Professional Android 4 Application Development, Wrox Publications & John Wiley, New York, Second Edition, 2009.

3 Zigurd Mednieks, Laird Dornin, Blake Meike G, Masumi Nakamura, Programming Android: Java Programming for the New Generation of Mobile Device, O'Reilly Media, USA, Third Edition, 2011.

4 https://developer.android.com/training/basics/firstapp.

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DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING
CO-PO MAPPING

Regulation: **R 2020**

Course Code: **20CS664** **Course Name:** **ANDROID APPLICATION DEVELOPMENT**

CO	Course Outcomes	Programme Outcomes													
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	*Comprehend the mobile application development trends and Android platform*	3	2	2	1	1	-	-	-	1	-	-	1	3	1
CO2	*Implement adaptive, responsive user interfaces that work across a wide range of devices.*	3	2	3	2	2	-	-	-	1	-	-	2	3	2
CO3	*Demonstrate methods in storing, sharing and retrieving data in Android applications.*	3	2	3	2	2	-	-	-	1	-	-	2	3	2
CO4	*Infer long running tasks and background work in Android applications.*	3	2	2	2	2	-	-	-	1	-	-	1	3	1
CO5	*Analyze the performance of android applications and understand the role of permissions and security.*	3	2	3	2	2	-	-	-	1	-	-	2	3	2
	Average	**3**	**2**	**2**	**2**	**2**	**-**	**-**	**-**	**1**	**-**	**-**	**2**	**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
20CS665	**APPLICATION FRAMEWORKS (PROFESSIONAL ELECTIVE - II)**	3	0	0	3

Prerequisite: *Basics of Java Programming.*

Course Outcomes : On successful completion of the course, the student will be able to		***Cognitive Level***
CO1:	*Discover the web applications fundamentals.*	*Understand*
CO2:	*Identify the concepts of new application frameworks.*	*Understand*
CO3:	*Experienced in full stack development.*	*Analyze*
CO4:	*Discern the industry standard application development frameworks.*	*Understand*
CO5:	*Apply the frameworks for modern application development technology*	*Apply*

UNIT - I FUNDAMENTALS OF JAVASCRIPT [9]

Introduction: JavaScript – Variable Declarations with Let and Const – Arrow Functions – New String and Array Methods – Objects – Classes – Spread operator – Destructing – Rest Operator – Template String – Promises – async and await – import syntax and modules.

UNIT - II REACT JS [9]

React Js: Introduction – JSX – Rendering Elements-components – Props – State – Life cycle of components – Conditional rendering – List – Keys – Forms.

UNIT - III STATE MANAGEMENT IN REACT JS [9]

Introduction: Redux – Context API – Refs – React Hooks: Introduction – Hooks in Action –The Hooks API – Routing in React – State Management – Internationalization.

UNIT - IV NODE JS [9]

Introduction: Node JS – Setup Dev Environment – Node JS Modules – NPM – Creating Web server – CRUD – File System – Debugging Node JS Application – Events – Serving Static Resources – Database connectivity.

UNIT - V FRAMEWORK ON NODE JS [9]

Express JS: Introduction to Environment setup – Routing – Http Methods – URL Building – Middleware – Static files –Form Data, Database: Mongo DB Setup and Connectivity – Cookies – Sessions – RESTful APIs – Error Handling – Debugging.

Total = 45 Periods

Text Books :

1 Frank Zammetti, Modern Full-Stack Development, O'Reilly, Apress, US, First Edition, 2020.

2 Douglas Crockford, JavaScript: The good parts, O'Reilly Yahoo Press, US, First Edition, 2008.

Reference Books :

1 David Choi - Full Stack React, Type Script and Node, O'Reily & Packt Publishing, US, First Edition, 2020.

2 David Flanagan, JavaScript: The Definitive Guide, O'Reilly Media, US, Sixth Edition, 2011.

3 Thomas A Powell, Fritz Schneider, JavaScript: The Complete Reference, Tata McGraw Hill, New Delhi, Third Edition, 2013.

4 Anthony Accomazzo, Fullstack React: The Complete Guide to ReactJS and Friends, Fullstack.IO, First Edition, 2017.

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DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING
CO-PO MAPPING

Regulation: R 2020

Course Code: 20CS665 **Course Name: APPLICATION FRAMEWORKS**

CO	Course Outcomes	Programme Outcomes													
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	*Discover the web applications fundamentals.*	3	3	3	2	1	-	-	-	1	-	-	1	3	2
CO2	*Identify the concepts of new application frameworks.*	3	3	3	3	2	-	-	-	1	-	-	1	2	1
CO3	*Experienced in full stack development.*	3	3	2	2	1	-	-	-	1	-	-	1	3	2
CO4	*Discern the industry standard application development frameworks.*	2	3	3	1	2	-	-	-	1	-	-	1	3	2
CO5	*Apply the frameworks for modern application development technology*	3	2	3	2	1	-	-	-	1	-	-	1	2	2
	Average	**3**	**3**	**3**	**2**	**2**	**-**	**-**	**-**	**1**	**-**	**-**	**1**	**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
20CS666	**HIGH SPEED NETWORKS (PROFESSIONAL ELECTIVE - II)**	3	0	0	3

Prerequisite: Basic knowledge of Computer Networks.

Course Outcomes : On successful completion of the course, the student will be able to		***Cognitive Level***
CO1:	*Explain the basics of high speed networks.*	*Understand*
CO2:	*Determine the functionality of congestion control and identify traffic management.*	*Understand*
CO3:	*Explain the functionality of QoS in IP Networks.*	*Understand*
CO4:	*Illustrate fundamentals of wireless communications.*	*Understand*
CO5:	*Summarize fundamentals of network management and Its applications.*	*Understand*

UNIT - I BASICS OF HIGH SPEED NETWORKS [9]

Introduction – Frame Relay Networks – ATM Protocol architecture – ATM Logical Connection – ATM Cells – ATM Service Categories – AAL – High Speed LANs: Emergence of High Speed LANs – Ethernets – Fibre Channel – Wireless LANs.

UNIT - II CONGESTION AND TRAFFIC MANAGEMENT [9]

Congestion Control in Data Networks and Internets – Link Level Flow and Error Control – TCP Traffic – Congestion Control in ATM Networks – Interior Routing Protocols.

UNIT - III QoS IN IP NETWORKS [9]

Integrated Service Architecture – Queuing Discipline – Random Early Detection – Differentiated Services Protocol for QoS Support – RSVP– Multiprotocol Label Switching – Real Time Transport Protocol – IP Version 6.

UNIT - IV PRINCIPLES OF WIRELESS NETWORK OPERATIONS [9]

Local Broad Band and Ad hoc Networks – Introduction to Wireless LANS – IEEE 802.11 WLAN – WATM – HIPERLAN – Ad hoc Networking and WPAN.

UNIT - V NETWORK MANAGEMENT AND APPLICATIONS [9]

Network Management – Firewalls – MIB – SNMP – COPS VPNS – Mobile IP – Voice over IP.

Total = 45 Periods

Text Books :

1 Williams Stallings., High Speed networks and Internet Performance and Quality of Service, Pearson, New Delhi, Second Edition, Last Impression 2010.

2 Kaven Pahlavan and Prashant Krishnamoorthy, Principles of Wireless Network, Prentice Hall of India, New Delhi, Second Edition, 2010

Reference Books :

1 Adrian Farrel. The Internet and Its Protocols, Elsevier Publications, Netherlands, First Edition, 2011.

2 Behrouz A and Forouzan. Data Communication and Computer Networking, McGraw Hill, New Delhi, Fourth Edition, 2011.

3 Larry, L. Peterson, Bruce S and Davie., Computer Networks, Elsevier Publications, Netherlands, Third Edition, 2003

4 Stallings, High Speed Networks and Internet, Pearson India, Second Edition, 2002.

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

Regulation: R 2020

Course Code: 20CS666 **Course Name: HIGH SPEED NETWORKS**

CO	Course Outcomes	Programme Outcomes													
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	*Explain the basics of high speed networks.*	3	3	3	2	1	-	-	-	1	-	-	1	3	2
CO2	*Determine the functionality of congestion control and identify traffic management.*	3	3	2	1	2	-	-	-	1	-	-	1	3	1
CO3	*Explain the functionality of QoS in IP Networks.*	3	3	2	2	1	-	-	-	1	-	-	1	3	2
CO4	*Illustrate fundamentals of wireless communications.*	3	3	3	1	1	-	-	-	1	-	-	1	3	1
CO5	*Summarize fundamentals of network management and Its applications.*	3	3	3	2	1	-	-	-	1	-	-	1	3	1
	Average	**3**	**3**	**2**	**2**	**1**	**-**	**-**	**-**	**1**	**-**	**-**	**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
20CS667	**CLOUD SERVICES MANAGEMENT (PROFESSIONAL ELECTIVE - II)**	3	0	0	3

Prerequisite: *Fundamental knowledge in networking and Cloud Computing*

Course Outcomes: On successful completion of the course, the student will be able to		***Cognitive Level***
CO1:	*Describe Cloud Service Management terminology, definition and concepts.*	*Understand*
CO2:	*Compare and contrast cloud service management with traditional IT service management.*	*Analyze*
CO3:	*Identify strategies to reduce risk and eliminate issues associated with adoption of cloud services.*	*Understand*
CO4:	*Select appropriate structures for designing, deploying and running cloud-based services in a business environment.*	*Apply*
CO5:	*Illustrate the benefits and drive the adoption of cloud-based services to solve real world problems.*	*Apply*

UNIT– I CLOUD SERVICE MANAGEMENT FUNDAMENTALS [9]

Cloud Ecosystem – Essential Characteristics – Basics of Information Technology Service Management and Cloud Service Management – Service Perspectives – Cloud Service Models – Cloud Service Deployment Models.

UNIT – II CLOUD SERVICES STRATEGY [9]

Cloud Strategy Fundamentals – Cloud Strategy Management Framework – Cloud Policy – Key Driver for Adoption – Risk Management – IT Capacity and Utilization – Demand and Capacity matching – Demand Queueing – Change Management – Cloud Service Architecture.

UNIT– III CLOUD SERVICE MANAGEMENT [9]

Cloud Service Reference Model – Cloud Service Life Cycle – Basics of Cloud Service Design – Dealing with Legacy Systems and Services – Benchmarking of Cloud Services – Cloud Service Capacity Planning – Cloud Service Deployment and Migration – Cloud Marketplace – Cloud Service Operations Management.

UNIT– IV CLOUD SERVICE ECONOMICS [9]

Pricing models for Cloud Services Freemium – Pay Per Reservation – Pay per User – Subscription based Charging – Procurement of Cloud-based Services – Capex Vs Opex Shift – Cloud service Charging – Cloud Cost Models.

UNIT– V CLOUD SERVICE GOVERNANCE AND VALUE [9]

IT Governance Definition – Cloud Governance Definition – Cloud Governance Framework – Cloud Governance Structure – Cloud Governance Considerations – Cloud Service Model Risk Matrix – Understanding Value of Cloud Services – Measuring the value of Cloud Services – Balanced Scorecard – Total Cost of Ownership.

Total = 45 Periods

Text Books :

1 Enamul Haque, Cloud Service Management and Governance: Smart Service Management in Cloud Era, Enel Publications, UK, Second Edition, 2023.

2 Thomas Erl, Ricardo Puttini and Zaigham Mohammad, Cloud Computing: Concepts, Technology & Architecture, PHI Publishers, Delhi, First Edition, 2013

Reference Books :

1 Thomas Erl, Robert Cope and Amin Naserpour, Cloud Computing Design Patterns, The Pearson Service Technology Series, Pearson Education, US, 2015.

2 Praveen Ayyappa, Economics of Cloud Computing: LAP LAMBERT Academic Publishing, India, First Edition, 2020.

3 Rajkumar Buyya, Christian Vecchiola and S. Thamarai Selvi, Mastering Cloud Computing: Foundations and Applications Programming, Morgan Kaufmann Publishers, First Edition, 2013.

4 https://onlinecourses.nptel.ac.in/noc21_cs14/

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

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

CO PO MAPPING

Regulation: R 2020

Course Code: 20CS667 **Course Name: CLOUD SERVICES MANAGEMENT**

CO	Course Outcomes	Programme Outcomes													
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	*Describe Cloud Service Management, terminology, definition and concepts.*	3	3	1	1	3	-	-	-	2	2	-	2	1	3
CO2	*Compare and contrast cloud service management with traditional IT service management.*	3	1	2	3	3	-	-	-	1	2	-	1	2	2
CO3	*Identify strategies to reduce risk and eliminate issues associated with adoption of cloud services.*	3	1	3	1	3	-	-	-	3	3	-	1	2	1
CO4	*Select appropriate structures for designing, deploying and running cloud-based services in a business environment.*	1	3	1	2	2	-	-	-	3	3	-	1	2	2
CO5	*Illustrate the benefits and drive the adoption of cloud-based services to solve real world problems.*	1	3	3	2	2	-	-	-	3	3	-	2	3	2
	Average	**3**	**3**	**3**	**2**	**3**	**-**	**-**	**-**	**3**	**3**	**-**	**2**	**2**	**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
20CS761	**INFORMATION SECURITY (PROFESSIONAL ELECTIVE - III)**	3	0	0	3

Prerequisite: Basic Knowledge of Network Security.

Course Outcomes : On successful completion of the course, the student will be able to		***Cognitive Level***
CO1:	*Summarize the principal concepts, major issues and basic approaches*	Remember
CO2:	*Identify the threats, attacks, legal professional and ethical issues.*	Understand
CO3:	*Discover the process of identifying, assessing and treating risks.*	Understand
CO4:	*Design the appropriate standards and practices in the Information Security System.*	Apply
CO5:	*Utilize the appropriate security technologies to prevent security breach.*	Apply

UNIT – I BASICS OF INFORMATION SECURITY [9]

History, Definition – Information Security, Critical Characteristics of Information – CNSS Security Model – Components of an Information Systems – Securing the Components – Balancing Security and Access – The SDLC – The Security SDLC – Security Professional and the Organization – Communities of Interest.

UNIT – II SECURITY INVESTIGATION [9]

Need for Security – Business Needs – Threats – Attacks – Legal, Ethical and Professional Issues – An Overview of Computer Security – Access Control Matrix. Policy: Security policies, Confidentiality policies, Integrity policies and Hybrid policies.

UNIT– III SECURITY ANALYSIS [9]

Introduction – An Overview of Risk Management – Risk Identification – Risk Assessment – Risk Control strategies – Selecting a Risk Control Strategy – Quantitative versus Qualitative Risk Management.

UNIT– IV LOGICAL DESIGN [9]

Blueprint for Security – Information Security Policy – Standards and Practices – ISO 17799/BS 7799 – NIST Models – VISA International Security Model – Design of Security Architecture – Planning for Continuity

UNIT– V PHYSICAL SECURITY AND MAINTENANCE [9]

Security Technology – Intrusion Detection System – Scanning and Analysis Tools – Access Control Devices – Physical Security – Security and Personnel – Information Security Maintenance – Digital Forensics.

Total = 45 Periods

Text Book :

1 Michael E Whitman and Herbert J Mattord, Principles of Information Security, Cengage Learning, India, Sixth Edition, 2018.
2 Micki Krause, Harold F. Tipton, Handbook of Information Security Management, CRC Press, Florida, Fifth Edition, 2004.

References :

1 Mark Stamp, Information Security: Principles and Practice, John Wiley and Sons, United States, Second Edition 2011.
2 Stuart McClure, Joel Scrambray, George Kurtz, Hacking Exposed, Tata McGraw- Hill, New Delhi, Seventh Edition 2012.
3 Charles P. Pfleeger & Shari Lawrence Pfleeger and Jonathan Margulies, Security in Computing, Pearson Education, New Delhi, Fifth Edition, 2015
4 Jason Andress, The Basics of Information Security: Understanding the Fundamentals of InfoSec in Theory and Practice, Syngress, First Edition, 2011.

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DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING
CO-PO MAPPING

Regulation: R 2020

Course Code: 20CS761 **Course Name: INFORMATION SECURITY**

CO	Course Outcomes	Programme Outcomes													
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	*Summarize the principal concepts, major issues and basic approaches*	3	3	3	3	3	-	-	-	2	-	2	1	2	1
CO2	*Identify the threats, attacks, legal professional and ethical issues.*	3	2	2	3	3	-	-	-	2	-	2	1	2	1
CO3	*Discover the process of identifying, assessing and treating risks.*	3	3	2	1	2	-	-	-	1	-	2	1	2	1
CO4	*Design the appropriate standards and practices in the Information Security System.*	3	3	3	1	3	-	-	-	2	-	2	1	2	1
CO5	*Utilize the appropriate security technologies to prevent security breach.*	3	3	3	1	3	-	-	-	2	-	2	1	2	1
	Average	3	3	3	2	3	-	-	-	2	-	2	1	2	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
20CS762	**SOCIAL NETWORK ANALYSIS (PROFESSIONAL ELECTIVE - III)**	3	0	0	3

Prerequisite: Basic knowledge of networks and data mining concepts.

Course Outcomes : On successful completion of the course, the student will be able to		*Cognitive Level*
CO1:	*Develop semantic web related applications.*	*Understand*
CO2:	*Represent knowledge using ontology.*	*Understand*
CO3:	*Predict human behaviour in social web and related communities.*	*Apply*
CO4:	*Evaluate social networks.*	*Understand*
CO5:	*Comprehend the various social networks Applications*	*Understand*

UNIT – I BASIC CONCEPT OF SEMANTIC WEB [9]

Introduction to Semantic Web: Limitations of Current Web – Development of Semantic Web – Emergence of the social Web – Social Network Analysis: Development of Social Network Analysis – Electronic Sources for Network Analysis: Electronic Discussion Networks – Blogs and Online Communities – Web Based Networks – Applications of Social Network Analysis.

UNIT – II MODELING AND VISUALIZATION [9]

Visualizing Online Social Networks – A Taxonomy of Visualizations – Graph Representation – Centrality – Clustering – Node-Edge Diagrams – Visualizing Social Networks with Matrix– Based Representations – Node-Link Diagrams – Hybrid Representations – Modelling and aggregating social network data – Random Walks and their Applications – Use of Hadoop and Map Reduce.

UNIT – III MINING COMMUNITIES [9]

Aggregating and reasoning with social network data, Advanced Representations – Extracting evolution of Web Community from a Series of Web Archive – Detecting Communities in Social Networks – Evaluating Communities – Core Methods for Community Detection and Mining – Applications of Community Mining Algorithms – Node Classification in Social Networks.

UNIT – IV EVOLUTION OF SOCIAL NETWORKS [9]

Evolution in Social Networks – Framework – Tracing Smoothly Evolving Communities – Models and Algorithms for Social Influence Analysis – Influence Related Statistics – Social Similarity and Influence – Influence Maximization in Viral Marketing – Algorithms and Systems for Expert Location in Social Networks – Expert Location without Graph Constraints – with Score Propagation – Expert Team Formation.

UNIT – V APPLICATIONS OF SOCIAL NETWORKS [9]

Graph Theory – Centrality – Clustering – Node Edge Diagrams – Matrix Representation – Visualizing Online Social Networks – Co-Citation Networks. A New Linguistic Approach to Assess the Opinion of Users in Social Network Environments – Explaining Scientific and Technical Emergence Forecasting – Social Network Analysis for Biometric Template Protection

Total = 45 Periods

Text Books :

1 Charu C. Aggarwal, Social Network Data Analytics, Springer, United States, Second Edition, 2014.

2 Peter Mika, Social Networks and the Semantic Web, Springer, United States, First Edition, 2010.

Reference Books :

1 Ajith Abraham, Aboul Ella Hassanien, vaclasnsel, Computational Social Network Analysis: Trends, Tools and Research Advances, Springer, United States, Third Edition, 2012.

