B.E. – Electronics and Communication Engineering

CURRICULUM & SYLLABI

Regulation 2018

(Applicable to candidates admitted in the academic year 2018-2019 onwards)

K.S.R. College of Engineering

(Autonomous)
K.S.R. Kalvi Nagar, Tiruchengode – 637 215
Namakkal (Dt), Tamilnadu, India
Email : info@ksrce.ac.in Website : www.ksrce.ac.in

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

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

(REGULATIONS 2018)

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 national and the world.

Mission of the Institution

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

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

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

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

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

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

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

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

Program Outcomes (POs)	
PO1	**Engineering Graduates will be able to:** **Engineering Knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO2	**Problem Analysis:** Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
PO3	**Design/Development of Solutions:** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
PO4	**Conduct Investigations of Complex Problems:** Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
PO5	**Modern Tool Usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.
PO6	**The Engineer and Society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
PO7	**Environment and Sustainability:** Understand the impact of the professional engineering solutions in societal and environmental contexts, 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	**Professional Skill:** Specify, design and test modern electronic systems that perform analog and digital processing functions.
PSO2	**Problem – Solving Skills:** Design essential elements (circuits and antennas) of modern RF/Wireless communication systems.

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

SEMESTER – I

Sl.No.	Course Code	Course Name	Category	Hours/ Week			Credit	Maximum Marks		
				L	T	P	C	CA	ES	Total
THEORY										
1.	18EN151	Technical English – I (Common to All Branches)	HSMC	2	0	1	3	30	70	100
2.	18MA151	Engineering Mathematics – I (Common to All Branches)	BSC	3	1	0	4	30	70	100
3.	18PH043	Engineering Physics (Common to EE &EC)	BSC	3	0	0	3	30	70	100
4.	18GE028	Manufacturing Practices (Common to CS,EE,EC & IT)	ESC	1	0	4	3	30	70	100
PRACTICAL										
5.	18AU027	Engineering Graphics Laboratory (Common to CE,CS,EE, EC & IT)	ESC	0	0	3	1	50	50	100
6.	18PH028	Physics Laboratory (Common to AU,ME,EE & EC)	BSC	0	0	3	1	50	50	100
			Total	10	1	9	15	600		
MANDATORY COURSE										
7.	18MC052	Environmental Science and Engineering (Common to EE & EC)	MC	3	0	0	0	50	50	100

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

SEMESTER – II

Sl.No.	Course Code	Course Name	Category	Hours/ Week			Credit	Maximum Marks		
				L	T	P	C	CA	ES	Total
THEORY										
1.	18EN251	Technical English – II (Common to All Branches)	HSMC	2	0	1	3	30	70	100
2.	18MA242	Applied Mathematics (Common to EC &EE)	BSC	3	1	0	4	30	70	100
3.	18CH051	Engineering Chemistry (Common to All Branches)	BSC	3	0	0	3	30	70	100
4.	18EC214	Electric Circuits	ESC	3	0	0	3	30	70	100
5.	18CS041	Programming for Problem solving (Common to AU, CE, EE, EC & ME)	ESC	3	0	0	3	30	70	100
PRACTICAL										
6.	18EC221	Electric Circuits Laboratory	ESC	0	0	3	1	50	50	100
7.	18CH028	Chemistry Laboratory (Common to AU, EE & EC)	BSC	0	0	3	1	50	50	100
8.	18CS027	Programming for Problem solving Laboratory (Common to AU, CE, EE, EC & ME)	ESC	0	0	3	1	50	50	100
			Total	15	1	10	19	800		
MANDATORY COURSE										
9.	18MC051	Constitution of India	MC	3	0	0	0	50	50	100

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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.	18MA344	Differential Equations and Numerical Methods (Common to EC & EE)	BSC	3	1	0	4	30	70	100
2.	18CS332	C++ and Data Structures	ESC	3	0	0	3	30	70	100
3.	18EC313	Electronic Devices	PCC	3	0	0	3	30	70	100
4.	18EC314	Digital Electronics	PCC	3	0	0	3	30	70	100
5.	18EC315	Electromagnetic Theory	PCC	3	1	0	4	30	70	100
6.	18EE331	Electrical Machines	ESC	3	0	0	3	30	70	100
PRACTICAL										
7.	18CS326	C++ and Data Structures Laboratory	ESC	0	0	3	1	50	50	100
8.	18EC322	Electronic Devices Laboratory	PCC	0	0	3	1	50	50	100
9.	18EC323	Digital Electronics Laboratory	PCC	0	0	3	1	50	50	100
10.	18HR351	Career Development Skill I (Common to All Branches)	EEC	0	2	0	0	50	50	100
			Total	18	4	9	23	1000		

SEMESTER – IV

Sl.No.	Course Code	Course Name	Category	Hours/ Week			Credit	Maximum Marks		
				L	T	P	C	CA	ES	Total
THEORY										
1.	18MA433	Probability and Stochastic Process	BSC	3	0	0	3	30	70	100
2.	18EC412	Signals and Systems	PCC	3	1	0	4	30	70	100
3.	18EC413	Transmission Lines and Wave Guides	PCC	3	0	0	3	30	70	100
4.	18EC414	Electronic Circuits	PCC	3	0	0	3	30	70	100
5.	18EC415	Linear Integrated Circuits	PCC	3	0	0	3	30	70	100
6.	18EC416	Microprocessors and Microcontrollers	PCC	3	0	0	3	30	70	100
PRACTICAL										
7.	18EC421	Electronic Circuits and Simulation Laboratory	PCC	0	0	3	1	50	50	100
8.	18EC422	Linear Integrated Circuits Laboratory	PCC	0	0	3	1	50	50	100
9.	18EC423	Microprocessors and Microcontrollers Laboratory	PCC	0	0	3	1	50	50	100
10.	18HR442	Career Development Skill II	EEC	0	2	0	0	50	50	100
			Total	18	3	9	22	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.	18HS001	Principles of Management (Common to All Branches)	HSMC	3	0	0	3	30	70	100
2.	18EC512	Analog Communication Systems	PCC	3	1	0	4	30	70	100
3.	18EC513	Digital Signal Processing	PCC	3	1	0	4	30	70	100
4.	18EC514	Computer Networks	PCC	3	0	0	3	30	70	100
5.	18EC515	Embedded Systems	PCC	3	0	0	3	30	70	100
6.		Open Elective – I	OEC	3	0	0	3	30	70	100
PRACTICAL										
7.	18EC521	Digital Signal Processing Laboratory	PCC	0	0	3	1	50	50	100
8.	18EC522	Computer Networks Laboratory	PCC	0	0	3	1	50	50	100
9.	18EC523	Embedded System Design Laboratory	PCC	0	0	3	1	50	50	100
10.	18HR543	Career Development Skill III	EEC	0	2	0	0	50	50	100
			Total	18	4	9	23	1000		

SEMESTER – VI

Sl.No.	Course Code	Course Name	Category	Hours/ Week			Credit	Maximum Marks		
				L	T	P	C	CA	ES	Total
THEORY										
1.	18HS051	Professional Ethics (Common to All Branches)	HSMC	3	0	0	3	30	70	100
2.	18EC612	Digital Communication Systems	PCC	3	0	0	3	30	70	100
3.	18EC613	Digital Image Processing	PCC	3	0	0	3	30	70	100
4.	18EC614	VLSI Design	PCC	3	0	0	3	30	70	100
5.		Professional Elective – I	PEC	3	0	0	3	30	70	100
6.		Open Elective – II	OEC	3	0	0	3	30	70	100
PRACTICAL										
7.	18EC621	Communication Systems Laboratory	PCC	0	0	3	1	50	50	100
8.	18EC622	VLSI Laboratory	PCC	0	0	3	1	50	50	100
9.	18CS028	Python Programming Laboratory (Common to CS,EC & EE)	PCC	0	0	3	1	50	50	100
10.	18HR644	Career Development Skill IV	EEC	0	2	0	0	50	50	100
			Total	18	2	9	21	1000		

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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.	18EC711	Wireless and Cellular Communication	PCC	3	0	0	3	30	70	100
2.	18EC712	RF and Microwave Engineering	PCC	3	0	0	3	30	70	100
3.	18EC713	Fiber Optical Communication	PCC	3	0	0	3	30	70	100
4.		Professional Elective – II	PEC	3	0	0	3	30	70	100
5.		Professional Elective – III	PEC	3	0	0	3	30	70	100
6.		Open Elective – III	OEC	3	0	0	3	30	70	100
PRACTICAL										
7.	18EC721	RF, Optical and Microwave Laboratory	PCC	0	0	3	1	50	50	100
8.	18EC722	Project Work Phase – I	PW	0	0	6	3	50	50	100
			Total	18	0	9	22	800		

SEMESTER – VIII

Sl.No.	Course Code	Course Name	Category	Hours/ Week			Credit	Maximum Marks		
				L	T	P	C	CA	ES	Total
THEORY										
1.		Professional Elective – IV	PEC	3	0	0	3	30	70	100
2.		Professional Elective – V	PEC	3	0	0	3	30	70	100
3.		Open Elective – IV	OEC	3	0	0	3	30	70	100
PRACTICAL										
4.	18EC821	Project Work Phase – II	PW	0	0	12	6	50	50	200
			Total	9	0	12	15	500		

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List of Electives		

PROFESSIONAL ELECTIVE – I (SEMESTER – VI)										
Sl.No.	**Course Code**	**Course Name**	**Specialization**	**Hours/ Week**			**Credit**	**Maximum Marks**		
				L	**T**	**P**	**C**	**CA**	**ES**	**Total**
1.	18EC661	Antenna and Wave Propagation	S1	3	0	0	3	30	70	100
2.	18EC662	Medical Electronics	S4	3	0	0	3	30	70	100
3.	18EC663	Advanced Microprocessors and Microcontrollers	S3	3	0	0	3	30	70	100
4.	18EC664	Information Theory and Coding	S1	3	0	0	3	30	70	100
5.	18EC665	Computer Architecture	S6	3	0	0	3	30	70	100
6.	18EC666	Advanced Digital Communication Techniques	S1	3	0	0	3	30	70	100
7.	18EC667	Advanced Digital Systems Design	S3	3	0	0	3	30	70	100
8.	18CS091	.NET Framework Technologies (Common to CS & EC)	S6	3	0	0	3	30	70	100

PROFESSIONAL ELECTIVE – II (SEMESTER – VII)										
Sl.No.	**Course Code**	**Course Name**	**Specialization**	**Hours/ Week**			**Credit**	**Maximum Marks**		
				L	**T**	**P**	**C**	**CA**	**ES**	**Total**
1.	18EC761	Telecommunication and Switching Networks	S1	3	0	0	3	30	70	100
2.	18EC762	CMOS Analog Circuits	S2	3	0	0	3	30	70	100
3.	18EC764	PC Hardware, Installation, Troubleshooting and Servicing	S6	3	0	0	3	30	70	100
4.	18EC765	High Performance Networks	S6	3	0	0	3	30	70	100
5.	18EC768	Electronic System Design	S4	3	0	0	3	30	70	100
6.	18EC769	Embedded System Design	S3	3	0	0	3	30	70	100
PROFESSIONAL ELECTIVE – III (SEMESTER – VII)										
1.	18EC763	Fundamentals of Nano Electronics	S1	3	0	0	3	30	70	100
2.	18EC766	Wireless Sensor Networks	S6	3	0	0	3	30	70	100
3.	18EC767	ASIC Design	S2	3	0	0	3	30	70	100
4.	18EC771	Robotics	S4	3	0	0	3	30	70	100
5.	18EC772	CAD for VLSI	S2	3	0	0	3	30	70	100
6.	18EC773	Wireless Networks	S6	3	0	0	3	30	70	100

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List of Electives

PROFESSIONAL ELECTIVE – IV (SEMESTER – VIII)										
Sl.No.	**Course Code**	**Course Name**	**Specialization**	**Hours/ Week**			**Credit**	**Maximum Marks**		
				L	**T**	**P**	**C**	**CA**	**ES**	**Total**
1.	18EC861	Satellite Communication	S1	3	0	0	3	30	70	100
2.	18EC862	MEMS Technology	S4	3	0	0	3	30	70	100
3.	18EC866	Multimedia Compression and Communication	S5	3	0	0	3	30	70	100
4.	18EC867	Embedded Networks	S3	3	0	0	3	30	70	100
5.	18EC868	VLSI Signal Processing	S2	3	0	0	3	30	70	100
6.	18EC872	Architecture of DSPs	S5	3	0	0	3	30	70	100
PROFESSIONAL ELECTIVE – V (SEMESTER – VIII)										
7.	18EC863	ADHOC Networks	S6	3	0	0	3	30	70	100
8.	18EC864	Telecommunication System Modeling and Simulation	S1	3	0	0	3	30	70	100
9.	18EC865	Optical Networks	S6	3	0	0	3	30	70	100
10.	18EC869	ARM System Architecture	S3	3	0	0	3	30	70	100
11.	18EC871	Advanced Signal Processing	S5	3	0	0	3	30	70	100
12.	18EC873	Cryptography and Network Security	S6	3	0	0	3	30	70	100

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

LIST OF OPEN ELECTIVES(SEMESTER – V to VIII)										
Sl.No.	**Course Code**	**Course Name**	**Specialization**	**Hours/ Week**			**Credit**	**Maximum Marks**		
				L	**T**	**P**	**C**	**CA**	**ES**	**Total**
1.	18CS043	Python Programming	CSE	3	0	0	3	30	70	100
2.	18CS002	Java Programming	CSE	3	0	0	3	30	70	100
3.	18CS003	Operating Systems	CSE	3	0	0	3	30	70	100
4.	18CS868	Ethical Hacking	CSE	3	0	0	3	30	70	100
5.	18CS869	Internet of Things (IE)	CSE	3	0	0	3	30	70	100
6.	18CS512	Database Management Systems	CSE	3	0	0	3	30	70	100
7.	18CS411	Software Engineering	CSE	3	0	0	3	30	70	100
8.	18CS412	Design and Analysis of Algorithm	CSE	3	1	0	4	30	70	100
9.	18IT662	Cloud Computing	IT	3	0	0	3	30	70	100
10.	18IT511	Data Analytics (IE)	IT	3	0	0	3	30	70	100
11.	18EE413	Control Systems	EEE	3	1	0	4	30	70	100
12.	18EE092	Electronic Instrumentation	EEE	3	0	0	3	30	70	100
13.	18EE761	Soft Computing Techniques	EEE	3	0	0	3	30	70	100
14.	18ME773	Renewable Sources of Energy	MECH	3	0	0	3	30	70	100

15.	18EE513	Power Electronics	EEE	3	0	0	3	30	70	100
16.	18EE099	Electrical Wiring, Estimation and Costing	EEE	3	0	0	3	30	70	100
17.	18EE712	Industrial Automation and Control	EEE	3	0	0	3	30	70	100
18.	18ME712	Mechatronics	MECH	3	0	0	3	30	70	100
19.	18ME097	Industrial Safety Engineering	MECH	3	0	0	3	30	70	100
20.	18AU861	Electric and Hybrid Vehicles	AUTO	3	0	0	3	30	70	100
21.	18AU769	Intelligent Vehicles Technology	AUTO	3	0	0	3	30	70	100
22.	18CE664	Remote Sensing and GIS	CIVIL	3	0	0	3	30	70	100
23.	18CE867	Municipal Waste and Management	CIVIL	3	0	0	3	30	70	100
24.	18CE766	Environmental Impact and Assessment	CIVIL	3	0	0	3	30	70	100
25.	18MA434	Operations Research	MATHS	3	1	0	4	30	70	100
26.	18HS094	Disaster Management	MBA	3	0	0	3	30	70	100

LIST OF PROPOSED VALUE ADDED COURSES

Sl.No.	Course Name	Number of hours	Offered by Internal / External
1.	PCB Circuit Design	20 Hours	Internal / External
2.	Programming PIC Microcontrollers	20 Hours	Internal / External
3.	Real Time Applications of Aurduino	20 Hours	Internal / External
4.	LABVIEW	20 Hours	Internal / External
5.	MATLAB – Image and Signal Processing Tool box	20 Hours	Internal / External
6.	Industrial Automation using PLC and SCADA	20 Hours	Internal / External
7.	Network Simulator – 2	20 Hours	Internal / External
8.	CCNA Fundamentals (Module 1)	20 Hours	Internal / External
9.	CCNA - Routing and Switching (Module 2)	20 Hours	Internal / External
10.	C and C++ Programming	20 Hours	Internal / External
11.	Java Programming	20 Hours	Internal / External
12.	.Net and PHP	20 Hours	Internal / External
13.	Data Base Management Systems	20 Hours	Internal / External
14.	VHDL Programming	20 Hours	Internal / External
15.	Tanner Tool	20 Hours	Internal / External
16.	Mentor Graphics	20 Hours	Internal / External
17.	Programming in Digital Signal Processors	20 Hours	Internal / External

Sl.No	Subject Area	Credits Per Semester								Credits Total	Percentage Credits	Suggested Breakup of credits
		I	II	III	IV	V	VI	VII	VIII			
1	HSMC	3	3			3	3			12	7.5	12
2	ESC	4	8	7						19	11.875	25
3	BSC	8	8	4	3					23	14.375	24
4	PCC			12	19	17	12	10		70	43.75	48
5	PEC						3	6	6	15	9.375	18
6	OEC					3	3	3	3	12	7.5	18
7	PW							3	6	09	5.625	15
Total		15	19	23	22	23	21	22	15	160	100.00%	160

Total Credits for Regular Student – 160
Total Credits for Lateral Student – 126

K.S.R. COLLEGE OF ENGINEERING (Autonomous) **R 2018**

SEMESTER - I

		L	T	P	C
18EN151	**TECHNICAL ENGLISH – I (common to all branches)**	2	0	1	3

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

Objectives:

- *To develop basic conversation skills.*
- *To build vocabulary skills with the right choice of words.*
- *To improve students' understanding of grammar in context progressively.*
- *To empower students on professional writing*
- *To use the LSRW skills in professional context*

UNIT - I **[09]**

Synonyms & Antonyms – Tenses (Simple Present, Present Continuous, Present Perfect, Simple Past, and Simple Future) - Use of Modal Auxiliaries – Infinitive and Gerund –- Intensive Reading – Predicting Content – Interpretation - Active Listening - Listening for the main idea - Need based Correspondence (request for joining hostel, bonafide certificate)

UNIT - II **[09]**

British & American terminology - Impersonal passive – Standard Abbreviations and Acronyms - Predicting Content - Drawing inferences - Listening for specific details - Listening to News – Job Application and Resume – Writing Instructions

UNIT - III **[09]**

Preposition of Time, Place and Movement – Concord (Subject & Verb Agreement) – Passive Voice – Consonant Sounds – Pronunciation guidelines related to Vowels and Consonant – Skimming & Scanning - Inference – Context Based Meaning - Welcome Speech – Vote of Thanks.

UNIT - IV **[09]**

Newspaper Reading – Vocabulary Building – Phrasal Verbs (Put, Give, Look, Take, Get, Call) – Note making – Rearranging the jumbled sentences - MoC – Anchoring – Role play in academic context – E Mail Etiquette – Introducing others.

UNIT - V **[09]**

Listening to Dialogues – Listening to Telephonic Conversation - Recommendation Writing - Letter of Invitation (inviting, accepting and declining) – Paragraph writing - Letter to the Editor of a Newspaper – Drills using Minimal pairs – Presentation Skills.

Total (L: 45) = 45 Periods

Course Outcomes : On the successful completion of the course, students will be able to

CO1 : *Comprehend and apply Grammar in context for professional communication.*

CO2 : *Infer the gist and specific information.*

CO3 : *Express and interact in the society and place of study.*

CO4 : *Critically interpret by reading a text and comprehend a given text.*

CO5 : *Correspond and communicate for jobs.*

Text Books :

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

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

Reference Books :

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

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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SEMESTER – I

		L	T	P	C
18MA151	**ENGINEERING MATHEMATICS – I** (Common To All branches)	3	1	0	4

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

Objectives:

- *To study the concepts of Matrices and its Applications.*
- *To study the concepts and its applications of Ordinary Differential Equations*
- *To acquire knowledge in solving differential calculus.*
- *To study the concepts of functions of several variables*
- *To acquire the basics of Vector Calculus and its applications.*

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 paralleopiped only.

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

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

CO1 : *Interpret the basics of Matrix applications in the field of engineering.*

CO2 : *Acquire knowledge in solving ordinary differential equations.*

CO3 : *Explain and apply the concepts of differential calculus problems.*

CO4 : *Skills in developing and solving the functions of several variables.*

CO5 : *Acquire the basics of vector calculus and its applications*

Text Books :

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

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

Reference Books :

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

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

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

4 http://www.sosmath.com/matrix/matrix.html

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SEMESTER – I

		L	T	P	C
18PH043	**ENGINEERING PHYSICS (Common to EE, EC)**	3	0	0	3

Prerequisite: *NIL*

Objectives:

- *To compute and analyze various problems related to Engineering Physics.*
- *To understand the various optoelectronic devices and its applications in the field of Engineering and also to explore the prism concepts of Quantum physics.*
- *To emphasize the basic concepts behind the types of advanced materials & nanotechnology.*
- *To explore the basic concepts behind the sensors, transducers and Laser.*
- *To comprehend the fundamentals of physics thereby exploring it for potential engineering applications.*

UNIT - I QUANTUM PHYSICS [09]

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, Scanning Electron Microscopy (SEM),Transmission Electron Microscopy (TEM), .

UNIT - II OPTOELECTRONIC DEVICES [09]

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.

UNIT - III ADVANCED MATERIALS AND NANOTECHNOLOGY [09]

New Engineering Materials: metallic glasses – preparation, properties and applications – Shape memory alloys (SMA) – characteristics, properties of Ni Ti alloy applications – advantages and disadvantages of SMA.Nanomaterials: Properties-Top-down process: Ball Milling method – Bottom-up process: Vapour Phase Deposition method- Carbon nano tube (CNT): Properties, preparation by electric arc method, Applications

UNIT - IV LASER TECHNOLOGY [09]

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).

UNIT - V SENSOR TECHNOLOGY [09]

Definition – Principle of sensor & transducer – classification – types of Sensors – resolution, accuracy, sensitivity, – Inductive sensor – Linear Variable Differential Transistor (LVDT) – Thermal sensors – Thermocouple – Magnetic sensors – Strain gauge torque meters – biosensors – electronic nose –electronic tongue – medical, food and agricultural applications.

Total (L: 45) = 45 Periods

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

CO1 : *Enumerate the preambles of quantum physics and implement its concepts to tackle the cumbersome engineering problems.*

CO2 : *Explore the concepts of optoelectronic devices for the fabrication of electronic devices.*

CO3 : *Apply the techniques for manufacturing of advanced materials aided with Nano properties*

CO4 : *Categorize the types of laser and utilize it for specific application based on their desirable requisite.*

CO5 : *Utilize the conceived concepts and techniques for sensors and transducers.*

Text Book :

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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SEMESTER – I

		L	T	P	C
18GE028	**MANUFACTURING PRACTICES** (Common to CS, EC, EE & IT)	1	0	4	3

Prerequisite: *NIL*

Objective:

- *To study the basic concepts of manufacturing processes.*
- *To hands on training of Welding and Foundry processes.*
- *To acquire the knowledge of various manufacturing methods.*

GROUP-A

(CIVIL & MECHANICAL)

1. MANUFACTURING PROCESS :

Theory (Lectures & videos) **[10]**

1.Foundry
Mould preparation-Metal casting-plastic moulding.

2. Carpentry
Carpentry tools-carpentry operations-carpentry joints.

3. Fitting
Fitting tools-Fitting operations - power tools.

4. Welding
Types-Arc welding-Gas welding-Brazing.

5. Manufacturing Methods
Metal forming-Basic Machining-CNC Machining-Metal joining- Additive manufacturing-Glass Cutting.

2. WORKSHOP PRACTICE:

Practical **[25]**

LIST OF EXPERIMENTS

1. Prepare a mould using solid pattern using foundry process.
2. Make T- joint from the given wooden pieces using carpentry tools.
3. Make Butt joint using arc welding equipment.
4. Perform simple facing and turning operation using Centre Lathe.
5. Make holes as per the given dimensions using drilling machine.

Total [Group-A] = 35 periods

Course Outcomes: ***On completion of this course, the students will be able to***

CO1: Explore the fundamental knowledge of different manufacturing processes.
CO2: Construct different welding joints and preparation of mould cavity.
CO3: Examine various machining operations.

Text Books:

1 Hajra Choudhury S.K., Hajra Choudhury A.K. and Nirjhar Roy S.K., Elements of Workshop Technology, Vol. I and Vol. II, Media promoters and publishers private limited, Mumbai, Second Edition, 2017.
2 Gowri P. Hariharan and A. Suresh Babu, Manufacturing Technology – I Pearson Education, New Delhi, Second Edition, 2013.

Reference Books:

1 Roy A. Lindberg, Processes and Materials of Manufacture, Prentice Hall India, Delhi, 4th edition, 1998.
2 Kalpakjian S. And Steven S. Schmid, Manufacturing Engineering and Technology, Pearson Education, Delhi, 7th edition, 2014.
3 Rao P.N., Manufacturing Technology, Vol. I and Vol. II, Tata McGraw Hill, New Delhi, Third edition, 2013.

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SEMESTER – II

		L	T	P	C
18GE028	**MANUFACTURING PRACTICES** **GROUP B(ELECTRICAL & ELECTRONICS)** (Common To EC,EE, CS&IT)	1	0	4	3

Prerequisite: No prerequisites are needed for enrolling into the course

Objectives:

- *To study different types of wiring used in house.*
- To learn the procedure for calibration of Single phase Energy meter
- *To learn components in electronics, different logic gates and the working of CRO.*

(i) Theory (Lectures & videos) **[02]**

Electrical and Electronics

Electrical symbols

Electrical layout, Electrical wiring materials\

Electronics components

(ii) Practical **[08]**

List of Experiments:

ELECTRICAL ENGINEERING

1. Fluorescent lamp wiring & Stair-case wiring.
2. Calibration of Single phase Energy meter

ELECTRONICS ENGINEERING

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

Total (Group B) : 10 Periods

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

CO1: Construct different types of wiring used in house.

CO2: Calibrate single phase Energy meter.

CO3: Organize different electronic components and logic gates.

Examinations could involve the actual fabrication of simple components, utilizing one or more of the techniques covered above.

GROUP	*Theory Questions (Marks)*	*Duration (Minutes)*	*Practical Examinations (Marks)*	*Duration (Minutes)*	*Exam will be conducted for (Marks)*
Group-A	*20*	*30*	*50*	*90*	*70*
Group-B	*10*	*15*	*20*	*45*	*30*
Total	*30*	*45*	*70*	*135*	*100*

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SEMESTER - I

		L	T	P	C
18AU027	**ENGINEERING GRAPHICS LABORATORY**				
	(Common to CE, CS, EC, EE & IT)	0	0	3	1

Prerequisite: -

Objective:

- *To improve graphic skills for communication of concepts, ideas, and design of engineering products.*
- *To develop skill for using software to create 2D and 3D models.*
- *To become proficient in drawing the projection of various solids.*
- *To gain knowledge about orthographic and isometric projections.*
- *To improve their visualization skills so that they can apply these skills in developing new products.*

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

Course Outcomes: After successful completion of this course, the students should be able to:

CO1: *Construct the various plane curves.*

CO2: *Formulate orthographic projection of lines and plane surfaces.*

CO3: *Draw projections of solids and development of surfaces.*

CO4: *Prepare the isometric sections of simple solids.*

CO5: Develop the section of solids and surfaces.

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SEMESTER – I

		L	T	P	C
18PH028	**PHYSICS LABORATORY** (Common to all branches)	0	0	3	1

Prerequisite: *NIL*

Objectives:

- *To train engineering students on basis of measurements and the instruments.*
- *To gain the practical knowledge and hands on experiences of understanding the physics concepts applied in optics, sound and thermal physics.*
- *To give practical training on basic Physics experiments which are useful to engineers.*
- *Apply the analytical techniques and graphical analysis to the experimental data.*
- *To develop intellectual communication skills and discuss the basic principles of scientific concepts in a group.*

List of Experiments:

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

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

CO1 : *Comprehend the different physical parameters of optics.*

CO2 : *Perceive the production of ultrasonic waves through inverse piezoelectric effect and to determine the velocity of sound waves in the given liquid.*

CO3 : *Explore the principle of thermal conductivity thereby to calculate the thermal conductivity of various bad conductors like cardboard, mica, etc.*

CO4 : *Confer the experimental counterparts of materials properties such as modulus, solar cell, and energy gap.*

CO5 : *Imbibe the concept of capillary action in fluid dynamics and to compare the coefficient of viscosity of the given liquid.*

Text Book :

1 Faculty Members of Physics, Physics Lab manual, Department of Physics, K.S.R. College of Engineering, Namakkal, seventeenth Edition, 2018.