2 Borko Furht, Handbook of Social Network Technologies and Applications, Springer, United States, First Edition, 2011

3 Giles, Mark Smith, John Yen, Advances in Social Network Mining and Analysis, Springer, United States, First Edition, 2010.

4 Stanley Wasserman, Social Network Data Analysis, Cambridge University Press, First Edition, 2012.

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DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING
CO-PO MAPPING

Regulation: R 2020

Course Code: 20CS762 **Course Name: SOCIAL NETWORK ANALYSIS**

CO	Course Outcomes	Programme Outcomes													
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	*Develop semantic web related applications.*	3	3	3	-	3	2	-	-	1	-	-	2	3	*3*
CO2	*Represent knowledge using ontology.*	3	3	3	-	2	1	-	-	1	-	-	2	3	*3*
CO3	*Predict human behaviour in social web and related communities.*	3	3	3	-	3	1	-	-	1	-	-	2	3	*3*
CO4	*Evaluate social networks.*	3	3	3	-	3	2	-	-	1	-	-	2	3	*3*
CO5	*Comprehend the various social networks Applications*	3	3	3	-	2	3	-	-	1	-	-	2	3	*3*
	Average	**3**	**3**	**3**	**-**	**3**	**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
20CS763	**AGILE SOFTWARE DEVELOPMENT (PROFESSIONAL ELECTIVE - III)**	3	0	0	3

Prerequisite: *Basic concept of Software Engineering.*

Course Outcomes : On successful completion of the course, the student will be able to		***Cognitive Level***
CO1:	*Discern the background and driving forces for taking an Agile approach to software development.*	*Understand*
CO2:	*Compare agile software development model with traditional development models*	*Understand*
CO3:	*Recognize the business value of adopting Agile approaches.*	*Analyze*
CO4:	*Apply practices of XP and Incremental design.*	*Apply*
CO5:	*Comprehend the Agile development practices.*	*Apply*

UNIT - I FUNDAMENTALS OF AGILE PROCESS [9]

Introduction and background – Agile Manifesto and Principles –Stakeholders and Challenges – Overview of Agile Development Models: Scrum – Extreme Programming –Feature Driven Development – Crystal – Kanban – and Lean Software Development.

UNIT - II AGILE PROJECTS [9]

Planning for Agile Teams: Scrum Teams – XP Teams – General Agile Teams –Team Distribution; Agile Project Lifecycles: Typical Agile Project Lifecycles – Phase Activities – Product Vision – Release Planning: Creating the Product Backlog – User Stories – Prioritizing and Estimating – Creating the Release Plan; Monitoring and Adapting: Managing Risks and Issues – Retrospectives.

UNIT - III AGILE SCRUM FRAMEWORK [9]

Introduction to Scrum: Agile Scrum Framework – Scrum Artifacts – Meetings – Activities and Roles – Scrum Team Simulation – Scrum Planning Principles – Product and Release Planning – Sprinting: Planning – Execution – Review and Retrospective; User story definition and Characteristics – Acceptance tests and Verifying stories – Burn down chart – Daily scrum – Scrum Case Study.

UNIT - IV EXTREME PROGRAMMING [9]

Introduction to Extreme Programming (XP): XP Lifecycle – The XP Team – XP Concepts: Refactoring – Technical Debt – Time boxing – Stories – Velocity; Adopting XP: Pre-requisites – Challenges; Applying XP: Thinking- Pair Programming – Collaborating – Release – Planning – Development; XP Case Study.

UNIT - V AGILE SOFTWARE DESIGN AND DEVELOPMENT [9]

Agile design practices – Role of design Principles –Need and significance of Refactoring – Refactoring Techniques – Continuous Integration – Automated build tools – Version control; Agility and Quality Assurance: Agile Interaction Design – Agile approach to Quality Assurance – Test Driven Development – Pair programming: Issues and Challenges.

Total = 45 Periods

Text Books:

1 Robert C. Martin, Agile Software Development- Principles, Patterns and Practices, Prentice Hall, New Jersey, First Edition, 2013.

2 Kenneth S. Rubin, Essential Scrum: A Practical Guide to the Most Popular Agile Process, Addison Wesley, U.S, First Edition, 2012.

Reference Books:

1 James Shore and Shane Warden, The Art of Agile Development, O'Reilly Media, California, Second Edition, 2007.

2 Craig Larman, Agile and Iterative Development: A manager's Guide, Addison-Wesley, U.S, Second Edition, 2004.

3 Ken Schawber, Mike Beedle, Agile Software Development with Scrum, Pearson Education, India, First Edition, 2001.

4 Cohn, Mike, Agile Estimating and Planning, Pearson Education, India, First Edition, 2006.

5 Alistair Cockburn, Agile Software Development: The Cooperative Game, Addison-Wesley Professional, Second Edition, 2006.

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CO-PO MAPPING

Regulation: R 2020

Course Code: 20CS763 **Course Name: AGILE SOFTWARE DEVELOPMENT**

CO	Course Outcomes	Programme Outcomes													
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	*Discern the background and driving forces for taking an Agile approach to software development.*	3	3	3	3	2	-	-	-	-	3	3	3	3	2
CO2	*Compare agile software development model with traditional development models*	3	3	3	3	2	-	-	-	-	3	3	3	**3**	2
CO3	*Recognize the business value of adopting Agile approaches.*	3	3	3	3	2	-	-	-	-	3	3	3	**3**	2
CO4	*Apply practices of XP and Incremental design.*	3	3	3	3	2	-	-	-	-	2	3	3	**3**	2
CO5	*Comprehend the Agile development practices.*	3	3	3	3	2	-	-	-	-	3	3	3	3	2
	Average	**3**	**3**	**3**	**3**	**2**	**-**	**-**	**-**	**-**	**3**	**3**	**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
20CS764	**USER INTERFACE DESIGN (PROFESSIONAL ELECTIVE - III)**	3	0	0	3

Prerequisite: *Basic knowledge of web programming*

Course Outcomes : On successful completion of the course, the student will be able to		***Cognitive Level***
CO1:	*Explain the importance and principles of User Interface Design.*	Understand
CO2:	*Develop knowledge in interaction and visual design.*	Understand
CO3:	*Integrate the concepts of Communication-based design process.*	Remember
CO4:	*Recall the basic concepts behind manipulation and virtual environment.*	Understand
CO5:	*Identify the functions of interaction devices.*	Apply

UNIT – I PRINCIPLES OF UI DESIGN [9]

Introduction – importance of user interface – Characteristic of graphical and web interface – UI Is Communication Concept – Communication Design Principles – UI Design Situation – Core Principles of UI Communication – Effective Communication – Intuitive UI – Necessary and Unnecessary Consistency – Unintuitive UI – Inductive UI – Deductive UI.

UNIT – II INTERACTION AND VISUAL DESIGN [9]

Interactions – Controls – Commands – Labels and Instructions – Feedback –Task Steps and Navigation –- Surfaces – Errors and Notifications – Dynamic Elements – Importance of Visual Design – Graphic Designers – Layout -- Typography and Text – Color – Affordances – Icons and Glyphs – Animations and Transitions – Demanding Attention.

UNIT – III COMMUNICATION DESIGN PROCESS [9]

Communicating to People – Emotional Connection – Personality – Attributes – Good Tone – Motivating Users – Minimizing Effort – Forgiveness – Building Trustworthiness – Courageous Design-communication – Driven design process – Basic design process – Mistakes – Planning phase – Design phase – Refinement phase.

UNIT – IV MANIPULATION AND VIRTUAL ENVIRONMENTS [9]

Introduction – Examples of Direct Manipulation Systems – Discussion of Direct Manipulation – 3D Interfaces – Teleoperation – Virtual Augmented Reality – Command and Natural Languages: Command – Organization Functionality, Strategies, and Structure – Naming and Abbreviations – Natural Language in Computing.

UNIT – V INTERACTION DEVICES [9]

Introduction – Keyboards and Keypads – Pointing Devices – Speech and Auditory Interfaces – Small and Large Displays – Collaboration and Social Media Participation: Goals of Collaboration and Participation – Asynchronous Distributed Interfaces – Synchronous Distributed Interfaces – Face to Face Interfaces.

Total = 45 Periods

Text Books :

1 Ben Shneiderman, Plaisant, Cohen, Jacobs, Design The User Interface, Pearson Education, New Delhi, Fifth Edition, 2011.

2 McKay, Everett N. UI is communication: How to design intuitive, user centered interfaces by focusing on effective Communication, Elsevier Science , United States, First Edition, 2013.

Reference Books :

1 Alan Cooper, The Essentials of User Interface Design, Wiley India Pvt. Ltd, New Delhi, First Edition,2010

2 Wilbent O. Galitz, The Essential Guide To User Interface Design, John Wiley& Sons, United States, Third Edition, 2009

3 Alan Dix et al, Human - Computer Interaction, Prentice Hall, New Delhi, Third Edition,2009

4 Jenifer Tidwell, Charles Brewer and Aynne Valencia, Designing Interfaces, O'Reilly Media, Inc, Third Edition,2019.

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DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING
CO-PO MAPPING

Regulation: R 2020

Course Code: 20CS764 **Course Name: USER INTERFACE DESIGN**

CO	Course Outcomes	Programme Outcomes													
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	*Explain the importance and principles of User Interface Design.*	3	1	2	-	1	-	-	-	-	1	-	3	2	2
CO2	*Develop knowledge in interaction and visual design.*	3	3	2	-	1	-	-	-	-	1	-	3	2	2
CO3	*Integrate the concepts of Communication-based design process.*	3	2	2	-	1	-	-	-	-	1	-	3	2	2
CO4	*Recall the basic concepts behind manipulation and virtual environment.*	3	2	2	-	1	-	-	-	-	1	-	3	2	2
CO5	*Identify the functions of interaction devices.*	2	2	2	-	1	-	-	-	-	1	-	3	2	2
	Average	**3**	**2**	**2**	**-**	**1**	**-**	**-**	**-**	**-**	**1**	**-**	**3**	**2**	**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
20CS765	**BUSINESS INTELLIGENCE (PROFESSIONAL ELECTIVE - III)**	3	0	0	3

Prerequisite: *Basic Knowledge of relational database management system concepts and data warehousing*

Course Outcomes : **Upon Completion of the course, the students should be able to**		***Cognitive Level***
CO1:	*Recall about transaction processing and analytical applications and describe the need for business intelligence.*	*Remember*
CO2:	*Identify the technology and processes associated with data integration.*	*Understand*
CO3:	*Infer about data flow and transformations i.e., ETL using SSIS.*	*Understand*
CO4:	*Illustrate about multidimensional data modeling, life cycle and business scenario*	*Understand*
CO5:	*Demonstrate an enterprise dashboard that depicts the key performance indicators which helps in decision making.*	*Understand*

UNIT – I BASICS OF BUSINESS INTELLIGENCE [9]

Introduction to Digital Data and its types – Structured, Semi Structured and Unstructured – Introduction to OLTP and OLAP, OLAP Architectures – Data Models. BI Definitions and Concepts – Business Intelligence Applications – BI Framework – BI Process – BI Technology – BI Roles and Responsibilities – BI Best Practices.

UNIT – II DATA INTEGRATION [9]

Data Warehouse – Need and Goals of Data Warehouse – Data Integration – Need and Advantages of Data Integration – Common Data Integration Approaches – Data Integration Technologies – Data Quality – Data Profiling Concepts and Applications – Introduction to ETL using SSIS.

UNIT - III DATA FLOW AND TRANSFORMATIONS [9]

Introduction to SSIS Architecture – Introduction to ETL using SSIS – Integration Services Objects – Data Flow Components – Sources, Transformations and Destinations – Working with Transformations, Containers, Tasks, Precedence Constraints and Event Handlers.

UNIT - IV MULTIDIMENSIONAL DATA MODELING [9]

Introduction to Data and Dimension Modeling –Types of Data Model – Data Modeling Techniques – Fact Table – Dimension Table – Typical Dimensional Models – Dimensional Model Life Cycle – Introduction to Business Metrics and KPIs – Creating Cubes using SSAS.

UNIT – V ENTERPRISE REPORTING [9]

Introduction to Enterprise Reporting – Reporting Perspectives Common to all Levels of Enterprise – Report Standardization and Presentation Practices – Enterprise Reporting Characteristics in OLAP – Concepts of Balanced Scorecards, Dashboards – Create Dashboards – Scorecards vs Dashboards – Introduction to SSRS Architecture – Enterprise Reporting using SSRS.

Total = 45 Periods

Text Books :

1 R N Prasad, Seema Acharya, Fundamentals of Business Analytics, John Wiley India Pvt. Ltd, US, Second Edition, 2016.
2 David Loshin, Business Intelligence - The Savvy Manager's Guide, Morgan Kaufmann Publishers, United States, Second Edition, 2012.

Reference Books :

1 Efraim Turban, Ramesh Sharda, Dursun Delen, Decision Support and Business Intelligence Systems, Ninth Edition, United States, Pearson, 2013.
2 Carlo Vercellis, Business Intelligence: Data Mining and Optimization for Decision Making, Wiley Publications, New Jersey, 2009.
3 Guy Fouche, Lynn Langit, Foundations of SQL Server 2008 R2 Business Intelligence, Aprèss, India, Second Edition, 2008.
4 https://mindmajix.com/msbi/ssis-architecture-components-overview

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CO-PO MAPPING

Regulation: R 2020

Course Code: 20CS765 **Course Name: BUSINESS INTELLIGENCE**

CO	Course Outcomes	Programme Outcomes													
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	*Recall about transaction processing and analytical applications and describe the need for business intelligence.*	3	2	2	2	3	-	-	-	-	-	-	3	3	2
CO2	*Identify the technology and processes associated with data integration.*	3	2	3	2	3	-	-	-	-	-	-	3	**3**	**2**
CO3	*Infer about data flow and transformations i.e., ETL using SSIS.*	3	2	3	2	3	-	-	-	-	-	-	3	**3**	**2**
CO4	*Illustrate about multidimensional data modeling, life cycle and business scenario*	3	2	3	2	3	-	-	-	-	-	-	3	**3**	**2**
CO5	*Demonstrate an enterprise dashboard that depicts the key performance indicators which helps in decision making.*	3	2	2	2	3	-	-	-	-	-	-	3	**3**	**2**
	Average	**3**	**2**	**3**	**2**	**3**		-	-	-	-	-	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
20CS766	**SOFT COMPUTING (PROFESSIONAL ELECTIVE - III)**	3	0	0	3

Prerequisite: *Basics of Data mining algorithms.*

Course Outcomes : **Upon Completion of the course, the students should be able to**		***Cognitive Level***
CO1:	*Summarize the basic concepts of Soft Computing*	*Remember*
CO2:	*Examine various Artificial neural networks.*	*Understand*
CO3:	*Classify Fuzzy set and solving fuzzy problems.*	*Understand*
CO4:	*Describe the basics of Genetic algorithms.*	*Understand*
CO5:	*Identify the various Soft computing algorithms to solve the problems.*	*Apply*

UNIT – I BASICS OF SOFT COMPUTING [9]

Neural Networks – Application Scope of Neural Networks – Fuzzy Logic – Genetic Algorithm – Hybrid Systems – Soft Computing – Artificial Neural Network – Evolution of Neural Networks – Basic Models of ANN – Weights – Bias – Threshold – Learning Rate – Momentum Factor – Vigilance Parameter – McCulloch – Pitts Neuron – Linear Separability – Hebb Network.

UNIT – II ARTIFICIAL NEURAL NETWORKS [9]

Perceptron Networks – Adaptive Linear Neuron – Multiple Adaptive Linear Neurons – Back-Propagation Network – Radial Basis Function Network – Pattern Association – Auto associative and Hetero associative Memory Networks – Bidirectional Associative Memory (BAM) – Hopfield Networks – Fixed Weight Competitive Nets – Kohonen Self-Organizing Feature Maps.

UNIT – III FUZZY SYSTEMS [9]

Fuzzy Logic – Classical Sets (Crisp Sets) – Fuzzy Sets – Fuzzy Relation - Features of the Membership Functions –Fuzzification – Methods of Membership Value Assignments – Defuzzification– Lambda– Cuts for Fuzzy Sets (Alpha-Cuts) – Lambda–Cuts for Fuzzy Relations – Defuzzification Methods – Fuzzy Reasoning – Fuzzy Inference Systems.

UNIT – IV GENETIC ALGORITHMS [9]

Biological Background – Traditional Optimization and Search Techniques – Genetic Algorithm and Search Space – Simple GA – General Genetic Algorithm – Operators – Stopping Condition – Constraints.

UNIT – V HYBRID SOFT COMPUTING AND SWARM INTELLIGENCE ALGORITHMS [9]

Neuro-Fuzzy Hybrid Systems – Genetic Neuro-Hybrid Systems – Genetic Fuzzy Hybrid and Fuzzy Genetic Hybrid Systems – Simplified Fuzzy ARTMAP – Swarm Intelligence Algorithms – Ant Colony Optimization – Artificial Bee Colony – Particle Swarm Optimization – Firefly Algorithm.

Total =45 Periods

Text Books :

1 S. N. Sivanandam , S. N. Deepa, Principles of Soft Computing, Wiley India Pvt. Ltd., India second Edition, 2019.
2 Adam Slovik, Swarm Intelligence Algorithms: Modification and Applications, Taylor & Francis, United Kingdom, First Edition, 2020.

Reference Books :

1 Jyh-Shing Roger Jang, Chuen-Tsai Sun, EijiMizutani, Neuro-Fuzzy and Soft Computing, Prentice Hall of India, Second Edition, 2002.
2 Kwang H. Lee, First course on Fuzzy Theory and ApplicationsII, Springer, First Edition 2005.
3 N.P. Padhy, S. P. Simon, Soft Computing with MATLAB Programming, Oxford University Press, Second Edition,2015.
4 S. Rajasekaran, G. A. Vijayalakshmi Pai, Neural Networks, Fuzzy Logic and Genetic Algorithm, Synthesis and Applications, PHI Learning Pvt. Ltd., Second Edition, 2017.
5 Samir Roy, Introduction to Soft Computing, Pearson Education India, First Edition, 2013.

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DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING
CO-PO MAPPING

Regulation: R 2020

Course Code: 20CS766 **Course Name: SOFT COMPUTING**

CO	Course Outcomes	Programme Outcomes													
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	*Summarize the basic concepts of Soft Computing*	3	2	2	3	3	2	1	-	2	-	2	1	2	1
CO2	*Examine various Artificial neural networks.*	3	2	2	3	3	2	1	-	2	-	2	1	2	1
CO3	*Classify Fuzzy set and solving fuzzy problems.*	3	1	2	1	2	1	1	-	2	-	2	1	2	1
CO4	*Describe the basics of Genetic algorithms.*	3	1	3	1	3	1	1	-	2	-	2	1	2	1
CO5	*Identify the various Soft computing algorithms to solve the problems.*	3	-	3	1	3	-	1	-	2	-	2	1	2	1
	Average	3	2	2	2	3	2	1	-	2	-	2	1	2	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
20CS767	**SERVICE ORIENTED ARCHITECTURE (PROFESSIONAL ELECTIVE - IV)**	3	0	0	3

Prerequisite: *Basic Knowledge of XML and Web service*

Course Outcomes: On successful completion of the course, the student will be able to		***Cognitive Level***
CO1:	*Relate web services with service oriented architecture.*	Understand
CO2:	*Examine the issues related to SOA.*	Understand
CO3:	*Apply the tools and technique for service oriented architecture*	Apply
CO4:	*Develop service design using WSDL and XML schema languages.*	Apply
CO5:	*Evaluate SOA platform supported by J2EE and .NET*	*Evaluate*

UNIT – I BASICS OF SOA [9]

Basic Definition – Fundamentals of SOA – Characteristics about SOA – Benefits and Pitfalls of SOA. Evolution of SOA – Web Service and Primitive SOA – Extension of SOA – Web Service Extension.