2 Dr. P. Mani, Physics Lab Manual & Observation Book, Dhanam Publications, tweleth Edition Chennai 2017.

Reference Books :

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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SEMESTER – I

		L	T	P	C
18MC052	**ENVIRONMENTAL SCIENCE AND ENGINEERING**				
	(Mandatory, non - credit course) (Common to All Branches)	3	0	0	0

Prerequisite: *NIL*

Objectives:

- *To impart knowledge on the principle of environmental science and engineering.*
- *To embellish the students to understand the usages of natural resources, ecosystem and biodiversity.*
- *To create awareness on pollution, value education and social issues.*
- *To appreciate the importance of environment by assessing its impact on the human world.*
- *To envision the surrounding environment, its functions and its value.*

UNIT - I INTRODUCTION TO ENVIRONMENTAL STUDIES AND NATURAL RESOURCES [09]

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 [09]

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 [09]

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 [09]

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 [09]

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 (L: 45) = 45 Periods

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

CO1 : Prioritize the importance in conservation of resources for future generation.

CO2 : Relate the importance of ecosystem and biodiversity.

CO3 : Analyze the impact of pollution and hazardous waste in a global and societal context.

CO4 : Identify the contemporary issues that result in environmental degradation that would attempt to provide solutions to overcome the problems.

CO5 : Categorize the concept of Sustainability and Green Chemistry.

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, Fourth Edition, 2014.

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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SEMESTER - II

		L	T	P	C
18EN251	**TECHNICAL ENGLISH – II** (common to all branches)	2	0	1	3

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

Objectives:

- *To make students firm on vocabulary and grammar.*
- *To develop students speaking ability*
- *To enhance students' professional skills on professional writing.*
- *To enable students reading and listening skills.*
- *To optimize LSRW skills for personal development*

UNIT - I **[09]**

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

UNIT - II **[09]**

Numerical Adjectives – Prefixes & Suffixes- If Conditionals – E-mail Writing - Greetings and Introductions – Making Requests – Seeking Information – Inviting People – Likes & Dislikes -. Listening for main ideas - Report Writing.

UNIT - III **[09]**

Framing Questions – 'Wh' Question – Yes / No Question –Discourse markers - Cause and Effect Expression - Critical reading, Making inference - Transcoding (Interpretation of Charts) - Listening and Note taking – Oral Presentation.

UNIT - IV **[09]**

Expression of Purpose – Editing text for Spelling and Punctuation – Redundancies - Business Correspondence – Calling for Quotations, Seeking Clarification, placing order and Complaint - Extensive Listening – Short Comprehension Passages.

UNIT - V **[09]**

Instructions – Describing – Telephone Etiquette - Listening to fill up forms and gapped texts – Agenda and Minutes of meeting – Check list – Essay Writing – Reading Short texts from Journals and Newspapers.

Total = 45 Periods

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

CO1 : Comprehend and apply the enriched vocabulary, by knowing the basic grammatical structure, in academic and professional contexts.

CO2 : Recognize and use Standard English in diverse situations.

CO3 : Critically interpret by reading a text and comprehend a given text.

CO4 : Compose and write clearly in professional contest.

CO5 : Enhance the listening skill for academic purposes.

Text Books :

1 Dr.P.Rathna, English Work Book – II, VRB Publishers Pvt. Ltd., Chennai, Second Edition, 2016.

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

Reference Books :

1 Dr.S.Sumant, Technical English I, Tata McGraw Hill, Chennai, First Edition, 2016.

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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SEMESTER - II

18MA242 **APPLIED MATHEMATICS** L T P C

(COMMON TO EC AND EE) 3 1 0 4

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

Objectives:

- *To acquire the concepts of Laplace transform and inverse Laplace transform techniques.*
- *To apply the basics of Complex Variables along with classical theorems involving them.*
- *To develop sound knowledge in double, triple integrals.*
- *To provide basic ideas in Fourier series.*
- *To solve the ideas in Fourier Transforms.*

UNIT - I LAPLACE TRANSFORMATION [12]

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

UNIT – II COMPLEX VARIABLES [12]

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

UNIT - III MULTIPLE INTEGRALS [12]

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

UNIT - IV FOURIER SERIES [12]

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

UNIT – V FOURIER TRANSFORMS [12]

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

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

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

CO1 : Able to use the concepts of Laplace and inverse Laplace transform

CO2 : Apply the ideas of analytic functions, conformal mapping and bilinear transformations.

CO3 : Develop their skills in double and triple integrals.

CO4 : Apply the ideas of Fourier series and its applications in the field of engineering.

CO5 : Interpret the concepts of Fourier Transforms.

Text Books :

1. Veerarajan.T , Engineering Mathematics III, Tata McGraw Hill Publications, New Delhi, Fourth edition, 2016.
2. Dr.Grewal B.S, Higher Engineering Mathematics, Tata McGraw Hill Pub. Co, New Delhi , Forty four edition, 2018.

References :

1. Ravish R Singh and Mukul Bhatt, Engineering Mathematics II", McGraw Hill Publications, New Delhi, Third edition 2016.
2. Dr.P.Kandasamy, Dr.Thilagavathy and Dr.K.Gunavathy, Engineering Mathematics , S.Chand publication, New Delhi ,2006.
3. E.Kreyszig Advanced Engineering Mathematics , Wiley Publishers, Tenth edition, Reprint 2017.
4. Veerarajan. T , Engineering Mathematics For semester I and II, Tata McGraw Hill Publications, New Delhi, Third edition, 2015.

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SEMESTER – II

		L	T	P	C
18CH051	**ENGINEERING CHEMISTRY (Common to All Branches)**	3	0	0	3

Prerequisite: *NIL.*

Objectives:

- *To Impart knowledge about the manufacture, properties and uses of advanced engineering materials*
- *To acquaint the students with the basic concepts of corrosion mechanism and its control*
- *To understand the concept of thermodynamics*
- *To gain knowledge about atomic structure and chemical bonding*
- *To make the students conversant with various spectroscopic techniques*

UNIT - I ADVANCED ENGINEERING MATERIALS [09]

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 [09]

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 [09]

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 (Problems) – criteria of spontaneity; Gibb's – Helmholtz equation (Problems) – Clausius - Clapeyron equation; Maxwell's relations – Van't Hoff isotherm and isochore (problems).

UNIT - IV ATOMIC STRUCTURE AND CHEMICAL BONDING [09]

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 [09]

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 (L: 45) = 45 Periods

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

CO1 : Make use of the manufacture, properties and uses of advanced engineering materials.

CO2 : Recognize the knowledge on the concept of corrosion and its control.

CO3 : Assess knowledge about thermodynamics.

CO4 : Rationalize periodic properties such as ionization energy, electron affinity and electro negativity.

CO5 : Recognize the usage of various spectroscopic techniques.

Text Book :

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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SEMESTER - II

18EC214	**ELECTRIC CIRCUITS**	L	T	P	C
		3	0	0	3

Prerequisite: *Engineering Mathematics-I, Engineering Physics*

Objectives:

- *To understand basic Kirchhoff laws and apply for any electric circuits.*
- *To understand network theorems by converting complex circuits into simple circuits to find voltage, current power for DC circuits.*
- *To know the steady state and transient response of RL, RC, and RLC for AC circuits.*
- *To gain knowledge about resonance with its frequency response.*
- *To impart knowledge on the principle of magnetic coupled circuits and three phase network systems.*

UNIT - I DC NETWORK ANALYSIS [09]

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

UNIT - II NETWORK THEOREMS AND DUALITY [09]

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

UNIT - III SINUSOIDAL STEADY STATE ANALYSIS [09]

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

UNIT - IV TRANSIENTS AND RESONANCE IN RLC NETWORKS [09]

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

UNIT - V COUPLED NETWORKS AND THREE PHASE SYSTEMS [09]

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

Total (L: 45) = 45 Periods

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

CO1 : Apply the basic circuital laws to find current and voltage at particular node or branch.

CO2 : Apply network theorems to convert complex circuits into simple circuits to find voltage, current and power for DC circuits.

CO3 : Interpret the circuit response for RL, RC, and RLC for AC circuits with its phasor diagram.

CO4 : Analyze the transient behavior for RL, RC, and RLC for DC and Sinusoidal inputs.

CO5 : Identify the phase response for three phase circuits employing balanced and unbalanced loads.

Text Books :

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

2 David A. Bell, Fundamentals of Electric Circuits, Oxford University press, seventh edition united kingdom 2009.

Reference Books :

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

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

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

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

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

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SEMESTER – II

		L	T	P	C
18CS041	**PROGRAMMING FOR PROBLEM SOLVING** (Common to AU, CE, EC, EE & ME)	3	0	0	3

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

Objectives:

- *To learn the organization of a digital computer and problem solving.*
- *To study basics of C programming.*
- *To discover the knowledge of arrays and strings.*
- *To know the concepts of functions and pointers.*
- *To gain the knowledge of structures, unions and file.*

UNIT - I BASICS OF COMPUTER AND PROBLEM SOLVING [09]

Generation and Classification of Computer – Organization of Digital Computer – Categories of Software – Software Development Life Cycle – Number System and Conversions – Representation of an Algorithm: Pseudo code, Flowchart with examples – Steps in Problem Solving – Problem Solving Strategies.

UNIT - II C PROGRAMMING BASICS [09]

Fundamentals – Structure of a C program – Compilation and Linking processes – Constants, Variables – Data Types – Operators – Expressions – Managing Input and Output operations – Decision Making and Branching – Looping statements – Simple Programs.

UNIT - III ARRAYS AND STRINGS [09]

Arrays: Introduction, One Dimensional Array, Declaration – Initialization of One Dimensional Array, Two-Dimensional Arrays, Initializing Two Dimensional Arrays – Simple Programs. String: Declaring and Initializing String Variables – String handling Functions and Operations.

UNIT - IV FUNCTIONS AND POINTERS [09]

Function: Declaration – Definition – Categories – Pass by Value – Pass by Reference – Recursion – Pointers: Definition – Initialization – Pointers arithmetic – Pointers to Pointers – Pointers and Arrays – Simple Programs.

UNIT - V STRUCTURES AND UNIONS [09]

Structures: Declaration – Definition – Structure within a structure – Union – Storage Classes – Preprocessor Directives – Files: Defining and Opening a file – Closing a file – Input/output operations on files – Command line arguments.

Total (L: 45) = 45 Periods

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

CO1: Identify basics of computer and problem solving.

CO2: Summarize the basics of C programming.

CO3: Design and Implement C programs for arrays and strings.

CO4: Demonstrate efficient programs using functions and pointers

CO5: Implement simple C applications using structures, unions and file.

Text Books :

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

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

References :

1 Ashok N.Kamathane, Computer Programming, Pearson Education, India, Second Edition 2014.

2 Pradip Dey, ManasGhosh, Fundamentals of Computing and Programming in C, Oxford University Press, England First Edition, 2013.

3 Anita Goel and Ajay Mittal, Computer Fundamentals and Programming in C, Dorling Kindersley India Pvt. Ltd., Pearson Education in South Asia, Second Edition, 2013.

4 Nptel.ac.in/courses/106104128/.

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SEMESTER – II

		L	T	P	C
18EC221	**ELECTRIC CIRCUITS LABORATORY**	0	0	3	1

Prerequisites: *Engineering Physics*

Objective:

- *To familiarize the Kirchhoff's laws and apply in any electrical network.*
- *To understand the network theorem concepts and apply in any electrical to reduce the network.*
- *To learn the transient response for DC and AC circuits.*
- *To gain knowledge in series and parallel resonance circuits.*
- *To understand and measure voltage, current, power and power factor using single phase AC circuits*.

List of Experiments:

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

Total (P: 45) = 45 Periods

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

CO1 : Apply KCL, KVL to solve electric circuits and verify with theoretical value.

CO2 : Translate the complex circuit into simple circuit to find voltage, current and power for DC circuits using network theorems and verify with theoretical value.

CO3 : Construct a series and parallel resonant circuit and plot its frequency response.

CO4 : Analyze the transient behavior for RL, RC with DC and sinusoidal input.

CO5 : Analyze single phase AC circuits to measure voltage, current, power and power factor.

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SEMESTER – II

		L	T	P	C
18CH028	**CHEMISTRY LABORATORY**				
	(Common to All Branches)	0	0	3	1

Prerequisite: *NIL*

Objectives:

- *To gain the practical knowledge and hands on experiences of understanding the principle of conductometric titration.*
- *To acquaint the students with the estimation of iron by spectrophotometry.*
- *To analyze the instrumental methods of chemical analysis.*
- *To make the student to acquire practical skills in the determination of water quality parameters through volumetric and instrumental analysis.*
- *To impart knowledge about the theoretical principles of corrosion in metals.*

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 (P: 30) = 30 Periods

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

CO1 : Apply the principle of conductometric titration.

CO2 : Determine the role of pH in quantitative analysis of a solution.

CO3 : Perceive the knowledge of the concentration of Iron by electrochemical methods.

CO4 : Analyze the application of water in various fields.

CO5 : Identify the nature of corrosion process.

Text Book :

1 Department of Chemistry Staff members, Chemistry Laboratory Manual, K.S.R. College of Engineering, Tiruchengode, Third Edition, 2018.

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

Reference Books :

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

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

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

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

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SEMESTER – II

		L	T	P	C
18CS027	**PROGRAMMING FOR PROBLEM SOLVING LABORATORY** (Common to AU, CE, EC, EE & ME)	0	0	3	1

Prerequisite: No prerequisites are needed for enrolling into the course

Objective:

- *To study and identification of PC hardware and interfacing components.*
- *To learn the basic concept of creating a table, flow chart, mail merge in a word document.*
- *To know spreadsheet for creating the charts and apply formulas and functions.*
- *To get knowledge of power point presentation with animations and generate a report in MS access*
- *To gain the practical knowledge of how to implement C programs for simple application.*

LIST OF EXPERIMENTS

1. Study and Identification of PC Motherboard and its interfacing components
2. Prepare a Bio-data using MS Word with appropriate page, text and table formatting options and send the same to many recipients using mail merge.
3. Prepare a mark sheet with five subjects for five students in MS Excel File using Formulas, Functions and charts.
4. 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.

Implement the following program using Raptor tool and C

5. Generate Fibonacci series and compute factorial for a given number using looping statements. (While and do…while).
6. Consider the five subjects Physics, Chemistry, Biology, Mathematics and Computer. Calculate the average and grade according to following:
   Percentage >= 90%: Grade A
   Percentage >= 80%: Grade B
   Percentage >= 70%: Grade C
   Percentage >= 60%: Grade D
   Percentage >= 40%: Grade E
   Percentage < 40%: Grade F Using if … else & switch
7. Declare an array with N elements then delete given element from the array and display.
8. Maintain a record of 'n' employee details using an array of structures with four fields (Employee ID, Name, salary and designation). Assume appropriate data type for each field. Print the employee details.
9. Generate prime factors of an integer using functions.
10. Implement the following using pointer:
    i) Arithmetic operations ii) Swapping of two variables.

Total : 45 Periods

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

CO1: Create a table, flow chart, mail merge and apply text manipulation in a word document

CO2: Construct a spreadsheet for creating the charts and apply formulas and functions.

CO3: Design power point presentation with animations and generate a report in MS access.

CO4: Apply good programming design methods for program development.

CO5: Design and implement C programs for simple applications.

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SEMESTER – II

		L	T	P	C
18MC051	**CONSTITUTION OF INDIA** (Common to all branches)	3	0	0	0

Prerequisite: *Nil*

Objectives:

- *To promote* harmony throughout the nation.
- *To enables the supreme law and helps to* maintain integrity in the society *and to* promote unity among the citizens *to build a great nation.*
- *To learn about the fundamentals of our Indian constitution and their structure.*
- *To understand the formation of state government, union government, Indian Judiciary System and Election Commission.*
- *To provides a way of life. It includes fraternity, liberty, and equality as the notion of a happy life and which cannot be taken from each other.*

UNIT - I INTRODUCTION [09]

Historical Background – Significance of the Constitution - Making of the constitution – Constituent Assembly of India - Role of the constituent Assembly - Salient features of the constitution - Nature of Federal system.

UNIT - II FUNDAMENTAL RIGHTS AND DUTIES [09]

Preamble – Citizenship – Fundamental Rights – Fundamental Duties and Responsibilities – Directive Principles of State Policy - Procedure for Amendment.

UNIT - III UNION GOVERNMENT [09]

Union Government – President – Vice President – Prime Minister – Powers and Duties – Cabinet – Council of Ministers – Parliament - Functions – Lok Sabha – Rajya Sabha – Role of the Speaker.

UNIT - IV STATE GOVERNMENT [09]

State Government – The Governor – Council of Ministers and Chief Minister – Powers and Functions – State legislature – Local Governance.

UNIT - V JUDICIAL SYSTEM AND ELECTION COMMISION [09]

The Indian Judicial System – Supreme Court – High Courts of India – Judicial Review – Election Commission of India – Duties and Responsibilities – State Election Commissions – Roles and functions.

Total (L: 45) = 45 Periods

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

CO1 : Categorize the emergence and evolution of Indian Constitution.
CO2 : Comprehend the fundamental rights and duties of the Indian citizen.
CO3 : Recognize and evaluate the Indian Political scenario amidst the emerging challenges.
CO4 : Analyze the organs of the state in the contemporary scenario.
CO5 : Asses about the Indian judiciary system and working of Election Commission

Text Book :

1 P.M. Bakshi,"The Constitution of India ", Universal law Publishing, New Delhi, fifteenth Edition, 2018.

2 D.D.Basu, "Introduction to the constitution india", Lexis nexis Publisher, New Delhi, second Edition, 2015.

Reference Books :

1 Brij Kishore sharma,"Introduction to the constitution India", PHI Learning Pvt. Ltd, New Delhi, seventh Edition, 2015.

2 Sharma B. K, "Introduction to the Constitution of India", PHI Learning Pvt. Ltd, New Delhi, sixth Edition, 2011.

3 M. Laxmikanth, "Indian Polity", Tata McGraw Hill, New Delhi, sixth Edition, 2017.

4 Prof. Mahendra Pal Singh, "Constitution of India", Eastern Book company, Lucknow, thirteenth Edition, 2015.

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SEMESTER - III

18MA344	**DIFFERENTIAL EQUATIONS AND NUMERICAL METHODS**	L T P C
	(COMMON TO ECE AND EEE)	3 1 0 4

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

Objectives:

- *To acquire knowledge in solving partial differential equation.*
- *To describe the concepts of solving polynomials and transcendental equations and the system of linear equation.*
- *To handle large data's using interpolation.*
- *To study the concepts of numerical differentiation and integration.*
- *To solve the initial value problems of ordinary differential equations numerically.*

UNIT - I PARTIAL DIFFERENTIAL EQUATIONS [12]

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

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

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

UNIT - III INTERPOLATION AND APPROXIMATION [12]

Lagrange's interpolation and Divided difference method for solving unequal intervals – Newton's forward and backward difference interpolation techniques (equal intervals) - Cubic Spline.

UNIT - IV NUMERICAL DIFFERENTIATION AND INTEGRATION [12]

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

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

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

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

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

CO1 : Apply the concepts of partial differential equations.

CO2 : Enable to solve polynomial, transcendental equations, simultaneous linear equations numerically

CO3 : Able to apply the Interpolation techniques.

CO4 : Developing their skills in numerical differentiation and integration.

CO5 : Determine the numerical solutions to boundary value problems.

Text Books :

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

References :

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

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SEMESTER – III

		L	T	P	C
18CS332	**C++ AND DATA STRUCTURES**	3	0	0	3

Prerequisite: *Basic Knowledge of C Programming*

Objectives:

- *To study the basics of object-oriented programming.*
- *To learn the concepts of constructors and inheritance*
- *To gain the knowledge of linear data structures and its applications.*
- *To know the design and applications of non-linear tree data structures.*
- *To outline the basics of searching and sorting algorithms.*

UNIT - I **FUNDAMENTALS OF C++** **[09]**

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

UNIT - II **CONSTRUCTORS AND INHERITANCE** **[09]**

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

UNIT - III **DATA STRUCTURES AND ALGORITHMS** **[09]**

Analysis of Algorithms – Abstract Data Type – Lists – Stacks and Queues – Priority Queues – Binary Heap – Application – Heaps – Hashing – Hash Tables without Linked Lists.

UNIT - IV **NON LINEAR DATA STRUCTURES** **[09]**

Trees – Binary trees – Traversals – Binary Search Tree – AVL trees – Graph Algorithms – Topological sort – Shortest Path Algorithm – Dijiktras Algorithm – Minimum Spanning Tree – Prim's and Kruskal's algorithms.

UNIT - V **SORTING AND SEARCHING** **[09]**

Sorting – Bubble Sort – Insertion Sort – Shell Sort – Heap Sort – Merge Sort – Quick Sort – Bucket Sort – Searching techniques – Linear Search – Binary Search.

Total (L: 45) = 45 Periods

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

CO1: Outline the concepts of object oriented programming.

CO2: Demonstrate the ideas of constructors, inheritance and operator overloading.

CO3: Analyze the concept of list ADT and its implementation.

CO4: Summarize the knowledge in binary, binary search tree with its operations, AVL tree.

CO5: Design the notions of shortest path and minimum spanning tree algorithms.

Text Books :

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

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

References :

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

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

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

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

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SEMESTER – III

18EC313	**ELECTRONIC DEVICES**	L	T	P	C
		3	0	0	3

Prerequisite: *Electric Circuits*

Objectives:

- *To have basic Knowledge of semiconductor materials and apply for PN diode.*
- *To understand the amplifier design using voltage divider bias with its frequency response.*
- *To gain knowledge in various FET devices with its characteristics curve.*
- *To familiarize the rectifiers, filters and regulators circuits for various applications.*
- *To know the characteristics and applications of special diodes and triggering devices.*

UNIT – I SEMICONDUCTOR DIODES [09]

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

UNIT - II TRANSISTORS [09]

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

UNIT - III FET [09]

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

UNIT - IV RECTIFIERS AND POWER SUPPLIES [09]

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

UNIT - V SPECIAL SEMICONDUCTOR DEVICES [09]

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

Total (L: 45) = 45 Periods

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

CO1 : Interpret the operations of semiconductor devices using principle of solid state materials.

CO2 : Construct an amplifier circuit with its frequency response for bipolar transistors.

CO3 : Classify the various FET devices with its characteristics curve and its applications.

CO4 : Construct a suitable circuit for SMPS using rectifiers, filters and regulators.

CO5 : Illustrate the relationship between voltage and current for special diodes and triggering devices.

Text Books :

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

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

Reference Books :

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

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

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

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

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

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SEMESTER - III

		L	T	P	C
18EC314	**DIGITAL ELECTRONICS**	3	0	0	3

Prerequisite: *Nil*

Objectives:

- *To outline the basic postulates of Boolean algebra and methods for simplifying boolean expressions*
- *To develop a design procedure for combinational circuits*
- *To be exposed to design using PLD and concepts of memory.*
- *To understand the concepts of latches, flip-flops and counters*
- *To formulate a design procedure for sequential circuits and develop HDL models for digital circuits*

UNIT - I MINIMIZATION TECHNIQUES AND LOGIC GATES [09]

Minimization Techniques: Boolean postulates and laws - De-Morgan‟s theorem - Principle of duality - Boolean expression: Minterm, maxterm, Sum of Products, Product of Sums - Minimization of boolean expression: Algebraic method, Karnaugh map method, Don't care conditions, Quine – McCluskey method.

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

UNIT - II COMBINATIONAL CIRCUITS [09]

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

UNIT - III MEMORY AND PROGRAMMABLE LOGIC DEVICES [09]

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

UNIT - IV SEQUENTIAL CIRCUITS [09]

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

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

UNIT - V SYNCHRONOUS AND ASYNCHRONOUS SEQUENTIAL CIRCUITS [09]

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

Total (L: 45) = 45 Periods

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

CO1: Analyze *different methods used for simplification of boolean expressions.*

CO2: Design *and implement combinational circuits.*

CO3 : *Illustrate the nomenclature and technology in memory devices: ROM, RAM, PROM, PLD*

CO4 : *Analyze sequential digital circuits like flip-flops, registers and counters*

CO5 : *Formulate a design procedure for sequential circuits and develop HDL models for digital circuits*

Text Books :

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

2 Donald P.Leach, Albert Paul Malvino and Goutam Saha, Digital Principles and Applications, McGraw Hill Education, Eigth edition, 2015.

3 Charles H.Roth, Fundamentals of Logic Design, Thomson Learning, Fifth edition 2011.

Reference Books :

1 John F. Wakerly, Digital Design Principles and Practices, Pearson Education, Ninth Impression, 2013.
2 John.M Yarbrough, Digital Logic Applications and Design, Thomson Learning, Ninth Reprint, 2012.
3 Donald D.Givone, Digital Principles and Design, Tata McGraw, Twenty First, Reprint 2012.
4 Soumitra Kumar Mandal, Digital Electronics Principles and Applications, McGraw Hill, Seventh Reprint, 2014.
5 Stephen Brown, Zvonko Vranesic, Fundamentals of Digital Logic with VHDL Design, TMH, Third edition 2012
6 NPTEL Course Link:http://nptel.ac.in/courses/117106086

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SEMESTER - III

18EC315	**ELECTROMAGNETIC THEORY**	L	T	P	C
		3	1	0	4

Prerequisite: *Nil*

Objectives:

- *To understand the concepts of fields and potentials due to static charges.*
- *To learn the principles of static magnetic fields.*
- *To study electric and magnetic fields in materials.*
- *To analyze the relation between fields under time varying situations.*
- *To familiarize the principles of propagation of uniform plane waves.*

UNIT - I STATIC ELECTRIC FIELD [12]

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

UNIT - II STATIC MAGNETIC FIELD [12]

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

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

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

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

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

UNIT - V ELECTROMAGNETIC WAVES [12]

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

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

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

CO1 : Solve static electric field for various types of static charges and their potentials.

CO2 : Apply basic static magnetic field laws to find magnetic field intensity for various types of magnetic charges.

CO3 : Describe the interaction of electric/magnetic fields with materials and solve simple electrostatic and magneto static boundary value problems.

CO4 : Analyze the behavior of time varying field using Maxwell's equation and derive Maxwell's equation from fundamental laws and poynting vector.

CO5 : Apply the evaluation of wave equation from Maxwell's equation for different mediums with different boundaries.

Text Books :

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

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

Reference Books :

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

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

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

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

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

6 NPTEL Course Link: http://nptel.ac.in/courses/115101005/

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SEMESTER - III

18EE331	**ELECTRICAL MACHINES**	L	T	P	C
		3	0	0	3

Prerequisite: *Nil*

Objective:

- *To understand the construction, operation and characteristics of various types of DC machines.*
- *To gain knowledge about the construction, working principle and characteristics of transformers.*
- *To learn the construction, working and performance characteristics of single and three phase induction motor.*
- To familiarize the constructional details and operation of the Synchronous machines
- *To understand the operation and performance of special machines.*

UNIT - I D.C. MACHINES [09]

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

UNIT - II TRANSFORMERS [09]

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

UNIT - II INDUCTION MOTORS [09]

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

UNIT - IV SYNCHRONOUS MACHINES [09]

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

UNIT - V SPECIAL MACHNIES [09]

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

Total (L: 45) = 45 Periods

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

CO1 : *Explain the construction, operating principle, performance, starting and speed control of DC machines.*

CO2 : *Demonstrate the construction, working principle and performance of transformers.*

CO3 : *Explain the constructional details, characteristics & starting methods of induction motor.*

CO4 : *Describe the constructional details, regulation characteristics and starting methods of synchronous machines.*

CO5 : *Explain the working principle of special electrical machines.*

Text Books :

1 Nagrath I.J and Kothari D. P., Electric Machines, Tata McGraw Hill Publishing Company Ltd, New Delhi, Fourth Edition, 2012.