UNIT – II WEB SERVICE AND CONTEMPORARY SOA [9]

Message Exchange Pattern – Service Activity – Coordination – Atomic Transaction Business Activity – Orchestration – Choreography – Addressing Reliable Messaging Correlation and Policies – Meta data Exchange – Security Notification and Eventing.

UNIT– III PRINCIPLES OF SERVICE ORIENTATION [9]

Principles of Service Orientation – Building SOA – Planning and Analysis – SOA Delivery Strategies – Service Oriented Analysis: Introduction – Service Modelling of Service Oriented Analysis.

UNIT – IV SERVICE ORIENTED DESIGN [9]

Introduction to Service Oriented Design – WSDL related XML Schema Language – WSDL Language Basics – SOAP Language Basics – Service Interface Design Tools – Steps to Composing SOA – Consideration for Choosing Service Layers – SOA Extension – Service Design and Business Process Design.

UNIT– V WEB SERVICE EXTENSION AND SOA PLATFORM [9]

WS-Addressing Language Basics – WS-Reliable Messaging Language Basics – WS-Policy Language Basics – WS Metadata Exchange Language Basics – WS-Security Language Basics – SOA Platform Basics – SOA Support in J2EE, SOA Support in .NET– Case Studies.

Total = 45 Periods

Text Books :

1 Thomas Erl, Service Oriented Architecture, Concepts, Technology and Design, Pearson Education, New Delhi, Second Edition, 2016.

2 Thomas Erl, SOA Principles of Service Design, Prentice Hall, New Delhi, First Edition, 2014.

Reference Books :

1 Eric Newcomer, Greg Lomow, Understanding SOA with Web Services, Pearson Education, New Delhi, Third Edition 2009.

2 Dan Woods and Thomas Mattern, Enterprise SOA Designing IT for Business Innovation, O'reilly, California, First Edition 2006.

3 Ben Schneiderman, Designing the User Interface, Addison Wesley, US, Fifth Edition, 2000.

4 https://www.youtube.com/watch?v=WMNzOCemKko

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DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING
CO-PO MAPPING

Regulation: R 2020

Course Code: 20CS767 **Course Name: SERVICE ORIENTED ARCHITECTURE**

CO	Course Outcomes	Programme Outcomes													
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	*Relate web services with service oriented architecture.*	3	3	2	-	2	-	-	-	-	1	-	3	3	2
CO2	*Examine the issues related to SOA.*	3	3	2	-	2	-	-	-	-	1	-	3	3	2
CO3	*Apply the tools and technique for service oriented architecture*	3	3	2	-	2	-	-	-	-	1	-	3	3	2
CO4	*Develop service design using WSDL and XML schema languages.*	3	2	2	-	1	-	-	-	-	1	-	3	3	2
CO5	*Evaluate SOA platform supported by J2EE and .NET*	2	2	2	-	1	-	-	-	-	1	-	3	3	2
	Average	3	3	2	-	2	-	-	-	-	1	-	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
20CS768	**CYBER SECURITY**				
	(PROFESSIONAL ELECTIVE - IV)	3	0	0	3

Prerequisite: *Basics of Computer Networks and Security.*

Course Outcomes : On successful completion of the course, the student will be able to		***Cognitive Level***
CO1:	*Have an overview of cyber crime scenario and legal perspective on cyber crime.*	*Understand*
CO2:	*Comprehend different types of cyber attacks*	*Understand*
CO3:	*Realize about tools and methods used in cyber crime*	*Remember*
CO4:	*Identify the need of cyber laws*	*Understand*
CO5:	*Outline and know how cyber forensics is used in cyber crime investigations.*	*Understand*

UNIT– I FUNDAMENTALS OF CYBER CRIME AND CYBER OFFENCES [9]

Cybercrime definition and origins of the word – Cyber crime and information security – Classifications of cybercrimes, Cybercrime and the Indian ITA 2000 – A global Perspective on cybercrimes – How criminal plan the attacks – Social Engineering – Cyberstalking – Cybercafe and Cybercrimes – Botnets – Attack vector – Cloud computing

UNIT – II TOOLS AND METHODS USED IN CYBER CRIME [9]

Proxy Servers and Anonymizers – Password Cracking – Keyloggers and Spywares – Virus and Worms – Steganography – DoS and DDoS Attacks – SQL Injection – Buffer Overflow – Attacks on Wireless Networks – Phishing – Identity Theft (ID Theft)

UNIT – III CYBER CRIME AND IT ACT [9]

The Legal Perspectives – Need of Cyber law: The Indian Context – The Indian IT Act – Challenges - Digital Signature and the Indian IT Act – Amendments to the Indian IT Act – Cybercrime and Punishment – Cyber law, Technology and Students: Indian Scenario.

UNIT – IV COMPUTER FORENSICS [9]

Historical Background of Cyber forensics – Digital Forensics Science –The Need for Computer Forensics – Cyber forensics and Digital Evidence – Forensics Analysis of Email – Digital Forensics Lifecycle – Chain of Custody Concept – Network Forensics – Approaching a Computer Forensics Investigation – Computer Forensics and Steganography – Relevance of the OSI 7 Layer Model – Computer Forensics and Social Networking Sites: The Security/Privacy Threats – Forensics Auditing – Anti Forensics.

UNIT – V CYBER SECURITY [9]

Organizational Implications – Cost of Cybercrimes and IPR Issues: Lesson for Organizations – Web Treats for Organizations: The Evils and Perils – Security and Privacy Implications from Cloud Computing – Social Media Marketing: Security Risk and Perils for Organization – Social Computing and the Associated Challenges for Organizations – Protecting People's Privacy in the Organization – Organizational Guidelines for Internet Usage – Safe Computing Guidelines and Computer Usage Policy – Incident Handling – Best Practices.

Total = 45 Periods

Text Books :

1 Nina Godbole and Sunit Belapure, Cyber Security Understanding Cyber Crimes, Computer Forensics and Legal Perspectives, Wiley Publication, New Delhi, First Edition, Reprint, 2018.

2 Anand Shinde, Introduction to Cyber Security Guide to the World of Cyber Security, Notion Press, India, 2021

Reference Books:

1 Mike Shema, Anti-Hacker Tool Kit (Indian Edition), McGraw Hill Publication, New Delhi, Fourth Edition, 2014

2 Nina Godbole, Information Systems Security, Wiley Publication, New Jersey, Second Edition, 2017

3 Cyrus Piekari and Anton Chuvakin, Security Warrior, O'Reilly Publishers, California, Second Edition, 2005

4 Anand Shinde, Introduction to Cyber Security : Guide to the World of Cyber Security, First Edition, Reprint, 2021.

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

Regulation: R 2020

Course Code: 20CS768 **Course Name: CYBER SECURITY**

CO	Course Outcomes	Programme Outcomes													
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	*Have an overview of cyber crime scenario and legal perspective on cyber crime.*	3	3	3	-	3	3	2	2	-	-	-	2	2	2
CO2	*Comprehend different types of cyber attacks*	3	2	3	-	2	2	1	2	-	-	-	2	2	2
CO3	*Realize about tools and methods used in cyber crime*	3	3	3	-	3	2	1	2	-	-	-	2	2	2
CO4	*Identify the need of cyber laws*	3	2	2	-	2	2	1	3	-	-	-	2	2	2
CO5	*Outline and know how cyber forensics is used in cyber crime investigations.*	3	2	2	-	2	2	1	3	-	-	-	2	2	2
Average		**3**	**2**	**3**	**-**	**2**	**2**	**1**	**2**	**-**	**-**	**-**	**2**	**2**	**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
20CS769	**SOFTWARE DEFINED NETWORKS (PROFESSIONAL ELECTIVE - IV)**	3	0	0	3

Prerequisite: *Basic Knowledge of computer networks.*

Course Outcomes: On successful completion of the course, the student will be able to		***Cognitive Level***
CO1:	*Analyze the evolution of software defined networks.*	Understand
CO2:	*Express the various components of SDN and their uses.*	Understand
CO3:	*Summarize the advanced and emerging networking technologies*	Remember
CO4:	*Explain the use of SDN in the current networking scenario*	Understand
CO5:	*Design and develop various applications of SDN.*	Apply

UNIT – I **FUNDAMENTALS OF SOFTWARE DEFINED NETWORKS** **[9]**

History of Software Defined Networking (SDN) – Modern Data Center – Traditional Switch Architecture – Why SDN – Evolution of SDN – How SDN Works – Centralized and Distributed Control and Date Planes.

UNIT – II **OPEN FLOW AND SDN CONTROLLERS** **[9]**

Open Flow Specification – Drawbacks of Open SDN, SDN via APIs, SDN Via Hypervisor– Based Overlays – SDN via Opening up the Device – SDN Controllers – General Concepts

UNIT–III **DATA CENTERS** **[9]**

Multitenant and Virtualized Multitenant Data Center – SDN Solutions for the Data Center Network – VLANs – EVPN – VxLAN – NVGRE

UNIT – IV **SDN PROGRAMMING** **[9]**

Programming SDNs: Northbound Application Programming Interface – Current Languages and Tools – Composition of SDNs – Network Functions Virtualization (NFV) and Software Defined Networks: Concepts – Implementation and Applications

UNIT– V **SDN FRAMEWORK** **[9]**

Juniper SDN Framework – IETF SDN Framework – Open Daylight Controller – Floodlight Controller – Bandwidth Calendaring – Data Center Orchestration

Total = 45 Periods

Text Books :

1 Paul Goransson and Chuck Black, Software Defined Networks: A Comprehensive Approach, Morgan Kaufmann ,First Edition, 2014.
2 Thomas D. Nadeau, Ken Gray, SDN: Software Defined Networks, O'Reilly Media, US, First Edition, 2013.

Reference Books :

1 Siamak Azodolmolky, Software Defined Networking with Open Flow, Packet Publishing, Second Edition, 2013.
2 Vivek Tiwari, SDN and Open Flow for Beginners‖, Amazon Digital Services, Inc., First Edition, 2013.
3 Fei Hu, Editor, Network Innovation through Open Flow and SDN: Principles and Design, CRC Press, First Edition, 2014.
4 Feamster, Nick, Jennifer Rexford, and Ellen Zegura. The road to SDN: an intellectual history of programmable networks. ACM SIGCOMM Computer Communication Review 44.2 (2014): 87-98.

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

Regulation: R 2020

Course Code: 20CS769 **Course Name: SOFTWARE DEFINED NETWORKS**

CO	Course Outcomes	Programme Outcomes													
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	*Analyze the evolution of software defined networks.*	3	2	3	-	3	1	1	-	2	1	1	2	1	3
CO2	*Express the various components of SDN and their uses.*	3	2	2	-	3	1	1	-	2	1	1	3	2	3
CO3	*Summarize the advanced and emerging networking technologies*	3	3	3	-	3	2	1	-	1	1	2	2	1	3
CO4	*Explain the use of SDN in the current networking scenario*	3	3	3	-	3	2	2	-	1	1	1	2	2	3
CO5	*Design and develop various applications of SDN.*	3	3	3	-	3	2	2	-	2	2	3	3	2	3
	Average	**3**	**3**	**3**	**-**	**3**	**2**	**1**	**-**	**2**	**1**	**1**	**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
20CS771	**INFORMATION STORAGE MANAGEMENT (PROFESSIONAL ELECTIVE - IV)**	3	0	0	3

Prerequisite: *Basic Knowledge of Database Management Systems.*

Course Outcomes : On successful completion of the course, the student will be able to		***Cognitive Level***
CO1:	*Elucidate logical and physical components of a storage infrastructure and RAID.*	Understand
CO2:	*Depict different storage networking technologies.*	Understand
CO3:	*Demonstrate the need of backup, archive and replication*	Apply
CO4:	*Confer cloud computing characteristics and benefits.*	Understand
CO5:	*Summarize the security and monitoring aspects of data center components.*	Apply

UNIT – I OVERVIEW OF STORAGE SYSTEM [9]

Introduction to Information Storage, Virtualization and Cloud Computing – Key Data Center Elements – Compute, Application and Storage Virtualization – Disk Drive and Flash Drive Components and Performance – RAID – Intelligent Storage System and Storage Provisioning.

UNIT – II STORAGE NETWORKING TECHNOLOGIES AND VIRTUALIZATION [9]

Fiber Channel SAN components, FC Protocol and Operations – Block Level Storage Virtualization – iSCSI and FCIP as an IP– SAN Solutions – Converged Networking Option – FCoE – Network Attached Storage (NAS) – Components, Protocol and Operations – File Level Storage Virtualization – Object Based Storage and Unified Storage Platform.

UNIT–III BACKUP, ARCHIVE AND REPLICATION [9]

Business Continuity Terminologies, Planning and Solutions – Clustering and Multi-pathing Architecture to Avoid Single Points of Failure – Backup and Recovery – Methods, Targets and Topologies – Data Deduplication and Backup in Virtualized Environment – Fixed Content and Data Archive – Local and Remote Replications in Classic and Virtual Environments – Three site Remote Replication and Continuous Data Protection.

UNIT– IV INFORMATION AVAILABILITY, MONITORING AND MANAGING DATACENTER [9]

Reason for planned/unplanned outages and the impact of downtime – Impact of Downtime – Differentiate between Business Continuity and Disaster Recovery – RTO and RPO – Identify single points of failure in a storage infrastructure and solutions to mitigate these failures – Architecture of backup/recovery – Different backup / recovery topologies – Replication technologies – Role in ensuring information availability and business continuity.

UNIT– V SECURING AND MANAGING STORAGE INFRASTRUCTURE [9]

Security Threats and Counter Measures in Various Domains – Security Solutions for FCSAN, IP-SAN and NAS environments – Security in Virtualized and Cloud Environments – Monitoring and Managing Various Information Infrastructure Components in Classic and Virtual Environments – Information Lifecycle Management (ILM) and Storage Tiering.

Total = 45 Periods

Text Books :

1 Somasundaram Gnanasundaram and Alok Shrivastava, Information Storage and Management: Storing, Managing and Protecting Digital Information in Classic Virtualized, and Cloud Environments, EMC Education Services, Wiley India Pvt. Ltd, India, Second Edition, 2012.

2 EMC Corporation, Information Storage and Management: Storing, Managing, and Protecting Digital Information, Wiley, India, Second Edition, 2012.

References :

1 Marc Farley, Building Storage Networks, Tata McGraw Hill, New Delhi, Second Edition, 2001.

2 Robert Spalding, Storage Networks: The Complete Reference, Tata McGraw Hill, New Delhi, First Edition, 2003.

3 http://www.webopedia.com/TERM/R/RAID.html.

4 Emc Education Services, Information Storage and Management, Wiley, Second Edition, 2012.

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DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING
CO-PO MAPPING

Regulation: **R 2020**

Course Code: **20CS771** **Course Name:** **INFORMATION STORAGE MANAGEMENT**

CO	Course Outcomes	Programme Outcomes													
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	*Elucidate logical and physical components of a storage infrastructure and RAID.*	3	3	3	3	3	-	-	-	2	-	2	1	2	1
CO2	*Depict different storage networking technologies.*	3	2	2	3	3	-	-	-	2	-	2	1	2	1
CO3	*Demonstrate the need of backup, archive and replication*	3	3	2	2	2	-	-	-	1	-	2	1	2	1
CO4	*Confer cloud computing characteristics and benefits.*	3	3	3	2	3	-	-	-	2	-	2	1	2	1
CO5	*Summarize the security and monitoring aspects of data center components.*	3	3	1	2	3	-	-	-	2	-	2	1	2	1
	Average	**3**	**3**	**3**	**2**	**3**	**-**	**-**	**-**	**2**	**-**	**2**	**1**	**2**	**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
20CS772	**MACHINE LEARNING TECHNIQUES (PROFESSIONAL ELECTIVE - IV)**	3	0	0	3

Prerequisite: *Basic knowledge of Data Mining and Artificial Intelligence.*

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:	*Apply the appropriate Machine learning strategy for any given problem*	*Apply*
CO3:	*Design a neural network for an application of your choice*	*Understand*
CO4:	*Outline existing machine learning algorithms to improve classification efficiency*	*Understand*
CO5:	*Design systems that use 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 – The Confusion Matrix and Basic Statistics – Bias – Variance Trade off.

UNIT– II PARAMETRIC AND SEMI-PARAMETRIC METHODS [9]

Introduction – Neural Network representation – Appropriate problems for Neural Network Learning Parametric Classification – Regression –Tuning Model Complexity – Model Selection Procedures. Multivariate Methods: Data – Parameter Estimation – Estimation of Missing Values – Multivariate Normal Distribution – Multivariate Classification and Regression. Semi parametric method: Clustering k-Means Clustering – Hierarchical Clustering.

UNIT – III DIMENSIONALITY REDUCTION AND EVOLUTIONARY MODELS [9]

Linear Discriminant Analysis (LDA) – Principal Component Analysis (PCA) – Factor Analysis – Independent Component Analysis – Probabilistic Model – 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 – Vector Quantization.

UNIT– V GRAPHICAL MODELS [9]

Graphical model: Canonical cases for conditional independence -Bayesian Networks – Markov Random Fields – Hidden Markov Model (HMMS) – Markov Chain Monte Carlo (MCMC) 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.
3. Ethem Alpaydin, Introduction to Machine Learning, MIT Press, Bogaziçi University, Second Edition, 2013.

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. Aurélien Géron, Hands-On Machine Learning with Scikit-Learn, Keras, and TensorFlow: Concepts, Tools, and Techniques to Build Intelligent Systems, Shroff/O'Reilly, Third Edition, 2022.

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

Regulation: R 2020

Course Code: 20CS772 **Course Name: MACHINE LEARNING TECHNIQUES**

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	3	2
CO2	*Apply the appropriate Machine learning strategy for any given problem*	3	3	2	2	2	2	-	-	-	-	-	1	3	2
CO3	*Design a neural network for an application of your choice*	3	2	2	3	2	2	-	-	-	-	-	1	3	2
CO4	*Outline existing machine learning algorithms to improve classification efficiency*	3	2	3	2	2	1	-	-	-	-	-	1	3	2
CO5	*Design systems that uses the appropriate graph models of machine learning*	3	2	2	2	3	2	-	-	-	-	-	1	3	2
	Average	**3**	**2**	**2**	**3**	**2**	**2**		**-**	**-**	**-**	**-**	**1**	**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
20CS773	**DATA SCIENCE**				
	(PROFESSIONAL ELECTIVE - IV)	3	0	0	3

Prerequisite: *Basic knowledge of Data warehousing and data Mining.*

Course Outcomes : On successful completion of the course, the student will be able to		***Cognitive Level***
CO1:	*Identify and Present an overview data science and applications.*	*Understand*
CO2:	*Examine the methods of data collection.*	*Understand*
CO3:	*Examine the various statistical methods in EDA*	*Understand*
CO4:	*Apply statistical methods to develop and evaluate the models.*	*Apply*
CO5:	*Construct decision making for complex projects.*	*Apply*

UNIT – I OVERVIEW OF DATA SCIENCE [9]

Introduction to Data Science – Evolution of Data Science – Data Science Roles – Stages in a Data Science Project – Applications of Data Science in various fields – Data Security Issues.

UNIT – II DATA COLLECTION AND DATA PRE-PROCESSING [9]

Data Collection Strategies – Data Pre-Processing Overview – Data Cleaning – Data Integration and Transformation – Data Reduction – Data Discretization.

UNIT – III EXPLORATORY DATA ANALYTICS [9]

Descriptive Statistics – Mean, Standard Deviation, Skewness and Kurtosis – Box Plots – Pivot Table – Heat Map – Correlation Statistics – ANOVA.

UNIT– IV MODEL DEVELOPMENT [9]

Simple and Multiple Regression – Model Evaluation using Visualization – Residual Plot – Distribution Plot – Polynomial Regression and Pipelines – Measures for In-sample Evaluation – Prediction and Decision Making.