2 B L Theraja and AK Theraja, A Textbook of Electrical Technology: Volume II AC and DC Machines, S. Chand & Co Ltd, New Delhi, Twenty-third Edition, 1959.

Reference Books :

1 A.E. Fitzgerald, Charles kingslyJ r, Stephen D. Umans, Electric Machinery, Tata McCraw Hill Publishing Company Ltd, New Delhi, Seventh edition 2013.

2 K.Murugesh Kumar, Electric Machines , Vikas publishing house Pvt Ltd , New Delhi, First edition,2003.

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

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

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SEMESTER - III

		L	T	P	C
18CS326	**C++ and DATA STRUCTURES LABORATORY**	0	0	3	1

Prerequisite: *Basic Knowledge in C Programming*

Objective:

- *To implement various concepts of OOPs using C++.*
- *To develop programming skill on linear and non-linear data structures.*
- *To learn the various tree structures.*
- *To get knowledge about various applications of linear and non-linear data structures.*
- *To familiarize with various sorting techniques.*

List of Experiments:

C++:

1. Write a C++ program to create a class for student to get and print details of a student.
2. Write a C++ program for counting function calls using static members
3. Write a C++ program for adding two complex numbers using operator overloading with and without friend function.
4. Write a C++ program for calculating factorial of a given number using copy constructor
5. Write a C++ program to read and display of student details using multiple and multilevel inheritance
6. Write a C++ program to read and display of book details using virtual function (run-time polymorphism)

Data Structures:

7. Write a C program that uses functions to perform the following.
    a) Create a singly linked list of integers.
    b) Insert a given integer to the above linked list.
    c) Delete a given integer from the above linked list.
    d) Display the contents of the above list after i) insertion ii) deletion.
8. Write a C program that uses functions to perform the following.
    a) Create a doubly linked list of integers.
    b) Insert a given integer to the above doubly linked list.
    c) Delete a given integer from the above doubly linked list.
    d) Display the contents of the above list after i) insertion ii) deletion.
9. Write a C program that uses stack operations to convert a given infix expression into its postfix equivalent, implement the stack using an array.
10. Design and develop a program in C to simulate the working of a queue of integers using an array. Provide the following operations: i) insertion ii) deletion iii)display
11. Develop a C program to generate expression tree and display it in the following order : i)Preorder ii) Postorder iii) Inorder
12. Write C programs for implementing the following sorting methods to arrange a list of integers in ascending order: a) Bubble sort b) Merge sort

Total (P: 45) = 45 Periods

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

CO1 : *Develop simple programs using class and objects concepts.*

CO2 : *Demonstrate the concepts of constructors, inheritance, operator overloading and friend function.*

CO3 : *Summarize the concept of singly and doubly linked list.*

CO4 : *Analyze the applications of stack and queue.*

CO5 : *Construct the sorting algorithm techniques.*

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SEMESTER – III

		L	T	P	C
18EC322	**ELECTRONIC DEVICES LABORATORY**	0	0	3	1

Prerequisite: *Electric Circuits laboratory*

Objective:

- *To familiarize the VI characteristics of diodes and transistors (BJT& FET).*
- *To understand the VI characteristics of triggering devices.*
- *To design an amplifier using voltage divider bias for the given specification and find its half power frequencies.*
- *To construct a rectifier, filter and regulator circuits for various applications.*
- *To know the characteristics of diodes and transistor using SPICE tool.*

List of Experiments:

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

Total (P: 45) = 45 Periods

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

CO1 : *Demonstrate the characteristics of diodes and transistors (BJT& FET).*

CO2 : *Demonstrate the characteristics of triggering devices.*

CO3 : *Analyze an amplifier using voltage divider bias for the given specification and able to plot frequency response of the circuit.*

CO4 : *Construct a rectifier, filter and regulator circuits for various applications.*

CO5 : *Interpret the characteristics of diode and transistor using SPICE tool and simulate the same.*

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SEMESTER - III

		L	T	P	C
18EC323	**DIGITAL ELECTRONICS LABORATORY**	0	0	3	1

Prerequisites: *Nil*

Objectives:

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

List of Experiments:

1. Realization of gates using universal gates.
2. Construction of simple arithmetic circuits- adder and subtractor.
3. Construction of Code converters using logic gates
   i). BCD to Excess-3 code and vice versa
   ii). Binary to Gray code and vice-versa
4. Construction of parity checker, generator and magnitude comparator circuits.
5. Construction of Multiplexer, Demultiplexer, Encoder and Decoder using logic gates.
6. Construct and verify the functionality of 4-bit Ripple counter and Modulo N counter.
7. Design and implementation of 3-bit synchronous up / down counter.
8. Implementation of SISO, SIPO, PISO and PIPO shift registers using flip-flops.
9. Simulation of combinational logic circuits and sequential logic circuits using HDL.
10. Design a Digital System. (Any Hardware/ Simulation circuit).

Total (P: 45) = 45 Periods

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

CO1 : *Analyze the concept of universal logic gates*

CO2 : *Construct simple* arithmetic circuits

CO3 : *Construct basic combinational circuits and verify their functionalities*

CO4 : *Apply the design procedure to design basic sequential circuits such as counters and shift registers*

CO5 : *Develop HDL models for combinational and sequential circuits*

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SEMESTER - III

		L	T	P	C
18HR351	**CAREER DEVELOPMENT SKILLS I** (Common to all Branches)	0	2	0	0

Prerequisite: No prerequisites are needed for enrolling into the course

Objectives:

- *To help individuals cope with continued changes in the world of work.*
- *To help individuals understand their unique abilities, interests, and aptitudes.*
- *Ability to speak, express and interact in the society and place of study.*
- *Critically interpret and comprehend a given text.*
- *Ability to make extempore speech.*

UNIT - I EFFECTIVE ENGLISH - SPOKEN ENGLISH [06]

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

UNIT - II ESSENTIAL COMMUNICATION [06]

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

UNIT - III WRITTEN COMMUNICATION - PART 1 [06]

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

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

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

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

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

Total = 30 Periods

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

CO1: Have competent knowledge on grammar with an understanding of its basic rules.
CO2: Communicate effectively and enhance interpersonal skills with renewed self – confidence.
CO3: Construct sentence in English and make correction.
CO4: Perform oral communication in any formal situation.
CO5: Develop their LSRW skills.

Text Books :

1 Anne Laws, Writing Skills, Orient Black Swan. Hyderabad, First Edition, 2011.
2 Sarah Freeman, Written Communication in English, Orient Black Swan, Hyderabad, First Edition, 2015

Reference Books :

1 M Ashra Rizvi, Effective Technical Communication, Tata McGraw HILL, New Delhi, First Edition, 2005.
2 Raj N Bakshmi, English Grammar Practice, Orient Black Swan, Hyderabad, First Edition, 2009.
3 Norman Lewis. W.R., "Word Power Made Easy", Goyal Publications
4 Thakur K B Sinha, Enrich Your English, Vijay Nicole, Chennai, First Edition, 2005.

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SEMESTER - IV

18MA433	**PROBABILITY AND STOCHASTIC PROCESSES**	L	T	P	C
		3	0	0	3

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

Objectives:

- *To study the basic concepts of probability and distributions.*
- *To relate discrete and continuous random variables*
- *To classify the types of random processes*
- *To comprehend about the correlation functions and spectral densities*
- *To apply the technique of white noise in the field of Engineering*

UNIT - I RANDOM VARIABLES [09]

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

UNIT – II TWO DIMENSIONAL RANDOM VARIABLES [09]

Joint distributions – marginal and conditional distribution – Covariance – Correlation and Regression analysis – Central limit theorem (for independent and identically distributed random variables)

UNIT - III CLASSIFICATION OF RANDOM PROCESSES [09]

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

UNIT - IV CORRELATION AND SPECTRAL DENSITIES [09]

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

UNIT – V LINEAR SYSTEMS WITH RANDOM INPUTS [09]

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

Total (L: 45) = 45 Periods

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

CO1 : *Explain the concepts of one dimensional discrete and continuous random variables for Engineering Applications.*

CO2 : *Analyze the importance of two dimensional random variables.*

CO3 : *Gain the knowledge of Stationary, Markov, Poisson, Sine wave processes.*

CO4 : *Examine the relationship between spectral density and correlation function*

CO5 : *Design and implement the concept of linear system and white noise.*

Text Books :

1. Oliver C. Ibe, Fundamentals of Applied probability and Random processes, Elsevier, Fifth edition, 2017.
2. T.Veerarajan, Probability, statistics and Random processes ,Tata McGraw-Hill Publications, Third edition,2008

References :

1. Leon-Garcia,A, Probability and Random Processes for Electrical Engineering, Pearson Education Asia, sixth Edition, 2016.
2. Yates and D.J. Goodman, Probability and Stochastic Processes, John Wiley and Sons, sixth edition, 2017.
3. Miller. S.L and Childers. S.L, Probability and Random Processes with applications to Signal Processing and Communications, Elsevier Inc., fifth edition, 2016
4. https://www.stat.cmu.edu/~cshalizi/754/

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SEMESTER - IV

18EC412	**SIGNALS AND SYSTEMS**	L	T	P	C
		3	1	0	4

Prerequisites : *Applied Mathematics, Differential Equations and Numerical Methods*

Objectives:

- *To identify with the fundamental characteristics of signals and systems.*
- *To learn about Fourier series, Fourier transform, Laplace transform and their properties.*
- *To gain knowledge about LTI CT systems in the time domain and various transform domains.*
- *To learn about Z transform, DTFT and their properties.*
- *To gain knowledge about LTI DT systems in the time domain and various transform domains.*

UNIT - I CLASSIFICATION OF SIGNALS AND SYSTEMS [12]

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

UNIT - II ANALYSIS OF CONTINUOUS TIME SIGNALS [12]

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

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

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

UNIT - IV ANALYSIS OF DISCRETE TIME SIGNALS [12]

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

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

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

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

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

CO1 : *Illustrate mathematical description and representation of continuous and discrete time signals and systems.*

CO2 : *Apply Fourier series, Fourier transform and Laplace transform for continuous time signals.*

CO3 : *Examine Continuous time LTI systems using Fourier series, Fourier transform and Laplace transform.*

CO4 : *Apply DTFT and Z- transform for discrete-time signals.*

CO5 : *Examine Discrete time LTI systems using DTFT and Z-Transforms.*

Text Books :

1 Allan V.Oppenheim, S.Wilsky and S.H.Nawab, Signals and Systems, Pearson Education, New York, Second Edition, 2017.

2 Edward W Kamen and Bonnie's Heck, Fundamentals of Signals and Systems, Pearson Education, New York, Third Edition, 2014.

Reference Books :

1 H P Hsu, Rakesh Ranjan Signals and Systems, Schaums Outlines, Tata McGraw Hill, New Delhi, Indian Reprint 2017.

2 P.RameshBabu, R.Anandanatarajan, Signals and Systems, Scitech Publications, Chennai, Fourth Edition, Reprint 2015.

3 Simon Haykins and Barry Van Veen, Signals and Systems, John Wiley & Sons, United States, Second Edition, 2012.

4 Robert A. Gabel and Richard A.Roberts, Signals & Linear Systems, John Wiley, United States, Third Edition, 2014.

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

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SEMESTER – IV

18EC413 **TRANSMISSION LINES AND WAVE GUIDES**

L	T	P	C
3	0	0	3

Prerequisite: *Engineering Electromagnetics*

Objectives:

- *To learn the fundamentals of transmission lines.*
- *To understand the distortion associated in transmission lines.*
- *To familiarize transmission lines at radio frequencies.*
- *To analyze propagation of signals through parallel planes and waveguides.*
- *To describe the working principle of resonators and its design procedures.*

UNIT - I FUNDAMENTALS OF TRANSMISSION LINES [09]

The neper - The decibel - Characteristic impedance of symmetrical networks - Current and voltage ratios - Propagation constant - Properties of symmetrical networks - A line of cascaded T sections - Equivalent circuit - General solution of the transmission line - Physical significance of the equations - The infinite line.

UNIT - II TRANSMISSION LINE THEORY [09]

Wavelength - Velocity of propagation - Distortion line - Distortion less line condition - Loading - The telephone cable - Loaded telephone cable – Campbel's formula - Open and short circuited lines - Input impedance of open and short circuited lines - Reflection on a line not terminated in Z0 - Reflection coefficient - Reflection factor and reflection loss - Insertion loss - Standing waves - Nodes - Standing wave ratio.

UNIT - III THE LINE AT RADIO FREQUENCY [09]

Parameters of open wire line and coaxial cable at RF - Line constants for dissipation - Voltages and currents on the dissipation less line - Power and impedance measurement on lines - Section of transmission line: $\lambda/2$, $\lambda/4$, $\lambda/8$ line - Impedance matching - Single and double stub matching - Circle diagram - Smith chart and its applications - Stub matching problems using smith chart.

UNIT - IV GUIDED WAVES BETWEEN PARALLEL PLANES [09]

Waves between parallel planes of perfect conductors - Field components of TM, TE & TEM waves between parallel planes - Manner of wave travel - Characteristics of TM, TE & TEM waves - Wave impedance - Attenuation factor of TM, TE & TEM waves.

UNIT - V WAVEGUIDES AND RESONANT CAVITIES [09]

Waves between rectangular waveguide - TM and TE waves in rectangular guide - Bessel functions - Waves between circular waveguide - TM and TE waves in circular waveguide - Characteristics of TM and TE waves in rectangular and circular wave guides - Excitation of wave guides - Resonant cavities - Rectangular resonant cavity - Q factor of a rectangular cavity resonator for TE101 mode.

Total (L: 45) = 45 Periods

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

CO1: Develop transmission line concepts from filter theory.
CO2: Discuss the propagation characteristics of signals in transmission lines.
CO3: Describe the signal propagation at radio frequencies.
CO4: Analyze signal propagation in parallel planes.
CO5: Analyze signal propagation in waveguides and cavity resonator.

Text Books :

1 John D. Ryder, Networks, Lines and Fields, Prentice Hall of India, Second edition, 2015.

2 E.C.Jordan, K.G. Balmain: EM Waves and Radiating Systems, Prentice Hall of India, Second edition, 2011.

Reference Books :

1 G S N Raju, Electromagnetic Field Theory and Transmission Lines, Pearson Education, Singapore, First edition, 2012.

2 S.F.Mahmoud, Electromagnetic Waveguides Theory and Applications, Peter Peregrinus ltd, England, First edition, 2001.

3 B.Somanathan Nair, Transmission Lines and wave guides, Pearson Education, Bengaluru, First edition, 2011.

4 P.Baskaran, Transmission Lines and wave guides, Scitech Publications, Chennai, First edition, 2015.

5 NPTEL Course Link: http://nptel.ac.in/courses/115101005/

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SEMESTER – IV

		L	T	P	C
18EC414	**ELECTRONIC CIRCUITS**	3	0	0	3

Prerequisite: *Electronic Devices*

Objectives:

- *To learn various types of power amplifier and calculate its efficiency.*
- *To know the concept of various types of feedback and design negative feedback amplifiers.*
- *To study about different oscillator circuits.*
- *To understand various types of tuned amplifier.*
- *To gain knowledge on wave shaping circuits and multivibrators for different applications.*

UNIT - I LARGE SIGNAL AMPLIFIERS [09]

Classification of amplifiers – RC coupled Class A amplifier – Transformer coupled class A amplifier, efficiency – Second and higher order harmonic distortions – Class B amplifier, push–pull amplifier and efficiency, complementary symmetry and efficiency – Distortion in amplifiers – Class C, Class D and Class E amplifiers – Thermal stability and heatsink.

UNIT - II FEEDBACK AMPLIFIERS [09]

Introduction – Classification – Block diagram – Loop gain – Gain with feedback – Effects of negative feedback: Sensitivity, desensitivity of gain, Cut–off frequencies, Distortion, Noise, Input impedance and output impedance with feedback – Negative feedback topologies – Method of identifying feedback topology and feedback factor – Nyquist criterion for stability of feedback amplifiers.

UNIT - III TUNED AMPLIFIERS [09]

Coil losses – Loaded and unloaded Q of tank circuit – Small signal tuned amplifier – Analysis of capacitor coupled single tuned and double tuned amplifiers – Effect of cascading single tuned and double tuned amplifiers on bandwidth–Stagger tuned amplifier – Large signal tuned amplifier: Class C tuned amplifier, efficiency and applications – Stability of tuned amplifier: Neutralization, Hazeltine neutralization method.

UNIT - IV OSCILLATORS [09]

Barkhausen criterion – Mechanism for start of oscillation and stabilization of amplitude – Classification – General form of an LC oscillator – LC oscillators: Hartley, Colpitts and Clapp oscillators – RC oscillators: Phase shift, Wien bridge and Twin-T oscillators – Frequency range of RC and LC oscillators – Quartz crystal – Miller and Pierce crystal oscillators – Frequency stability of oscillators.

Blocking Oscillators: Free running blocking oscillator – Monostable blocking oscillator with base timing and emitter timing.

UNIT - V MULTIVIBRATORS AND TIME BASE CIRCUITS [09]

RC, RL Integrator and Differentiator circuits – Diode: Clippers and Clampers – Astable, monostable and Bistable multivibrators – Triggering methods for bistable multivibrator – Schmitt trigger circuit – UJT saw tooth waveform generator –Time base circuits.

Total (L: 45) = 45 Periods

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

CO1: Classify a power amplifier based on the Q point and calculate its efficiency.
CO2: Compare various types of negative feedback amplifiers.
CO3: Construct different types of oscillator circuits using transistor.
CO4: Design different types of tuned amplifiers.
CO5: Construct wave shaping circuits and multivibrators for different applications.

Text Books :

1 Adel S.Sedra , Kenneth C.Smith, Micro Electronic Circuits: Theory and Applications, Oxford University Press, England, Seventh Edition 2017.

2 Anil K Maini, Varsha Agarwal, Electronic Devices & Circuits, John Wiley India, New Delhi, Second Edition 2015.

Reference Books :

1 Robert L. Boylestad and Louis Nashelsky, Electronic Devices and Circuit Theory, Pearson, London, Eleventh Edition, 2015.

2 David A. Bell, Electronic Devices and Circuits, Oxford University Press, England, Fifth Edition, 2008.

3 Millman.J. and Halkias C.C, Integrated Electronics, McGraw Hill Education, New York City, Second Edition, 2017.

4 Schilling.D.L and Belove.C, Electronic Circuits" McGraw Hill Education, New York City, Third Edition, 2002.

5 NPTEL Course Link: http://nptel.ac.in/courses/117108107/32

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SEMESTER - IV

18EC415	LINEAR INTEGRATED CIRCUITS	L	T	P	C
		3	0	0	3

Prerequisite: *Electronic Devices*

Objectives:

- *To understand the fabrication of integrated circuits.*
- *To learn the linear and non-linear applications of operational amplifiers.*
- *To study the analog multipliers and PLL.*
- *To learn the concepts of DAC and ADC.*
- *To know the special function ICs.*

UNIT - I MONOLITHIC IC [09]

Advantages of ICs over discrete components – Manufacturing process of monolithic ICs – Construction of monolithic bipolar transistor – Monolithic diodes – Integrated resistors – Monolithic capacitors – Inductors – Current mirror and current sources – BJT Differential amplifier with active loads – General operational amplifier stages – DC and AC characteristics – Open and closed loop configurations.

UNIT - II APPLICATIONS OF OPERATIONAL AMPLIFIERS [09]

Sign changer – Scale changer – Phase shift circuits – Voltage follower – V-to-I and I-to-V converters – Adder – Subtractor – Instrumentation amplifier – Integrator – Differentiator – Logarithmic amplifier – Antilogarithmic amplifier – Comparators, schmitt trigger – Precision rectifier, peak detector, clipper and clamper – First order low-pass, high-pass filters – Phase shift and wien bridge oscillator – Astable and monostable multivibrator

UNIT - III ANALOG MULTIPLIER AND PLL [09]

Analog multiplier using emitter coupled transistor pair – Gilbert multiplier cell – Variable transconductance technique - Analog multiplier IC and their applications – PLL: Closed loop analysis, voltage controlled oscillator, monolithic PLL IC 565 - Applications of PLL: AM/FM detection, FSK modulation/demodulation and frequency synthesizing.

UNIT - IV DAC AND ADC [09]

Analog and digital data conversions - D/A converter: Specifications, Types: Weighted resistor type, R-2R ladder type, voltage and current mode R -2R ladder types – Switches for D/A converters –A/D Converters: Specifications, Types: Flash, successive approximation, single slope, dual slope.

UNIT - V SPECIAL FUNCTION ICs [09]

Timer IC 555 - IC voltage regulators – Three terminal fixed and adjustable voltage regulators – IC 723 general purpose regulator – Monolithic switching regulator – Switched capacitor filter IC MF10 –ICL8038 function generator - Audio power amplifier – Video amplifier – Isolation amplifier – Opto-couplers and fibre optic IC.

Total (L: 45) = 45 Periods

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

CO1: Interpret the different steps involved in fabrication of IC's and analyze the DC and AC characteristics of OP-AMP.
CO2: Build various operational amplifier circuits.
CO3: Explain the analog multiplier and PLL circuits.
CO4: Describe the working principle of ADC and DAC circuits.
CO5: Describe the special function ICs.

Text Books :

1 Sergio Franco, Design with Operational Amplifiers and Analog Integrated Circuits, TMH, New Delhi, Fourth Edition, 2017.

2 D. Roy Choudhry and Shail Jain, Linear Integrated Circuits, New Age International Pvt. Ltd , Bengaluru, Fifth Edition, 2018.

Reference Books :

1 S. Salivahanan & V.S. Kanchana Bhaskaran, Linear Integrated Circuits, TMH, New Delhi, Third Edition, 2018.

2 Ramakant A. Gayakwad, OP- AMP and Linear ICs, Prentice Hall, United States, Fourth Edition, 2009.

3 Gray and Meyer, Analysis and Design of Analog Integrated Circuits, Wiley International, United States, Fifth Edition, 2009.

4 B.S. Sonde, Introduction to System Design using Integrated Circuits, New Age Pub, Bengaluru, Second Edition, 2013.

5 NPTEL Course Link:http://nptel.ac.in/video.php?subjectId=108106068.

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SEMESTER – IV

		L	T	P	C
18EC416	**MICROPROCESSORS AND MICROCONTROLLERS**	3	0	0	3

Prerequisite: *Nil*

Objectives:

- *To understand the basic concepts and programming of 8085 microprocessor.*
- *To gain the basic concepts and programming of 8086 microprocessor.*
- *To understand the operations of peripheral interfacing.*
- *To familiarize 8051 microcontroller architecture and programming.*
- *To familiarize the microprocessors and microcontroller applications.*

UNIT - I **8 BIT MICROPROCESSOR ARCHITECTURE AND PROGRAMMING** **[09]**

Evolution – Introduction: Address, data and control bus, Clock generation – 8085: Hardware architecture, addressing modes, instruction set, timing diagrams, interrupts, assembly language programming.

UNIT - II **16 BIT MICROPROCESSOR ARCHITECTURE AND PROGRAMMING** **[09]**

8086: Hardware architecture, signals, addressing modes, maximum and minimum mode configurations, assembler directives, instruction set, timing diagram, interrupts, assembly language programming.

UNIT - III **MICROPROCESSOR PERIPHERAL INTERFACING** **[09]**

Introduction - Programmable peripheral interface (Intel 8255) – Serial communication interface (8251) - Keyboard and display controller (8279) – Programmable interval timers (Intel 8253, 8254) – Programmable interrupt controller (8259) - Analog to digital converter, Digital to analog converter - Printer interface.

UNIT - IV **8 BIT MICROCONTROLLER ARCHITECTURE AND PROGRAMMING** **[09]**

8051 Microcontroller: Hardware architecture, special function register, I/O ports and circuits, external memory, timers and counters, serial data input/output, interrupts, addressing modes, instruction set, assembly language programming.

UNIT - V **MICROCONTROLLER PERIPHERAL INTERFACING** **[09]**

8051 Interfacing: DC motor, stepper motor, sensors, relay, keyboard, switches, seven segment display, RTC and LCD. Case study: Traffic light control.

Total (L: 45) = 45 Periods

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

CO1: Describe the architecture of 8085 microprocessor and develop 8085 programming skills in assembly language.
CO2: Demonstrate the architecture of 8086 microprocessor and develop 8086 programming skills in assembly language.
CO3: Interpret different external peripheral devices with micro processors
CO4: Describe the architecture of 8051 microcontroller and develop programming skills in 8051 assembly language.
CO5: Develop different interfacing applications using microcontrollers and peripherals.

Text Books :

1 Krishna Kant, Microprocessors and microcontrollers architecture, programming and system design using 8085, 8086, 8051 and 8096, PHI Publications, New Delhi, Second Edition, 2014.
2 Douglas V Hall, Microprocessors and interfacing, Programming and Hardware, Tata McGraw Hill Publications, New Delhi, Third Edition, 2012.

Reference Books :

1 Muhammad Ali Mazidi, Janice Gillispie Mazidi, Rolin D.MCKinlay "The 8051 Microcontroller and Embedded systems", Pearson Education, London, Second Edition, 2011.
2 Ramesh S Gaonkar, "Microprocessor architecture programming and application with 8085", Penram International Publishing, Mumbai, Sixth Edition, 2013.
3 Kenneth J. Ayala, The 8086 Microprocessor: programming & interfacing the PC, Delmar Publishers, USA, First Edition, 2007.
4 A K Ray, K M Bhurchandi, Advanced Microprocessors and Peripherals, TMH Publications, New Delhi, Third Edition, 2012.
5 NPTEL Course Link : http://nptel.ac.in/courses/108107029/, http://nptel.ac.in/courses/106108100/

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SEMESTER – IV

		L	T	P	C
18EC421	**ELECTRONIC CIRCUITS AND SIMULATION LABORATORY**	0	0	3	1

Prerequisite: *Electronic Devices Laboratory*

Objectives:

- *To understand class B push pull amplifier with and without distortion.*
- *To learn the concepts of negative feedback amplifier and plot the frequency response..*
- *To study and observe the output waveforms of oscillator circuits.*
- *To know about narrow band amplifier and different wave shaping circuits.*
- *To learn the performance of electronic circuits through simulation using PSpice.*

List of Experiments:

Design and Analyze the characteristics of the following circuits:

1. Class B complementary symmetry power amplifier.
2. Series feedback amplifier (voltage and current).
3. RC phase shift and Hartley oscillators.
4. Tuned class C amplifier.
5. Integrator, Differentiators, Clippers & Clampers.
6. Astable and Monostable Multivibrators.

Simulation using SPICE Tool:

7. Shunt feedback amplifier (voltage and current).
8. Wein Bridge and Colpitts oscillators.
9. Bistable Multivibrator and Schmitt trigger circuit.
10. Time base circuits.

Total (P: 45) = 45 Periods

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

CO1 : Construct a class B push pull amplifier with and without distortion.
CO2 : Analyze the frequency response of voltage series and current series negative feedback amplifiers.
CO3 : Develop an oscillator circuit and observe its output waveform.
CO4 : Design a narrow band amplifier and different wave shaping circuits for various applications
CO5: Interpret the characteristics of electronic circuits using PSpice.

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SEMESTER – IV

		L	T	P	C
18EC422	**LINEAR INTEGRATED CIRCUITS LABORATORY**	0	0	3	1

Prerequisite: *Electronic Devices Lab*

Objectives:

- *To design amplifiers and filters using op-amp.*
- *To perform various operations using IC 741.*
- *To design various filter circuits using op-amp.*
- *To construct oscillator and regulator circuits.*
- *To learn PSpice and to perform simulation of LIC circuits.*

List of Experiments:

Design and verification of

1. Inverting, non-inverting and differential amplifiers using op-amp
2. Integrator and differentiator using op-amp
3. Instrumentation amplifier using op-amp
4. Active low pass, high pass filters using op-amp
5. Astable & monostable multivibrators and schmitt trigger using op-amp
6. Phase shift and wien bridge oscillators using op-amp
7. Astable and monostable multivibrators using IC 555 timer.
8. Frequency multiplier using PLL.
9. Voltage regulator using LM723.
10. Simulation of any above three experiments using PSpice.

Total (P: 45) = 45 Periods

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

CO1: Design op-amp circuits for different applications.
CO2: Demonstrate the frequency response of various filters using op-amp.
CO3: Develop waveform generators using timer.
CO4: Design the voltage regulator circuit using LM723.
CO5: Demonstrate various applications of operational amplifiers using PSpice.