UNIT – V MODEL EVALUATION [9]

Generalization Error – Out-of-Sample Evaluation Metrics – Cross Validation – Overfitting – Under Fitting and Model Selection – Prediction by using Ridge Regression – Testing Multiple Parameters by using Grid Search.

Total = 45 Periods

Text Books :

1 Cathy O'Neil and Rachel Schutt, Doing Data Science, O'Reilly, Shroff publisher, First Edition, 2013.

2 Jojo Moolayil, Smarter Decisions: The Intersection of IoT and Data Science, Packt publisher, Mumbai, First Edition, 2016.

Reference Books :

1 Peter Bruce, Andrew Bruce and Peter Gedeck, Practical Statistics for Data Scientists, O'Reilly Media, Inc,,US, Second Edition, 2020

2 Pratap Dangeti, Statistics for Machine Learning, Birmingham, Packt Publishing, Mumbai, First Edition, 2017

3 David Dietrich, Barry Heller, Beibei Yang, Data Science and Big data Analytics, Wiley Publishing, New Jersey, First Edition, 2015

4 Joel Grus, Data Science from Scratch, O'Reilly, US, Second Edition, 2019.

5 Diego Miranda-Saavedra, How to Think about Data Science, CRC Press, First Edition, 2022.

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

Regulation: R 2020

Course Code: 20CS773 **Course Name: DATA SCIENCE**

CO	Course Outcomes	Programme Outcomes													
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	*Identify and present an overview data science and applications.*	3	1	1	2	2	-	-	-	2	-	1	2	2	3
CO2	*Examine the methods of data collection.*	3	2	2	2	2	-	-	-	2	-	1	2	**2**	**3**
CO3	*Examine the various statistical methods in EDA*	3	3	3	2	3	-	-	-	2	-	1	2	**2**	**3**
CO4	*Apply statistical methods to develop and evaluate the models.*	3	3	3	2	3	-	-	-	2	-	3	3	**2**	**3**
CO5	*Construct decision making for complex projects.*	3	3	3	3	3	-	-	-	2	-	3	3	2	3
	Average	**3**	**3**	**2**	**2**	**3**	**-**	**-**	**-**	**2**	**-**	**1**	**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
20CS774	**R PROGRAMMING (PROFESSIONAL ELECTIVE - IV)**	3	0	0	3

Prerequisite: *Basic knowledge about Graphics and Multimedia*

Course Outcomes: On successful completion of the course, the student will be able to		***Cognitive Level***
CO1:	*Create artful graphs to visualize complex data sets and functions*	*Create*
CO2:	*Write more efficient code using parallel R and vectorization*	*Apply*
CO3:	*Interface R with C/C++ and Python for increased speed or functionality*	*Understand*
CO4:	*Find new packages for text analysis, image manipulation, and perform statistical analysis of the same*	*Understand*
CO5:	*Develop interfacing R to other Languages*	*Apply*

UNIT – I **BASIC CONCEPT OF** R **[9]**

Introducing to R – R Data Structures – Help functions in R – Vectors – Scalars – Declarations – recycling – Common Vector operations – Using all and any – Vectorized operations – NA and NULL values – Filtering – Vectorised if-then else – Vector Equality – Vector Element names

UNIT – II **MATRICES, ARRAYS AND LISTS** **[9]**

Matrices, Arrays and Lists Creating matrices – Matrix operations – Applying Functions to Matrix Rows and Columns – Adding and deleting rows and columns – Vector/Matrix Distinction – Avoiding Dimension Reduction – Higher Dimensional arrays – lists – Creating lists – General list operations – Accessing list components and values – applying functions to lists – Recursive lists.

UNIT – III **DATA FRAMES** **[9]**

Creating Data Frames – Matrix-like operations in frames – Merging Data Frames – Applying functions to Data frames – Factors and Tables – Factors and levels – Common functions used with factors – Working with tables – Other factors and table related functions

UNIT – IV **CONTROL STATEMENTS, FUNCTIONS AND R GRAPHS** **[9]**

Control statements – Arithmetic and Boolean operators and values – Default values for arguments – Returning Boolean values – Functions are objects – Environment and Scope issues – Writing Upstairs – Recursion – Replacement functions – Tools for composing function code – Math and Simulations in R Creating Graphs – Customizing Graphs – Saving graphs to files.

UNIT – V **INTERFACING** **[9]**

Interfacing R to other languages – Parallel R – Basic Statistics – Linear Model – Generalized Linear models – Non-linear models – Time Series and Auto-correlation – Clustering

Total = 45 Periods

Text Books:

1 Norman Mat off, The Art of R Programming: A Tour of Statistical Software Design, No Starch Press, First Edition, 2011.
2 Jared P. Lander, R for Everyone: Advanced Analytics and Graphics, Addison-Wesley Data & Analytics Series, First Edition 2013.

Reference Books:

1 Mark Gardener, Beginning R – The Statistical Programming Language, Wiley, India, First Edition, 2013
2 Robert Knell, Introductory R: A Beginner's Guide to Data Visualisation, Statistical Analysis and Programming in R, Amazon Digital South Asia Services Inc, First Edition, 2013.
3 The Art of R Programming, Norman Matloff, Cengage Learning: Efficient R Programming: A Practical Guide to Smarter Programming, O'Reilly, First Edition, 2016.
4 Rob Kabacoff, Manning: R in Action: Data Analysis and Graphics with RNov 5, Unabridged by Robert Kabacoff and Dale Ogden, Manning Publications, First Edition, 2018

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

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

CO-PO MAPPING

Regulation: R 2020

Course Code: 20CS774 **Course Name: R PROGRAMMING**

CO	Course Outcomes	Programme Outcomes													
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	*Create artful graphs to visualize complex data sets and functions*	3	3	2	3	3	-	-	-	-	-	2	3	3	3
CO2	*Write more efficient code using parallel R and vectorization*	3	3	2	3	2	-	-	-	-	-	2	3	3	**3**
CO3	*Interface R with C/C++ and Python for increased speed or functionality*	3	3	1	3	2	-	-	-	-	-	3	2	3	2
CO4	*Find new packages for text analysis, image manipulation, and perform statistical analysis of the same*	3	3	2	2	3	-	-	-	-	-	2	3	3	**3**
CO5	*Develop interfacing R to other Languages*	3	3	2	3	1	-	-	-	-	-	2	3	3	3
	Average	**3**	**3**	**2**	**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
20CS775	**WEB APPLICATION SECURITY (PROFESSIONAL ELECTIVE - IV)**	3	0	0	3

Prerequisite: *Basic knowledge about web programming*

Course Outcomes: On successful completion of the course, the student will be able to		***Cognitive Level***
CO1:	*Summarize the Basics of web applications.*	*Understand*
CO2:	*Identify the various types of threats and mitigation measures of web applications.*	*understandy*
CO3:	*Apply the security principles in developing a reliable web application.*	*Apply*
CO4:	*Use industry standard tools for web application security and identify Vulnerabilities.*	*Understand*
CO5:	*Apply penetration testing to improve the security of web applications.*	*Apply*

UNIT – I OVERVIEW OF WEB APPLICATIONS [9]

Introduction – History of web applications – Interface and structure – Benefits and drawbacks of web applications – Web application Vs Cloud application.

UNIT – II WEB APPLICATION SECURITY FUNDAMENTALS [9]

Security Fundamentals: Input Validation – Attack Surface Reduction Rules of Thumb – Classifying and Prioritizing Threads

UNIT – III BROWSER SECURITY PRINCIPLES [9]

Origin Policy – Exceptions to the Same-Origin Policy – Cross-Site Scripting and Cross-Site Request Forgery – Reflected XSS - HTML Injection.

UNIT – IV WEB APPLICATION VULNERABILITIES [9]

Understanding vulnerabilities in traditional client server application and web applications – Client state manipulation – cookie-based attacks – SQL injection – Cross domain attack (XSS/XSRF/XSSI) http header injection. SSL vulnerabilities and testing – Proper encryption use in web application – Session vulnerabilities and testing.

UNIT – V SECURE WEBSITE DESIGN [9]

Architecture and Design Issues for Web Applications – Deployment Considerations Input Validation – Authentication – Authorization – Configuration Management – Sensitive Data – Session Management –Cryptography – Parameter Manipulation – Exception Management – Auditing and Logging.

Total = 45 Periods

Text Books :

1 Sullivan, Bryan, and Vincent Liu. Web Application Security, A Beginner's Guide. McGraw Hill Professional, First Edition, 2011.

2 Stuttard, Dafydd, and Marcus Pinto. The Web Application Hacker's Handbook: Finding and Exploiting Security Flaws. Second Edition, John Wiley Sons, 2011

Reference Books :

1 Andrew Hoffman, Web Application Security, Second Edition, , O'Reilly Media, Inc,2024

2 Joel Scambray, Vincent Liu, Caleb Sima, Hacking Exposed Web Applications, McGraw-Hill Education, Third Edition, 2010.

3 Mike Shema, Hacking Web Apps: Detecting and Preventing Web Application Security Problems, Syngress, First Edition, October 2012,

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

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

CO-PO MAPPING

Regulation: R 2020

Course Code: 20CS775 **Course Name: WEB APPLICATION SECURITY**

CO	Course Outcomes	Programme Outcomes													
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	*Summarize the Basics of web applications.*	3	3	3	3	2	2	-	-	-	-	3	3	3	3
CO2	*Identify the various types of threats and mitigation measures of web applications.*	3	3	3	3	2	2	-	-	-	-	2	3	3	2
CO3	*Apply the security principles in developing a reliable web application.*	3	3	3	3	3	2	-	-	-	-	2	2	3	3
CO4	*Use industry standard tools for web application security and identify Vulnerabilities.*	3	3	3	3	3	2	-	-	-	-	1	2	3	2
CO5	*Apply penetration testing to improve the security of web applications.*	3	3	3	3	3	2	-	-	-	-	2	3	3	2
	Average	**3**	**3**	**3**	**3**	**3**	**2**	**-**	**-**	**-**	**-**	**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
20CS776	**STORAGE TECHNOLOGIES (PROFESSIONAL ELECTIVE - IV)**	3	0	0	3

Prerequisite: *Fundamental knowledge in networking and Cloud Computing*

	Course Outcomes: On successful completion of the course, the student will be able to	***Cognitive Level***
CO1:	*Demonstrate the fundamentals of information storage management and various models of Cloud infrastructure services and deployment.*	*Understand*
CO2:	*Illustrate the usage of advanced intelligent storage systems and RAID.*	*Understand*
CO3:	*Interpret various storage networking architectures - SAN, including storage subsystems and virtualization.*	*Understand*
CO4:	*Examine the different role in providing disaster recovery and remote replication technologies.*	*Apply*
CO5:	*Infer the security needs and security measures to be employed in information storage management.*	*Understand*

UNIT – I STORAGE SYSTEMS [9]

Introduction to Information Storage: Digital data and its types – Information storage – Key characteristics of data center and Evolution of computing platforms – Information Lifecycle Management. Third Platform Technologies: Cloud computing and its essential characteristics – Cloud services and cloud deployment models – Big data analytics – Social networking and mobile computing – Characteristics of third platform infrastructure – Imperatives for third platform transformation.

UNIT – II INTELLIGENT STORAGE SYSTEMS AND RAID [9]

Components of an intelligent storage system – Components – Addressing and performance of hard disk drives and solid – State drives – RAID – Types of intelligent storage systems – Scale-up and scale out storage Architecture.

UNIT – III STORAGE NETWORKING TECHNOLOGIES AND VIRTUALIZATION [9]

Block-Based Storage System – File-Based Storage System – Object-Based and Unified Storage. Fibre Channel SAN: Software-defined networking – FC SAN components and architecture – FC SAN topologies – Link aggregation and zoning – Virtualization in FC SAN environment. Internet Protocol SAN: iSCSI protocol – Network components and connectivity – Link aggregation – Switch aggregation and VLAN – FCIP protocol – Connectivity and configuration.

UNIT – IV BACKUP, ARCHIVE AND REPLICATION [9]

Introduction to Business Continuity – Backup architecture – Backup targets and methods – Data deduplication – Cloud-based and mobile device backup – Data archive – Uses of replication and its characteristics – Compute based, storage-based and network-based replication – Data migration – Disaster Recovery as a Service.

UNIT – V SECURING STORAGE INFRASTRUCTURE [9]

Information security goals – Storage security domains – Threats to a storage infrastructure – Security controls to protect a storage infrastructure – Governance – Risk and Compliance – Storage infrastructure management functions – Storage infrastructure management processes.

Total = 45 Periods

Text Books:

1 G. Somasundaram and Alok Shrivastava, EMC Corporation, Information Storage and Management, Wiley Publishing, Inc., India, First Edition, 2009

2 Jon Tate, Pall Beck, Hector Hugo Ibarra, Shanmuganathan Kumaravel and Libor Miklas, Introduction to Storage Area Networks, IBM – Redbooks, Ninth Edition, 2017

Reference Books:

1 Ulf Troppens, Rainer Erkens, Wolfgang Mueller-Friedt, Rainer Wolafka, Nils Haustein, Storage Networks Explained, Wiley Publication, India, Second Edition, 2009

2 John W. Rittinghouse and James F. Ransome, Cloud Computing: Implementation, Management, and Security, CRC Press, US, 2010

3 Thomas Erl, Ricardo Puttini and Zaigham Mohammad Cloud Computing: Concepts, Technology & Architecture, PHI Publishers, India, First Edition, 2013

4 Gerardus Blokdyk, Storage Technologies A Complete Guide, 5STARCooks, Kindle Edition, 2019.

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DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING
CO PO MAPPING

Regulation: R 2020

Course Code: 20CS776 **Course Name: STORAGE TECHNOLOGIES**

CO	Course Outcomes	Programme Outcomes													
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	*Demonstrate the fundamentals of information storage management and various models of Cloud infrastructure services and deployment.*	2	2	1	3	3	-	-	-	2	3	1	3	1	2
CO2	*Illustrate the usage of advanced intelligent storage systems and RAID.*	3	2	2	3	3	-	-	-	2	2	3	2	2	3
CO3	*Interpret various storage networking architectures - SAN, including storage subsystems and virtualization.*	3	1	3	3	3	-	-	-	3	2	1	2	2	3
CO4	*Examine the different role in providing disaster recovery and remote replication technologies.*	3	3	1	2	3	-	-	-	2	2	3	1	2	2
CO5	*Infer the security needs and security measures to be employed in information storage management.*	2	2	2	2	2	-	-	-	2	2	3	1	3	2
	Average	**3**	**2**	**2**	**3**	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**

SEMESTER – VIII

		L	T	P	C
20CS861	**BLOCKCHAIN TECHNOLOGIES (PROFESSIONAL ELECTIVE – V)**	3	0	0	3

Prerequisite: Basics of ***Data*** Structures and Cryptography.

Course Outcomes: On successful completion of the course, the student will be able to		***Cognitive Level***
CO1:	*Identify emerging working models for Block chain Technology.*	*Understand*
CO2:	*Examine the concept of bit coin and mathematical background behind it.*	*Understand*
CO3:	*Apply the learning of solidity to build de-centralized apps on Ethereum.*	*Apply*
CO4:	*Recognize and analyze the working of Hyperledger.*	*Understand*
CO5:	*Develop applications on Blockchain.*	*Apply*

UNIT – I BASICS OF CRYPTOGRAPHY AND BLOCKCHAIN [9]

Introduction to Blockchain – Blockchain Technology Mechanisms and Networks – Blockchain Origins – Objective of Blockchain – Blockchain Challenges – Transactions and Blocks – P2P Systems – Keys as Identity – Digital Signatures – Hashing and Public Key Cryptosystems – Private Vs Public Blockchain.

UNIT – II BITCOIN AND CRYPTOCURRENCY [9]

Bitcoin – Bitcoin Network – Bitcoin Mining Process – Mining Developments – Bitcoin Wallets – Decentralization and Hard Forks – Ethereum Virtual Machine (EVM) – Merkle Tree – Double – Spend Problem – Blockchain and Digital Currency – Transactional Blocks – Impact of Blockchain Technology on Cryptocurrency.

UNIT – III ETHEREUM [9]

Introduction to Ethereum – Consensus Mechanisms – Metamask Setup – Ethereum Accounts – Transactions – Receiving Ethers – Smart Contracts.

UNIT – IV HYPERLEDGER AND SOLIDITY PROGRAMMING [9]

Hyperledger – Distributed Ledger Technology and its Challenges – Hyperledger and Distributed Ledger Technology – Hyperledger Fabric – Hyperledger Composer – Solidity – Language of Smart Contracts – Installing Solidity and Ethereum Wallet – Basics of Solidity – Layout of a Solidity Source File and Structure of Smart Contracts – General Value Types.

UNIT – V BLOCKCHAIN APPLICATIONS [9]

Internet of Things – Medical Record Management System – Domain Name Service – Future of Blockchain – Alt Coins.

Total = 45 Periods

Text Books :

1 Imran Bashir, Mastering Blockchain: Inner workings of blockchain, from cryptography and decentralized identities, to DeFi, NFTs and Web3, Packt Publishing Limited, UK, Fourth Edition, 2023.
2 Narayanan, J. Bonneau, E. Felten, A. Miller, S. Goldfeder, Bitcoin and Cryptocurrency Technologies: A Comprehensive Introduction, Princeton University Press, New Jersey, First Edition,2016.

Reference Books :

1 Andreas M. Antonopoulos, Gavin Wood, Mastering Ethereum: Building Smart Contracts and DApps: Building Smart Contracts and DApps, Stanford University Press, California, Fourth Edition, 2021.
2 Ritesh Modi, Solidity Programming Essentials: A beginner's guide to build smart contracts for Ethereum and blockchain Paperback, Ingram short title, US, Second Edition, 2018.
3 Daniel Drescher, Blockchain Basics: A Non-Technical Introduction paperback, Apress, New York, First Edition, 2017.
4 Chandramouli Subramanian, Blockchain Technology, Universities Press (India) Pvt. Ltd., First Edition, 2020.

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DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING
CO-PO MAPPING

Regulation: R 2020

Course Code: 20CS861 **Course Name: BLOCKCHAIN TECHNOLOGIES**

CO	Course Outcomes	Programme Outcomes													
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	*Identify emerging working models for Block chain Technology.*	3	1	2	1	-	2	-	-	-	-	2	2	3	2
CO2	*Examine the concept of bit coin and mathematical background behind it.*	3	1	2	1	-	2	-	-	-	-	2	2	**3**	2
CO3	*Apply the learning of solidity to build de-centralized apps on Ethereum.*	3	1	1	1	-	2	-	-	-	-	2	2	**3**	2
CO4	*Recognize and analyze the working of Hyperledger.*	3	1	1	1	-	2	-	-	-	-	2	2	**3**	2
CO5	*Develop applications on Blockchain.*	3	1	2	1	-	2	-	-	-	-	2	2	3	2
	Average	**3**	**1**	**2**	**1**	**-**	**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

		L	T	P	C
20CS862	**ETHICAL HACKING**				
	(PROFESSIONAL ELECTIVE – V)	3	0	0	3

Prerequisite: Data Structures and Cryptography.

Course Outcomes : On successful completion of the course, the student will be able to		***Cognitive Level***
CO1:	*Identify the basics of hacking.*	*Understand*
CO2:	*Explore different foot printing and scanning methods.*	*Understand*
CO3:	*Identify the basics of computer based vulnerabilities.*	*Understand*
CO4:	*Exposed to programming languages for security professionals.*	*Understand*
CO5:	*Explore the different phases in penetration testing.*	*Understand*

UNIT – I INTRODUCTION TO ETHICAL HACKING [9]

Ethical Hacking overview – Role of Security and Penetration Testers – Penetration Testing Methodologies – TCP/IP Concepts Review – IP Addressing – Overview of Numbering Systems .