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SEMESTER - IV

		L	T	P	C
18EC423	**MICROPROCESSORS AND MICROCONTROLLERS LABORATORY**	0	0	3	1

Prerequisite: *Nil*

Objectives :

- *To develop assembly language programming in 8085 microprocessor.*
- *To give hands on experience in 8086 assembly language programming.*
- *To develop assembly language programming in 8051 microcontroller.*
- *To give hands on experience in peripheral interfacing with 8085, 8086 and 8051.*
- *To enhance their knowledge on the latest trends and technologies.*

List of Experiments:

1. 8085 Microprocessor
   (i) Arithmetic Operations
   (ii) Array Processing

2. 8086 Microprocessor
   (i) Arithmetic Operations
   (ii) Sorting and Searching
   (iii) String Manipulation

3. 8051 Microcontroller
   (i) Arithmetic Operations
   (ii) Logical and Bit Manipulation

4. Peripheral Interfacing
   (i) Programmable peripheral interface (8255) using 8085.
   (ii) Programmable interval timer (8253) using 8085.
   (iii) ADC and DAC using 8085.
   (iv) Keyboard and display controller (8279) using 8086.
   (v) Programmable interrupt controller (8259) using 8086.
   (vi) Stepper motor using 8051.

5. Simple 8051 programming using KEIL and Proteus Software.

Total (L: 45) = 45 Periods

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

CO1: Apply the programming skill to write assembly language programming for 8085 microprocessor.
CO2: Apply the programming knowledge to write assembly language programs for 8086 microprocessor.
CO3: Develop the concepts of microcontroller programming.
CO4: Build the interfacing concepts to program with peripherals.
CO5: Apply the programming using simulation software.

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SEMESTER - IV

		L	T	P	C
18HR442	**CAREER DEVELOPMENT SKILLS - II**	0	2	0	0

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

Objectives:

- *To make students strong on verbal and logical reasoning.*
- *To strengthen students on number system.*
- *To develop students on logarithms.*
- *Critically interpret and comprehend a given text.*
- *To strengthen students on quick maths.*

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.

What is Writing – Sentence – Phrase – Kinds of Sentences – Parts of Sentence – Parts of Speech – Articles – Academic Essay Writing – Precise Writing – Report Abstracts – Letter Writing – Memo – Cover Letter – Resume Writing.

UNIT - V QUANTITATIVE APTITUDE – PART 3 **[06]**

Profit and Loss – Simple Interest & Compound Interest – Problem on Ages – Calendar.

Total = 30 Periods

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

CO1: Speak and write appropriately by understanding and applying the basic grammatical rules.
CO2: Demonstrate various principles involved in solving mathematical problems and thereby reducing the time taken for performing job functions.
CO3: Enhance their communication skills and instructiveness.
CO4: Enhance interpersonal relationship building skills with self – confidence.
CO5: Critically evaluate various real life situation by resorting to analysis of key issues and factors.

Text Books :

1 Anne Laws, Writing Skills, Orient Black Swan., Hyderabad, 2011.
2 Abhijit Guha, Quantitative Aptitude, TMH, 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 Sarah Freeman, Written Communication in English, Orient Black Swan, Hyderabad, First Edition, 2015.
3 M.B. Lal & Goswami, Objective Instant Arithmetic, Upkar Publications, First Edition, 2010.
4 Norman Lewis, Word Power Made Easy, W.R.Goyal Publications, Reprint, 2012.
5 M Ashra Rizvi, Effective Technical Communication, Tata McGraw HILL, New Delhi, First Edition, 2005.

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SEMESTER – V

		L	T	P	C
18HS001	**PRINCIPLES OF MANAGEMENT (Common to All Branches)**	3	0	0	3

Objectives:

- *To explain the historical background and fundamentals of management thought.*
- *To discuss about various concepts of planning.*
- *To describe the various concepts of Organizational structure.*
- *To illustrate the various management leadership concepts.*
- *To develop the emerging concepts of management though and philosophy*

UNIT - I OVERVIEW OF MANAGEMENT [09]

Definition of Management – Importance of management – Management functions – Levels of management – Role of managers – Management a science or an art – Evolution of Management thought: Scientific management and Administrative Principles of management – Ethical issues in Management.

UNIT - II PLANNING [09]

Planning: Meaning, purpose, Steps and Types of Plans - Management by objectives (MBO) – Decision Making: Types of Decisions, Steps in Rational Decision making, Common difficulties in Management Decision Making.

UNIT – III ORGANISING [09]

Nature and purpose of organizing : Organization structure, Process and Principles of organizing – Line & Staff authority – Departmentation – Span of Control – Centralization and Decentralization – Delegation of authority – Staffing : Sources of Recruitment, Selection process – Training methods – Performance appraisal methods.

UNIT - IV DIRECTING [09]

Creativity and Innovation – Motivation and Satisfaction: Motivation Theories – Leadership: Leadership theories and Styles – Communication: Barriers to communication, Principles of effective Communication

UNIT - V CONTROLLING [09]

Steps in a control Process: Need for control system, Budgetary and Non-Budgetary control techniques, Problems of the control system, Essentials of effective control system, and Benefits of control.

Total (L: 45) = 45 Periods

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

CO1: Explain the fundamentals of Management thoughts and the conceptual frame work of Management

CO2: Discuss the various concepts of planning, MBO and Strategy to help solving managerial problems

CO3: Explain the concepts of organizing, Delegation and Decision making.

CO4: Describe the management concepts and styles in Leading.

CO5: Illustrate the various controlling and emerging concepts in management thought and philosophy

Text Books :

1. L.M.Prasad, Principles and Practices of Management, Sultan Chand & Sons, New Delhi, Eleventh Edition, 2015.
2. P.C.Tripathi and Reddy Principles of Management, McGraw Hill, New Delhi, Eighth Edition, 2015.

Reference Books :

1. Hellriegel, Slocum & Jackson, Management A Competency Based Approach, Thomson South Western, London, Fifteenth Edition, 2017.
2. Harold Koontz, Heinz Weihrich and mark V Cannice, Management - A Global Entrepreneurial Perspective, Tata McGraw Hill, New Delhi, Twelveth Edition, 2014.
3. Andrew J. Dubrin, Essentials of Management, Thomson South western, London, Tenth edition, 2014.
4. Robbins S.P., Fundamentals of Management, Pearson, New Delhi, Second Edition, 2003.

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SEMESTER – V

		L	T	P	C
18EC512	**ANALOG COMMUNICATION SYSTEMS**	3	1	0	4

Prerequisites: *Engineering Mathematics, Electronic Devices and Circuits.*

Objectives:

- *To familiarize the random signals and noise in communication systems.*
- *To impart knowledge on different amplitude modulation techniques.*
- *To learn about angle modulation and pulse modulation.*
- *To infer the functions of AM transmitters and receivers.*
- *To infer the functions of FM transmitters and receivers.*

UNIT - I RANDOM SIGNALS AND NOISE THEORY [12 Periods]

Probability and Random variables- Random process and Gaussian process - Probability density function- Autocorrelation - Power spectral density - External noise - Internal noise - Noise figure - Equivalent noise resistance - Noise temperature - Noise bandwidth- Noise triangle.

UNIT - II AMPLITUDE MODULATION [12 Periods]

Basic representation of communication system - Baseband and band pass signal - Transmission media –Electromagnetic spectrum - Need for modulation - Amplitude modulation: Single tone and multi tone modulation, Phasor representation, Power relations, Representation of DSBSC and SSBSC- Principles of VSB Signals - Frequency translation - FDM- Nonlinear distortion. Generation of AM: Low level, high level, SSBSC and DSBSC.

UNIT - III ANGLE MODULATION AND PULSE MODULATION [12 Periods]

Frequency modulation: Single tone and multi tone modulation, Representation, Frequency spectrum, Phasor representation, Narrow band and Wide band FM, Average power, Bandwidth requirements – Principles of Phase modulation - Comparison of AM, FM & PM - Generation of FM: Direct method and Indirect method - Pulse modulation: PAM, PWM, PPM.

UNIT - IV AM RECEIVERS [12 Periods]

Receiver parameters - Tuned radio frequency receiver – Super heterodyne receiver: RF section and characteristics - Frequency changing and tracking - Intermediate frequencies and IF amplifiers - Detection and automatic gain control – Costas receiver - Single side band receivers, AM detectors: Linear and Non-linear - Noise in DSBSC, SSBSC and AM receivers.

UNIT - V FM RECEIVERS [12 Periods]

Introduction - Comparison of AM and FM receiver - FM demodulators - FM demodulator comparison - Stereo FM multiplex reception - Pre-emphasis and de-emphasis - Noise in FM receivers.

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

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

CO1: Infer the concepts of random signals and noise in communication systems.

CO2: Describe the concepts of Amplitude Modulation and its types.

CO3: Discuss the concepts of Angle Modulation, Pulse Modulation and its types.

CO4: Examine the AM Receivers and its noise performance.

CO5: Examine the FM Receivers and its noise performance.

Text Books :

1 George Kennedy, Bernard Davis & SRM Prasanna, Electronic Communication Systems, Tata McGraw-Hill Education, New Delhi, Sixth Edition, 2017.

2 Simon Haykin & Michael Moher, Communication Systems, Wiley India Pvt. Ltd., New Delhi, Fifth Edition, 2011.

Reference Books :

1 Wayne Tomasi, Electronic Communications Systems – Fundamentals Through Advanced, Pearson Education, New York, Fifth Edition, 2008.

2 A.Bruce Carlson & Paul B. Crilly, Communication Systems, Tata McGraw-Hill Education, New Delhi, Fifth Edition, 2011.

3 H Taub, D Schilling & G Saha, Principles of Communication Systems, Tata McGraw-Hill Education, New Delhi, Fourth Edition, 2013.

4 P.Ramkrishna Rao, Analog Communication, Tata McGraw-Hill, New Delhi, First Edition, 2011.

5 Proakis & Salehi, Fundamentals of Communication Systems, Pearson Education, New York, Third Edition, 2008.

6 Dennis Roddy & John Coolen, Electronic Communication, Pearson Education, New York, Fourth Edition, 2009.

7 NPTEL Course Link:http://nptel.ac.in/courses/117102059/

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SEMESTER – V

		L	T	P	C
18EC513	**DIGITAL SIGNAL PROCESSING**	3	1	0	4

Prerequisite: *Differential Equations and Numerical Methods, Signals and Systems*

Objectives:

- *To learn discrete Fourier transform, properties of DFT and its application to linear filtering.*
- *To explore the design procedures for FIR digital filters*
- *To explore the design procedures for IIR digital filters*
- *To understand the effects of finite precision representation on digital filters and understand the fundamental concepts of multi rate signal processing*
- *To gain the knowledge in DSP architecture and programming*

UNIT - I DISCRETE FOURIER TRANSFORM AND FAST FOURIER TRANSFORM [12]

Introduction to Discrete Fourier Transform pairs and its properties – Relation between z transform and DTFT with DFT – Fast Fourier Transform: Introduction, computations using Decimation in Time and Decimation in Frequency algorithms – Sectional convolution: Overlap add and overlap save methods.

UNIT - II DESIGN OF FINITE IMPULSE RESPONSE DIGITAL FILTERS [12]

Design of FIR filters - symmetric and Anti-symmetric FIR filters - design of linear phase FIR filters using Fourier series method - FIR filter design using windows (Rectangular, Hamming and Hanning window), Frequency sampling method. FIR filter structures - linear phase structure, direct form realizations.

UNIT - III DESIGN OF INFINITE IMPULSE RESPONSE DIGITAL FILTERS [12]

Characteristics of practical frequency selective filters. Characteristics of commonly used analog filters - Butterworth filters, Chebyshev filters. Design of IIR filters from analog filters (LPF, HPF) - Impulse invariance method, Bilinear transformation. Frequency transformation in the analog domain. Structure of IIR filter - direct form I, direct form II, Cascade, parallel realizations.

UNIT - IV FINITE WORD LENGTH EFFECTS AND MULTIRATE SIGNAL PROCESSING [12]

Quantization noise – Derivation for quantization noise power – Binary fixed point and floating point number representations – Truncation and rounding error – Input quantization error – Coefficient quantization error – Product quantization error – Limit cycle oscillations : Zero limit cycle oscillation, overflow limit cycle oscillation and signal scaling – Introduction to multirate signal processing: Up sampling, down sampling and effects of spectrum.

UNIT - V DIGITAL SIGNAL PROCESSORS [12]

Introduction to DSP architecture: Multiplier and multiplier accumulator, bus architectures and memory access scheme, multiported memory, pipelining, special addressing modes – Architecture of TMS320C6747 – Introduction to C programing for DSP applications with code composer studio and simple programs using C.

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

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

CO1: Describe the concepts of DFT, FFT and convolution process

CO2: Design appropriate type of FIR filter and implement digital filters in different FIR filter structures

CO3: Design digital IIR filter using appropriate type and implement digital filters in various realization structures

CO4: Analyze and Characterize the effects of finite precision representation on digital filters

CO5: Describe digital signal processors and the programming concepts

Text Books:

1 John G Proakis and Dimtris G Manolakis, Digital Signal Processing Principles, Algorithms and Application, Pearson Education, USA,Fourth Edition, 2014.

2 Venkataramani B and Bhaskar M, Digital Signal Processor Architecture, Programming and Application, Tata McGraw Hill, New Delhi, Second Edition, 2013.

Reference Books:

1 Mitra S K, Digital Signal Processing, A Computer based approach, Tata McGraw Hill, Fourth Edition, New Delhi, 2013.

2 EsakkirajanS, VeerakumarT, Digital Signal Processing, Tata McGraw Hill, First Edition, New Delhi, 2021.

3 Sen M Kuo and Bob H Lee, Real-Time Digital Signal Processing: Implementations, Application and Experiments with the TMS320C55X, John Wiley & Sons Ltd, England, 2003.

4 Texas Instruments, TMS320C6747 DSP data sheet and User's Manual.

5 Online reference: http://nptel.ac.in/courses/117102060/

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SEMESTER – V

		L	T	P	C
18EC514	**COMPUTER NETWORKS**	3	0	0	3

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

Objectives:

- *To gain knowledge about layers in OSI and TCP/IP model.*
- *To understand the concept of data link layer protocols and connecting devices.*
- *To familiarize with the addressing and routing protocols.*
- *To know about transport layer protocols and QoS enhancement methods.*
- *To learn the functions of application layer protocols and network security.*

UNIT - I PHYSICAL LAYER [09]

Data communications - Networks: Network criteria, connection types, network topology, network types - Network models: OSI model - TCP/IP model - Addressing - Guided and unguided transmission media - Switching: Circuit switched networks, datagram networks, virtual circuit networks.

UNIT - II DATA LINK LAYER [09]

Data link control: Framing, flow control and error control - Protocols: Simple protocol, stop and wait, sliding window, Go Back N, selective repeat - HDLC - Multiple access: Random access, controlled access - IEEE 802.3: Standard Ethernet, changes in the standard, fast Ethernet, gigabit Ethernet - IEEE 802.11 - Connecting devices: Hub, repeater, switch, bridge, router, gateway.

UNIT - III NETWORK LAYER [09]

Logical addressing: IPv4, IPv6 addresses - Internet Protocol: Internetworking, IPv4, IPv6, transition from IPv4 to IPv6 - Address mapping - Delivery - Forwarding - Routing protocols: Intra and inter domain routing, distance vector routing, link state routing, path vector routing.

UNIT - IV TRANSPORT LAYER [09]

Transport layer services - Multiplexing and demultiplexing - User datagram protocol - Transmission control protocol - Congestion control - Quality of Service - Techniques to improve QoS.

UNIT - V APPLICATION LAYER AND NETWORK SECURITY [09]

Domain Name System (DNS) - E-mail - FTP - WWW - HTTP - Network security: Cryptography, symmetric key and public key algorithms, digital signature, communication security, authentication protocols.

Total (L: 45) = 45 Periods

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

CO1: Describe the role of data communication and physical layer.

CO2: Describe the concepts of data link layer services and protocols, multiple access protocols, Ethernet protocol and various connecting devices.

CO3: Interpret network layer protocols and routing.

CO4: Illustrate the purpose of transport layer protocols and services.

CO5: Implement the application layer protocols and the need for network security.

Text Books :

1 Behrouz A. Forouzan, Data Communication and Networking, Tata McGraw-Hill, Fifth Edition, 2017.

2 Andrew S. Tannenbaum and David J. Wetherall, Computer Networks, Prentice Hall, Fifth Edition, 2011.

Reference Books :

1 Wayne Tomasi, Introduction to Data Communication and Networking, Pearson Education, First Edition, 2007.

2 William Stallings, Data and Computer Communications, Pearson Education, Eighth Edition, 2014.

3 James F. Kurouse & Keith W. Ross, Computer Networking: A Top down Approach, Pearson Education, Fifth Edition, 2012.

4 Greg Tomsho, Guide to Networking Essentials, Cengage Learning, Seventh Edition, 2016.

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SEMESTER – V

		L	T	P	C
18EC515	**EMBEDDED SYSTEMS**	3	0	0	3

Prerequisite: *Microprocessors and Microcontrollers*

Objectives:

- *To know about the basics of embedded systems and its applications.*
- *To familiarize the concept of embedded devices and buses.*
- *To gain knowledge about embedded programming.*
- *To be exposed the basic concepts of Real Time Operating Systems.*
- *To understand the various types of RTOS and case studies.*

UNIT - I INTRODUCTION TO EMBEDDED SYSTEMS [09]

Embedded system: Definition - Classification - Categories - Recent trends - Design considerations and requirements - Overview of architecture - Purpose - Major application area - Design life cycle.

UNIT - II EMBEDDED DEVICES AND BUSES [09]

IO types and examples - Serial communication devices - Parallel device ports - Sophisticated interfacing features in device ports - Wireless devices - Timer and counting devices - Watchdog timer - Real time clock - Networked embedded systems - Serial bus communication protocols - Parallel bus device protocols - Internet enabled systems - Wireless and mobile system protocols - ISR concept - Interrupt sources - Interrupt service handling mechanism.

UNIT - III EMBEDDED PROGRAMMING [09]

Software programming in assembly and high level language - Program elements: Macros and functions, data types, data structures, modifiers, statements, loops and pointers - Object oriented programming - Embedded programming in C++ - Embedded programming in JAVA - Program models - DFG models - State machine programming models for event controlled program flow - Modeling of multiprocessor systems - UML modeling.

UNIT - IV REAL TIME OPERATING SYSTEMS [09]

Multiple processes, Threads in an application - Tasks - Task states - Semaphore - Shared data - Inter process communication - Signal function - Semaphore functions - Message queue functions - Mailbox functions - Pipe functions - Socket functions - OS services - Process management - Timer functions - Event functions - Memory management - Device, File and IO subsystems management - Interrupt routines in RTOS environment and handling of interrupt source calls.

UNIT - V CASE STUDIES [09]

Types of RTOS - Introduction and features of MUCOS II, Vx Works, Windows CE, OSEK, Linux and RT Linux - Case studies: Automatic chocolate vending machine - Sending application layer byte streams on a TCP/IP network - Adaptive cruise control.

Total (L: 45) = 45 Periods

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

CO1: Interpret the basic concepts of embedded system and its application.
CO2: Outline the concepts of various I/O interface devices and buses.
CO3: Describe the essentials for Embedded programming.
CO4: Explain the various functions and services in Real Time Operating Systems.
CO5: Analyze the different types of RTOS and real time applications.

Text Books :

1 Prasad K.V.K.K, Embedded Real-Time Systems: Concepts, Design & Programming, Dream Tech Press, New Delhi, First Edition, 2015.

2 Raj Kamal, Embedded Systems Architecture, Programming and Design, McGraw-Hill Education, New Delhi, Second Edition, 2011.

Reference Books :

1 David E. Simon, An Embedded Software Primer, Addison-Wesley Professional, United States, First Edition, 2007.

2 Daniel .W Lewis, Fundamentals of Embedded Software, Prentice Hall India Learning, New Delhi, 2003.

3 Jean J. Labrosse, MicroC/OS – II The Real Time Kernel, CRC Press Publisher, United States, Second Edition, 2002.

4 http://nptel.ac.in/courses/108102045.

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SEMESTER – V

		L	T	P	C
18EC521	**DIGITAL SIGNAL PROCESSING LABORATORY**	0	0	3	1

Prerequisites: *Programming for problem solving& Signals and Systems*

Objectives:

- *To recall the signal generation and processing*
- *To understand time and frequency representation of signals.*
- *To design and simulate IIR filters and analyzes their responses on MATLAB.*
- *To design and simulate FIR filters and analyzes their responses on MATLAB.*
- *To learn the processing algorithms using the Programmable Digital Signal Processors.*

List of Experiments:

Using MATLAB / Equivalent open source

1. Basic signal generation and processing
2. a) Generation of Continuous and Discrete Elementary signals using Mathematical expression.
   b) Operations on signals and sequences such as addition, multiplication, scaling, shifting, folding.
   c) Locating the zeros and poles and plotting the pole zero maps in s-plane and z-plane for the given transfer function.
3. Discrete Fourier Transform using FFT and IFT.
4. Convolution and correlation of discrete signals.
5. Sampling and effect of aliasing.
6. Design of FIR filters and IIR filters.

Using TMS 320C50 Processor

7. Study of various addressing modes of Digital signal processors using simple programming examples.
8. Calculation of DFT using FFT.
9. Implementation of FIR filter and IIR filter.

Using TMS 320C6747 Processor

10. Sampling of input signal and display.
11. Convolution and correlation of discrete signals.

Total (P: 45) = 45 Periods

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

CO1: *Carryout basic signal processing operations using MATLAB.*

CO2: *Solve time and frequency domain representation of signals.*

CO3: *Design and simulate IIR filters and their responses.*

CO4: *Design and simulate FIR filters and their responses.*

CO5: *Implement the basic Digital signal Processing algorithms using Processors.*

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SEMESTER – V

		L	T	P	C
18EC522	**COMPUTER NETWORKS LABORATORY**	0	0	3	1

Prerequisites: *Computer Networks.*

Objective:

- *To get practical exposure on basic networking concepts.*
- *To learn about LAN protocols and its operation.*
- *To familiarize the functions of data link layer protocols and routing algorithms*
- *To understand the role of cryptography techniques and cable crimping.*
- *To learn NS-2 programming for simulation of networking and routing algorithms.*

List of Experiments:

1. PC to PC communication:

   Parallel communication using 8 bit parallel cable.

   Serial communication using RS 232 cable.

2. Ethernet LAN protocol:

   Create scenario and verify the performance of Ethernet LAN protocol.

3. Token bus and token ring protocols:

   Create scenario and verify the performance of token bus and token ring protocols.

4. Implementation of stop and wait protocol.

5. Implementation of Go Back N and selective repeat protocols.

6. Implementation of distance vector routing algorithm.

7. Implementation of link state routing algorithm.

8. Implementation of data encryption and decryption.

9. Transfer of files from PC to PC using windows socket processing.

10. Simulation and performance analysis of LAN using NS-2.

11. Crimping of Ethernet cable.

Total (P: 45) = 45 Periods

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

CO1: Evaluate the performance of parallel and serial communication.

CO2: Compare and contrast the performance of token bus and token ring protocols.

CO3: Implement the concept of data link layer protocols, routing algorithms and cable crimping.

CO4: Demonstrate network security and file transfer concepts.

CO5: Simulate the performance of LAN using NS2 and measure the performance.

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SEMESTER – V

		L	T	P	C
18EC523	**EMBEDDED SYSTEM DESIGN LABORATORY**	0	0	3	1

Prerequisites: *Fundamentals of "C" Programming & Microprocessors and Microcontrollers Laboratory*

Objectives:

- *To Familiarize the Embedded C programming for 8051 microcontroller using Keil.*
- *To develop the C programming knowledge using MPLAB.*
- *To interface the ARM processor with peripheral devices for various applications using keil.*
- *To gain practical knowledge about LCD interfacing and PWM generation in Firebird V Robot.*
- *To demonstrate ADC and white line following in Firebird V Robot.*

List of Experiments:

1. 8051 Microcontroller programming in Embedded C using Keil
    a. Flash.
    b. LCD interfacing.

2. PIC Microcontroller programming using MPLAB
    a. Implementation of Elevator controller.
    b. Implementation of Alarm clock controller.
    c. Implementation of model train controller.

3. ARM processor programming in Embedded C using Keil
    a. Musical Tone Generator Interface.
    b. 4x4 Matrix Hex Keypad Interface.
    c. 6 – Digit, 7 – segment Display with calculator type keyboard Interface.
    d. Graphical LCD Interface.

4. Atmega processor programming in Firebird V Robot,
    a. Interfacing LCD for debugging.
    b. DC motor control and PWM generation for velocity control.
    c. Analog-to-Digital conversion and white line following.

Total (P: 45) = 45 Periods

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

CO1: Model the 8051 microcontroller programming interfacing using Keil.

CO2: Build embedded C program for various PIC Microcontrollers using MPLAB.

CO3: Design various display interfacing units in ARM processor using Keil.

CO4: Analyze the LCD interfacing and motor control in Firebird V Robot.

CO5: Develop a C programming for ADC and white line following in Firebird V Robot.

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SEMESTER - V

		L	T	P	C
18HR543	**CAREER DEVELOPMENT SKILLS – III**	0	2	0	0

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

Objectives:

- *To enhance the writing and speaking skills through continuous practices.*
- *To sharpen the verbal and logical reasoning through skillful conceptualization.*
- *To improve the learning skills of students in aptitude*
- *To learn the problem solving skill and to improve thinking capability of the students.*
- *To study the various concept in core subjects.*

UNIT - I WRITTEN AND ORAL COMMUNICATION – PART 1 [06]

Reading Comprehension Level 3 - Self Introduction - News Paper Review - Self Marketing - Debate- Structured and Unstructured GDs Psychometric Assessment – Types & Strategies to answer the questions Practices: Sentence Completion - Sentence Correction - Jumbled Sentences - Synonyms & Antonyms - Using the Same Word as Different Parts of Speech - Interpretation of Pictorial Representations – Editing.

UNIT - II VERBAL & LOGICAL REASONING – PART 2 [06]

Syllogism - Assertion and Reasons - Statements and Assumptions - Identifying Valid Inferences - identifying Strong Arguments and Weak Arguments - Statements and Conclusions- Cause and Effect - Deriving Conclusions from Passages - Seating Arrangements Practices: Analogies - Blood Relations - Statement & Conclusions.

UNIT - III QUANTITATIVE APTITUDE – PART 3 [06]

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

UNIT - IV QUANTITATIVE APTITUDE – PART 4 [06]

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

UNIT - V DEPARTMENT TECHNICAL TOPICS [06]

Networks – Solution Methods, Network Theorems, Time and frequency domain analysis of circuits.

Electronic Devices–Diode, BJT, JFET, MOS capacitor, MOSFET, LED, p-i-n and avalanche photo diode, Basics of LASERs & IC fabrication.

Analog Circuits - Simple diode circuits, clippers, Clampers, Biasing of transistors, Small Signal Equivalent circuits of diodes, BJTs, MOSFETs, amplifiers, filters, differential amplifiers, oscillators, simple opamp & 555 circuits and Power supplies.

Total = 30 Periods

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

CO1: Understand the nearness of leading various texts.

CO2: Perform well in verbal and logical reasoning.

CO3: Understand and develop the etiquette necessary to present oneself in a professional setting.

CO4: Demonstrate various principles involved in solving mathematical problems and thereby reducing the time taken for performing job functions.

CO5: Enhance the comprehension Skills in core subjects.

Text Books :

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

2 Abhijt Guha, Quantitative Aptitude, TMH, Third Edition, New Delhi, 2009.

Reference Books :

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

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

3 M.B. Lal & Goswami, Objective Instant Arithmetic, Upkar Publications, First Edition, 2010.

4 Norman Lewis, Word Power Made Easy,W.R.Goyal Publications, Reprint, 2012.

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

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SEMESTER – VI

		L	T	P	C
18HS051	**PROFESSIONAL ETHICS**				
	(Common to All Branches)	3	0	0	3

Objectives:

- *To gain the knowledge of basic perception of ethics, moral and values*
- *To know the current Industrial standards*
- *To know the risk and safety benefit in industry*
- *To Discuss the rights and responsibility of an engineers*
- *To Acquire Knowledge in global issues and able to apply in ethical principles in professional life.*

UNIT - I ENGINEERING ETHICS [09]

Senses of 'Engineering Ethics' - Variety of Moral Issued - Types of Inquiry - Moral dilemmas - Moral autonomy - Kohlberg's theory - Gilligan's theory - Consensus and Controversy - Models of Professional roles – Professional Ideals and Virtues- Uses of Ethical Theories.

UNIT - II ENGINEERING AS SOCIAL EXPERIMENTATION [09]

Engineering as Experimentation - Engineers as responsible Experimenters - Codes of Ethics –Industrial standards- Balanced Outlook on Law - The Challenger Case Study.

UNIT - III ENGINEER'S RESPONSIBILITY FOR SAFETY [09]

Safety and Risk - Assessment of Safety and Risk - Risk Benefit Analysis - Reducing Risk – Liability– The Chernobyl and Bhopal case studies.

UNIT - IV RESPONSIBILITIES AND RIGHTS [09]

Collegiality and Loyalty - Respect for Authority - Collective Bargaining - Confidentiality - Conflicts of Interest - Occupational Crime - Professional Rights - Employee Rights - Intellectual Property Rights (IPR) – Discrimination.

UNIT - V GLOBAL ISSUES [09]

Multinational Corporations - Environmental Ethics - Computer Ethics - Weapons Development - Engineers as Managers- Consulting Engineers-Engineers as Expert Witnesses and Advisors – Corporate social responsibility (CSR) – Moral Leadership – Code of Conduct.

Total (L: 45) = 45 Periods

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

CO1: Explain the basic perceptions of ethics, moral and values.

CO2: Describe the current industrial standards

CO3: Discuss the risk and safety benefits in the industry

CO4: Explain the professional rights and responsibilities of an engineers

CO5: Illustrate the Various global issues and apply the ethical principles in professional life.

Text Books :

1. Mike Martin and Roland Schinzinger, Ethics in Engineering, McGraw-Hill, New Delhi, Fifth Edition, 2017.
2. Dr.K.R.Govindan and S.Senthilkumar, Professional Ethics, Anuradha Agencies, Chennai, Revised Edition, 2014.

Reference Books :

1. Govindarajan M, Natarajan S, Senthil Kumar V. S, Engineering Ethics, Prentice Hall of India, New Delhi, Fourth Edition, 2016.
2. Charles D. Fleddermann, Engineering Ethics, Pearson Education / Prentice Hall, New Delhi, Seventh Edition, 2015.
3. Charles E Harris, Michael S. Protchard and Michael J Rabins, Engineering Ethics - Concepts and Cases, Thompson Learning, New Delhi , Sixth Edition, 2015.
4. A.B Rao, Business Ethics & Professional Values– Excel books, New Delhi, Fifth Edition, 2014.

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SEMESTER – VI

18EC612	DIGITAL COMMUNICATION SYSTEMS	L	T	P	C
		3	0	0	3

Prerequisite: *Analog communication systems*

Objectives:

- *To learn the basics of digital communication*
- *To familiar with baseband formatting techniques*
- *To know the baseband coding techniques*
- *To learn about baseband reception techniques*
- *To expose the band pass signal processing*

UNIT - I FUNDAMENTALS OF DIGITAL COMMUNICATION [09]

Elements of digital communication systems: Model of digital communication systems – Channel classification – Performance measure – Geometric representation of signals; Gram Schmidt orthogonalisation procedure – Bandwidth – Mathematical models of communication channel.

UNIT - II BASEBAND FORMATTING TECHNIQUES [09]

Sampling: Impulse sampling, natural sampling, sampler implementation – Quantization: Uniform and non-uniform – Encoding techniques for analog sources: PCM, DPCM, Delta modulation, Adaptive delta modulation, spectral waveform encoding, model-based encoding.

UNIT - III BASEBAND CODING TECHNIQUES [09]

Block codes, convolutional codes – Concept of error free communication – Classification of line codes, desirable characteristics and power spectra of line codes.

UNIT - IV BASEBAND RECEPTION TECHNIQUES [09]

Noise in communication systems – Receiving filter – Correlator type – Matched filter type – Equalizing filter – Signal and system design for ISI elimination, Implementation – Eye pattern analysis – Synchronization – Detector, Maximum likelihood detector, error probability, figure of merit for digital detection.

UNIT - V BANDPASS SIGNAL TRANSMISSION AND RECEPTION [09]

Memory less modulation methods – Transmitter, receiver signal space diagram and BER; ASK, FSK, PSK, QAM, QPSK – Band pass receiving filter, error performance.

Total (L: 45) = 45 Periods

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

CO1: Interpret the basic transmission and reception of digital communication.

CO2: Describe the baseband formatting techniques.

CO3: Apply the various baseband coding methods.

CO4: Discuss the baseband reception techniques.

CO5: Summarize band pass signal processing systems.

Text Books :

1 Amitabha Bhattacharya, Digital Communications, Tata McGraw Hill, New Delhi, First Edition, 2013.

2 Simon Haykin, Digital Communications, John Wiley, United States, Fourth Edition, 2012.

3 Bernard Sklar, Digital Communication, Pearson Education, New York, Second Edition, 2014.

Reference Books :

1 John.G. Proakis, Fundamentals of Communication Systems, Pearson Education, New York, Second Edition, 2014.

2 Michael. B. Purrsley, Introduction to Digital Communication, Pearson Education, New York, First Edition, 2006.

3 Herbert Taub & Donald L Schilling, Principles of Communication Systems, TMH, New Delhi, Third Edition, 2008.

4 Leon W. Couch, Digital and Analog Communication Systems, Pearson Education, New York, Seventh Edition, 2008.

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SEMESTER – VI

18EC613	DIGITAL IMAGE PROCESSING	L	T	P	C
		3	0	0	3

Prerequisite: *Digital Signal Processing*

Objectives:

- *To learn the fundamental representation of an images*
- *To familiar with the concept of various transforms using images*
- *To understand the various techniques of image enhancement and restoration*
- *To exposed the knowledge about image segmentation and representation*
- *To learn about image compression techniques*

UNIT - I DIGITAL IMAGE FUNDAMENTALS [09]

Elements of digital image processing systems - Elements of visual perception - Basic relationship between pixels: Connectivity, Distance measure - Brightness - Contrast - Hue - Saturation - Mach band effect - Color image fundamentals: RGB - HSI models - Conversion from RGB to HSI - Image sampling - Quantization - Dither.

UNIT - II IMAGE TRANSFORMS [09]

2D transforms - DFT - DCT- DST - Walsh - Hadamard - Slant - Haar transform - DWT: Haar wavelet, Daubechies wavelet - CWT: Hermitian wavelet, Poisson wavelet.

UNIT - III IMAGE ENHANCEMENT AND RESTORATION [09]

Spatial domain enhancement: Gray level transformations - Histogram modification and specification techniques - Image averaging - Directional smoothing - Median - Geometric mean - Harmonic mean - Contra harmonic mean filters - Homomorphic filtering - Color image enhancement - Image restoration: Degradation model - Unconstrained restoration and constrained restoration - Inverse filtering - Wiener filtering - Geometric transformations.

UNIT - IV IMAGE SEGMENTATION AND REPRESENTATION [09]

Line and point detection, Edge detection, Edge linking via Hough transform - Morphological operations - Thresholding - Region based segmentation - Region growing - Region splitting and merging - Representation: Chain codes, Signatures, Boundary segments, Skeletons.

UNIT - V IMAGE COMPRESSION [09]

Need for data compression - Lossless compression: Huffman coding, Run length coding, Bit plane coding, LZW coding. Lossy compression: Vector quantization, Block truncation coding - Applications: Satellite image processing - Image forensic science.

Total (L: 45) = 45 Periods

Course Outcomes : On the successful completion of the course, students will be able to

CO1: Understand the fundamentals in digital imaging
CO2: Apply various image transformation techniques
CO3: Apply image enhancement and restoration techniques on various images
CO4: Demonstrate the image segmentation and representation techniques
CO5: Interpret image compression techniques and image processing applications

Text Books:

1 Rafael C Gonzalez, Richard E Woods, Digital Image Processing, Pearson Education, Fourth Edition, 2018.

2 Jayaraman .S, Esakkirajan.S, Veerakumar T, Digital Image Processing, Tata McGraw Hill, Second Edition, New Delhi, 2020.

Reference Books :

1 Anil K- Jain, Fundamentals of Digital Image Processing, Pearson Education, First Edition, New Delhi, 2015.

2 Kenneth R.Castleman, Digital Image Processing, Pearson, Second reprint, New Delhi, 2008.

3 William K Pratt, Digital Image Processing: PIKS Scientific Inside, John Wiley, Fourth Edition, New Delhi, 2006.

4 David Salomon, Data Compression: The Complete Reference, Springer - Verlag, Third Edition, New York, 2011.

5 http://nptel.ac.in/courses/117105079/

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SEMESTER – VI

		L	T	P	C
18EC614	**VLSI DESIGN**	3	0	0	3

Prerequisite: *Electronic Devices and Circuits, Digital Electronics*

Objectives:

- *Familiarize Verilog programming concepts and coding types*
- *Gain knowledge about MOS technology*
- *Learn about operation and characteristics of MOSFET*
- *Understand the concept of CMOS logic gate design and layout*
- *Gain knowledge about storage elements and different types of dynamic logic circuits*

UNIT - I VERILOG HDL [09]

Basic concepts - Modules and ports - Operators - Structural modeling - Data flow modeling - Behavioral modeling - Switch level modeling - Test benches - Verilog code for: adders, subtractors, multiplexer, demultiplexer, encoder, decoder, priority encoder, comparator, D-Latch, D flip flop, shift register and counter.

UNIT - II VLSI FABRICATION TECHNIQUES [09]

Chip design hierarchy - IC layers - Photolithography and pattern transfers - CMOS fabrication processes: nWell - pWell - Twin tub - Silicon on insulator - Submicron CMOS process - Masks and layout - CMOS design rules: SCMOS design rule set - Lambda based layout.

UNIT - III MOSFET [09]

Basic MOS transistors - MOSFET operation - MOSFET switch model - Square law model - MOSFET parasitics - MOSFET SPICE modeling - CMOS inverter voltage transfer curve - Body effect - Threshold voltage - Latch up problem in CMOS circuits - Latch up prevention.

UNIT - IV CMOS LOGIC GATE DESIGN AND LAYOUT [09]

NAND and NOR gates - Complex logic gates - Stick diagram - CMOS Layout -Tri state circuits - Large FETs - Transmission gate and pass transistor logic - Standard cell design: Cell hierarchies - Cell libraries.

UNIT - V STORAGE ELEMENTS AND DYNAMIC LOGIC CIRCUITS [09]

SR latch - Bit level register - D flip flop - Dynamic D flip flop - Static RAM cell - Clocked CMOS - Dynamic logic - Domino logic - SR logic - Dynamic memories.

Total (L: 45) = 45 Periods

Course Outcomes: On the successful completion of the course, students will be able to

CO1: Utilize the Verilog HDL coding to implement in digital circuit applications.

CO2: Demonstrate the VLSI fabrication process and its design rules.

CO3: Examine the operation of MOSFET.

CO4: Identify the logic design and layout for COMS circuits.

CO5: Describe the types of memory elements based on its logic design.

Text Books :

1 John P. Uyemura, Chip Design for Submicron VLSI: CMOS layout and simulation, Cengage Learning India Private Ltd, 11th Indian Reprint 2013.

2 Samir Palnitkar, Verilog HDL A Guide to Digital Design and Synthesis, Pearson Education, Second Edition, 2010.

Reference Books :

1 Kamran Eshraghian, Douglas A. Pucknell and Sholeh Eshraghian, Essentials of VLSI Circuits and Systems, Prentice Hall of India Pvt Ltd, 2013.

2 John P. Uyemura, Introduction to VLSI Circuits and Systems, John Wiley & Sons, reprint 2009.

3 J.Bhasker, Verilog HDL Primer, BS publication, Third Edition, 2005.

4 http://nptel.ac.in/courses/108101089/

5 http://nptel.ac.in/syllabus/syllabus.php?subjectId=117108041

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SEMESTER – VI

		L	T	P	C
18EC621	**COMMUNICATION SYSTEMS LABORATORY**	0	0	3	1

Prerequisite: *Analog communication systems*

Objectives:

- *To know the performance of various analog and digital modulation techniques.*
- *To understand the characteristics of ASK, FSK and PSK using MATLAB.*
- *To learn the concept of sampling and multiplexing.*
- *To study the performance of various antennas.*
- *To categorize the frequency response of RF filters.*

List of Experiments:

1. To Design AM modulator and demodulator circuit and determine the modulation index of various modulation types using spectrum analyzer and math mode of CRO.
2. To Design FM modulator and demodulator circuit and determine the modulation index.

To Design and observe the waveforms for

3. Pulse Modulation - PAM, PWM, PPM.
4. Pulse code modulation encoder and decoder.
5. Delta modulation and demodulation.
6. Digital Modulation Techniques - ASK, FSK, PSK. Compare its bit error performance using MATLAB.
7. Sampling & TDM.
8. Radiation pattern of Yagi-Uda, Horn, Loop antennas and determine its bandwidth, gain and directivity.
9. To simulate broadside array and end fire array using MATLAB.
10. Determine the S-parameters using network analyzer.(DUT Specific)
11. Frequency response of RF filters using spectrum analyzer.

Total (P: 45) = 45 Periods

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

CO1: Describe the concept of analog and digital modulation techniques.

CO2: Infer the various types of digital modulation techniques.

CO3: Discuss about the sampling and multiplexing.

CO4: Interpret the performance of various antennas.

CO5: Summarize the frequency response of RF filters.

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SEMESTER - VI

		L	T	P	C
18EC622	**VLSI LABORATORY**	0	0	3	1

Prerequisites: *Digital Electronics, Electronic Devices and Circuits and Basic concept of C*

Objective:

- *Understand the modeling of combinational circuits using Verilog HDL*
- *Understand the modeling of sequential circuits using Verilog HDL*
- *Learn SPICE tool to design for CMOS circuits*
- *Understand the functional verification of the digital circuits with the help of FPGA*
- *Apply design procedures on various VLSI logic circuit application*

List of Experiments:

- Design and simulation of combinational logic circuit using verilog.
  1. Adder
  2. Multiplexer and demultiplexer
  3. Encoder and decoder
  4. Multiplier
- Design and simulation of sequential logic circuit using verilog.
  5. Flip flops
  6. Counters
  7. Shift registers
  8. Frequency divider
- CMOS circuit design using SPICE.
  9. CMOS inverter
  10. CMOS NAND and NOR gates
  11. CMOS based combinational logic circuits
- FPGA implementation with synthesis report.
  12. Combinational and sequential circuits

Total (P: 45) = 45 Periods

Course Outcomes: On the successful completion of the course, students will be able to

CO1: *Model a combinational circuits using Verilog HDL.*

CO2: *Model a sequential circuits using Verilog HDL.*

CO3: *Utilize the SPICE tool to design CMOS circuits*

CO4: *Functional verification of the digital circuits with the help of FPGA.*

CO5: *Apply design procedures on VLSI logic circuit application*

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SEMESTER – VI

		L	T	P	C
18CS028	**PYTHON PROGRAMMING LABORATORY** (Common To CS, EC & EE)	0	0	3	1

Prerequisite: *Basic knowledge of C programming.*

Objectives:

- *To learn the python environment script code.*
- *To study python programs with conditionals and looping statement.*
- *To use functions for python structured programs.*
- *To implement object oriented programming concepts in python.*
- *To read and write data from and to files in python.*

LIST OF EXPERIMENTS

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

Total (P: 45) = 45 Periods

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

CO1: Design simple programs using conditionals and loops.
CO2: Write functions to solve mathematical problems
CO3: Demonstrate the use of files in python.
CO4: Develop simple applications using python.
CO5: Construct GUI applications using python programming

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SEMESTER - VI

		L	T	P	C
18HR644	**CAREER DEVELOPMENT SKILLS – IV**	0	2	0	0

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

Objectives:

- *To enhance their writing and reading skills in a technical concept.*
- *To improve their own problem solving skills.*
- *To study the data interpretation and analysis of various methods.*
- *To enhance their own growth opportunities.*
- *To learn the different concepts in core subjects.*

UNIT - I WRITTEN AND ORAL COMMUNICATION – PART 2 [06]

Self-Introduction – GD – Personal Interview Skills Practices on Reading Comprehension Level 2 – Paragraph Writing – Newspaper and Book Review Writing – Skimming and Scanning – Interpretation of Pictorial Representations – Sentence Completion – Sentence Correction – Jumbled Sentences – Synonyms& Antonyms – Using the Same Word as Different Parts of Speech – Editing.

UNIT - II QUANTITATIVE APTITUDE [06]

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

UNIT - III DATA INTERPRETATION AND ANALYSIS [06]

Data Interpretation based on Text – Data Interpretation based on Graphs and Tables. Graphs Column Graphs, Bar Graphs, Line Charts, Pie Chart, Graphs representing Area, Venn Diagram & Flow Charts.

UNIT - IV RESUME WRITING & PRESENTATION SKILLS [06]

An Introduction to the Resume – Types of Resumes – Common Resume Errors – Anatomy of a Resume – What is a Cover Letter? – Types of Cover Letters – Enhancing the Language and Style of Your Resume and Cover Letter – Assessment.

Presentation Skills: Oral presentation and public speaking skills; business presentations. – Understand the Situation – Know Your Tools – Know Yourself – Organize it, Write the Script – Practice – Delivering a Presentation.

UNIT - V DEPARTMENT TECHNICAL TOPICS [06]

Digital circuits - Boolean algebra, logic gates, Combinatorial circuits, Sequential circuits, Sample and hold circuits, ADCs, DACs, Microprocessor (8085).

Analog Communication - Random signals and noise, Analog communication systems, AM, FM modulation and Demodulation, Spectral Analysis, super heterodyne receivers, signal-to-noise ratio.

Digital Communication - Sample and Hold Circuits, PCM & DPCM, Digital modulation techniques ASK, FSK, PSK, bandwidth consideration and probability of error calculations, Basics of TDMA, FDMA and CDMA and GSM..

Total (T=30) =30 Periods

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

CO1: Employ critical thinking in personal interviews type situations.

CO2: Understand the Quantitative Aptitude problems in geometry.

CO3: Understand the data interpretation and analysis by using various graphs.

CO4: Enhance the skills in resume writing and presentation.

CO5: Enhance the comprehension Skills in core subjects.

Text Books :

1 Dr.R.S.Aggarwal, Quantitative Aptitude, S. Chand & Company Limited, New Delhi, Sixteenth Edition, 2018.

2 Dr.R.S.Aggarwal, A Modern Approach to Verbal & Non -Verbal Reasoning, S. Chand & Company Limited, New Delhi, Fourth Edition,2015.

Reference Books :

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

2 Abhijit Guha, Quantitative Aptitude, TMH, New Delhi, Third Edition,2016.

3 M.B. Lal, Goswami,Objective Instant Arithmetic, Upkar Publications, Delhi, Second Edition,2012.

4 W.R.Norman Lewis, Word Power Made Easy, Goyal Publications, New Delhi, Fourth Edition,2016.

5 B.L Theraja, V.K Pandey, Objective Electrical Technology, S Chand Publications, New Delhi, Fourth Edition,2014.

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SEMESTER - VII

18EC711	**WIRELESS AND CELLULAR COMMUNICATION**	L	T	P	C
		3	0	0	3

Prerequisite: *Digital Communication Systems*

Objectives:

- *To learn about the evolution of wireless systems.*
- *To gain knowledge on the principles of radio concepts and propagation models.*
- *To understand various medium access schemes.*
- *To know about various diversity schemes and spread spectrum techniques.*
- *To familiarize the concept of wireless LAN and its architecture*

UNIT - I WIRELESS COMMUNICATION SYSTEMS [09]

Generation of wireless communication systems: 2G, 3G and 4G - Examples of wireless systems: Cordless, Paging system and Cellular telephone system - Comparison of wireless system - Personal communication system.

UNIT - II CELLULAR FUNDAMENTALS [09]

Frequency reuse - Handoff - Channel assignment - Interference - Improving coverage and capacity in cellular systems - Radio propagation mechanisms: Free space propagation and two ray ground reflection model.

UNIT - III WIRELESS ACCESS SYSTEMS [09]

Access methods: TDMA, FDMA, CDMA and CSMA - Capacity of CDMA and SDMA - OFDM - MIMO - Future wireless systems: Introduction to front haul and back haul.

UNIT - IV ANTENNA DIVERSITY AND SPREAD SPECTRUM [09]

Diversity: Space, Time, Polarization and frequency - Selection diversity improvement - Combining techniques: Selective diversity combining, Maximal ratio, Equal gain combining, Feed forward and feedback combining - Spread spectrum: Basic principles, Direct sequence spread spectrum, Frequency hopping spread spectrum.

UNIT - V WIRELESS LAN [09]

Fundamentals of WLAN - IEEE 802.11n WLAN standard, architecture and services, physical layer - MAC sub layer - MAC management sub layer - IEEE standards - HIPER LAN - Bluetooth - Overview of WIFI - WIMAX - LTE.

Total (L: 45) = 45 Periods

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

CO1: Explain the evolution of wireless systems.

CO2: Describe the fundamentals of cellular concepts.

CO3: Classify the types of accessing techniques.

CO4: Identify various diversity schemes and spread spectrum.

CO5: Discuss the architecture and services of Wireless LAN.

Text Books :

1 Rappaport. T.S., Wireless communications, Pearson Education, Noida, Second Edition, 2014.

2 David Tse and Pramod Viswanath, Fundamentals of Wireless Communication, Cambridge University Press, United Kingdom, First Edition, 2005.

Reference Books :

1 Jochen Schiller, Mobile Communications, Pearson Education, Noida, Second Edition, 2017.

2 Kaveth Pahlavan and Prashant Krishnamurthy, Principles of Wireless Networks, John Wiley & Sons Ltd, United States, Second Edition, 2013.

3 Simon Haykin and Michael Moher, Modern Wireless Communication, Pearson Education, Noida, First Edition, 2011.

4 Kazi Mohammed Saidul Hug and Jonathan Rodriguez, Back hauling/Front hauling for future wireless systems, John Wiley & Sons Ltd, United States, First Edition, 2017.

5 Hung Yu Wei, Jarongriew Rykowski, Sudhir Dixit, WIFI, WIMAX and LTE – Multihop mesh networks, John Wiley publications, United States, First Edition, 2013.

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SEMESTER-VII

18EC712	**RF AND MICROWAVE ENGINEERING**	L	T	P	C
		3	0	0	3

Prerequisites: *Electronic Devices and Circuits*

Objectives:

- *To understand the two-port network and high frequency parameters.*
- *To learn about microwave sources and Microwave tubes.*
- *To gain the knowledge on various passive and active microwave devices.*
- *To understand the different microwave amplifiers and oscillators.*
- *To learn the various microwave measurement techniques.*

UNIT- I TWO PORT NETWORK THEORY [09]

Review of low frequency parameters: Impedance, Admittance, Hybrid and ABCD parameters-Different types of interconnections in two port network - High frequency parameters: Formulation of S parameter for two port network and multiport network - Properties of S parameters - Reciprocal and lossless networks –Transmission matrix-RF behavior of resistors, capacitors and inductors.

UNIT- II MICROWAVE TUBES [09]

Two cavity klystron: Transit time effect, velocity modulation, current modulation and bunching - Reflex klystron -Slow wave structures - Helix traveling wave tube, its analysis and gain considerations –Magnetron; Operation of Cylindrical magnetron, Hull cutoff magnetic and Hull cutoff voltage Equation.

UNIT-III PASSIVE AND ACTIVE MICROWAVE DEVICES [09]

Terminations, Attenuators, Phase shifters, Power dividers, Circulator, Isolators-S matrix of power dividers and directional coupler-Rat race coupler–Impedance matching devices: Crystal diode, Schott key diode, PIN diode, Gunn diode, READ diode and IMPATT diode.

UNIT- IV RF AMPLIFIER AND MATCHING NETWORKS [09]

Characteristics of amplifiers - Amplifier power relations - Stability considerations - Stabilization methods - Constant VSWR circles-Constant Noise figure circles-Broadband, high power and multistage amplifiers -Matching Networks: Impedance matching using discrete components -Two component matching networks - Frequency response and quality factor -T and Pi matching networks – Micro strip line matching networks - Single stub and Double stub matching networks.

UNIT- V MICROWAVE MEASUREMENTS [09]

Measuring instruments: VSWR meter, Power meter, Spectrum analyzer, Network analyzer-Measurement of impedance, frequency, Power, VSWR, Q-factor, dielectric constant, scattering coefficients, attenuation, S-parameters.

Total (L: 45) = 45 Periods

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

CO1: Apply High frequency parameters to design two port RF & Microwave networks
CO2: Describe the operation of various microwave tubes and microwave sources
CO3: Illustrate the active and passive microwave devices used in microwave communication systems
CO4: Construct microwave matching networks and amplifiers
CO5: Describe microwave signal parameters measurements techniques.

Text Books:

1. Samuel Y.Liao, Microwave Devices and Circuits, Prentice Hall of India, Third Edition, 2012
2. Reinhold Ludwig and Gene Bogdanov, RF Circuit Design: Theory and Applications, Pearson, Second Edition, 2011
3. David M.Pozar, Microwave Engineering, Wiley India(P) Ltd, New Delhi, Fourth Edition, 2008

Reference Books:

1. S.Vasuki, D.Margaret Helena and R.Rajeswari, Microwave Engineering, McGraw Hill Education, First Edition, 2015.
2. Annapurna Das and Sisir K Das, Microwave Engineering, Tata McGraw Hill, New Delhi, Second Edition,2009
3. Robert E Collin, Foundations for Microwave Engineering, John Wiley & Sons Inc, Second Edition, 2000.
4. Thomas H Lee, Planar Microwave Engineering: A Practical Guide to Theory, Measurements and Circuits, Cambridge University Press, First Edition, 2004

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SEMESTER - VII

18EC713	**FIBER OPTICAL COMMUNICATION**	L	T	P	C
		3	0	0	3

Prerequisite: *Digital Communication*

Objectives:

- *To learn the optical fiber waveguide modes, configurations and structures.*
- *To understand different kinds of losses in optical fibers.*
- *To familiarize the various optical sources, power launching and coupling.*
- *To acquire knowledge about different types of optical receiver and different sources of noise in detectors.*
- *To gain knowledge about point to point link, WDM, EDFA and solitons.*

UNIT - I OPTICAL FIBER WAVEGUIDES [09]

Ray theory transmission: Total internal reflection, acceptance angle, numerical aperture, skew rays – Electromagnetic mode theory of optical propagation: EM wave, modes in planar guide, phase and group velocity - Cylindrical fibers - SM fibers - Fiber attenuation measurements - Fiber numerical aperture measurements - Fiber diameter measurements.

UNIT - II SIGNAL DEGRADATION IN OPTICAL FIBERS [09]

Attenuation - Material absorption losses in silica glass fibers - Linear and nonlinear scattering losses - Fiber bend loss - Mid-band and far-band infrared transmission - Intra and intermodal dispersion - Overall fiber dispersion - Polarization - Nonlinear effects - Optical fiber connections: Fiber alignment and joint losses, fiber splices, fiber connectors, fiber couplers.

UNIT - III OPTICAL SOURCES [09]

LEDs - LASER diodes: Semiconductor laser diode, fabry-perot laser, distributed feedback lasers, modulation of laser diodes, temperature effects - Power launching and coupling: Source to fiber power launching, lensing scheme for coupling improvement, LED coupling to single mode fibers.

UNIT - IV OPTICAL RECEIVER [09]

Optical detectors: PIN photo detector, avalanche photodiodes, construction, characteristics and properties - Photo detector noise: Noise sources, signal to noise ratio, detector response time, comparison of photo detector – Fundamental receiver operation: Digital signal transmission, error sources -Front end amplifier - Probability of error - Quantum limit.

UNIT - V DIGITAL TRANSMISSION SYSTEMS [09]

Point to point link: System considerations, link power budget, rise time budget - Noise effects on system performance - Operational principles of WDM - Solitons - EDFA - Basic concepts of SONET/SDH.

Total (L: 45) = 45 Periods

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

CO1: Describe the concepts of optical fiber waveguide modes and the measurement of various optical fiber parameters.

CO2: Analyze the signal degradation in optical fibers and optical connections.

CO3: Demonstrate the characteristics of various optical sources, power launching and coupling.

CO4: Illustrate the characteristics of various fiber optic detectors and front end amplifiers in optical receivers.