UNIT – II FOOT PRINTING AND SCANNING NETWORKS [9]

Foot printing concepts – Using Web Tools for Foot printing – Conducting Competitive Intelligence – Introduction to Social Engineering – Using Port-Scanning Tools – Conducting Ping Sweeps – Understanding Scripting.

UNIT – III SYSTEM HACKING [9]

Hacking Web Servers – Web Application Components – Vulnerabilities – Tools for Web Attackers and Security Testers Hacking Wireless Networks – Components of a Wireless Network – Wardriving – Wireless Hacking – Tools of the Trade

UNIT–IV PROGRAMMING FOR SECURITY PROFESSIONALS [9]

Programming Fundamentals – C language – HTML – Perl – Windows OS Vulnerabilities – Tools for Identifying Vulnerabilities – Countermeasures – Linux OS Vulnerabilities – Countermeasures

UNIT – V PENETRATION TESTING [9]

Introduction – Security Assessments – Types of Penetration Testing – Phases of Penetration Testing – Choosing Different Types of Pen –Test Tools – Penetration Testing Tools.

Total = 45 Periods

Text Books :

1 Michael T. Simpson and NicholasAntill, Ethical Hacking and Network defense, Cengage Learning, New Delhi, Forth Edition, 2022.
2 EC-Council, Ethical Hacking and Countermeasures: Attack Phases, Cengage Learning, New Delhi, Second Edition, 2016.

Reference Books :

1 Steven Defino, Barry Kaufman and Nick Valenteen, Official Certified Ethical Hacker review guide, Cenage learning, New Delhi, Second Edition, 2012.
2 Jon Erickson, Hacking: The Art of Exploitation, William Pollock, United States, Second Edition, 2018.
3 Patrick Engebretson, The Basics of Hacking and Penetration Testing, SYNGRESS, Elsevier, Second Edition, 2013.
4 Ankit Fadia, he Unofficial Guide to Ethical Hacking, Laxmi Publications, Second Edition, 2006.

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

Regulation: R 2020

Course Code: 20CS862 **Course Name: ETHICAL HACKING**

CO	Course Outcomes	Programme Outcomes													
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	*Identify the basics of hacking.*	3	3	3	-	3	3	-	3	-	-	-	2	3	2
CO2	*Explore different foot printing and scanning methods.*	3	3	2	-	1	2	-	1	-	-	-	1	3	2
CO3	*Identify the basics of computer-based vulnerabilities.*	3	3	2	-	3	3	-	2	-	-	-	3	3	2
CO4	*Exposed to programming languages for security professionals.*	3	3	2	-	3	2	-	1	-	-	-	2	3	2
CO5	*Explore the different phases in penetration testing.*	3	3	2	-	3	2	-	1	-	-	-	3	3	2
	Average	**3**	**3**	**2**	-	**3**	**2**	-	**1**	-	-	-	**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
20CS863	**SOFTWARE PROJECT MANAGEMENT (PROFESSIONAL ELECTIVE – V)**	3	0	0	3

Prerequisite: *Basic knowledge of software engineering*

Course Outcomes: On successful completion of the course, the student will be able to		***Cognitive Level***
CO1:	*Summarize basics of software project management and project evaluation.*	*Understand*
CO2:	*Obtain adequate knowledge about software activity planning, monitoring and control.*	*Understand*
CO3:	*Utilize extensive knowledge about workflow and checkpoints*	*Understand*
CO4:	*Examine the process automation and project control.*	*Understand*
CO5:	*Review the staff selection process and the issues related to people management.*	*Understand*

UNIT– I OVERVIEW OF PROJECT MANAGEMENT AND EVALUATION [9]

Project Definition – Contract Management – Activities Covered by Software Project Management – Overview of Project Planning – Stepwise Project Planning – Strategic Assessment – Technical Assessment – Cost Benefit Analysis – Cash Flow Forecasting – Cost Benefit Evaluation Techniques – Risk Evaluation – Software Effort Estimation – Bottom-up Estimation.

UNIT– II ACTIVITY PLANNING, MONITORING AND CONTROL [9]

Objectives – Project Schedule – Sequencing and Scheduling Activities – Network Planning Models – Forward Pass – Backward Pass – Activity Float – Shortening Project Duration – Activity on Arrow Networks – Risk Management – Categories of Risk – A framework for dealing with risk – Risk Identification – Risk assessment – Risk Planning – Change Control – Managing Contracts – Types of Contract – Stages In Contract Placement – Contract Management – Acceptance.

UNIT – III WORK FLOWS AND CHECK POINTS [9]

Work Flows of the process: Software Process Workflows – Iteration Workflows. Checkpoints of the process: Major Mile Stones – Minor Milestones – Periodic Status Assessments. Iterative Process Planning: Work Breakdown Structures – Planning Guidelines – Cost and Schedule Estimating – Iteration Planning Process – Pragmatic Planning.

UNIT– IV PROCESS AUTOMATION AND PROJECT CONTROL [9]

Process Automation: Automation Building Blocks – Project Control and Process instrumentation: Seven Core Metrics – Management Indicators – Quality Indicators – Life Cycle Expectations – Pragmatic Software Metrics – Metrics Automation – Tailoring the Process: Process Discriminants.

UNIT– V MANAGING PEOPLE AND ORGANIZING TEAMS [9]

Introduction – Understanding Behavior – Organizational Behavior – Selecting The Right Person For The Job – Instruction in The Best Methods – Motivation – The Oldman – Hackman Job Characteristics Model – Working In Groups – Becoming A Team – Decision Making – Leadership – Organizational Structures – Stress – Health And Safety – Case Studies.

Total = 45 Periods

Text Books:

1 Bob Hughes and Mike Cotterell, Rajib Mall Software Project Management, Tata McGraw Hill, New Delhi, Sixth Edition, 2018.

2 Walker Royce, Software Project Management: A Unified Approach, Pearson Education, New Delhi, First Edition, 2005.

Reference Books:

1 Robert K. Wysocki, Effective Software Project Management, Wiley Publication, India, Second Edition, 2011.

2 Pankaj Jalote, Software Project Management in practice, Pearson Education, New Delhi, Second Edition,2005.

3 Walker Royce, Software Project Management: A Unified Approach, Pearson Education, New Delhi, First Edition,1998.

4 S. A. Kelkar, Software Project Management: A Concise Study, PHI Learning Pvt. Ltd, Third Edition, 2012

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DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING
CO-PO MAPPING

Regulation: **R 2020**

Course Code: **20CS863** **Course Name:** **SOFTWARE PROJECT MANAGEMENT**

CO	Course Outcomes	Programme Outcomes													
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	*Summarize basics of software project management and project evaluation.*	3	3	3	3	3	-	-	-	-	3	-	3	3	3
CO2	*Obtain adequate knowledge about software activity planning, monitoring and control.*	3	3	3	3	2	-	-	-	-	3	-	3	2	3
CO3	*Utilize extensive knowledge about workflow and checkpoints*	3	3	2	3	3	-	-	-	-	3	-	2	2	3
CO4	*Examine the process automation and project control.*	3	3	3	3	3	-	-	-	-	3	-	3	2	3
CO5	*Review the staff selection process and the issues related to people management.*	3	3	3	2	2	-	-	-	-	3	-	3	3	3
	Average	3	3	3	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 – VIII

		L	T	P	C
20CS864	**KNOWLEDGE BASED DECISION SUPPORT SYSTEM (PROFESSIONAL ELECTIVE - V)**	3	0	0	3

Prerequisite: *Basic Knowledge of Artificial Intelligence and Expert System.*

Course Outcomes: On successful completion of the course, the student will be able to		***Cognitive Level***
CO1:	*Recognize Simon's four phases of decision making: Intelligence, Design, Choice, and Implementation*	*Understand*
CO2:	*Illustrate the conceptual foundation of the decision support system and methodology and relate them each other.*	*Understand*
CO3:	*Discuss the need for Enterprise Information Systems and Knowledge Management*	*Understand*
CO4:	*Summarize the knowledge acquisition, representation and reasoning*	*Understand*
CO5:	*Describe the basic concepts of management support system modeling*	*Understand*

UNIT – I FUNDAMENTALS OF DECISION-MAKING SYSTEM [9]

Decision Making Systems, Modeling and Support – Introduction and Definition – Systems – Models – Modeling process – Decision making: The Intelligence phase – The Design phase – The Choice phase – Evaluation: The implementation phase.

UNIT – II DECISION SUPPORT SYSTEMS [9]

Decision Support Systems (DSS) – Characteristics and Capabilities of DSS – Components of DSS – DSS Hardware – DSS Classifications – DSS Development – Traditional System Development Life Cycle – Methodologies – Technology Levels and Tools – Development platforms – Tool selection – Team Developed DSS – End User Developed DSS.

UNIT – III ENTERPRISE INFORMATION SYSTEMS AND KNOWLEDGE MANAGEMENT [9]

Enterprise Information Systems: Concepts and Definitions – The Evolution of Executive and Enterprise Information Systems – Executives' Roles and Information Needs – Characteristics and Capabilities of Executive Support Systems – Comparing and Integrating EIS and DSS. Knowledge Management: Introduction to Knowledge Management – Organizational Learning and Transformation – Knowledge Management Initiatives – Approaches to Knowledge Management – Information Technology in Knowledge Management – Knowledge Management Systems Implementation – Roles of People in Knowledge Management – Ensuring Success of Knowledge Management

UNIT– IV KNOWLEDGE ACQUISITION, REPRESENTATION AND REASONING [9]

Knowledge Engineering – Scope and Types of Knowledge – Methods of Knowledge Acquisition from Experts – Knowledge Acquisition from Multiple Experts – Knowledge Verification and Validation – Representation of Knowledge – Reasoning in Rule-Based Systems – Explanation and Meta knowledge – Inferencing with Uncertainty – Expert Systems Development

UNIT – V MANAGEMENT SUPPORT SYSTEMS [9]

Overview – Models of MSS Integration – Intelligent DSS -- Intelligent Modeling and Model Management – Integration with the Web, Enterprise Systems, and Knowledge Management – The Impacts of MSS – MSS Impacts on Organizations and Individuals – Decision-Making and the Manager's Job – Issues of Legality, Privacy, and Ethics – Intelligent Systems and Employment Levels – Future of Management-Support Systems.

Total = 45 Periods

Text Books:

1 Efrain Turban, Jay E. Aronson, Decision Support Systems and Intelligent Systems, Pearson Education, New Delhi, Seventh Edition 2007.

2 Ganesh Natarajan, Sandhya Shekhar, Knowledge management -Enabling Business Growth, Tata McGraw Hill, New Delhi, First Edition, 2002

Reference Books:

1 George M. Marakas, Decision Support System, Prentice Hall, India, First Edition, 2003.

2 Efrem A. Mallach, Decision Support and Data Warehouse Systems, Tata McGraw-Hill, New Delhi, Second Edition, 2002.

3 Robert H. Bonczek, Foundations of Decision Support Systems, Academic Press New York, Second Edition, 2014.

4 C. W. Holsapple and Andrew B. Whinston, Decision Support Systems: A Knowledge-based Approach, Course Technology Inc, Tenth Edition, 1996.

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DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING
CO-PO MAPPING

Regulation: **R 2020**

Course Code: **20CS864** **Course Name:** **KNOWLEDGE BASED DECISION SUPPORT SYSTEM**

CO	Course Outcomes	Programme Outcomes													
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	*Recognize Simon's four phases of decision making: Intelligence, Design, Choice, and Implementation*	3	2	-	-	2	3	-	-	1	-	2	2	3	3
CO2	*Illustrate the conceptual foundation of the decision support system and methodology and relate them each other.*	3	2	-	-	2	3	-	-	1	-	2	2	3	3
CO3	*Discuss the need for Enterprise Information Systems and Knowledge Management*	3	2	-	-	2	3	-	-	1	-	2	2	3	3
CO4	*Summarize the knowledge acquisition, representation and reasonin.g*	3	2	-	-	2	3	-	-	1	-	2	2	3	3
CO5	*Describe the basic concepts of management support system modeling*	3	2	-	-	2	3	-	-	1	-	2	2	3	3
	Average	**3**	**2**	**-**	**-**	**2**	**3**	**-**	**-**	**1**	**-**	**2**	**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
20CS865	**PERVASIVE COMPUTING (PROFESSIONAL ELECTIVE - V)**	3	0	0	3

Prerequisite: *Fundamental knowledge in networking and sensor network.*

Course Outcomes: On successful completion of the course, the student will be able to		***Cognitive Level***
CO1:	*Comprehend the basic about pervasive computing concepts.*	*Remember*
CO2:	*Acquire the logics of Resource Management and Human Computer Interface.*	*Understand*
CO3:	*Infer about Mobile Transactions and User Preferences.*	*Understand*
CO4:	*Considerate the privacy about Mobile and pervasive computing.*	*Understand*
CO5:	*Examine the pervasive and ubiquitous computing.*	*Understand*

UNIT – I PERVASIVE COMPUTING CONCEPTS [9]

Perspectives of Pervasive Computing – Challenges – Technology – Infrastructure and Devices – Middleware for Pervasive Computing Systems – Pervasive Computing Environments – Context Collection and Wireless Sensor Networks – User Tracking – Context Reasoning.

UNIT– II RESOURCE MANAGEMENT AND HUMAN COMPUTER INTERFACE [9]

Efficient Resource Allocation in Pervasive Environments– Transparent Task Migration – HCI Service and Interaction Migration – Context-Driven HCI Service Selection – Video Calls at a Smart Office – A Web Service – Based HCI Migration Framework.

UNIT – III MOBILE TRANSACTIONS AND USER PREFERENCES [9]

Introduction – Mobile Transaction Framework – Context-Aware Pervasive Transaction Model – Dynamic Transaction Management – Formal Transaction Verification – Evaluations – Content-Based Recommendation in an RSS Reader – A Collaborative Filtering-Based Recommendation – Preference-Based Top-K Recommendation in Social Networks.

UNIT – IV CONSIDERATE PRIVACY [9]

Codifying Privacy – Motivating Privacy – Conceptualizing Privacy – Mobile Computing Characteristics – pervasive and Ubiquitous Computing Characteristics.

UNIT – V PRIVACY IMPLICATION [9]

Data Shadows – The Digitalization of Daily Life – From Atoms to BITS – Profiling – Predicting Behavior – Supporting Privacy in Mobile and Pervasive Computing.

Total = 45 Periods

Text Books:

1 Minyi Guo, Jingyu Zhou, Feilong Tang and Yao Shen, Pervasive Computing Concepts, Technologies and Applications, CRC Press, First Edition, 2020.

2 Marc Langheinrich and Florian Schaub, Privacy in Mobile and Pervasive Computing, Morgan and Claypool Publishers, Third Edition, 2022.

Reference Books:

1 Natalia Silvis and Cividjian, Pervasive Computing: Engineering Smart Systems, Springer International Publishing, Second Edition, 2017.

2 Aboul-Ella Hassanien, Jemal H. Abawajy, Ajith Abraham and Hani Hagras, Pervasive Computing: Innovations in Intelligent Multimedia and Applications, Springer International Publishing, Second Edition, 2009.

3 Uwe Hansmann, Lothar Merk, Martin S. Nicklous and Thomas Stober, Pervasive Computing: The Mobile World, Springer Professional Computing, Second Edition, 2003.

4 Burkhardt, Pervasive computing: Technology and architecture of mobile internet applications, Pearson India, First Edition, 2004.

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

Regulation: R 2020

Course Code: 20CS865 **Course Name: PERVASIVE COMPUTING**

CO	Course Outcomes	Programme Outcomes													
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	*Comprehend the basic about pervasive computing concepts.*	3	2	3	-	-	-	-	-	1	2	-	2	3	3
CO2	*Acquire the logics of Resource Management and Human Computer Interface.*	3	2	3	-	-	-	-	-	1	2	-	2	3	3
CO3	*Infer about Mobile Transactions and User Preferences.*	3	2	3	-	-	-	-	-	1	2	-	2	3	3
CO4	*Considerate the privacy about Mobile and pervasive computing.*	3	2	3	-	-	-	-	-	1	2	-	2	3	3
CO5	*Examine the pervasive and ubiquitous computing.*	3	2	3	-	-	-	-	-	1	2	-	2	3	3
	Average	**3**	**2**	**3**	**-**	**-**	**-**	**-**	**-**	**1**	**2**	**-**	**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
20CS866	**AD HOC AND SENSOR NETWORKS (PROFESSIONAL ELECTIVE - V)**	3	0	0	3

Prerequisite: *Basic knowledge of computer networks.*

Course Outcomes: On successful completion of the course, the student will be able to		***Cognitive Level***
CO1:	*Summarize the applications of ad hoc and wireless sensor networks.*	*Understand*
CO2:	*Examine the protocol design issues of ad hoc and sensor networks.*	*Understand*
CO3:	*Design routing protocols for ad hoc wireless networks with respect to some protocol design issues.*	*Understand*
CO4:	*Identify the basic concepts of wireless sensor networks and MAC layer Protocols.*	*Understand*
CO5:	*Discuss the WSN routing issues, localization and Quality of Sensor Networks in an efficient manner.*	*Understand*

UNIT– I FUNDAMENTALS OF AD HOC NETWORKS [9]

Fundamentals of Wireless Communication Technology – The Electromagnetic Spectrum – Radio Propagation Mechanisms – Characteristics of the Wireless Channel – Cellular and Ad Hoc Wireless Networks – Applications of Ad Hoc networks – Wireless Sensor Networks – Design Challenges in Ad hoc Wireless Networks.

UNIT – II MAC PROTOCOLS FOR AD HOC WIRELESS NETWORKS [9]

Issues in Designing a MAC Protocol – Classification of MAC Protocols – Contention Based Protocols: Media Access Protocol for Wireless LANS, Busy Tone Multiple Access Protocol. – Contention Based Protocols with Reservation Mechanisms: Collision Avoidance Time Allocation Protocol, Hop Reservation Multiple Access Protocol. – Contention Based Protocols with Scheduling Mechanisms: Distributed Priority Scheduling – Distributed Wireless Ordering Protocol.

UNIT – III ROUTING PROTOCOLS FOR AD HOC WIRELESS NETWORKS [9]

Issues in Designing a Routing for Ad Hoc Networks – Classification of Routing Protocols – Table Driven Routing Protocol: Destination Sequenced Distance Vector Routing Protocol – On-Demand Routing Protocol: Dynamic Source Routing Protocol, Ad Hoc On Demand Distance Vector Routing Protocol – Hybrid Routing Protocols – Hierarchical Routing Protocols.

UNIT – IV WIRELESS SENSOR NETWORKS AND MAC PROTOCOLS [9]

Introduction – Sensor Node Technology – Sensor Taxonomy – WN operating Environment – WN Trends – Sensor Network Architecture – Data Dissemination – Data Gathering – MAC Layer Protocols: Self-Organizing, Hybrid TDMA/FDMA and CSMA Based MAC – IEEE 802.15.4

UNIT – V WSN ROUTING, LOCALIZATION AND QOS [9]

Challenges and Issues in WSN Routing – Routing strategies in Wireless Sensor Networks – Localization – Indoor and Sensor Network Localization – Quality of Sensor Network (QOS) – Energy Efficient Design – Synchronization – Transport Layer Issues – Security Issues – Real Time communication – wireless Fidelity Systems.

Total = 45 Periods

Text Books :

1 C. Siva Ram Murthy, and B. S. Manoj, Ad Hoc Wireless Networks: Architectures and Protocols, Prentice Hall, India, Second Edition, 2013.

2 Kazem Sohraby, Daniel Minoli and Taieb Znati, Wireless Sensor Networks-Technology, Protocols and Applications, John Wiley, India, Third Edition,2013.