CO5: Outline the Point to point link and understand the concepts of WDM, Solitons, EDFA and SONET.

Text Books :

1 Gerd Keiser, Optical Fiber Communication, McGraw Hill, Noida, First Edition, 2013.

2 John M. Senior, Optical Fiber Communication, Pearson Education, New Delhi, Third Edition, 2014.

References :

1 Govind P.Agrawal, Fiber-optic communication systems, John Wiley & sons, New Delhi, Fourth Edition, 2010.

2 Harry J.R Dutton, Understanding Optical Communications, IBM Corporation, International Technical Support Organization, 2012.

3 J.Gower, Optical Communication System, Prentice Hall of India, Second Edition, 2003.

4 R.P. Khare, Fiber Optics and Optoelectronics, Oxford University Press, Boston, First Edition, 2007.

5 http://nptel.ac.in/courses/117101054/13

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SEMESTER-VII

		L	T	P	C
18EC721	**RF, OPTICAL AND MICROWAVE LABORATORY**	0	0	3	1

Prerequisites: *Analog and Digital Communication systems*

Objectives:

- *To perform the characteristics of Klystron and Gunn oscillator*
- *To Measure radiation pattern of Horn Antenna and*
- *To learn the various methods of microwave and optical devices measurement.*
- *To understand the measurement of optical sources and fiber*
- *To perform RF amplifier and filter design*

List of Experiments:

Microwave Experiments:

Characteristics of Reflex klystron and Gunn diode oscillator.
DirectionalcoupleDirectivityandCouplingcoefficientmeasurement.
VSWR Measurements-Determination of terminated impedance.
Radiation pattern and Gain measurement of Horn antenna.
Guide wavelength, frequency measurement.

Optical Experiments:

Fiber optic analog and digital link.
Measurement of numerical aperture of fibers.
Measurement of bend losses.
DC characteristics of LED and VI characteristics of LASER diode.
BER and Eye pattern measurement using a high band width oscilloscope.

RF Experiments:

Analysis of RF circuit design using spectrum analyzer.
Study of frequency response of RF band pass filter.
Design of Micro Strip Patch Antenna using HFSS – Study Experiments

Total (P: 45) = 45 Periods

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

CO1: Measure the characteristics parameters of Klystron and Gunn diode.
CO2: Perform various characteristics parameters measurements of microwave devices.
CO3: Perform the transmission of analog and digital signals through optical fiber cables.
CO4: Measure the characteristics parameters of laser and LED and interpret the data obtained.
CO5: Design and test RF amplifier and filters

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SEMESTER - VII

		L	T	P	C
18EC722	**PROJECT WORK PHASE - I**	0	0	6	3

***Prerequisites*:** All the core and elective courses of the programme

Objectives:

- *To provide opportunity for the students to implement their skills acquired from the previous semesters to practical problems/problems faced by industry/development of new concepts.*
- *Make the students come up with innovative/ new ideas in his/her area of interest.*
- *Learn methodology to select a project and able to work in a team leading to development of hardware/software product.*
- *Impart the knowledge to model any design using modern tools and demonstrate the working of the model.*
- *To train the students in preparing project report and to face reviews and viva voce examination.*

The students should adhere the following Guidelines:

1. To start with literature review about the proposed idea of the project and executing the same in consultation with the project guide/project coordinator/Industry experts.

2. A detailed analysis/modeling/simulation/design/problem solving/experiment is must to complete and an effort leading to paper publication or patenting is desired.

3. The progress of the project work phase I is evaluated based on a minimum of three reviews and the review committee may be constituted by the Head of the Department.

4. A project work phase I report is required to be submitted at the end of the semester in the prescribed format.

5. The project work phase I is evaluated based on oral presentation and the project report jointly by external and internal examiners constituted by the Head of the Department.

Total (P: 45) = 45 Periods

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

CO1	Identify, analyze, interpret and formulate the problem and conceptualize the methodology of the project in research areas of the department interests or of Industrial importance.
CO2	*Solve a specific problem right from its identification and literature review till the successful solution of the same.*
CO3	*Apply the theoretical concepts to solve real time problems with teamwork and multi-disciplinary approach.*
CO4	*Design /develop/conduct experiment and document the results by using modern tools/methods.*
CO5	*Prepare a good project report and be able to present the ideas with clarity.*

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SEMESTER - VIII

		L	T	P	C
18EC821	**PROJECT WORK PHASE - II**	0	0	12	6

***Prerequisites*:** All the core and elective courses of the programme

Objectives:

- *To provide opportunity for the students to implement their skills acquired from the previous semesters to practical problems/problems faced by industry/development of new concepts.*
- *Make the students come up with innovative/ new ideas in his/her area of interest.*
- *Learn methodology to select a project and able to work in a team leading to development of hardware/software product.*
- *Impart the knowledge to model any design using modern tools and demonstrate the working of the model.*
- *To train the students in preparing project report and to face reviews and viva voce examination.*

The students should adhere the following Guidelines:

1. A detailed analysis/modeling/simulation/design/problem solving/experiment is must to complete and an effort leading to paper publication or patenting is desired.

2. A working model or prototype is to be submitted at the end semester for evaluation.

3. Project work phase II done at Industry should be duly supported by certificate from the Industry. The students should provide a copy of certificate at the end of the project report.

4. The progress of the Project work phase II is evaluated based on a minimum of three reviews and the review committee may be constituted by the Head of the Department.

5. A Project work phase II report is required to be submitted at the end of the semester in the prescribed format.

6. The Project work phase II is evaluated based on oral presentation and the project report jointly by external and internal examiners constituted by the Head of the Department.

Total (P: 90) = 90 Periods

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

CO1: Identify, analyze, interpret and formulate the problem and conceptualize the methodology of the project in research areas of the department interests or of Industrial importance.

CO2: Solve a specific problem right from its identification and literature review till the successful solution of the same.

CO3: Apply the theoretical concepts to solve real time problems with teamwork and multidisciplinary approach.

CO4: Design /develop/conduct experiment and document the results by using modern tools/methods.

CO5: Prepare a good project report and be able to present the ideas with clarity.

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SEMESTER – VI

		L	T	P	C
18EC661	**ANTENNA AND WAVE PROPAGATION (PROFESSIONAL ELECTIVE – I)**	3	0	0	3

Prerequisite: *Electromagnetic theory, Transmission lines and wave guides*

Objectives:

- *To gain knowledge about antenna fundamentals and radiation properties.*
- *To understand the concept of antenna arrays and its types.*
- *To learn the different types of low and high frequency antennas.*
- *To know about special antennas and antenna measurement techniques.*
- *To familiarize the concept about various methods of radio wave propagation.*

UNIT - I ELECTROMAGNETIC RADIATION AND ANTENNA FUNDAMENTALS [09]

Review of electromagnetic theory: Vector potential - Retarded case - Hertizian dipole - Half wave dipole - Quarter wave monopole - Antenna characteristics: Radiation pattern, beam solid angle, directivity, gain, input impedance, polarization, bandwidth, reciprocity, effective aperture, effective length, antenna temperature.

UNIT - II ANTENNA ARRAYS [09]

Expression for electric field from two and N element arrays - Linear arrays: Broad side array and end fire array - Method of pattern multiplication - Binomial array - Phased arrays - Frequency scanning arrays - Adaptive arrays.

UNIT - III LOW AND HIGH FREQUENCY ANTENNAS [09]

Loop antennas: Radiation from small loop and its radiation resistance - Helical antenna: Normal mode and axial mode operation - Yagi Uda antenna - Log periodic antenna - Rhombic antenna - Horn antenna - Reflector antennas and their feed systems - Micro strip antenna.

UNIT - IV SPECIAL ANTENNAS AND ANTENNA MEASUREMENTS [09]

Special applications: Antenna for terrestrial mobile communication systems - GPR - Embedded antennas - UWB - Plasma antenna - Smart antennas. Antenna measurements: Radiation pattern - Gain - Directivity - Polarization - Impedance - Efficiency.

UNIT - V WAVE PROPAGATION [09]

Ground wave propagation: Attenuation characteristics - Calculation of field strength - Space wave propagation: Reflection from ground for vertically and horizontally polarized waves - Reflection characteristics of earth - Resultant of direct and reflected ray at the receiver - Duct propagation - Sky wave propagation: Structure of the ionosphere - Effective dielectric constant of ionized region - Mechanism of refraction - Refractive index - Critical frequency - Skip distance - Maximum usable frequency - Fading - Diversity reception.

Total (L: 45) = 45 Periods

Course Outcomes: On the successful completion of the course, students will be able to

CO1: Describe antenna radiation principles and its fundamental parameters.

CO2: Design different types of antenna arrays and their radiation patterns.

CO3: Develop various types of low and high frequency antennas.

CO4: Illustrate different types of special antennas and techniques used in antenna measurements.

CO5: Demonstrate different types of wave propagation methods and its characteristics.

Text Books :

1 Prasad K. D, Antennas and Wave Propagation, Satya Prakashan Publications, New Delhi, 2009.

2 John D. Kraus, Ronald J. Marhefka, and Ahmad S. Khan, Antennas and Wave Propagation, Tata McGraw-Hill, New Delhi , Fifth Edition, 2017.

Reference Books :

1 Constantine A. Balanis, Antenna Theory: Analysis and Design, John Wiley & Sons, USA, Fourth Edition, 2016.

2 Edward C. Jordon and Keith G. Balmain, Electromagnetic Waves and Radiating Systems, Pearson Education, Second Edition, 2015.

3 Robert E.Collin, Antennas and Radiowave Propagation, McGraw-Hill Education, US, Fourth Edition, 1987.

4 Ganesh Rao D, B Somanathan Nair and Deepa Reghunath, Antennas and Radio-Wave Propagation, Sanguine technical publishers, Bangalore, First Edition, 2007.

5 https://nptel.ac.in/courses/117/107/117107035/

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SEMESTER - VI

		L	T	P	C
18EC662	**MEDICAL ELECTRONICS (PROFESSIONAL ELECTIVE – I)**	3	0	0	3

Prerequisite: *Electronics Devices & Electronic Circuits*

Objectives:

- *To learn the methods of recording various bio-potentials.*
- *To understand the design and working of various diagnostic equipment.*
- *To be familiar with the design and working of various therapeutic equipment.*
- *To expose the principles and working behind various imaging techniques.*
- *To gain knowledge about the recent trends in medical instrumentation.*

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, typical waveforms and signal characteristics.

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 EQUIPMENT [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

Course Outcomes: On the successful completion of the course, students will be able to

CO1: Describe the recording methods of various bio-potentials.

CO2: Interpret various measurements of bio-chemical and non-electrical parameter.

CO3: Explain different types of therapeutic equipment.

CO4: Discuss the principles of various medical imaging modalities.

CO5: Describe the recent trends in medical instrumentation.

Text Books :

1 R.S.Khandpur, Handbook of Biomedical Instrumentation, Tata McGraw Hill, Noida, 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, United States, Fourth Edition, 2010.

2 Joseph J.Carr and John M.Brown, Introduction to Biomedical Equipment Technology, John Wiley &Sons, United States, 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.

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SEMESTER - VI

		L	T	P	C
18EC663	**ADVANCED MICROPROCESSORS AND MICROCONTROLLERS (PROFESSIONAL ELECTIVE – I)**	3	0	0	3

Prerequisite: *Microprocessors and Microcontrollers*

Objectives:

- *To learn the architecture of advanced processors.*
- *To gain knowledge about the Pentium processors.*
- *To expose the fundamentals of PIC Architecture and programming.*
- *To study of interfacing techniques of the PIC microcontroller.*
- *To equip with practical techniques for application development on real PIC hardware.*

UNIT - I ADVANCED MICROPROCESSOR ARCHITECTURE [09]

Microprocessor architecture – Real mode memory addressing – Protected mode memory addresses – Memory paging – Data addressing modes – Addressing modes: Program memory – Stack memory – Data movement instructions – Arithmetic and logic Instructions - Program control instructions.

UNIT - II PENTIUM PROCESSORS [09]

Introduction to pentium microprocessor – Special pentium registers - Pentium memory management – New pentium instructions – Pentium processor – Special pentium pro features – Pentium 4 processor.

UNIT - III PIC MICROCONTROLLER [09]

Architecture – Memory organization – Addressing modes – Instruction set – PIC programming in assembly and C – I/O port – Data conversion – RAM and ROM allocation – Timer programming.

UNIT - IV PERIPHERAL INTERFACING OF PIC MICROCONTROLLER [09]

Timers – Interrupts, I/O ports – I2C bus – A/D converter – UART – CCP modules – ADC, DAC and sensor interfacing – Flash and EEPROM memories.

UNIT - V CASE STUDIES FOR PIC MICROCONTROLLER [09]

Weather monitoring – Real time clock – DC motor speed control – Relays and opto isolators – PWM motor control – Industrial applications.

Total (L: 45) = 45 Periods

Course Outcomes : On the successful completion of the course, students will be able to

CO1: Describe the architecture of advanced processor and develop programming skills in assembly language.

CO2: Demonstrate the different types of Pentium processors.

CO3: Describe the architecture of PIC microcontroller and develop programming skills in C and assembly language.

CO4: Illustrate the use of peripheral devices.

CO5: Design the hardware for microcontroller-based system.

Text Books :

1 B.B.Brey, The Intel Microprocessor 8086/8088 /80186/80188, 80286, 80386, 80486 PENTIUM, PENTIUM Pro, PII, PIII IV Archietecture, Programming Interfacing, Pearson Education, United States, Seventh Edition, 2010.

2 John B Peatman Design with PIC Microcontroller, Pearson Education, United States, Fourth Edition, 2009.

Reference Books :

1 John Paul Shen, Mikko H.Lipasti, Modern Processor Design: Fundamentals of Superscalar Processors, Waveland Press, First Edition, United States, 2013.

2 Douglas V.Hall, Microprocessors and Interfacing, Tata McGraw Hill Publications, New Delhi, Second Edition, 2012.

3 Muhammad Ali Mazidi, Rolin D. Mckinlay, Danny Causey, PIC Microcontroller and Embedded Systems using Assembly and C for PIC18, Pearson Education, London, 2008.

4 Tim Wilmshurst, Designing Embedded Systems with PIC Microcontrollers: Principles and Applications, Newness Publisher, Oxford, Second Edition 2009.

5 http://nptel.ac.in/courses/117104072/35.

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SEMESTER - VI

18EC664	INFORMATION THEORY AND CODING (PROFESSIONAL ELECTIVE – I)	L	T	P	C
		3	0	0	3

Prerequisite: *Digital Communication Systems*

Objectives:

- *To study the fundamentals of information theory*
- *To understand the various types of source coding methods*
- *To know the different methods of channel coding*
- *To learn the block codes for error correcting and detecting process*
- *To study the convolutional codes for error correcting and detecting process*

UNIT - I INFORMATION THEORY [09]

Information - Information rate - Entropy - Classification of codes - Kraft McMillan inequality - Source coding theorem – Shannon Fano coding - Huffman coding - Extended Huffman coding - Joint and conditional entropies - Mutual information - Discrete memory less channels: BSC, BEC and channel capacity - Shannon limit

UNIT - II SOURCE CODING [09]

Text: Adaptive Huffman coding, arithmetic coding and latex format - Audio: Perceptual coding, masking techniques, psychoacoustic model, MPEG audio layers - I,II & III - Dolby AC3 - Image and video formats: GIF, TIFF, BMP,PNG , SIF, CIF & QCIF - Image compression: JPEG - Video compression: Principles-I,B,P frames and motion estimation.

UNIT - III CHANNEL CODING [09]

Characteristics of speech signals - Quantization techniques - Channel vocoder - Linear predictive coding -Information capacity theorem - Implication of the information capacity theorem - Information capacity of colored noise channel - Rate distortion theory - Data compression.

UNIT - IV BLOCK CODES [09]

Hamming codes: Hamming weight, hamming distance, minimum distance decoding - Single parity codes - Repetition codes: Linear block codes, cyclic codes - Syndrome calculation, encoder and decoder - CRC.

UNIT - V CONVOLUTIONAL CODES [09]

Convolutional codes - Code tree, trellis, state diagram - Encoding - Decoding: Sequential search and Viterbi algorithm - Principle of turbo coding - Other codes: RS code, Golay code and Burst error correcting code.

Total (L: 45) = 45 Periods

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

CO1: Illustrate the concepts of information theory.

CO2: Discuss the source coding methods used in image and video broadcasting.

CO3: Infer the methodology of channel coding.

CO4: Describe the various block codes for error correcting and detecting process.

CO5: Describe the various convolutional codes for error correcting and detecting process.

Text Books :

1 R.Bose, Information Theory, Coding and Cryptography, Tata McGraw Hill, New Delhi, Third Edition, 2016

2 Fred Halsall, Multimedia Communications: Applications, Networks, Protocols and Standards, Pearson Education Asia, Fourth Edition, 2009.

Reference Books :

1 K.Sayood, Introduction to Data Compression, Elsevier, Netherlands, Fifth Edition, 2017.

2 S.Gravano, Introduction to Error Control Codes, Oxford University Press, England, First Edition, 2007.

3 Amitabha Bhattacharya, Digital Communications, Tata McGraw Hill, New Delhi, First Edition, 2013.

4 Theodore Rappaport, Wireless Communications - Principles and Practice, Pearson Education, Bengaluru, Second Edition, 2012.

5 https://nptel.ac.in/courses/117/101/117101053/.

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SEMESTER – VI

18EC665	**COMPUTER ARCHITECTURE**	L	T	P	C
	(PROFESSIONAL ELECTIVE – I)	3	0	0	3

Prerequisite: *Basic knowledge of Digital Electronics*

Objectives:

- *To familiarize the basic structure and operation of a digital computer.*
- *To describe the arithmetic and logic unit and implementation of fixed point and floating point arithmetic unit.*
- *To study the concepts of pipelined execution.*
- *To gain knowledge the hierarchical memory system including cache and virtual memories,*
- *To discuss the different ways of communication with I/O devices.*

UNIT – I BASIC STRUCTURE OF COMPUTERS [09]

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 [09]

Fundamental concepts – Instruction execution – Hardware components – Instruction fetch and execution steps – Control signals – Hardwired control – CISC style processors – Micro programmed control – Nano programming.

UNIT – III PIPELINING [09]

Basic concepts – Pipeline organization – Pipelining issues – Data dependencies – Memory delays – Branch delays –Resource limitations – Performance evaluation – Superscalar operation.

UNIT – IV MEMORY SYSTEM [09]

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 [09]

Accessing I/O devices – Programmed I/O – Interrupt initiated I/O – Direct memory access – Buses – Bus arbitration – Interconnection standards: SCSI – USB – Firewire – SATA – PCI express – I/O devices and processors.

Total (L: 45) = 45 Periods

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

CO1: Demonstrate the instruction sets with various addressing modes.

CO2: Know how to generate control signals using control units.

CO3: Explain pipelining concepts.

CO4: Demonstrate the performance of memory in commercial processor.

CO5: Explain how to organize I/O devices.

Text Book :

1 David A. Patterson and John L. Hennessy, Computer Organization and Design: The Hardware/Software Interface, Morgan Kaufmann / Elsevier, Fifth Edition, 2014.

2 V.Carl Hamacher, Zvonko G. Varanesic and Safat G. Zaky, Computer Organization, 6/e, McGraw-Hill Inc, New Delhi, First Edition, 2012.

References :

1 M.Morris Mano, Computer System Architecture, McGraw Hill Reprint, Third Edition, 2012.

2 William Stallings, Computer Organization and Architecture – Designing for Performance, Prentice Hall, Eight Edition, 2010.

3 John P. Hayes, Computer Architecture and Organization, Third Edition, Tata McGraw Hill, 2012.

4 V.P.Heuring, H.F.Jordan, Computer Systems Design and architecture, Pearson Education, USA, Second Edition, 2004.

5 www.nptel.ac.in/courses/106102062.

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SEMESTER - VI

		L	T	P	C
18EC666	**ADVANCED DIGITAL COMMUNICATION TECHNIQUES (PROFESSIONAL ELECTIVE – I)**	3	0	0	3

Prerequisite: *Digital communication systems*

Objectives:

- *To understand the basic digital modulation schemes*
- *To learn about OFDM and reduction mechanism for OFDM*
- *To understand the architecture of block codes*
- *To familiarize on viterbi algorithm and convolutional codes*
- *To gain the knowledge of different equalization techniques and algorithms*

UNIT - I DIGITAL MODULATION TECHNIQUES [09]

Advantages of constant envelope modulation - Binary frequency shift keying - Coherent and non-coherent detection of BFSK - Minimum shift keying - Gaussian minimum shift keying - M-aryphase shift keying - M-ary quadrature amplitude modulation - M-ary frequency shift keying.

UNIT - II OFDM [09]

Generation of subcarriers uses the IFFT - Guard time and cyclic extension - Windowing - OFDM signal processing - Peak power problem - PAP reduction schemes: Clipping - Filtering - Coding and scrambling.

UNIT - III BLOCK CODES [09]

Architecture and performance - Binary block codes - Orthogonal, biorthogonal, transorthogonal - Shannon's channel coding theorem - Channel capacity - Matched filter - Linear block codes - Hamming, Golay, Cyclic, BCH, Reed-Solomon codes.

UNIT - IV CONVOLUTIONAL CODES [09]

Representation of codes using polynomial, state diagram, tree diagram, and trellis diagram - Decoding techniques using maximum Likelihood, Viterbi algorithm - Sequential and threshold methods - Turbo coding.

UNIT - V EQUALIZATION TECHNIQUES [09]

Band limited channels - ISI - Nyquist criterion - Controlled ISI - Partial response signals - Equalization algorithms - Viterbi algorithm - Linear equalizer - Decision feedback equalization - Adaptive equalization algorithms.

Total (L: 45) = 45 Periods

Course Outcomes : On the successful completion of the course, students will be able to

CO1: Apply fundamental digital modulation mechanisms to estimate bandwidth, power etc.

CO2: Describe OFDM concepts and applications

CO3: Apply different block codes to detect and correct errors

CO4: Apply convolutional codes to detect and correct errors

CO5: Classify different equalization techniques in communication systems

Text Books :

1 M.K.Simon, S.M.Hinedi and W.C.Lindsey, Digital communication techniques; Signaling and detection, Prentice Hall India, New Delhi.1995, Reprint edition 2003.

2 Richard Van Nee & Ramjee Prasad, OFDM for Multimedia Communications, Artech House Publication, London Reprint edition,2001.

Reference Books :

1 Simon Haykin, Digital communications, John Wiley and sons, 2014, New Jersey, Fifth Edition.

2 John G. Proakis., Digital Communication, McGraw Hill Publication, New Delhi, Second Edition, 2001.

3 Theodore S.Rappaport., Wireless Communications, Pearson Education, New Delhi, Second Edition, 2002.

4 Stephen G.Wilson., Digital Modulation and Coding, Pearson Education, New Delhi, First Indian Reprint, 2003.

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SEMESTER - VI

		L	T	P	C
18EC667	**ADVANCED DIGITAL SYSTEMS DESIGN (PROFESSIONAL ELECTIVE – I)**	3	0	0	3

Prerequisite: *Digital Electronics*

Objectives:

- *To expose the students to analyze and design synchronous sequential circuits.*
- *To introduce methods to analyze and design asynchronous sequential circuits.*
- *To gain knowledge about different fault diagnosis and testing methods.*
- *To introduce the logics for design of programmable devices.*
- *To design and implementation of digital circuits using programming tools.*

UNIT - I SEQUENTIAL CIRCUIT DESIGN [09]

Analysis and modeling of Clocked Synchronous Sequential Network (CSSN): State diagram, state table, state table assignment and reduction - Design of synchronous sequential circuit - Design of iterative circuit - ASM chart and realization using ASM.

UNIT - II ASYNCHRONOUS SEQUENTIAL CIRCUIT DESIGN [09]

Analysis of Asynchronous Sequential Circuit (ASC) - Flow table reduction - Races in ASC - State assignment and transition table - Design of ASC - Static, dynamic and essential hazards - Data synchronizers - Mixed operating mode asynchronous circuits - Design of vending machine controller.

UNIT - III SYNCHRONOUS DESIGN USING PROGRAMMABLE DEVICES [09]

Programmable logic device families - Designing a synchronous sequential circuit using PLA/PAL - Realization of finite state machine using PLD - FPGA - Xilinx FPGA - Xilinx 4000.

UNIT - IV SYSTEM DESIGN USING VERILOG HDL [09]

Hardware modeling with Verilog HDL - Data types and operators for modeling in Verilog HDL - Behavioural descriptions in Verilog HDL - HDL based synthesis - Synthesis of finite state machines - Structural modeling - Compilation and simulation of Verilog code - Test bench - Realization of combinational and sequential circuit using Verilog.

UNIT - V FAULT DIAGNOSIS AND TESTABILITY ALGORITHMS [09]

Fault table method - Path sensitization method - Boolean difference method - Kohavi algorithm - Tolerance techniques - The Compact Algorithm - Fault in PLA - Test generation - Masking cycle - DFT schemes - Built in self-test.

Total (L: 45) = 45 Periods

Course Outcomes

On the successful completion of the course, students will be able to

CO1	*Analyze and design synchronous sequential circuits.*
CO2	*Analyze and design asynchronous sequential circuits.*
CO3	*Illustrate about different fault models and fault diagnosis.*
CO4	*Describe the architecture of programmable logic devices and design digital circuits using programmable devices.*
CO5	*Demonstrate and use programming tools for implementing digital circuits of industry standards.*

Text Books :

1 Charles H. Roth Jr., Larry L Kinney, Fundamentals of Logic design, Cengage Learning, 7/e, 2014.

2 Nripendra N Biswas, Logic Design Theory, Prentice Hall of India, 2010.

Reference Books :

1 Donald G. Givone, Digital principles and Design, Tata McGraw Hill, 21st Reprint, 2012.

2 Stephen Brown and Zvonk Vranesic, Fundamentals of Digital Logic with VHDL Design, TMH, 2004.

3 S. Palnitkar, Verilog HDL – A Guide to Digital Design and Synthesis, Pearson, 2003.

4 Parag K Lala, Digital System design using PLD, BS Publications, 2003.

5 John M Yarbrough, Digital Logic applications and Design, Thomson Learning, 9th Reprint, 2012.

6 https://www.ee.usyd.edu

7 https://www.cse.iitb.ac.in

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SEMESTER – VI

		L	T	P	C
18CS091	**.NET FRAMEWORK TECHNOLOGIES (Common To CS & EC) (PROFESSIONAL ELECTIVE – I)**	3	0	0	3

Prerequisite: *Basic knowledge of Object oriented programming.*

Objectives:

- *To impart the fundamental concepts of C# and .Net Framework.*
- *To learn the basic object oriented aspects of c#.*
- *To use various control in windows forms application.*
- *To create ASP .Net application.*
- *To deploy the created .Net application in real world.*

UNIT – I .NET FRAMEWORK AND C# **[09]**

Origins of .Net strategy – .Net Framework – Visual Studio .Net –.Net languages – Benefits – Characteristics of C# – Applications of C# – Difference between C# and other Object Oriented Languages – Literals – Data types – Operators – Expressions – Statements – Looping: For each – Methods – Arrays – Strings.

UNIT – II OBJECT ORIENTED ASPECTS OF C# **[09]**

Class – Objects – Inheritance – Polymorphism – Operator Overloading – Delegates – Events and Exceptions.

UNIT – III APPLICATION DEVELOPMENT ON .NET **[09]**

Controls – Menus and Context menus – Forms – Building Windows Application – Relational Databases and SQL – ADO .Net object model – Getting started with ADO.Net – ADO Managed Providers – Data Bound Controls – Changing Database Records – ADO .Net and XML.

UNIT – IV WEB BASED APPLICATION DEVELOPMENT ON .NET **[09]**

Introduction to ASP.Net – Creating ASP .Net Site – ASP .Net working with page – ADO.Net Data Containers – Creating Bindable Grids of Data – ASP.Net Catching – Sessions and Cookies – Programming Web Services.

UNIT – V DEPLOYING .NET APPLICATION **[09]**

Assemblies – Versioning – Attributes – Reflection – Viewing Metadata –Type Discovery – Reflecting on a Type – Marshalling – Remoting – Server object types – Specifying with an interface – Building a server – Building a client – Using single call threads.

Total (L: 45) = 45 Periods

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

CO1: Solve the basic problems using object and classes in C#.

CO2: Demonstrate the concepts of OOPs.