Reference Books :

1 Carlos De Morais Cordeiro, Dharma Prakash Agrawal Ad Hoc & Sensor Networks: Theory and Applications, World Scientific Publishing Company, Singapore, Second Edition, 2011.

2 Feng Zhao and LeonidesGuibas, Wireless Sensor Networks, Elsevier Publication, Netherlands, First Edition, 2004.

3 Holger Karl and Andreas Willig Protocols and Architectures for Wireless Sensor Networks, Wiley, India, Second Edition, 2005.

4 Jagannathan Sarangapani, Wireless Ad hoc and Sensor Networks, CRC Press, Boca Raton, First Edition, 2007.

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

Regulation: R 2020

Course Code: 20CS866 **Course Name: AD HOC AND SENSOR NETWORKS**

CO	Course Outcomes	Programme Outcomes													
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	*Summarize the applications of ad hoc and wireless sensor networks.*	3	2	3	-	1	-	-	-	1	2	-	2	3	3
CO2	*Examine the protocol design issues of ad hoc and sensor networks.*	3	2	3	-	1	-	-	-	1	2	-	2	3	3
CO3	*Design routing protocols for ad hoc wireless networks with respect to some protocol design issues.*	3	2	3	-	1	-	-	-	1	2	-	2	3	3
CO4	*Identify the basic concepts of wireless sensor networks and MAC layer Protocols.*	3	2	3	-	1	-	-	-	1	2	-	2	3	3
CO5	*Discuss the WSN routing issues, localization and Quality of Sensor Networks in an efficient manner.*	3	2	3	-	1	-	-	-	1	2	-	2	3	3
	Average	**3**	**2**	**3**	**-**	**1**	**-**	**-**	**-**	**1**	**2**	**-**	**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
20CS867	**UI AND UX DESIGN (PROFESSIONAL ELECTIVE - V)**	3	0	0	3

Prerequisite: *Basic knowledge about software engineering*

Course Outcomes: On successful completion of the course, the student will be able to		***Cognitive Level***
CO1:	*Build UI for user Applications*	*Understand*
CO2:	*Evaluate UX design of any product or application*	*Evaluate*
CO3:	*Demonstrate UX Skills in product development*	*Understand*
CO4:	*Implement Sketching principles*	*Understand*
CO5:	*Create Wireframe and Prototype*	*Create*

UNIT – I BASICS OF DESIGN [9]

UI vs. UX Design – Core Stages of Design Thinking – Divergent and Convergent Thinking – Brainstorming and Game storming – Observational Empathy

UNIT – II UI DESIGN [9]

Visual and UI Principles – UI Elements and Patterns – Interaction Behaviors and Principles – Branding – Style Guides

UNIT – III UX DESIGN [9]

Introduction to User Experience – Why You Should Care about User Experience – Understanding User Experience – Defining the UX Design Process and its Methodology – Research in User Experience Design – Tools and Method used for Research – User Needs and its Goals – Know about Business Goals

UNIT – IV WIREFRAMING, PROTOTYPING AND TESTING [9]

Sketching Principles – Sketching Red Routes – Responsive Design – Wireframing – Creating Wireflows – Building a Prototype – Building High-Fidelity Mockups – Designing Efficiently with Tools – Interaction Patterns – Conducting Usability Tests – Other Evaluative User Research Methods – Synthesizing Test Findings – Prototype Iteration

UNIT – V RESEARCH, DESIGNING, IDEATING, & INFORMATION ARCHITECTURE [9]

Identifying and Writing Problem Statements – Identifying Appropriate Research Methods – Creating Personas – Solution Ideation – Creating User Stories – Creating Scenarios – Flow Diagrams – Flow Mapping – Information Architecture

Total = 45 Periods

Text Books :

1 Joel Marsh, UX for Beginners, O'Reilly, New York, First Edition, 2022.

2 Jon Yablonski, Laws of UX using Psychology to Design Better Product & Services, O'Reilly, New York, First Edition, 2021

Reference Books :

1 Jenifer Tidwell, Charles Brewer, Aynne Valencia, Designing Interface, O'Reilly, Third Edition, 2020

2 Steve Schoger, Adam Wathan, Refactoring UI, 2018

3 Steve Krug, Don't Make Me Think, Revisited: A Commonsense Approach to Web & Mobile, Third Edition, 2015

4 https://www.nngroup.com/articles/, https://www.interaction-design.org/literature.

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

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

CO-PO MAPPING

Regulation: R 2020

Course Code: 20CS867 **Course Name: UI AND UX DESIGN**

CO	Course Outcomes	Programme Outcomes													
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	*Build UI for user Applications*	3	1	1	*3*	1	-	-	-	2	2	1	1	3	3
CO2	*Evaluate UX design of any product or application*	2	3	1	*3*	1	-	-	-	2	2	1	1	3	3
CO3	*Demonstrate UX Skills in product development*	2	3	3	*3*	1	-	-	-	2	2	1	1	3	3
CO4	*Implement Sketching principles*	1	3	3	*3*	1	-	-	-	2	2	1	1	3	3
CO5	*Create Wireframe and Prototype*	1	2	3	*3*	1	-	-	-	2	2	1	1	3	3
	Average	**2**	**3**	**3**	***3***	**1**	**-**	**-**	**-**	**2**	**2**	**1**	**1**	**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
20CS868	**PRINCIPLES OF PROGRAMMING LANGUAGES (PROFESSIONAL ELECTIVE - V)**	3	0	0	3

Prerequisite: *Basic knowledge about programming concept and compiler design*

Course Outcomes: On successful completion of the course, the student will be able to		***Cognitive Level***
CO1:	*Describe syntax and semantics of programming languages*	*Understand*
CO2:	*Identify data, data types, and basic statements*	*Understand*
CO3:	*Discover call-return architecture and ways of implementing them*	*Understand*
CO4:	*Infer about object-orientation, concurrency, and event handling in programming languages*	*Understand*
CO5:	*Develop programs in functional programming languages*	*Apply*

UNIT – I SYNTAX AND SEMANTICS [9]

Evolution of programming languages – Describing syntax and semantics – Lexical and syntax analysis – Lexical analysis – parsing problem – Recursive descent parsing – Bottom-up parsing

UNIT – II DATA, DATA TYPES, AND BASIC STATEMENTS [9]

Names – Variables – Binding – Type checking – Scope and lifetime – Primitive data types – Strings – Array types – Associative arrays – Record types – Union types – Pointers and References – Arithmetic expressions – Overloaded operators – Type conversions – Relational and Boolean expressions – Assignment statements – Mixed mode assignments.

UNIT – III SUBPROGRAMS AND IMPLEMENTATIONS [9]

Subprograms – Design issues – Local referencing – Parameter passing – Overloaded subprograms – Generic subprograms – Design issues for functions – Semantics of call and return – Implementing simple subprograms – Stack and dynamic local variables – Nested subprograms – Blocks – Dynamic scoping.

UNIT – IV OBJECT ORIENTATION, CONCURRENCY AND EVENT HANDLING [9]

Object orientation Programming – Design issues for OOP languages – Implementation of object-oriented constructs – concurrency – Semaphores – Monitors – Message passing – Threads – Statement level concurrency – Exception handling in java – Event handling with java

UNIT – V FUNCTIONAL AND LOGIC PROGRAMMING LANGUAGES [9]

Introduction to mathematical functions – Fundamentals of functional programming languages – Programming with Scheme – Programming with ML – Introduction to logic programming – Programming with Prolog – Applications.

Total = 45 Periods

Text Books:

1 Robert W. Sebesta, Concepts of Programming Languages, Pearson, Delhi, Twelfth Edition, 2022.

2 Michael L. Scott, Programming Language Pragmatics, Elsevier, Netherlands, Fourth Edition,2018.

Reference Books:

1 R. Kent Dybvig, The Scheme programming language, Prentice Hall, US, Fourth Edition, 2011.

2 Jeffrey D. Ullman, Elements of ML programming, Pearson, Delhi, Second Edition,1997.

3 W. F. Clocksin and C. S. Mellish, Programming in Prolog Using the ISO Standard, Springer, New York, Fifth Edition, 2003.

4 Er. Anil Panghal and Ms. Sharda Panghal, Principles of Programming Languages, Laxmi Publications, First Edition, 2015.

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DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

CO PO MAPPING

Regulation: R 2020

Course Code: 20CS868 **Course Name: PRINCIPLES OF PROGRAMMING LANGUAGES**

CO	Course Outcomes	Programme Outcomes													
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	*Describe syntax and semantics of programming languages*	2	2	3	2	1	3	-	-	-	3	2	3	3	2
CO2	*Identify data, data types, and basic statements*	3	3	3	2	2	3	-	-	-	3	2	3	3	2
CO3	*Discover call-return architecture and ways of implementing them*	3	3	3	2	2	3	-	-	-	3	2	3	3	2
CO4	*Infer about object-orientation, concurrency, and event handling in programming languages*	3	3	3	3	2	2	-	-	-	3	3	2	3	3
CO5	*Develop programs in functional programming languages*	3	3	3	3	3	3	-	-	-	3	1	3	3	2
	Average	**3**	**3**	**3**	**2**	**2**	**3**	**-**	**-**	**-**	**3**	**1**	**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
20CS869	**SECURITY AND PRIVACY IN CLOUD (PROFESSIONAL ELECTIVE - V)**	3	0	0	3

Prerequisite: *Fundamental knowledge in networking and Cloud Computing*

Course Outcomes : On successful completion of the course, the student will be able to		***Cognitive Level***
CO1:	*Cognize the cloud concepts and fundamentals.*	*Understand*
CO2:	*Illustrate the security challenges in the cloud.*	*Understand*
CO3:	*Define cloud policy and Identity and Access Management.*	*Understand*
CO4:	*Apprehend various risks and audit and monitoring mechanisms in the cloud.*	*Apply*
CO5:	*Express the various architectural and design considerations for security in the cloud.*	*Apply*

UNIT – I FUNDAMENTALS OF CLOUD SECURITY CONCEPTS [9]

Overview of cloud security – Security Services – Confidentiality – Integrity – Authentication – Nonrepudiation – Access Control – Basic of cryptography – Conventional and public-key cryptography – Hash functions – Authentication and digital signatures.

UNIT – II SECURITY DESIGN AND ARCHITECTURE FOR CLOUD [9]

Security design principles for Cloud Computing – Comprehensive data protection – End-to-end access control – Common attack vectors and threats – Network and Storage – Secure Isolation Strategies – Virtualization strategies – Inter-tenant network segmentation strategies – Data Protection strategies: Data retention – Deletion and archiving procedures for tenant data – Encryption

UNIT – III ACCESS CONTROL AND IDENTITY MANAGEMENT [9]

Access control requirements for Cloud infrastructure – User Identification – Authentication and Authorization – Roles-based Access Control – Multi-factor authentication – Single Sign-on, Identity Federation – Identity providers and service consumers – Storage and network access control options – Intruder Detection and prevention.

UNIT – IV CLOUD SECURITY DESIGN PATTERNS [9]

Introduction to Design Patterns – Cloud bursting – Geo-tagging – Secure Cloud Interfaces – Cloud Resource Access Control – Secure On-Premise Internet Access – Secure External Cloud.

UNIT – V MONITORING, AUDITING AND MANAGEMENT [9]

Proactive activity monitoring – Incident Response – Monitoring for unauthorized access – Malicious traffic – Abuse of system privileges – Events and alerts – Auditing – Record generation – Reporting and Management – Tamper-proofing audit logs – Quality of Services – Secure Management – User management – Identity management – Security Information and Event Management.

Total = 45 Periods

Text Books :

1 Ronald L. Krutz, Russell Dean Vines, Cloud Security: A Comprehensive Guide to Secure Cloud Computing, Wiley Publishing, First Edition, 2010.

2 Dr. T. Grace Shalini and Dr.Rathnamala S, Security and Privacy in Cloud,Technical Publication, First Edition, 2023

Reference Books :

1 Tim Mather, SubraKumaraswamy, and ShahedLatif, Cloud Security and Privacy, OREILLY, First Edition, 2011

2 Raj Kumar Buyya , James Broberg, andrzejGoscinski, Cloud Computing Principles and Paradigms, Wiley, First Edition, 2013

3 Dave shackleford, Virtualization Securit, SYBEX a wiley Brand, First Edition, 2013

4. Shahed Laitf, Subra Kumaraswamy, et al., Cloud Security and Privacy, O'Reilly Media, Inc, USA, First Edition, 2009.

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

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

CO PO MAPPING

Regulation: **R 2020**

Course Code: **20CS869** **Course Name:** **SECURITY AND PRIVACY IN CLOUD**

CO	Course Outcomes	Programme Outcomes													
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	*Cognize the cloud concepts and fundamentals.*	2	2	3	1	2	1	-	1	-	-	-	2	1	3
CO2	*Expound the security challenges in the cloud.*	1	2	2	1	2	1	-	1	-	-	-	2	2	2
CO3	*Define cloud policy and Identity and Access Management.*	1	2	3	1	3	1	-	1	-	-	-	3	2	3
CO4	*Apprehend various risks and audit and monitoring mechanisms in the cloud.*	2	1	3	1	2	1	-	1	-	-	-	2	2	2
CO5	*Express the various architectural and design considerations for security in the cloud.*	2	3	2	1	1	2	-	1	-	-	-	2	3	2
	Average	2	2	3	1	2	1	-	1	-	-	-	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
20AU901	**BASICS OF AUTOMOBILE ENGINEERING** (Open Elective)	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 – slidemesh – 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**

		L	T	P	C
20AU902	**AUTOMOTIVE ENGINE 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:	*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, DhanpatRai 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, DhanpatRai 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.

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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, treedozer, 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, guncarriers and transport vehicles.

UNIT - V VEHICLE SYSTEMS AND FEATURES [09]

Brake system and actuation – OCDB and dry disc caliper brakes. Body hoist and bucket operationalhydraulics. Hydro-pneumatic suspension cylinders. Power steering system. Kinematics for loader andbulldozer 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**

		L	T	P	C
20AU907	**MODERN AND INTELLIGENT VEHICLE SYSTEM** (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 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.

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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**

		L	T	P	C
20AU908	**VEHICLE MAINTENANCE** (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 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.

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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**

20CE902 **BUILDING PLANNING AND CONSTRUCTION** (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:	*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, aluminum and glass; Types of masonry, English and Flemish bonds, rubble and ashlars masonry, cavity and partition walls - Lightweight 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)

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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**	**-**	**-**	**-**	**-**	**-**	**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, Second 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

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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)

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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.

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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 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

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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	*Interpret knowledge about 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)

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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.

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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**	**-**	-

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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/

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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)

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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 Disposal‖, McGraw-Hill, Inc., Second Edition, Noida, 1997.

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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

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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**	**-**	-	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**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: NIL

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.

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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: NIL

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.

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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**

		L	T	P	C
20CS903	**FUNDAMENTALS OF DATABASE CONCEPTS** (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:	*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 [09]

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 [09]

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#

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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**

		L	T	P	C
20CS904	**INTERNET PROGRAMMING** (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:	*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**

		L	T	P	C
20CS905	**FUNDAMENTALS OF MOBILE APPLICATION DEVELOPMENT** (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:	*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]

The 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

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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**

		L	T	P	C
20CS906	**PRINCIPLES OF ETHICAL HACKING** (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:	*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 [09]

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 [09]

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 [09]

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 [09]

Understanding Web Applications – Understanding Web Application Vulnerabilities – Tools for Web Attackers and Security Testers – Hacking Wireless Networks

UNIT - V PROTECTION SYSTEM [09]

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.

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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**

		L	T	P	C
20CS907	**GREEN TECHNOLOGY** (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:	*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/.

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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: **NIL**

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.

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DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

CO-PO MAPPING

PING

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**

		L	T	P	C
20CS909	**BIG DATA AND ANALYTICS** (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:	*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 – MapReduce Execution, Algorithms using MapReduce, 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 Analytics‖, 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.

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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**

		L	T	P	C
20CS910	**HARDWARE AND TROUBLE SHOOTING** (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:	*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.

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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.

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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.

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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**

		L	T	P	C
20EE903	**ELECTRICAL POWER GENERATION SYSTEMS** (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 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.

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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.

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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**

		L	T	P	C
20EE905	**INDUSTRIAL AUTOMATION** (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 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

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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 [09]

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 [09]

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 [09]

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 [09]

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 [09]

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.

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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.

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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.

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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**

		L	T	P	C
20EE910	**PRINCIPLES OF SOFT COMPUTING TECHNIQUES** (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 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

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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**

		L	T	P	C
20EE911	**EMBEDDED SYSTEM 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:	*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
1	*Describe the recording methods of various bio-potentials.*	2	1	2	-	-	1	-	-	-	-	-	1	-	-
2	*Illustrate the working of various equipment that deal with bio-chemical and non-electrical parameter measurement.*	2	1	2	-	-	1	-	-	-	-	-	1	-	-
3	*Discuss the different types of therapeutic equipment.*	2	1	2	-	-	1	-	-	-	-	-	1	-	-
4	*Interpret the principles of various medical imaging modalities.*	2	1	2	-	-	1	-	-	-	-	-	1	-	-
5	*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
1	*Describe the evolution and associated techniques of Nano science.*	3	3	3	-	-	-	-	-	-	-	-	-	-	-
2	*Interpret the diversities in Nano systems.*	3	3	3	-	-	-	-	-	-	-	-	-	-	-
3	*Classify different Nano particles, shells and their Characterization.*	3	3	3	-	-	-	-	-	-	-	-	-	-	-
4	*Illustrate the importance of nanotechnology in biotechnology.*	3	3	3	-	-	-	-	-	-	-	-	-	-	-
5	*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 II, 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
1	*Interpret the fundamental concepts of semiconductor device.*	3	3	2	-	-	-	-	-	-	-	-	-	-	-
2	*Explain the various characteristics of amplifiers.*	3	3	2	-	-	-	-	-	-	-	-	-	-	-
3	*Outline the fundamental concepts of Digital Electronics*	3	3	2	-	-	-	-	-	-	-	-	-	-	-
4	*Describe about 8085 microprocessors*	3	3	2	-	-	-	-	-	-	-	-	-	-	-
5	*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**

20EC904	**ANALOG AND DIGITAL 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	*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
1	*Describe analog communication techniques*	3	3	3	-	-	-	-	-	-	-	-	-	-	-
2	*Describe Digital communication techniques*	3	3	3	-	-	-	-	-	-	-	-	-	-	-
3	*Use data and pulse communication techniques*	3	3	3	-	-	-	-	-	-	-	-	-	-	-
4	*Explain Source and Error control coding*	3	3	3	-	-	-	-	-	-	-	-	-	-	-
5	*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 Superheterodyne 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
1	Determine the performance of analog modulation schemes in time and frequency domains.	3	3	3	-	-	-	-	-	-	-	-	-	-	-
2	Determine the performance of systems for generation and detection of modulated analog signals.	3	3	3	-	-	-	-	-	-	-	-	-	-	-
3	Characterize analog signals in time domain as random processes and in frequency domain using Fourier transforms	3	3	3	-	-	-	-	-	-	-	-	-	-	-
4	Determine the performance of analog communication systems in the presence of Noise	3	3	3	-	-	-	-	-	-	-	-	-	-	-
5	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**

20EC906	**FUNDAMENTALS OF ROBOTICS** (Open Elective)	L	T	P	C
		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
1	*Describe the basis of Robotics*	3	3	3	-	-	-	-	-	-	-	-	-	-	-
2	*Describe the technologies applicable for Robotics in computer based vision*	3	3	3	-	-	-	-	-	-	-	-	-	-	-
3	*Interpret the different sensing elements of robot*	3	3	3	-	-	-	-	-	-	-	-	-	-	-
4	*Develop the algorithms applicable for robotics*	3	3	3	-	-	-	-	-	-	-	-	-	-	-
5	*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**

20EC908	**CONSUMER ELECTRONICS** (Open Elective)	L	T	P	C
		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.

5 Philip Hoff, Consumer Electronics for Engineers, Cambridge University Press. London, First Edition, 1998.

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 [09]

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 [09]

Data Manipulation – Data Import and Export – Manipulation Data – Vectoring Functions – Infix Operator – Replacement Functions – Function with arguments and return statement.

UNIT – III MACHINE LEARNING [09]

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 [09]

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 [09]

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, andGraphics, 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 **[09]**

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 **[09]**

Cyber Forensics: Definition – Disk Forensics – Network Forensics – Wireless Forensics – Database Forensics – Malware Forensics – Mobile Forensics – Email Forensics.

UNIT – III ETHICAL HACKING **[09]**

Ethical Hacking– Hacking Windows – Network Hacking – Web Hacking – Password Hacking – Malware – Scanning – Cracking.

UNIT – IV DIGITAL EVIDENCE IN CRIMINAL INVESTIGATIONS **[09]**

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 **[09]**

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. Rittinghouse, William M. Hancock,Cyber Security Operations Handbook, ElsevierPublications , 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**

		L	T	P	C
20IT904	**BLOCKCHAIN TECHNOLOGIES** (Open Elective)	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 cas escenarios.*	*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 [09]

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 [09]

Game Theory –Prisoner's Dilemma –Byzantine Generals' Problem – The Blockchain – Merkle Trees – Properties of BlockchainSolutions – Blockchain Transactions – Distributed consensus mechanisms – Blockchain applications.

UNIT – III BITCOIN [09]

History of Money – Working with Bitcoins – Bitcoin Blockchain – The Bitcoin Network – Bitcoin Scripts – Full Nodes vs SPVs – Bitcoin Wallets.

UNIT – IV ETHEREUM AND HYPERLEDGER [09]

Bitcoin to Ethereum – Ethereum Blockchain – Ethereum Smart Contracts – Ethereum Virtual Machine and Code Execution– Ethereum Ecosystem – Swarm – Whisper – DApp – Development components – Hyperledger: Iroha – Blockchain Explorer – Fabric Chain tool.

UNIT – V APPLICATIONS OF BLOCKCHAIN [09]

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 Valencourt, 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 SuriaNarayanan, Kavita Saini, Blockchain Technology and Applications, CRC Press, United States, First Edition ,2021.

3 E. Golden Julie, J. Jesu Vedha Nayahi, 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

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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 blockchain and apply in real case scenarios.*	3	2	3	-	-	-	-	-	-	-	-	3	-	-
CO2:	*Discuss the core components and working of blockchain.*	3	2	3	-	-	-	-	-	-	-	-	3	-	-
CO3:	*Explain the technical concepts of bit coin.*	3	2	3	-	-	-	-	-	-	-	-	3	-	-
CO4:	*Interpret the Ethereum blockchain 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**

		L	T	P	C
20IT905	**INTERNET OF THINGS AND APPLICATIONS** (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 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. ArshdeepBahga 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, David Boswarthick, 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**

		L	T	P	C
20IT906	**PRINCIPLES OF SOFTWARE TESTING** (Open Elective)	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 **[09]**

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 **[09]**

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 **[09]**

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 **[09]**

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 **[09]**

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 Glenford J.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**

		L	T	P	C
20IT907	**FOUNDATION SKILLS IN LOGIC BUILDING** (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 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 [09]

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 [09]

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 [09]

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 [09]

Searching: Linear Search – Binary Search. Sorting: Bubble Sort – Selection Sort – Insertion Sort – Merge Sort –Quicksort – Heap Sort.

UNIT – V NUMBER BASED PROBLEMS [09]

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** **[09]**

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** **[09]**

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** **[09]**

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** **[09]**

CloudSim Simulator – Architecture – User code – CloudSim – GridSim – SimJava –Working platform for CloudSim – GreenCloud.

UNIT-V **VMWARE SIMULATOR** **[09]**

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**

		L	T	P	C
20IT909	**OPEN SOURCE TECHNOLOGIES** (Open Elective)	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, TataMcGraw 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)**

R 2020

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

		L	T	P	C
20IT910	**PRINCIPLES OF SOFTWARE ENGINEERING** (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 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 [09]

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 [09]

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 [09]

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 [09]

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 [09]

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**

		L	T	P	C
20ME901	**BASIC MECHANICAL ENGINEERING** (Open Elective)	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)

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

20ME902	**SOLAR ENERGY UTILIZATION** (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:	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 Sukhatme 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)

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

		L	T	P	C
20ME903	**PRODUCTION TECHNOLOGY OF AGRICULTURAL MACHINERY** (Open Elective)	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, Kerala, 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)

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

		L	T	P	C
20ME904	**SELECTION OF MATERIALS** (Open Elective)	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)

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

		L	T	P	C
20ME905	**MARINE 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:	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)

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

20ME906	**SENSORS AND TRANSDUCER** (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:	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 andeddy 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 Puneet Sawney, 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)

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

		L	T	P	C
20ME907	**ENERGY AUDITING** (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 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)

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

20ME908	**FIBRE REINFORCED PLASTICS** (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:	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)

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

20ME909	**LEAN MANUFACTURING** (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:	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)

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

20ME910	**SURFACE 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:	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, New york, 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, Oxboarduniv. 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 behaviour of engineering materials	3	3	3	-	-	-	-	-	-	-	-	-	-	-
	Average	**3**	**3**	**3**	**3**	**-**	-	-	-	-	-	-	**-**	**-**	**-**

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

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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´sIndustrial Hygiene and Toxicology, Wiley, Inderscience, 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 fire fighting 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,Mc GrawHill, 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**

		L	T	P	C
20SF907	**FOOD SAFETY (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 StandardsAct: salient provision and prospects, FSSAI, PFA, certification- AGMARK, ISI (BIS). Role ofinternational 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 Interscience, 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, SafetyCage. 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	-	-
		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**

20SH901	**APPLI CATIONS OF STATISTICS** (Open Elective)	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	*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.

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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 Ilustrated 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

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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' machines.

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) **R2020**

		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 GrawHill, 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 Akhlesh Lakhtakia (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

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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
VACCS01	**CORE JAVA**	1	0	2	1

Course Outcomes : On successful completion of the course, the student will be able to ***Cognitive Level***

CO1: *Inference the knowledge of servlet and JSP.* *Understand*

CO2: Explore the concept of *enterprise java beans architecture and lifecycle.* *Apply*

Module – I **SERVLET AND JAVA SERVER PAGES** **[7]**

Introduction – Servlet – JSP Architecture – HTTP Requests – HTTP Responses – Servlet API Overview – Basic Servlet Application – Generic Servlet – HTTP Servlet – HTML Forms – Deployment Descriptor. URL Rewriting – Hidden Fields – Session Tracking – Cookies – HTTP Session. JSP Overview – Comments – Implicit Objects – Directives – Scripting Elements – Actions.

Module – II **ENTERPRISE JAVABEANS** **[8]**

EJB Architecture: Logical Architecture – Software Architecture – View of EJB Conversation – Building and Deploying EJB's – Roles in EJB – EJB Session Beans: constraints on session beans – Life Cycle with example – EJB Entity Beans: When to use Entity Bean – Bean Managed Versus Container – Managed Persistence – primary keys – Entity Bean Life Cycle

Total = 15 Periods

Text Books :

1 Jeffrey C Jackson, Web Technologies – A Computer Science Perspective, Pearson Education, 2012.

2 Uttam Kumar Roy, Advanced Java Programming, Oxford Press, 2015.

Reference Books :

1 Paul Deitel, Harvey Deitel and Abbey Deitel, Internet and World Wide Web – How to Program, Pearson Education, New Delhi, Fifth Edition, 2018.

2 Tom Valesky, Enterprise Java Beans, Addison Wesley, New Delhi, 2001.

3 James McGovern, et.al, J2EE 1.4 Bible, Wiley Publishing, 2004.

4 D.T. Editorial Services, Java 8 Programming Black Book, Dreamtech Press, Delhi, First Edition, 2015.

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DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

CO-PO MAPPING

Regulation: **R 2020**

Course Code: **VACCS01** **Course Name:** **CORE JAVA**

CO	Course Outcomes	Programme Outcomes													
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	*Inference the knowledge of servlet and JSP.*	3	3	2	2	3	-	-	-	-	-	2	1	-	-
CO2	Explore the concept of *enterprise java beans architecture and lifecycle.*	3	3	2	2	3	-	-	-	-	-	2	3	-	-
	Average	3	3	2	2	3	-	-	-	-	-	2	3	-	-

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

K.S.R. COLLEGE OF ENGINEERING (Autonomous) R2020

VALUE ADDED COURSE

VACCS02	**FULL STACK DEVELOPMENT**	L	T	P	C
		1	0	2	1

Course Outcomes : 0n successful completion of the course, the student will be able to ***Cognitive Level***

CO1: Summarize the concepts of Basics of Web Page Creation *Understand*

CO2: Identify and apply the concept of backend with front end. *Understand*

Module - I **HTML, CSS AND JAVASCRIPT** [8]

Introduction to HTML– Doctype Element – Headings, Paragraphs, and Formatting Text – Lists and Links – Images and Tables – Introduction to CSS – Applying CSS to HTML – Selectors, Properties and Values – CSS Colors and Backgrounds – CSS Box Model – CSS Text and Font Properties - Applying JavaScript (internal and external) – Variables and Operators – Math and String Manipulation – Objects and Arrays – Date and Time – Conditional Statements – Switch Case – Looping in JS – Functions.

Module - II **REACT JS, NODE JS AND MONGODB** [7]

React JS – Introduction – Templating using JSX - Components, State and Props – Lifecycle of Components – Rendering List and Portals – Error Handling – Routers – Redux and Redux Saga – Immutable.js – Service Side Rendering. Node JS – Overview – Basics and Setup – Console – Command Utilities – Modules – Concepts – Events – Node JS with Express – Node JS Database Access. MongoDB – SQL and NoSql Concepts – Create and Manage MongoDB.

Total = 15 Periods

Text Books :

1 John Dean, Web Programming with HTML5, CSS, and JavaScript, Jones & Bartlett Learning, First Edition, 2019.

2 Vasan Subramanian, Pro MERN Stack: Full Stack Web App Development with Mongo, Express, React and Node, A Press, First Edition, 2017

Reference Books :

1 Jon Duckett, Beginning Web Programming with HTML, XHTML, and CSS, Wiley Publishing, Second Edition, 2008

2 Jennifer Niederst Robbins, Learning Web Design: A Beginner's Guide to HTML, CSS, JavaScript, and Web Graphics, O'Reilly, Fifth Edition, 2018

3 Chris Northwood, The Full Stack Developer: Your Essential Guide to the Everyday Skills Expected of a Modern Full, APress, First Edition, 2018

4 Mardan A., Full Stack JavaScript. Learn Backbone.js, Node.js and MongoDB, APress, Second Edition, 2016

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

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

CO-PO MAPPING

Regulation: R2020

Course Code: VACCS02 **Course Name: FULL STACK DEVELOPMENT**

CO	**Course Outcomes**	**Programme Outcomes**													
		PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	*Summarize the concepts of Basics of Web Page Creation.*	3	3	3	-	3	-	-	-	3	-	3	3	-	-
CO2	*Identify and apply the concept of backend with front end.*	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**

VALUE ADDED COURSE

		L	T	P	C
VACCS03	**C# AND .NET**	1	0	2	1

Course Outcomes : On successful completion of the course, the student will be able to ***Cognitive Level***

CO1: Identify core concepts of c# and .net Framework *Understand*

CO2: Apply the concept of ADO.Net and create the dynamic web page using ASP.NET *Apply*

Module – I BASICS OF C# AND .NET **[8]**

HTML Fundamentals – CSS Types – Introduction to Java Scripts – .Net Framework overview – C# overview – Variables and Functions – Basic Programs.

Module – II WEB APP DEVELOPMENT **[7]**

Introduction to MS SQL Server – Introduction to ADO.Net – C# with ADO.Net connectivity – Asp.Net development – N-Tier Architecture : MVC : Model – View – Controller – Demo Project

Total = 15 Periods

Text Books :

1 Herbert Schildt ,C# 4.0 the Complete Reference, McGrawHill, First Edition, 2010

2 Robert Powel, Richard Weeks, C# and the .NET Framework, Tech media, First Edition, 2002.

Reference Books :

1 Andrew Trolsens, Pro C# 5.0 and the .NET 4.5 Framework, Dreamtech Press, Sixth Edition, 2012.

2 https://learn.microsoft.com/en-us/dotnet/csharp/programming-guide/

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CO-PO MAPPING

Regulation: R 2020

Course Code: VACCS03 **Course Name: C# AND .NET**

CO	Course Outcomes	Programme Outcomes													
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	*Identify core concepts of c# and .net Framework*	1	2	3	3	3	1	1	2	2	2	-	2	-	-
CO2	*Apply the concept of ADO.Net and create the dynamic web page using ASP.NET*	1	2	3	3	3	1	1	2	2	2	-	2	-	-
	Average	**1**	**2**	**3**	**-**	**3**	**3**	**1**	**3**	**2**	**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
VACCS04	**APP DEVELOPMENT**	1	0	2	1

Course Outcomes : On successful completion of the course, the student will be able to ***Cognitive Level***

CO1: Interpret fundamentals of application development *Understand*
CO2: Develop Native applications with GUI Components *Apply*

Module – I BASICS OF MOBILE AND WEB APPLICATION DEVELOPMENT [7]

Basics of Web and Mobile application development − Native App − Hybrid App − Cross-platform App − Progressive Web App − Responsive Web design.

Module – II NATIVE APP DEVELOPMENT USING JAVA [8]

Native Web App − Benefits of Native App − Scenarios to create Native App −Tools for creating Native App − Cons of Native App − Popular Native App Development Frameworks − Java and Kotlin for Android − Swift and Objective − C for iOS − Basics of React Native − Native Components – JSX – State – Props.

Total = 15 Periods

Text Books :

1 Raymond K. Camden, Apache Cordova in Action, Manning, 2015

2 Dawn Griffiths, Head First Android Development, O'Reilly, First Edition, 2015.

Reference Books :

1 John Horton, Android Programming for Beginners, Packt Publishing, Second Edition, 2018.

2 Anthony Accomazzo, Houssein Djirdeh, Sophia Shoemaker, Full Stack React Native: Create beautiful mobile apps with JavaScript and React Native, Devin Abbott, Full Stack publishing, 2019.

3 Shaun Lewis, Mike Dunn, Native Mobile Development, O'Reilly Media, 2019.

4 Pawan Lingras, Matt Triff, Rucha Lingras, Building Cross-Platform Mobile and Web Apps for Engineers and Scientists: An Active Learning Approach, Cengage Learning, 2016.

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CO-PO MAPPING

Regulation: R 2020

Course Code: VACCS04 **Course Name: APP DEVELOPMENT**

CO	Course Outcomes	Programme Outcomes													
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	*Interpret fundamentals of application development*	2	2	1	2	3	-	-	-	1	1	2	1	-	-
CO2	*Develop Native applications with GUI Components*	2	1	3	2	2	-	-	-	3	2	2	3	-	-
	Average	**2**	**2**	**3**	**2**	**3**	**-**	**-**	**-**	**3**	**2**	**2**	**3**	**-**	**-**

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

K.S.R. COLLEGE OF ENGINEERING (Autonomous) **R2020**

VALUE ADDED COURSE

VACCS05	**PYTHON PROGRAMMING IN MACHINE LEARING**	**L**	**T**	**P**	**C**
		1	**0**	**2**	**1**

Course Outcomes : on successful completion of the course, the student will be able to ***Cognitive Level***

CO1: Summarize the basic concepts of machine learning in python *Understand*

CO2: Apply the appropriate machine learning strategy for any given problem *Apply*

MODULE – I **PYTHON BASICS** **[8]**

Introduction to Python: Installation of Python environment (Jupyter Notebook in ANACONDA) – Strings – List – tuple – Dictionaries – Object Oriented Programming: Concept Class and Object creation – Object attributes and class attributes – Methods – Numpy: Importing csv file – Handling arrays – Implementing mathematical operations on arrays using numpy – Pandas: Accessing data – Manipulating data in data frame – Plotting of data using matplotlib.

MODULE – II **SUPERVISED MACHINE LEARNING ALGORITHMS** **[7]**

Introduction to types of machine learning – Supervised machine learning – Bivariate and Multiple Linear Regression Binary and Multi-class Logistic Regression – Decision Tree – Random Forest – KNN algorithm and its implementation in python – SVM algorithm – SVM cost function and accuracy– Mini project implementation.

Total = 15 Periods

Text Books :

1 Andreas C. Müller and Sarah Guido, Introduction to Machine Learning with Python, O'Reilly Media, US, First Edition, 2016.

2 Stephen Marsland, Machine Learning – An Algorithmic Perspective, CRC Press, Second Edition, US, 2014.

Reference Books :

1 Michael Bowles, Machine Learning in Python-Essential Techniques for Predictive Analysis, Wiley Publication, US, First Edition, 2015.

2 Ethem Alpaydin, Introduction to Machine Learning, MIT Press, UK, Third Edition, 2014

3 Peter Flach, Machine Learning: The Art and Science of Algorithms that Make Sense of Data, Cambridge University Press, India, First Edition, 2012.

4 https://www.dataquest.io/blog/machine-learning-python/

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DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING
CO-PO MAPPING

Regulation: **R 2020**

Course Code: **VACCS05** **Course Name:** **PYTHON PROGRAMMING IN MACHINE LEARING**

CO	**Course Outcomes**	**Programme Outcomes**													
		PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	*Summarize the basic concepts of machine learning in python*	3	3	3	-	3	-	-	-	3	-	3	3	-	-
CO2	*Apply the appropriate machine learning strategy for any given problem*	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**

VALUE ADDED COURSE

		L	T	P	C
VACCS06	**ADVANCD C PROGRAMMING**	1	0	2	1

Course Outcomes : On successful completion of the course, the student will be able to ***Cognitive Level***

CO1: Infer about concept of storage class and pointers *Understand*

CO2: Apply the knowledge of file handling concepts and preprocessors *Apply*

Module – I STORAGE CLASS AND POINTERS [8]

Storage class – Automatic – External – Static – Register – Pointer – Pointer to Pointer – Pointer Arithmetic – Dangling Pointer – Void Pointer – Dereference Pointer – Null Pointer – Function Pointer.

Module – II FILE HANDLING AND PREPROCESSOR [7]

File handling – fread – fwrite – fprintf – fscanf –fputc- fgetc – fputs –fgets – fseek – rewind – ftell – Preprocessor – macros – #include – #define – #undef – ifdef – #if – #else – #error – #pragma.

Total = 15 Periods

Text Books :

1 Herbert Schildt, C - The Complete Reference, Tata McGraw-Hill, New Delhi, Fourth Edition, 2013.

2 Ashok N.Kamathane, Computer Programming, Pearson Education, New Delhi, Second Edition, 2014.

Reference Books :

1 Pradip Dey and Manas Ghosh, Fundamentals of Computing and Programming in C, Oxford University Press, Bengaluru, First Edition, 2013.