CO3: Design application programs using .Net Components.

CO4: Design website using ASP .Net.

CO5: Build a server and client with an interface.

Text Books :

1 E. Balagurusamy, Programming in C#, Tata McGraw Hill, New Delhi, Third Edition, 2010.

2 J. Liberty, Ian Griffiths and Mathew Adams, Programming C# 4.0, O'Reilly, California, Sixth Edition, 2010.

References :

1 Andrew Troelsen, Pro c# 5.0 and the .net 4.5 frameworks, Apress, India, Sixth Edition, 2010.

2 Herbert Schildt, The complete reference C# 4.0, Tata McGraw Hill, New Delhii, First Edition, 2010.

3 Art Gittleman, Computing with C# & .Net Framework, Jones & Bartlett Publishers, US, Second Edition, 2011.

4 nptel.ac.in/courses/105108081/module9/lecture39/lecture.pdf

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SEMESTER - VII

		L	T	P	C
18EC761	**TELECOMMUNICATION AND SWITCHING NETWORKS (PROFESSIONAL ELECTIVE – II)**	3	0	0	3

Prerequisite: *Analog communication systems*

Objectives:

- *To gain knowledge about telecommunication systems.*
- *To outline the concepts of space switching, time switching and combination switching.*
- *To illustrate the concepts in network synchronization.*
- *To understand the various telephone operations.*
- *To familiarize with blocking probability, holding service time distributions in speech and data networks.*

UNIT - I OVERVIEW OF TELECOMMUNICATION [09]

Introduction: Evolution of telecommunication, basics of switching system, manual switching system - Telecommunication networks - Strowger switching systems: Signaling tones, strowger switching components, step-by-step switching, design parameters - Cross bar switching: Touch tone dial telephone, principles of cross bar switching and cross bar switch configurations, Centralized and distributed stored program control, software architecture, application software, enhanced services offered by stored program control.

UNIT - II DIGITAL SWITCHING [09]

Introduction to switching functions: Space division switching - Time division switching - Two dimensional switching: STS switching, TST switching, No-4 ESS Toll switch - Digital cross-connect systems - Digital switching in an analog environment.

UNIT - III NETWORK SYNCHRONIZATION CONTROL AND MANAGEMENT [09]

Timing: Timing recovery, phase locked loop, clock instability, jitter measurements, systematic jitter - Timing inaccuracies: Slips, asynchronous multiplexing - Network synchronization - Network control - Network management.

UNIT - IV TELEPHONE OPERATIONS [09]

Introduction: Subscriber loop system, switching hierarchy and routing, transmission plan, transmission systems, numbering plan, charging plan, signaling techniques - Digital subscriber access: Digital loop carrier systems, universal digital loop carrier systems, integrated digital loop carrier systems, next-generation digital loop carrier systems - Local microwave distribution service - Digital satellite services.

UNIT - V TRAFFIC ANALYSIS [09]

Traffic characterization: Arrival distributions, holding time distributions - Loss systems - Network blocking probabilities: End-to-End blocking probabilities overflow traffic - Delay systems: Exponential service times, constant service times, finite queues.

Total (L: 45) = 45 Periods

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

CO1 : *Summarize the different types of switching systems.*

CO2 : *Differentiate the types digital switching.*

CO3 : *Describe the network synchronization control and management.*

CO4 : *Classify the types of telephone operations.*

CO5 : *Identify the traffic characterization and analysis.*

Text Books :

1 John C Bellamy, Digital Telephony, John Wily & Sons, USA, Third Edition, 2009.

2 Thiagarajan Viswanathan, Telecommunication Switching Systems and Networks, PHI, New Deldi, Second Edition, 2015.

Reference Books :

1 J.E.Flood, Telecommunication Switching, Traffic and Networks, Pearson Education Ltd, USA, First Edition, 2016.

2 Syed R Ali, Digital Switching Systems, McGraw-Hill, First Edition, 2017.

3 William Stallings, Data and Computer Communications, Prentice Hall, New Delhi, Ninth Edition, 2011.

4 John G Van Bose and Fabrizio devetak, Signaling in telecommunication networks, Wiley Inter Science,USA, second Edition, 2007.

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SEMESTER - VII

18EC762	**CMOS ANALOG CIRCUITS**	L	T	P	C
	(PROFESSIONAL ELECTIVE – II)	3	0	0	3

Prerequisite: *VLSI Design*

Objectives:

- *To gain knowledge about fundamentals of analog ICs.*
- *To understand the concept of CMOS device modeling.*
- *To familiarize the concept of CMOS amplifiers.*
- *To learn about comparators and switched capacitor circuits.*
- *To study the operation of DAC and ADC converters.*

UNIT - I FUNDAMENTALS OF ANALOG ICs [09]

Analog integrated circuit design - Notation, symbology and terminology - Analog signal processing - Example of analog VLSI mixed signal circuit design - PN junction - MOS transistor - Passive components - Other considerations of CMOS technology - Integrated circuit layout.

UNIT - II CMOS DEVICE MODELING [09]

Simple MOS large signal model - Parameters - Small signal model - Computer simulation models - Subthreshold MOS model - SPICE simulation - MOS switch - Diode/Active resistor - Current sinks and sources - Current mirrors - Current and voltage references.

UNIT - III CMOS AMPLIFIERS [09]

Inverters - Differential amplifiers - Design of CMOS OPAMPs - Compensation of OPAMPs - Design of two stage OPAMPs - Power supply rejection ratio of two stage OPAMPs.

UNIT - IV COMPARATORS AND SWITCHED CAPACITOR CIRCUITS [09]

Characterization of a comparator - Two stage open-loop comparators - Other open-loop comparators - Switched capacitor circuits - Amplifiers - Integrators.

UNIT - V DIGITAL TO ANALOG AND ANALOG TO DIGITAL CONVERTERS [09]

Characterization of digital to analog converters - Parallel digital to analog converters - Extending the resolution - Serial digital to analog converters - Characterization of analog to digital converters: Serial, medium and high speed.

Total (L: 45) = 45 Periods

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

CO1: Outline the concept of analog ICs

CO2: Describe the different types of CMOS device modelling.

CO3: Classify various types of CMOS amplifiers.

CO4: Discuss the fundamentals of comparator and capacitor circuits.

CO5: Illustrate the concept about DAC and ADC converters

Text Books :

1 Phillip E.Allen, Douglas R.Holberg, CMOS Analog Circuit Design, Oxford University Press, 3rd edition, 2013.

2 Padmanabham Buddepu, Design of Analog CMOS Integrated Circuits, Second Edition Mc Graw Hill Education, 2017.

Reference Books :

1 Uyemura J.P, Analog CMOS Circuits In: Circuit Design for CMOS VLSI. Springer, Boston, 2011.

2 David Harris, CMOS VLSI Design: A Circuits and Systems Perspective, Pearson Education, India, 2011.

3 Liu Kramer, Indiveri, Delbruck, Douglas, Analog VLSI: Circuits and Principles, Pearson Education, 2006.

4 D.A.Pucknell and K.Eshraghian, Basic VLSI Design, PHI, 3rd edition, 2003

5 NPTEL Course Link:http://nptel.ac.in/courses/117101105/.

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SEMESTER – VII

		L	T	P	C
18EC764	**PC HARDWARE, INSTALLATION, TROUBLESHOOTING AND SERVICING (PROFESSIONAL ELECTIVE – II)**	3	0	0	3

Prerequisite: *Computer Architecture*

Objectives:

- *To learn the fundamental concepts of hardware and motherboards.*
- *To study various types of processor, memory*
- *To understand various storage devices.*
- *To gain knowledge about different I/O devices and peripherals.*
- *To learn how to assemble and configure computers*

UNIT – I HARDWARE AND MOTHERBOARDS [09]

Computer through generations – Basic computer hardware structure – Hardware and software – Different type of computers – Features of computer systems: Features of desktop system, Features of server computer, Features of laptops, Features of tablets. Motherboards: Features – Components – Form factor – Processor support – Controller – Memory support – Graphics support – BIOS – Connectors: Power supply, IDE and SATA – External devices interfaces – Selection of motherboards –Troubleshooting and maintenance of motherboards.

UNIT – II PROCESSING UNIT AND MEMORY [09]

Processor features – Developmental stages of CPU – Towards multiple core processors – Processor architectural details – Processor specifications – Installing and uninstalling CPU – CPU overheating issues – Common problems and solutions. Memory: Features, Types, Working, Memory map – Installing and uninstalling memory modules – Troubleshooting and maintenance of memory.

UNIT – III STORAGE DEVICES [09]

Storage: Storage devices, Hard disks: Details, Working, Feature, Installation, Selection, Specifications, Partitioning and formatting, Maintenance and troubleshooting. – Solid state drives: Installation, Optical storage devices features, Working of Optical storage drives, Installing optical drives, Specification for multi drives, Disc burning software, Troubleshooting and maintenance.

UNIT – IV INPUT AND OUTPUT DEVICES [09]

Features of monitor – CRT monitors: Working, Specification, Setting up, Troubleshooting and maintenance –– LCD monitors: Installing, Specification ,Specification for TFT monitors, Maintenance and troubleshooting of LCD monitors – LED monitors and touch screens – Keyboard: Types and features, Interfaces, Installing, Usage guidelines, Maintenance and troubleshooting– Mouse: Types, Working, Features, Interfaces, Maintenance and troubleshooting.– Printers: Types – Dot matrix printers: Specifications, Installing, Maintenance and troubleshooting – Laser printer: Features, Working, Specifications, Installing printer on networks, Managing laser printers, Maintenance and troubleshooting.

UNIT – V ASSEMBLING AND CONFIGURING COMPUTERS [09]

Assembling and configuring: Caution and Safety – Setting up the cabinet – Installing power supply unit – Installing cpu – Installing heat sink and cooling fan – Installing memory module – Mounting motherboard – Installing hard disk – Installing optical drive – Connecting motherboard power supply cables – Connecting to front panel – Connecting mouse, Keyboard and monitor – Switching on the computer – Configuring – BIOS installing operating system – Installing device drivers – installing add-on cards – Common problems and solutions

Total (L: 45) = 45 Periods

Course Outcomes: On successful completion of this course, the students will be able to

CO1: Define the concepts of hardware unit and motherboards.

CO2: Describe various processors and memory.

CO3: Discuss the concept of storage devices.

CO4: Illustrate various Input and Output Devices.

CO5: Identify the steps to assemble and configure computers.

Text Book :

1 J. L. James, Computer Hardware: Installation, Interfacing, Troubleshooting and Maintenance, PHI Learning, New Delhi, Fourth Edition, 2013.

2 B. Govindarajalu, IBM PC and Clones – Hardware, Troubleshooting and Maintenance, Tata McGraw-Hill, Noida, Second Edition, 2008.

References :

1 Jean Andrews, Guide to Hardware Managing, Maintaining and Troubleshooting, Cengage Learning (Course Technology), Noida, Fifth Edition, 2010.
2 Craig Zacker and John Rourke, PC Hardware: The Complete Reference, McGraw-Hill, Noida, First Edition, Reprint 2017.
3 Michael W. Graves and A+ Guide to PC Hardware Maintenance and Repair, Volume 1, Cengage Learning, Noida, First Edition, 2004.
4 Scott M. Mueller, Upgrading and Repairing PCs, Que Publishing, United States, Twenty Second Edition, 2015.

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SEMESTER – VII

18EC765	**HIGH PERFORMANCE NETWORKS (PROFESSIONAL ELECTIVE – II)**	L	T	P	C
		3	0	0	3

Prerequisite: *Computer networks*

Objectives:

- *To learn the network elements and its architecture.*
- *To understand different high speed networks and its functionalities.*
- *To familiarize the concept of protocols for QoS support. .*
- *To know the integrated and differentiated architecture.*
- *To learn the concepts of advanced networks.*

UNIT – I NETWORK CONCEPTS [09]

Introduction - Principles - Applications - Services: Network elements- Network mechanisms - Layered architecture: layered network - Limitations.

UNIT – II HIGH SPEED NETWORKS [09]

Frame Relay Networks – Asynchronous transfer mode – ATM Protocol Architecture, ATM logical Connection, ATM Cell – ATM Service Categories – AAL, High Speed LANs: Fast Ethernet, Gigabit Ethernet, Fiber Channel – Wireless LANs: applications, requirements – Architecture of 802.11.

UNIT – III PROTOCOLS FOR QOS SUPPORT [09]

RSVP – Goals & Characteristics, Data Flow, RSVP operations, Protocol Mechanisms – Multiprotocol Label Switching – Operations, Label Stacking, Protocol details – RTP – Protocol Architecture, Data Transfer Protocol, RTCP.

UNIT – IV INTEGRATED AND DIFFERENTIATED SERVICES [09]

Integrated services architecture: Approach, components, services - Queuing discipline: Fair queuing, processor sharing, bit-round fair queuing, generalized processor sharing, weighted fair queuing - Random early detection - Differentiated services.

UNIT – V ADVANCED NETWORK CONCEPTS [09]

VPN: Remote access, site-to-site, tunneling and point to point protocol -Security in VPN - MPLS: Operation, routing, tunneling and use of FEC, traffic engineering and MPLS based VPNs - Overlay networks: Peer to peer connection.

Total (L: 45) = 45 Periods

Course Outcomes: On completion of this course, the students will be able to

CO1: Describe the elements of high speed networks.
CO2: Interpret the functionalities of high speed networks.
CO3: Illustrate the concept of protocols for real time operations.
CO4: Classify the various queuing disciplines and differentiated services.
CO5: Compare the connection-oriented services with reference to MPLS & VPN.

Text Book :

1 Jean Warland, PravinVaraiya, High Performance Communication Networks, Morgan Kaufmann Publishers, Second edition, 2011.
2 Nader F. Mir, Computer and Communication Networks, Dorling Kindersley, Third edition, 2009.

References :

1 Lenon Garcia Widjaja, Communication Networks, Tata McGraw-Hill, Second edition, 2010.
2 Othmarkyas, ATM Networks, International Thomson Computer Press, Second edition, 1993.
3 Ranier Handel Manfred N Huber, Stefan Schroder, ATM Networks - Concepts, Protocols Applications, Addison Wesley, Third edition, 2006.
4 IrvanPepelnjk, Jim Guichard& Jeff Apcar, MPLS and VPN Architecture, Cisco Press, Volume 1 and 2, 2007.

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SEMESTER - VII

		L	T	P	C
18EC768	**ELECTRONIC SYSTEM DESIGN (PROFESSIONAL ELECTIVE – II)**	3	0	0	3

Prerequisite: *Electronic devices and circuits*

Objectives:

- *To gain the fundamental knowledge on power supplies and amplifiers.*
- *To illustrate data acquisition systems.*
- *To study the concept of PCB design methods.*
- *To learn RF design methodologies.*
- *To summarize the PCB technology trends.*

UNIT - I DESIGN OF POWER SUPPLIES AND AMPLIFIERS [09]

Voltage regulations: Introduction - O/P resistance and load regulation - Types of regulators - Voltage converters. Power amplifiers: Basic consideration - Class A, class B and class AB Power amplifier - Power MOSFET.

UNIT - II DATA ACQUISITION SYSTEMS [09]

Digital to analog converters: Introduction, R-2R resistor ladder networks, CMOS current switches,16-bit monolithic DAC,DAC speed and settling time, Analog to digital converters: ADC transfer characteristic and quantization error, parallel comparator ADC, successive approximation ADC.

UNIT - III PRINTED CIRCUIT BOARD [09]

Layout planning: General considerations - PCB sizes - Layout approaches - Layout, General rules and parameters: Resistance, capacitance, inductance, conductor spacing, cooling requirements and package density, layout check.

UNIT - IV DESIGN RULES FOR DIGITAL & ANALOG CIRCUIT PCB's [09]

Digital circuit PCB: Introduction – Reflection - Cross talk - Around and supply line noise - Electromagnetic interference from pulse type EM fields. Analog circuit PCB: Component placing - Signal conductor - Supply and ground conductors.

UNIT - V PCB TECHNOLOGY TRENDS [09]

Introduction - Fine line conductors with ultra thin copper foil - Multilayer board - Multi wire board - Subtractive additive process - Semi additive process - Additive process - Flexible PCB - Metal core circuit boards - Mechanical milling of PCB.

Total (L: 45) = 45 Periods

Course Outcomes: On completion of this course, the students will be able to

CO1: Design of simple power supplies and amplifiers.

CO2: Illustrate data acquisition systems.

CO3: Explain the concept of PCB design methods.

CO4: Apply RF design methodologies to construct PCB boards.

CO5: Describe the PCB technology trends.

Text Books :

1 Reinhold Luduig and Pavel Bretchko, "RF Circuit Design – Theory and Applications", Pearson Education, USA Second Edition, 2012.

2 Walter C.Bosshart, "Printed circuit Boards – Design and Technology", Tata McGraw-Hill, New Delhi, Second Edition, 2012.

Reference Books :

1 Keith H.Billings, "Handbook of Switched Mode Power Supplies" McGraw-Hill Publishing Co., New Delhi, Third Edition 2011.

2 Michael Jaacob, "Applications and Design with Analog Integrated Circuits", PHI, New Delhi, Second Edition, 1999.

3 F.H.Mitchell, "Introduction to Electronic Design", Prentice Hall of India, New Delhi, Second Edition, 1992.

4 Sydney Soclof, "Applications of Analog Integrated Circuits", Prentice Hall of India, New Delhi, Second Edition 1997.

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SEMESTER - VII

		L	T	P	C
18EC769	**EMBEDDED SYSTEM DESIGN (PROFESSIONAL ELECTIVE – II)**	3	0	0	3

Prerequisite: *Microprocessor and Microcontroller*

Objectives:

- *To learn the basics of embedded architecture.*
- *To study the concepts of computing platform and design analysis.*
- *To familiarize the concepts of operating systems.*
- *To gain knowledge about the concepts of hardware accelerators and networks.*
- *To understand about the system design techniques in embedded system.*

UNIT - I INTRODUCTION TO EMBEDDED ARCHITECTURE [09]

Complex systems and microprocessors - Embedded system design process - Formalisms for system design - Design example: Model train controller - Instruction sets preliminaries - ARM processor - CPU: Programming input and output - Supervisor mode, exception and traps - Coprocessors - Memory system mechanism - CPU performance - CPU power consumption.

UNIT - II COMPUTING PLATFORM AND DESIGN ANALYSIS [09]

CPU buses - Memory devices - I/O devices - Component interfacing - Design with microprocessors - Development and debugging - Components for embedded programs - Model of programs - Assembly, linking and loading - Basic compilation techniques - Program optimization - Program validation and testing.

UNIT - III PROCESSES AND OPERATING SYSTEMS [09]

Multiple tasks and multi processes - Preemptive real time operating systems - Priority based scheduling - Inter process communication mechanisms - Evaluating operating system performance - Power management and optimization for processes.

UNIT - IV HARDWARE ACCELERATORS & NETWORKS [09]

CPUs and accelerators - Multiprocessor performance analysis - Consumer electronics architecture - Distributed embedded architecture - Networks for embedded systems - Network based design - Internet enabled systems - Vehicles as networks - Sensor networks.

UNIT - V SYSTEM DESIGN TECHNIQUES [09]

Design methodologies - Requirement analysis - Specifications - System analysis and architecture design - Quality assurance - Software tools for embedded system development - Design example: Alarm clock, software modem, elevator controller.

Total (L: 45) = 45 Periods

Course Outcomes: On completion of this course, the students will be able to

CO1: Explain the concepts of embedded architecture.
CO2: Analyze the optimization and validation of programming.
CO3: Illustrate the concept of processes in operating system.
CO4: Familiarize the use of accelerators and embedded network.
CO5: Analyze the various system design techniques in embedded systems.

Text Books :

1 Wayne Wolf, Computers as Components - Principles of Embedded Computing System Design, Morgan Kaufmann Publisher, USA, Second Edition, 2011.

2 Steve Heath, Embedded System Design by New Age Publications, London, First Edition, 2003.

Reference Books :

1 David E Simon, An Embedded Software Primer, Pearson Education, 2007.

2 K.V.K.K.Prasad, Embedded Real-Time Systems: Concepts, Design & Programming, Dreamtech Press, New Delhi, First Edition, 2009

3 Sriram V Iyer, Pankaj Gupta, Embedded Real Time Systems Programming, Tata McGraw Hill, 2004.

4 Tammy Noergaard, Embedded Systems Architecture, Elsevier, Nether Lands, First Edition, 2006.

5 https://nptel.ac.in/courses/108/102/108102045/

K.S.R. COLLEGE OF ENGINEERING (Autonomous) **R 2016**

SEMESTER -VII

18EC763	**FUNDAMENTALS OF NANO ELECTRONICS (PROFESSIONAL ELECTIVE – III)**	L	T	P	C
		3	0	0	3

Prerequisite: *Engineering physics*

Objectives:

- *To learn the evolution of Nanotechnology.*
- *To understand the different diversity techniques in Nano systems.*
- *To familiarize the different types of Nano particles and its characterization.*
- *To familiarize the application of Nano technology in biotechnology.*
- *To gain knowledge about the uses of Nano technology in industrial applications.*

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 quantum dots - 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 NANOTECHNOLOGY 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 (L: 45) = 45 Periods

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

CO1: Describe the evolution and associated techniques of Nano science.

CO2: Interpret the diversities in Nano systems.

CO3: Illustrate of Nano particles, shells and their Characterization.

CO4: Describe the importance of nanotechnology in biotechnology.

CO5: Outline the applications of nanotechnology in industry and society.

Text Books :

1 PradeepT,"Nano: The Essentials, Understanding Nano Science and Nano technology, Tata Mcgraw Hill, New Delhi, First Edition, 2007.

2 Mick Wilson, Kamali Kannargare., Geoff Smith, Nano technology: Basic Science and Emerging technologies, Overseas Press, New York, First Edition, 2005.

Reference Books :

1 Nalwa H S, Encyclopedia of Nanoscience and Nanotechnology, Vol 1-10, American Scientific Publishers, New York, 2004.

2 Rao C N R and Govindaraj A, Nanotubes and Nanowires, Royal Society of Chemistry, London, 2005.

3 Richard A L Jones, Soft Machines: Nanotechnology and Life, Oxford University Press, Boston, 2008

4 Charles P. Poole, Frank J. Owens, Introduction to Nanotechnology, Wiley Inter science, New York, 2003.

5 Mark A. Ratner, Daniel Ratner, Nanotechnology: A gentle introduction to the next Big Idea, Pearson Education, New Delhi, 2003

K.S.R. COLLEGE OF ENGINEERING (Autonomous) **R 2018**

SEMESTER – VII

18EC766	**WIRELESS SENSOR NETWORK**	L	T	P	C
	(PROFESSIONAL ELECTIVE – III)	3	0	0	3

Prerequisite: *Wireless Networks*

Objectives:

- *To learn the fundamentals of wireless sensor networks.*
- *To familiarize with the architecture of sensor nodes.*
- *To learn different protocols and power saving techniques for sensor networking.*
- *To understand about location discovery and sensor tasking.*
- *To learn the fundamentals of wireless sensor networks platform and tools.*

UNIT – I INTRODUCTION TO WIRELESS SENSOR NETWORKS [09]

Introduction - Issues and challenges - Characteristics requirements - Advantages - Applications of sensor networks -Difference between mobile Ad-hoc and sensor networks.

UNIT – II SENSOR NODE ARCHITECTURES [09]

Single node architecture: Layered, clustered - Hardware components - Energy consumption of sensor nodes, operating systems and execution environments - Network architecture: Sensor network scenarios - Optimization goals and figure of merit - Gateway concepts.

UNIT – III NETWORKING OF SENSORS [09]

Data dissemination and gathering - MAC protocols for wireless sensor networks - Low duty cycle protocols and wakeup concepts - S-MAC - Wakeup radio concepts - Assignment of MAC addresses - Routing protocols: Energy efficient, unicast, broadcast and multicast - Low energy adaptive clustering hierarchy - Power efficient data gathering.

UNIT – IV LOCATION DISCOVERY AND SENSOR TASKING [09]

Topology control - Clustering - Time synchronization - Localization and its services: Ranging techniques, range based localization algorithms - Sensor tasking and control: Task driven sensing, roles of sensor nodes and utilities, information based sensor tasking.

UNIT – V SENSOR NETWORK PLATFORMS AND TOOLS [09]

Operating systems for wireless sensor networks - Sensor node hardware - Berkeley motes, programming challenges - Node-level software platforms - Node-level simulators - State-centric programming.

Total (L: 45) = 45 Periods

Course Outcomes: On completion of this course, the students will be able to

CO1 Describe the basics of wireless sensor networks.

CO2: Explain the sensor nodes and architectures.

CO3: Interpret the MAC protocols and routing protocols for WSN.

CO4: Explain the concept of location discovery and sensor tasking.

CO5: Describe the sensor network platforms and tools.

Text Book :

1 Holger Karl & Andreas Willig, Protocols and Architectures for Wireless Sensor Networks, John Wiley, 2011.

2 Feng Zhao & Leonidas J. Guibas, Wireless Sensor Networks – An Information Processing Approach, Elsevier, Reprint 2012.

References :

1 C.Siva Ram Murthy, B.S.Manoj, Ad hoc Wireless Networks Architectures and Protocols, Second edition, Pearson Education, Nineteenth impression, 2012.

2 Anna Hac, Wireless Sensor Network Designs, John Wiley, 2012.

3 KazemSohraby, Daniel Minoli, &TaiebZnati, Wireless Sensor Networks-Technology, Protocols, and Applications, John Wiley, Reprint 2012.

4 Bhaskar Krishnamachari, “Networking Wireless Sensors”, Cambridge Press, 2005.

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SEMESTER - VII

18EC767	**ASIC DESIGN**	L	T	P	C
	(PROFESSIONAL ELECTIVE – III)	3	0	0	3

Prerequisite: *VLSI Design*

Objectives:

- *To learn about different types of ASIC, CMOS logic and ASIC library*
- *To familiar with the various logic cells and input output devices*
- *To study about various types of programmable ASICs architectures and interconnects*
- *To comprehend the low power design techniques and methodologies*
- *To understand the floor planning, placement and routing process*

UNIT - I INTRODUCTION TO ASIC, CMOS LOGIC AND ASIC LIBRARY [09]

Types of ASICs – Design flow – CMOS transistors – Combinational logic cell – Sequential logic cell – Data path logic cells – Transistors as resistors – Transistor parasitic capacitance – Logical effort.

UNIT - II LOGIC CELLS AND I/O CELLS [09]

Antifuse – Static RAM, EPROM and EEPROM technology – Xilinx LCA – Altera FLEX – Altera MAX – DC & AC inputs and outputs – Clock and power inputs – Xilinx I/O blocks.

UNIT - III INTERCONNECT AND DESIGN SOFTWARE [09]

Xilinx LCA – Xilinx EPLD – Altera MAX 5000 and 7000 – Altera MAX 9000 – Altera FLEX – Design systems – Half gate ASIC – Schematic entry – Low level design languages – PLA tools – EDIF.

UNIT - IV LOGIC SIMULATION AND SYNTHESIS, PARTITIONING [09]

Types of simulation – Verilog and logic synthesis – VHDL and logic synthesis – System partitioning – FPGA partitioning – Partitioning methods: Examples, constructive and iterative partitioning, K-L algorithm.

UNIT - V FLOOR PLANNING, PLACEMENT AND ROUTING [09]

Floor planning: goals, objectives – Placement: Terms and definitions, goals, objective, placement algorithms, simple placement examples – Physical design flow – Global routing: Goals, objectives, methods, between blocks, inside flexible blocks – Detailed routing: Goals, objective, measurement of channel density, left-edge algorithm, area routing algorithm – Circuit extraction – DRC.

Total (L: 45) = 45 Periods

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

CO1: Describe the basics of ASIC design flow and library design.

CO2: Interpret the logical cells and i/o cells.

CO3: Illustrate the interconnections in various vendors of FPGA

CO4: Apply various logic synthesis techniques, simulation and testing in digital system design.