2 E. Balagurusamy, Programming in ANSI C, Tata McGraw-Hill, New Delhi, Sixth Edition, 2012.

3 Yashavant P. Kanetkar, Let Us C, BPB Publications, New Delhi, Seventeenth Edition, 2011.

4 Brian W. Kernighan, Dennis M. Ritchie, C Programming Language, Person Education, India, Second Edition, 2015.

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

Regulation: R 2020

Course Code: VACCS06 **Course Name: ADVANCD C PROGRAMMING**

CO	Course Outcomes	Programme Outcomes													
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	*Infer about concept of storage class and pointers*	3	3	3	-	3	3	-	-	-	-	-	3	-	-
CO2	*Apply the knowledge of file handling concepts and preprocessors*	3	3	3	-	3	3	-	-	-	-	-	3	-	-
	Average	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
VACCS07	**WEBSITE DESIGN AND DEVELOPMENT**	1	0	2	1

Course Outcomes : On successful completion of the course, the student will be able to ***Cognitive Level***

CO1: Construct the idea of web designing at user interface. *Apply*

CO2: Inference the knowledge of data processing on client and server side. *Analyze*

Module – I BASICS OF HTML AND CSS [8]

HTML: An Introduction to HTML – HTML Syntax and Structure of HTML Page – HTML tags for data formatting – Tables – Links – Images – List – Frames – Forms – Media – 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. Animations – Tool tips – Wildcard Selectors in CSS – Basics of frameworks like Bootstrap.

Module – II JAVASCRIPT, BOOTSTRAP AND DOCUMENT OBJECT MODEL [7]

JavaScript: Syntax and Execution – Internal, embedded and External JavaScript. JavaScript: Variables – Arrays – Functions – Conditions – Loops – Type Conversion – Bootstrap Fundamentals, - Objects and DOM – Inbuilt Functions – Validation and Regular Expressions – Event Handling.

Total = 15 Periods

Text Books :

1 Randy Connolly and Ricardo Hoar, Fundamentals of Web Development, Pearson Education, New Delhi, Third Edition, 2022.

2 Paul Deitel, Harvey Deitel and Abbey Deitel, Internet and World Wide Web – How to Program, Pearson Education, New Delhi, Fifth Edition, 2018.

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, 2018.

3 Jon Duckett, Beginning Web Programming with HTML, XHTML and CSS, Wiley Publishing Inc, India, Second Edition, 2008.

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CO-PO MAPPING

Regulation: R 2020

Course Code: VACCS07 **Course Name: WEBSITE DESIGN AND DEVELOPMENT**

CO	Course Outcomes	Programme Outcomes													
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	*Construct the idea of web designing at user interface.*	3	3	3	3	3	2	-	-	-	-	2	3	-	-
CO2	*Inference the knowledge of data processing on client and server side.*	3	3	3	3	3	1	-	-	-	-	2	2	-	-
	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**

VALUE ADDED COURSE

		L	T	P	C
VACCS08	**SERVICE NOW**	1	0	2	1

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

CO1: Identify the knowledge of the service now in learning Platform. *Understand*

CO2: Apply the knowledge of service now to complete Micro certification . *Apply*

MODULE – I BASICS OF SERVICE NOW [8]

Service Now Platform Fundamentals Course Overview – The Service Now Platform Lesson – Next Experience, Navigation, and Access Module – Lists and Filters Module – Forms Module – Tasks Module – Reporting Module- Knowledge Management Module – Service Catalog Module – Virtual Agent Module.

MODULE – II MICRO CERTIFICATION [7]

Instance Help – Personalize Your Instance – Favorite a Filtered List – Create and Comment on a Record – Create a Visual Task Board from a List –Order an Item from Service Catalog – Create a Dashboard and a Report – Flag and Comment on a Knowledge Articles.

Total = 15 Periods

Text Books :

1 Anton A. Valle Implementing Service Now: Quick Guide to Service Now Best Practice Service Now Administration , 2022

2 Martin Wood Mastering Service Now Packet Publishing , Second Edition, 2016

Reference Books :

1 Tim Woodruff Learning Service Now, Packt Publishing, 2017

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CO-PO MAPPING

Regulation: R 2020

Course Code: VACCS08 **Course Name: SERVICE NOW**

CO	Course Outcomes	Programme Outcomes													
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	*Identify the knowledge of the service now in learning Platform.*	2	3	3	1	3	-	-	1	-	-	-	2	-	-
CO2	*Apply the knowledge of service now to complete Micro certification .*	3	3	3	3	3	-	-	2	-	-	-	2	-	-
	Average	**3**	**3**	**3**	**3**	**3**	**-**	**-**	**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
VACCS09	**SALESFORCE DEVELOPERS**	1	0	2	1

Course Outcomes : On successful completion of the course, the student will be able to ***Cognitive Level***

CO1:	*Apply data modelling techniques to design and configure custom objects, fields, and relationships in Sales force.*	*Apply*
CO2:	*Apply advanced data management and customization techniques in Sales force to enhance data organization and user experience.*	*Apply*

Module – I SALESFORCE FUNDAMENTALS [8]

Introduction to CRM – CRM Use Cases – Salesforce: Overview of Sales force platform and its Architecture – Advantage of Sales force, Sales force edition sand licenses – Sales force user interface and navigation – Sales force Mobile App and Sales force Lightning Experience – Signing up Developer Edition – Standard Objects – Creating Custom Objects – Field sand data types – Apps Creation.

Module – II SALESFORCE DATA MANAGEMENTAND CUSTOMIZATION [7]

Relationships and junction objects – Rollup Summary – Creating Formula Fields – Schema Builder. Data Validation – Validation rules. Working with Record Type sand Page Layouts – Compact Layout – Lightning Record Pages – Home Page Customization – Path Settings – List Views – Data import and data management tools.

Total = 15 Periods

Text Books :

1 Sharif Shaalan, Timothy Royer, Sales force for Beginners, A step-by-step guide to optimize sales and marketing and automate business processes with the Sales force platform, Second Edition, Packt Publishing, Second Edition, 2022.

Reference Books :

1 Sharif Shaalan, Sales force for Beginners: A step – by – step guide to creating, managing, and automating sales and marketing processes Paper back – Illustrated, Packet Publishing Limited, 2020

2 Practical Sales force Architecture: Understanding and Deploying the Sales force Eco system for the Enterprise Firstt Edition, 2023.

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CO-PO MAPPING

Regulation: R 2020

Course Code: VACCS09 **Course Name: SALESFORCE DEVELOPERS**

CO	Course Outcomes	Programme Outcomes													
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	*Apply data modelling techniques to design and configure custom objects, fields, and relationships in Sales force.*	3	-	3	-	-	-	-	-	2	-	-	3	-	-
CO2	*Apply advanced data management and customization techniques in Sales force to enhance data organization and user experience.*	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**

VALUE ADDED COURSE

		L	T	P	C
VACCS10	**DIGITAL MARKETING**	1	0	2	1

Course Outcomes : On successful completion of the course, the student will be able to ***Cognitive Level***

CO1: Identify core concepts of digital marketing and the role of digital marketing in business. *Understand*

CO2: Summarize the opportunities for deploying emerging social marketing media and techniques. *Understand*

Module – I BASICS OF DIGITAL MARKETING [8]

Introduction to Digital Marketing − Evolution of Digital Marketing − Internet Marketing: Underlying Technology and Frameworks − Factors Impacting Digital Marketplace – Value chain Digitization − Digital Marketing Business Models − Evaluation of Consumer Behavior Models.

Module – II SOCIAL MEDIA MARKETING [7]

Introduction to Social Media marketing – Blogging − Twitter and Microblogging − Social Networking − Media Sharing − Social News and Bookmarking − Ratings and Reviews – Forums − Virtual Worlds – Strategy −Tactics and practice − Measurement.

Total = 15 Periods

Text Books :

1 Puneet Singh Bhatia, Fundamentals of Digital Marketing, Pearson Education, First edition, 2017

2 Dan Zarrella, The Social Media Marketing Book, O'Reilly Publication, First Edition, 2009.

Reference Books :

1 Vandana Ahuja, Digital Marketing, Oxford University Press, Second Edition, 2015.

2 Philip Kotler, Marketing 4.0: Moving from Traditional to Digital Wiley, First Edition, 2017

3 Puneet Bhatia, Fundamentals of digital Marketing, Pearson Education, India, First Edition, 2020.

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CO-PO MAPPING

Regulation: R 2020

Course Code: VACCS10 **Course Name: DIGITAL MARKETING**

CO	Course Outcomes	Programme Outcomes													
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	*Identify core concepts of digital marketing and the role of digital marketing in business.*	-	-	-	-	-	-	-	2	2	2	2	-	-	-
CO2	*Summarize the opportunities for deploying emerging social marketing media and techniques.*	-	-	-	-	-	-	-	2	2	2	2	-	-	-
	Average	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2**	**2**	**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
VACCS11	**INTELLECTUAL PROPERTY RIGHTS**	1	0	2	1

Course Outcomes : On successful completion of the course, the student will be able to	***Cognitive Level***
CO1: Apply the basic concepts of understanding Intellectual Property rights.	*Understand*
CO2: Efficient management of Intellectual Property Rights and ascertain the Intellectual Property Rights	*Apply*

MODULE – I BASICS OF IPR [8]

Introduction to Intellectual Property – Role of IP in the Economic and Cultural Development of the Society – IP Governance – IP as a Global Indicator of Innovation – Origin of IP – History of IP in India – Major Amendments in IP Laws and Acts in India – Categories of Intellectual Property – Patents – Copyrights and Related Rights – Trademarks – Industrial Designs – Geographical Indications – Trade Secrets.

MODULE – II IP ORGANIZATIONS IN INDIA [7]

Department for Promotion of Industry and Internal Trade – National Research Development Corporation, New Delhi – Technology Information Forecasting and Assessment Council, New Delhi – Patent Facilitation Centre – Indian Web-Portals for Patents and Technologies – Study on Patents of India – Global Ranking of Select Asian Countries – Patents and Publication Profile of Indian Institutes – Commercialization of Patents – Education and Training in Intellectual Property – WIPO e-Learning Centre.

Total = 15 Periods

Text Books :

1 Rupinder Tewari, Mamta Bhardwaj Intellectual Property - A Primer for Academia, Publication Bureau, Panjab University, Chandigarh, Kindle Edition, 2016.
2 Deborah E. Bouchoux, Intellectual Property: The Law of Trademarks, Copyrights, Patents and Trade Secrets, Cengage Learning, Third Edition, 2012.

Reference Books :

1 Prabuddha Ganguli, Intellectual Property Rights: Unleashing the Knowledge Economy, McGraw Hill Education, 2011.
2 Derek Bosworth and Elizabeth Webster, The Management of Intellectual Property, Edward Elgar Publishing Ltd., 2013.
3 S. V. Satakar, Intellectual Property Rights and Copy Rights, ESS Publications, New Delhi, 2002.

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CO-PO MAPPING

Regulation: R 2020

Course Code: VACCS11 **Course Name: INTELLECTUAL PROPERTY RIGHTS**

CO	Course Outcomes	Programme Outcomes													
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	*Apply the basic concepts of understanding Intellectual Property rights.*	3	3	3	2	2	-	-	-	-	-	-	-	-	-
CO2	*Efficient management of Intellectual Property Rights and ascertain the Intellectual Property Rights.*	3	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**

VALUE ADDED COURSE

VACCS12	**GENERAL PHYSIOLOGY**	L	T	P	C
		1	0	2	1

Course Outcomes : On successful completion of the course, the student will be able to ***Cognitive Level***

CO1: Apply acquired knowledge of physiology and histology to produce structured review texts *Apply*

CO2: Identify the basic mechanisms of cell and tissue physiology. *Understand*

Module Content:

1. Introduction to Physiology
2. Transport of Ions through the Cell
3. Membrane Physiology of Epithelial Cells
4. Physiology of Skeletal Muscle
5. Physiology of Cardiac Muscle
6. Physiology of Blood and Hematopoietic Organs
7. Blood Plasma
8. Leukocytes
9. Lymphocytes and Immunity
10. Blood Groups

Total = 15 Periods

Text Books :

1 Koeppen BM, Stanton B. Berne & Levy Physiology, Seventh Edition, Elsevier, 2017

2 Hall JE. Guyton, Textbook of Medical Physiology. Fourteenth Edition, Elsevier; 2021

Reference Books :

1 Purves D, Neuroscience. Sixth Edition, Sinauer; 2018.

2 Paulev PE, Zubieta G, New Human Physiology, second Edition, https://www.zuniv.net/physiology/book/

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CO-PO MAPPING

Regulation: R 2020

Course Code: VACCS12 **Course Name: GENERAL PHYSIOLOGY**

CO	Course Outcomes	Programme Outcomes													
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	*Apply acquired knowledge of physiology and histology to produce structured review texts*	-	-	-	-	3	3	-	-	3	-	-	3	-	-
CO2	*Identify the basic mechanisms of cell and tissue physiology.*	-	-	-	-	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**

VALUE ADDED COURSE

		L	T	P	C
VACCS13	**DISASTER MANAGEMENT**	2	0	0	1

Course Outcomes : On successful completion of the course, the student will be able to ***Cognitive Level***

CO1: Demonstrate the fundamentals of Disaster, Vulnerability and Disaster Risk reduction . *Understand*

CO2: Interpret disaster response skills by adopting relevant tools and technology. *Understand*

Module – I HAZRADS, VULNERABILITY AND DISASTER RISKS [8]

Definition: Disaster, Hazard, Vulnerability, Resilience, Risks – Types of Disasters: Natural, Human induced, Climate change induced – Earthquake, Landslide, Flood, Drought, Fire – Technological disasters – Structural collapse, Industrial accidents, oil spills -Causes, Impacts including social, Economic, political, environmental, health, psychosocial, etc.– Disaster vulnerability profile of India and Tamil Nadu – Global trends in disasters: urban disasters, pandemics, Complex emergencies, Inter relations between Disasters and Sustainable development Goals.

Module – II TECHNOLOGY FOR DISASTER MANAGEMENT [7]

Early warning systems – Components of Disaster Relief: Water, Food, Sanitation, Shelter, Health, Waste Management – Role of GIS and Information Technology Components in Preparedness – Risk Assessment – Response and Recovery Phases of Disaster – Disaster Damage Assessment – Elements of Climate Resilient Development – Standard Operation Procedure for disaster response.

Total = 15 Periods

Text Books :

1 Taimpo, Disaster Management and Preparedness, CRC Publications,2016

2 Singh R, Disaster Management Guidelines for earthquakes, Landslides, Avalanches and tsunami, Horizon Press Publications,2017

Reference Books :

1 Tushar Bhattacharya, Disaster Science and Management, McGraw Hill India Education Pvt. Ltd., 2012

2 Gupta A.K., Niar S.S and Chatterjee S, Disaster management and Risk Reduction, Role of Environmental Knowledge, Narosa Publishing House, Delhi,2013

3 KapurAnu Vulnerable India: A Geographical Study of Disasters, IIAS and Sage, Publishers, New Delhi, 2010.

4 Singhal J.P. Disaster Management, Lakshmi Publications, 2010.

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CO-PO MAPPING

Regulation: R 2020

Course Code: VACCS13 **Course Name: DISASTER MANAGEMENT**

CO	Course Outcomes	Programme Outcomes													
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	*Demonstrate the fundamentals of Disaster, Vulnerability and Disaster Risk reduction .*	3	3	2	3	-	-	2	2	-	-	2	-	-	-
CO2	*Interpret disaster response skills by adopting relevant tools and technology.*	3	3	2	3	-	-	2	1	-	-	2	-	-	-
	Average	**3**	**3**	**2**	**3**	**-**	-	**2**	**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
VACCS14	**BASIC KNOWLEDGE ABOUT GROOMING**	1	0	2	1

Course Outcomes : On successful completion of the course, the student will be able to ***Cognitive Level***

CO1: Summarize the Importance of cosmetology and analyze skin and hair. *Understand*

CO2: Identify Equipment used for pedicure and Manicure and apply face makeup. *Understand*

Module – I COSMETOLOGY,SKIN AND HAIR [8]

Cosmetology – Introduction – Definition and its importance – Difference between beautician and cosmetologist –Features of a cosmetologist –Types and application– Structure and function of skin – Skin types – Skin tones –Tips for skin care and steps in basic facial. Care for skin and hair–Basic Hairstyles: Knotted style – Rolling style – Plaited style – Basic structure of skin and hair – Products available – Skin and hair care –Make up for face and hairdo styles.

Module – II FACE MAKEUP, PEDICURE AND MANICURE [7]

Face makeup: Meaning – make up application – Make up types – shape and colour of Hair –hair care and hair styles for occasion. Basic Haircuts– Straight Trimming – U cut and V cut.Pedicure: Definition– Need for pedicure –Tools and equipment used for pedicure, Step by step procedure of pedicure –Pedicure technique– Benefits.Manicure: Equipment used for Manicure Types – French, hot oil, dip power manicures–Paraffin wax treatments –Shaping of nails – Removal of the cuticles.

Total = 15 Periods

Text Books :

1 Dr. Neena Khanna, Body and Beauty Care, Pustak Mahal Publishers, 2011.

2 Rashmi Sharma, Herbal Beauty and Body Care. Pustak Mahal Publishers, 2011.

Reference Books :

1 Richa Dave, Make-up Album, Navneet Publication, 2006.

2 Catherine M. Frangie. Milady, Standard cosmetology, Milady Publishing Company, 2014.

3 RoshiniDayal, Natural Beauty Secrets from India, Tata publishing Enterprises. LLC,2008.

4 P.J. Fitzgerald. The complete book of Hairstyling ,Mansoor book house,Trinn ywood wall,sun sanna Iconstantive, 2003.

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CO-PO MAPPING

Regulation: **R 2020**

Course Code: **VACCS14** **Course Name:** **BASIC KNOWLEDGE ABOUT GROOMING**

CO	Course Outcomes	Programme Outcomes													
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	*Summarize the Importance of cosmetology and analyze skin and hair.*	-	-	-	-	3	3	-	-	3	-	-	3	-	-
CO2	*Identify Equipment used for pedicure and Manicure and apply face makeup.*	-	-	-	-	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**

VALUE ADDED COURSE

		L	T	P	C
VACCS15	**YOGA AND FITNESS PRACTICAL**	1	0	2	1

Course Outcomes : On successful completion of the course, the student will be able to ***Cognitive Level***

CO1: Outline knowledge about the human body and importance of yoga in physical fitness and Maintain the body and mind by following a better lifestyle. *Understand*

CO2: Become a career option and hence a source of income due to the growing demands of healthy and fit body and a stable mental health among all age groups. *Understand*

Module – I PHYSICAL EDUCATION AND FITNESS [7]

Changing trends and Career in Physical Education – Meaning and definition of physical education. Physical Fitness – Wellness and Lifestyle – Meaning and importance of physical fitness – wellness and lifestyle – Components of Physical fitness and wellness.

Module – II YOGA [8]

Yoga: History and development – Traditional school of yoga. Meaning and importance of yoga – Relaxation methods – Meditation: Techniques Yoga for concentration and related asanas benefits of meditation. Warm up: Neck bending, shoulder bending, neck rotation, shoulder movement, trunk movement, knee movement ankle movement. Yogasanas: Standing posture – Sitting posture.

Total = 15 Periods

Text Books :

1 Rath, S.S. Physical Fitness and Wellness,2019

2 Gore, M.M. Anatomy & Physiology of Yogic Practices,2017

Reference Books :

1 Yatendra, A.Yoga & Stress management,2019

2 International Day of YOGA, common protocol: Ministry of Ayurveda,Yoga & Naturepathy, Unani, Siddha and Homeopathy (AYUSH)

3 B. K. S. Iyengar, Core of the Yogasutras, 2012

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DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

CO-PO MAPPING

Regulation: R 2020

Course Code: VACCS15 **Course Name: YOGA AND FITNESS PRACTICAL**

CO	Course Outcomes	Programme Outcomes													
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	*Outline knowledge about the human body and importance of yoga in physical fitness and Maintain the body and mind by following a better lifestyle.*	-	-	-	-	3	3	-	-	3	-	-	3	-	-
CO2	*Become a career option and hence a source of income due to the growing demands of healthy and fit body and a stable mental health among all age groups.*	-	-	-	-	3	3	-	-	3	-	-	3	-	-
	Average	**-**	**-**	**-**	**-**	**3**	**3**	**-**	**-**	**3**	**-**	**-**	**3**	**-**	**-**

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