CO5: Outline the concepts of ASIC construction, floor planning, placement and routing

Text Books :

1 M.J.S.Smith, “Application Specific Integrated Circuits”, Pearson, USA, First Edition, New Delhi, 2012.

2 FarzadNekoogar and FaranakNekoogar, “From ASICs to SOCs: A Practical Approach”, Prentice Hall, New Delhi, 2003.

3 Charles H.Roth, ”Fundamentals of Logic Design”, Thomson Learning, USA, FifthEdition,2011.

References :

1 Wayne Wolf,“FPGA-Based System Design”, Pearson, USA, 2009.

2 John V. Oldfield, Richard C. Dorf ,“Field Programmable Gate Arrays”, John-Wiley, 2008.

3 Rajsuman.R, “System-on-a-Chip Design and Test”, Artech House Publishers, Boston, 2009.

4 Laung-Terng Wang, Yao-Wen Chang, Kwang-Ting Cheng, Morgan, “Electronic Design Automation: Synthesis, Verification, and Test,” Kaufmann Publishers, 2009.

5 https://nptel.ac.in/courses/117/106/117106092/ , S.Srinivasan, ―VLSI Circuits, NPTEL Course.

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SEMESTER - VII

		L	T	P	C
18EC771	**ROBOTICS (PROFESSIONAL ELECTIVE – III)**	3	0	0	3

Prerequisite: *Digital signal processing and Digital image processing*

Objectives:

- *To understand the fundamentals of robotics.*
- *To acquire the knowledge of robotics in computer based vision.*
- *To study the various sensing methods used in robots.*
- *To develop the various algorithms and planning's and networks in Robotics.*
- *To study the design aspects of 4 axis and 6 axis Robot.*

UNIT - I INTRODUCTION TO ROBOTICS [09]

Motion - Potential function - Road maps - Cell decomposition sensor and sensor planning - Kinematics - Forward and inverse kinematics - Transformation matrix and DH transformation - Inverse kinematics - Geometric methods and algebraic methods - Non holonomic constraints.

UNIT - II COMPUTER VISION [09]

Projection - Optics, projection on the Image plane and radiometry - Image processing - Connectivity - Images - Gray Scale and binary images - Blob filling – Thresholding - Histogram - Convolution - Digital convolution and filtering and Masking techniques - Edge detection - Mono and stereo vision - Face detection.

UNIT - III SENSORS AND SENSING DEVICES [09]

Introduction to various types of sensor - Resistive sensors - Range sensors – LADAR - Sonar - Radar and Infra-red - Introduction to sensing - Light sensing - Heat sensing - Touch sensing and position sensing.

UNIT - IV ARTIFICIAL INTELLIGENCE [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 - Bayesian networks - Decision trees and bayes net inference.

UNIT - V INTEGRATION TO ROBOT [09]

Building of 4 axis or 6 axis robot - Vision system for pattern detection - Sensors for obstacle detection - AI algorithms for path finding - Decision making.

Total (L: 45) = 45 Periods

Course Outcomes: On completion of this course, the students will be able to

CO1: Outline the basis of Robotics.
CO2: Summarize the technologies applicable for Robotics in computer based vision.
CO3: Model the different sensing elements of robot.
CO4: Develop the algorithms applicable for robotics.
CO5: Develop 4-axis and 6-axis robot.

Text Books :

1 Duda, Hart and Stork, Pattern Recognition, Wiley-Inter science, New Delhi, Second Edition, 2000.

2 Mallot, Computational Vision: Information Processing in Perception and Visual Behavior, MIT Press, London, Second Edition, 2000.

Reference Books :

1 Stuart Russell and Peter Norvig, Artificial Intelligence-A Modern Approach, Pearson Education Series in Artificial Intelligence, USA, Fourth Edition, 2020.

2 Robert Schilling and Craig, Fundamentals of Robotics, Analysis and control, PHI, 2006.

3 Forsyth and Ponce, Computer Vision, A modern Approach, Pearson Education, New York, Second Edition, 2003.

4 Saeed B.Niku, Introduction to Robotics; Analysis Control, Applications, Wiley, USA, Third Edition, 2019.

5 https://nptel.ac.in/courses/112/108/112108093/

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SEMESTER - VII

		L	T	P	C
18EC772	**CAD FOR VLSI (PROFESSIONAL ELECTIVE – III)**	3	0	0	3

Prerequisite: *VLSI Design*

Objectives:

- *To study various design tools in VLSI*
- *To understand various algorithms based on graph theory*
- *To know the different optimization techniques*
- *To learn the algorithms for placement, partitioning and floor planning*
- *To gain knowledge on routing*

UNIT - I INTRODUCTION TO VLSI DESIGN AND TOOLS [09]

VLSI Design problem - Design domains - Design action - Design methods and technologies - Algorithmic and system design - Structural and logic design - Transistor level design - Layout design - Verification methods - Design management tools.

UNIT - II GRAPH THEORY AND ALGORITHMS [09]

Terminology - Data structures for the representation of graphs - Computational complexity - Examples of graph algorithms: Depth first search - Breadth first search - Dijkstra‟s shortest path algorithm - Prim‟s algorithm for minimum spanning tree - Tractable and intractable problems: Combinatorial optimization problems - Decision problems - Complexity classes - NP completeness and NP hardness - Consequences.

UNIT - III COMBINATORIAL OPTIMIZATION AND LAYOUT COMPACTION [09]

Unit size placement problem - Backtracking - Branch and bound - Dynamic programming - Integer linear programming - Design rules - Symbolic layout - Problem formulation: Applications of compaction - Informal problem formulation - Graph theoretical formulation - Maximum distance constraints - Algorithms for constraint graph compaction: Longest path algorithm for DAGs - Longest path in graphs with cycles - Liao wong algorithm - Bellman ford algorithm.

UNIT - IV PLACEMENT, PARTITIONING AND FLOOR PLANNING [09]

Circuit representation - Wire length estimation - Types of placement problems - Placement algorithms - Constructive placement - Iterative improvement - Kernighan Lin partitioning algorithm – Floor planning concepts - Terminology and floor planning representation - Optimization problems in floor planning - Shape functions and floor planning sizing.

UNIT - V ROUTING AND ALGORITHMS [09]

Types of local routing problems - Area routing - Channel routing: Channel routing models - Vertical constraint graph - Horizontal constraints and left edge algorithm - Channel routing algorithms - Global routing - Standard cell layout - Building block layout and channel ordering - Algorithms for global routing - Problem definition and discussion - Efficient rectilinear steiner tree construction - Local transformations for global routing.

Total (L: 45) = 45 Periods

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

CO1 : Describe the concepts of VLSI design tools

CO2 : Infer the graph theory algorithms for optimization

CO3 : Identify the techniques for layout compaction

CO4 : Build the algorithms of placement, partitioning and floor planning

CO5 : Discuss the algorithms on routing

Text Books :

1 S.H. Gerez, Algorithms for VLSI Design Automation, John Wiley & Sons, New Delhi, Second Edition, Reprint 2013.

2 Stephen M. Trimberger, An Introduction to CAD for VLSI, Springer; Kluwar Academic Publisher, New Delhi, 2014.

Reference Books :

1 N.A. Sherwani, Algorithms for VLSI Physical Design Automation, Springer Kluwar Academic Publisher, New Delhi, Fourth India Reprint 2012.

2 Christopher Michael and Mohammed Ismail, Statistical Modeling of Computer-Aided Design of MOS VLSI Circuits, Kulwer Academic Publishers, 2010.

3 Drechsler R, Evolutionary Algorithms for VLSI CAD, Kluwar Academic Publisher, New Delhi, 2012.

4 D.Hill, D. Shugard, J. Fishburn and K. Keutzer, Algorithms and Techniques for VLSI Layout Synthesis, Springer Science & Business Media Publisher 2012.

5 http://nptel.ac.in/courses/106106089/

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SEMESTER – VII

		L	T	P	C
18EC773	**WIRELESS NETWORKS (PROFESSIONAL ELECTIVE – III)**	3	0	0	3

Prerequisite: *Wireless Communication*

Objectives:

- *To understand the concept about Wireless networks, protocol stack and standards*
- *To gain knowledge about mobile network layer.*
- *To study about fundamentals of 3G Services, its protocols and applications*
- *To have in depth knowledge on internetworking of WLAN and WWAN*
- *To learn about evolution of 4G Networks, its architecture and applications*

UNIT – I WIRELESS LAN [09]

Introduction - WLAN technologies: IEEE802.11: System architecture, protocol architecture, 802.11b, 802.11a – Hiper LAN: WATM, BRAN, HiperLAN2 – Bluetooth: Architecture, WPAN – IEEE 802.15.4, Wireless USB, Zigbee, 6LoWPAN, Wireless HART

UNIT – II MOBILE NETWORK LAYER [09]

Introduction - Mobile IP: IP packet delivery, Agent discovery, tunneling and encapsulation, IPV6 - Network layer in the internet - Mobile IP session initiation protocol - mobile ad - hoc network: Routing: Destination Sequence distance vector, IoT: CoAP

UNIT – III 3G OVERVIEW [09]

Overview of UTMS Terrestrial Radio access network - UMTS Core network Architecture: 3GPP Architecture, User equipment, CDMA2000 overview - Radio and Network components, Network structure, Radio Network, TD - CDMA, TD – SCDMA.

UNIT – IV INTERNETWORKING BETWEEN WLANS AND WWANS [09]

Internetworking objectives and requirements, Schemes to connect WLANS and 3G Networks, Session Mobility, Internetworking Architecture for WLAN and GPRS, System Description, Local Multipoint Distribution Service, Multichannel Multipoint Distribution System.

UNIT – V 4G & Beyond [09]

Introduction – 4G vision – 4G features and challenges - Applications of 4G – 4G Technologies: Multicarrier Modulation, Smart antenna techniques, IMS Architecture, LTE, Advanced Broadband Wireless Access and Services, MVNO.

Total (L: 45) = 45 Periods

Course Outcomes: On completion of this course, the students will be able to

CO1: Describe various wireless network protocols and its standards.

CO2: Interpret mobile network layer and routing.

CO3: Outline the concept of 3G networks and its architecture.

CO4: Compare various schemes used for internet working between WLANS AND WWANS.

CO5: Outline the concepts of 4G Networks and its architecture.

Text Book :

1 Jochen Schiller, “Mobile Communications” Second Edition, Pearson Education 2012.(Unit I,II,III)

2 Vijay Garg, “Wireless Communications and networking”, First Edition, Elsevier 2007.(Unit IV,V)

References :

1 Erik Dahlman, Stefan Parkvall, Johan Skold and Per Beming, "3G Evolution HSPA and LTE for Mobile Broadband”, Second Edition, Academic Press, 2010.

2 Anurag Kumar, D.Manjunath, Joy kuri, “Wireless Networking”, First Edition, Elsevier 2011.

3 Simon Haykin , Michael Moher, David Koilpillai, ”Modern Wireless Communications”, First Edition, Pearson Education 2013

4 Dharma Prakash Agarwal and Qing AnZeng, “Introduction to Wireless and Mobile Systems”, Thomson Learning, 3, reprint, 2010.

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SEMESTER – VIII

		L	T	P	C
18EC861	**SATELLITE COMMUNICATION (PROFESSIONAL ELECTIVE – IV)**	3	0	0	3

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

Objectives:

- *To learn satellite systems in relation to other terrestrial systems and its orbits.*
- *To gain knowledge of space segment and earth segment components.*
- *To know about satellite link analysis.*
- *To know about the different applications of satellite.*
- *To learn the information of satellite access by various users.*

UNIT – I SATELLITE ORBITS [09]

Introduction to satellite communications: Kepler's laws, Newton's law, orbital parameters, orbital perturbations, station keeping, geostationary and non-geostationary orbits-Look angle determination - Limits of visibility-Eclipse-Sub satellite point-Sun transit outage-Launch vehicles and propulsion : Principles of rocket propulsion, injection in to final orbit, launch vehicles for commercial satellites.

UNIT – II SPACE AND EARTH SEGMENTS [09]

Space segment: Structure, primary power, thermal subsystem, telemetry, tracking and command subsystem, attitude control, propulsion subsystem, transponders. Earth segment : Transmitters, receivers, tracking systems, terrestrial interface-Receive only TV systems-Master antenna TV systems - Transmit-receive earth station.

UNIT – III SATELLITE LINK DESIGN [09]

Link power budget equation-Satellite link: Uplink and downlink, C/N ratio – Interference analysis: Inter modulation, inter symbol, cross polarization - Terrestrial - Propagation consideration- Noise consideration.

UNIT – IV SATELLITE ACCESS [09]

Modulation and multiplexing: Voice, data, video, analog and digital transmission systems - Single access - Multiple access: FDMA: Pre assigned and demand assigned FDMA, TDMA: Pre assigned and demand assigned TDMA, reference bursts, CDMA: Direct sequence spread spectrum, the code signal, acquisition and tracking, spectrum spreading and de spreading.

UNIT – V SATELLITE APPLICATIONS [09]

INTELSAT series – INSAT – VSAT - Mobile satellite services: GSM, GPS, INMARSAT– Satellite navigational system- Direct Broadcast Satellites (DBS) - Direct to Home Broadcast (DTH) - Digital Video Broadcast (DVB) - Digital Audio Broadcast (DAB) - Business TV (BTV)- Google Earth.

Total (L: 45) = 45 Periods

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

C01: Describe the principles of the various models of orbital mechanisms and launching procedures of satellite.
C02: Illustrate the spacecraft sub system and earth segment used in satellite communication.
C03: Analyze the fundamental digital satellite link including link budgets, interference and noise consideration.
C04: Discuss different modulation, multiplexing techniques and multiple access techniques in satellite communication.
C05: Interpret the importance of satellite communications for applications like INSAT, INTELSAT, VSAT and mobile satellite services.

Text Book:

1 Dennis Roddy, Satellite Communications, McGraw Hill International, US, Fourth edition, Reprint 2013.

2 Wilbur L. Pritchard, Hendri G. Suyderhoud, Robert A. Nelson, Satellite Communication Systems Engineering, PHI, India, 1993.

Reference Books:

1 Tri T. Ha, Digital Satellite Communication, Tata McGraw Hill, India, Second edition, Reprint 2015.

2 Anil.K.Maini, Varsha Agraval, Satellite Communications, Wiley, US, Reprint, 2011.

3 M.Richharia, Satellite Communication Systems - Design Principles, Macmillan, UK, 2003.

4 Timothy Pratt, Charles Bostian & Jeremy Allnutt, Satellite Communications, John Wiley, US, Reprint 2011.

5 http://nptel.ac.in/courses/117105131.

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SEMESTER - VIII

		L	T	P	C
18EC862	**MEMS TECHNOLOGY (PROFESSIONAL ELECTIVE – IV)**	3	0	0	3

Prerequisite: *Electronic Devices, Electronic Circuits.*

Objectives:

- *To familiarize the basic concepts of MEMS materials and its fabrication techniques.*
- *To understand the actuation mechanisms for MEMS devices.*
- *To Understand the operations of MEMS Components*
- *To learn the operation of MEMS switches and micro relays.*
- *To understand the concepts of MEMS phase shifters and oscillators.*

UNIT - I MEMS MATERIALS AND FABRICATION TECHNIQUES [09]

Metals - Semiconductors -Intrinsic characteristics of MEMS - Essential electrical and mechanical concepts -Thin films for MEMS and their deposition techniques - Materials for polymer MEMS -Bulk micromachining for silicon-based MEMS - Silicon surface micro sensing for MEMS–Micro stereo lithography for polymer MEMS.

UNIT - II ACTUATION MECHANISMS FOR MEMS DEVICES [09]

Electrostatic sensors and actuators - Parallel plate capacitance - Inter digitated finger capacitors - Applications of comb drive devices - Thermal sensing and actuation-piezoelectric sensing and actuation.

UNIT - III MEMS COMPONENTS AND SYSTEMS [09]

Electrostatic parallel plate capacitors -Inter digital capacitors - MEMS switched capacitors-Discrete position control-Inductor model-Micromachining -Thick metal layers -Substrate etching -Self-assembly techniques-Solenoid type copper inductors -Reconfigurable MEMS networks-Filters-Antennas -Matching networks -Reconfigurable antennas -Quasi-optical components -Tunable resonator fundamentals.

UNIT - IV MEMS SWITCHES AND MICRO RELAYS [09]

Introduction -Switch parameters - Basics of switching - Switches for RF and microwave applications -Bistable micro relays and microactuators - Dynamics of the switch operation- MEMS switch design -Modeling and evaluation -MEMS inductors and capacitors-Electromechanical transducers –Microsensing for MEMS.

UNIT - V MEMS FILTERSAND PHASE SHIFTERS [09]

Introduction -Modeling of mechanical filters - Micromechanical filters-Surface acoustic wave filters -Millimeter-wave Tunable filters -Bulk acoustic wave filters -Reflection-type phase shifters - Switched-line phase shifters -Loaded-line phase shifters -Switched networks-Antenna feeds.

Total (L: 45) = 45 Periods

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

C01: Describe the basics of MEMS materials and its fabrication techniques.
C02: Identify the actuation mechanisms for MEMS devices.
C03: Illustrate the operation of MEMS Components
C04: Illustrate the operation of MEMS switches and micro relays.
C05: Outline the concepts of MEMS phase shifters and oscillators

Text Books :

1 Vijay K.Varadan, K.J. Vinoy, K.A. Jose., RF MEMS and their Applications", John Wiley and sons, LTD, 2003.
2 Chang Liu, “Foundations of MEMS” Pearson Education, 3rd Edition, 2012.

Reference Books :

1 Mohamed Gad-el-Hak, “MEMS: Introduction and Fundamentals”, CRC press. 2005.
2 Gabriel M. Rebeiz, "RF MEMS Theory, Design &Technology", Wiley Interscience, 2003.
3 Hector J. De Los Santos, "RF MEMS Circuit Design for Wireless Communications", Artech House, 2002.
4 Ville Kaajakari, “Practical MEMS: Design of microsystems, accelerometers, gyroscopes, RF MEMS, optical MEMS, and microfluidic systems”, Willy publications, 2003.

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SEMESTER - VIII

18EC866	**MULTIMEDIA COMPRESSION AND COMMUNICATION**	L	T	P	C
	(PROFESSIONAL ELECTIVE – IV)	3	0	0	3

Prerequisite: *Digital Image processing*

Objectives:

- *To study different multimedia components.*
- *To understand the various audio and video compression techniques.*
- *To study the various text and image compression techniques.*
- *To familiarize the concept of VoIP technology.*
- *To learn the concepts of multimedia networking.*

UNIT - I MULTIMEDIA COMPONENTS [09]

Introduction - Multimedia skills - Multimedia components and their characteristics: Text, sound, images, graphics, animation, video, hardware.

UNIT - II AUDIO AND VIDEO COMPRESSION [09]

Audio compression: DPCM, Adaptive PCM, Adaptive predictive coding, Linear predictive coding, Code excited LPC, perpetual coding - Video compression: Principles - H.261, H.263, MPEG 1, 2, 4 - Eco cancellation and noise Cancellation.

UNIT - III TEXT AND IMAGE COMPRESSION [09]

Compression principles - Source encoders and destination encoders - Lossless and lossy compression - Entropy encoding - Source encoding - Text compression: Static Huffman coding, Dynamic coding - Arithmetic coding - Lempel Ziv-welsh compression - Image compression.

UNIT - IV VoIP TECHNOLOGY [09]

Basics of IP transport - VoIP challenges - H.323/ SIP - Network architecture, Protocols, Call establishment and release - VoIP and SS7 - Quality of service - CODEC methods - VoIP application.

UNIT - V MULTIMEDIA NETWORKING [09]

Streamed stored and audio - Making the best effort service - Protocols for real time interactive applications - Distributing multimedia - Beyond best effort service - Scheduling and policing mechanisms - Integrated services - Differentiated services - RSVP.

Total (L: 45) = 45 Periods

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

CO1 : *Infer the concept of characteristics and elements of multimedia.*

CO2 : *Classify the various audio and video compression techniques.*

CO3 : *Illustrate the various text and audio compression techniques.*

CO4 : *Discuss various methods used in VoIP technology .*

CO5 : *Describe the issues and services that arise when designing and building multimedia networking.*

Text Books :

1 Fred Halshall, Multimedia Communication - Applications, Networks, Protocols and Standards, Pearson education, Bengaluru, First Edition, 2014.

2 Kurose and W.Ross Computer Networking A Top down approach, PE, Bengaluru, Seventh Edition, 2017.

Reference Books :

1 Tay Vaughan, Multimedia: Making it Work, Tata McGraw Hill, New Delhi, Eighth Edition, 2013.

2 K.R. Rao, Zoran. S.Bojkovic, D.A. Milovanovic, Multimedia Communication Systems: Techniques, Standards and Networks, Pearson education, Bengaluru, First Edition, 2012.

3 Ranjan Parekh, Principles of Multimedia, Tata McGraw Hill, New Delhi, First Edition 2011.

4 Mark A. Miller. P.E, Voice over IP Technologies, Willey, United states, Second Edition, 2002.

5 https://nptel.ac.in/courses/117/105/117105083/

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SEMESTER - VIII

		L	T	P	C
18EC867	**EMBEDDED NETWORKS (PROFESSIONAL ELECTIVE – IV)**	3	0	0	3

Prerequisite: *Computer networks*

Objectives:

- *To learn the basics of Ethernet.*
- *To gain knowledge on embedded Ethernet communications.*
- *To study the embedded Ethernet protocols.*
- *To learn the basics of CAN.*
- *To understand the CAN configuration.*

UNIT - I **ETHERNET BASICS** **[09]**

Elements of a network - Inside Ethernet - Building a network: Hardware options - Cables, connections and network speed - Design choices: Selecting components - Ethernet controllers.

UNIT - II **EMBEDDED ETHERNET** **[09]**

Internet in local and internet communications - Inside the Internet protocol - Exchanging messages using UDP and TCP - Serving web pages with dynamic data, serving web pages that respond to user Input.

UNIT - III **EMBEDDED ETHERNET PROTOCOLS AND SECURITY** **[09]**

Sending and receiving messages - Email protocols - File Transfer Protocol (FTP): FTP clients and server - Inside the file transfer protocol- Keeping devices and network secure: Limiting access with password - Rules for securing device and local network.

UNIT - IV **EMBEDDED NETWORK REQUIREMENTS** **[09]**

Code requirements - Communication requirements - Introduction to CAN open: CAN open standard - Object directory - Electronic data sheets and device - Configuration files - Service data objectives - Network management CAN open messages - Device profile encoder.

UNIT - V **CAN CONFIGURATION** **[09]**

CAN open configuration - Evaluating system requirements, choosing devices and tools - Configuring single devices - Overall network configuration - Network simulation - Network commissioning - Advanced features and testing.

Total (L: 45) = 45 Periods

Course Outcomes : On the successful completion of the course, students will be able to

CO1: Describe the basic concepts of Ethernet.
CO2: Analyze the Ethernet communications.
CO3: Demonstrate the concepts of network security.
CO4: Interpret the Controller Area Network.
CO5: Identify the configuration of CAN.

Text Books :

1. Jan Axelson Embedded Ethernet and Internet Complete, designing and programming small devices for networking, Penram International Publications, First Edition, Mumbai 2007.
2. Glaf P.Feiffer, Andrew Ayre and Christian Keyold, Embedded Networking with CAN and CAN open, Embedded System Academy, United States First Edition, 2005.

Reference Books :

1. Frank Vahid, Givargis, Embedded Systems Design: A Unified Hardware/Software Introduction, Wiley Publications, United States, Third Edition, 2011.
2. Behrouz A.Forouzan, Data Communication and Networking, Tata McGraw Hill Publications, New Delhi, Second Edition, 2008.
3. Konrad Etschberger, Controller Area Network, IXXAT Automation GmbH, Germany, First Edition, 2001.
4. http://www.can-cia.org/can.
5. http://www.semiconductors.bosch.de/en/20/can/3-literature.asp.

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SEMESTER - VIII

		L	T	P	C
18EC868	**VLSI SIGNAL PROCESSING (PROFESSIONAL ELECTIVE – IV)**	3	0	0	3

Prerequisite: Digital signal processing and VLSI design

Objectives:

- *To study a comprehensive coverage of techniques for designing efficient DSP architectures*
- *To know the retiming and unfolding algorithms for various DSP applications*
- *To familiarize the architectural optimization, both at block level as well as logic level*
- *To understand the concept about bit level arithmetic architecture different DSP Modules*
- *To learn numerical strength reduction, synchronous, wave and asynchronous pipeline.*

UNIT - I PROCESSING OF FIR FILTERS [09]

Introduction to DSP systems: Typical DSP algorithms, dataflow and dependence graphs - Critical path - Loop bound - Iteration bound: Longest path matrix algorithm - Pipelining and parallel processing of FIR filters.

UNIT - II RETIMING, ALGORITHMIC STRENGTH REDUCTION [09]

Retiming: Definitions and properties - Unfolding: Algorithm, properties and applications - Algorithmic strength reduction in filters and transforms (Qualitative analysis only).

UNIT - III FAST CONVOLUTION, PIPELINING AND PARALLEL PROCESSING OF IIR FILTERS [09]

Fast convolution: Cook -Toom algorithm and modified Cook - Toom algorithm-Pipelined and parallel recursive filters: Look ahead pipelining in first order IIR filters, look ahead pipelining with power of 2-decomposition and clustered look ahead pipelining - Parallel processing of IIR filters: Combined pipelining and parallel processing of IIR filters.

UNIT - IV SCALING, ROUNDOFF NOISE, BIT-LEVEL ARITHMETIC ARCHITECTURES [09]

Scaling operation - Round off noise - State variable description of digital filters: Scaling and round–off noise computation - Round off noise in pipelined IIR filters - Parallel multipliers: Parallel multiplication with sign extension, parallel carry ripple and carry save multipliers.

UNIT - V NUMERICAL STRENGTH REDUCTION, SYNCHRONOUS, WAVE AND ASYNCHRONOUS PIPELINES [09]

Numerical strength reduction: Sub expression elimination, multiple constant multiplications, iterative matching Synchronous pipelining and clocking styles: Clock skew in edge triggered single phase clocking and two phase clocking - Wave pipelining - Asynchronous pipelining: Bundled data versus dual rail protocol.

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

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

CO1: Infer the concept of pipelining and other processing for DSP applications

CO2: Discuss the concept of retiming algorithm

CO3: Describe the different algorithm used for pipelining

CO4: Illustrate the concept of noise modeling architecture based systems

CO5: Describe the concept of various types of pipelining process

Text Books :

1 KeshabK.Parhi, VLSI Digital Signal Processing Systems, Design and implementation, John Wiley, Inter science, 2008.

2 U.Meyer Baese, Digital Signal Processing with Field Programmable Gate Arrays, Springer Berlin Heidelberg, Fourth Edition, 2014.

Reference Books :

1 Gary Yeap, Practical Low Power Digital VLSI Design, Kluwer Academic Publishers, Second edition 2010.

2 Mohammed Isamail and Terri Fiez, Analog VLSI Signal and Information Processing, McGraw– Hill, 2007.

3 Jose E.France and Yannisvidis, Design of analog – Digital VLSI Circulation for Telecommunication and Signal Processing, Prentice Hall, 2006.

4 Parhi Keshab K, Vlsi Digital Signal Processing Systems, Wiley India Pvt. Ltd, Reprint, 2010.

5 http://nptel.ac.in/syllabus/syllabus.php?subjectId=117101006

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SEMESTER - VIII

		L	T	P	C
18EC872	**ARCHITECTURE OF DSPs (PROFESSIONAL ELECTIVE – IV)**	3	0	0	3

Prerequisite: *Digital Signal Processing, Microprocessor and Microcontroller*

Objectives:

- *To understand the basic architectural elements of DSP hardware.*
- *To learn the issues of computational accuracy of DSP's.*
- *To familiarize with the programmable digital signal processors*
- *To gain knowledge of interfacing memories and I/O to the DSP devices.*
- *To understand various PDSP applications.*

UNIT - I ARCHITECTURES FOR PDSP DEVICES [09]

Introduction - Basic architectural features - DSP computational building blocks - Bus architecture and memory - Data addressing capabilities - Address generation unit - Programmability and program execution - Features for external interfacing.

UNIT - II COMPUTATIONAL ACCURACY IN DSP IMPLEMENTATIONS [09]

Number formats for signals and coefficients in DSP systems - Dynamic range and precision - Sources of error in DSP implementations - A/D conversion errors - DSP computational errors - D/A conversion errors - Compensating filter.

UNIT - III PROGRAMMABLE DIGITAL SIGNAL PROCESSORS [09]

Introduction - Commercial digital signal processing devices - TMS320C54X: Data addressing modes, Memory space of processors, Program control, Instructions and programming, On- chip peripherals, Interrupts of processors, Pipeline operation of processor.

UNIT - IV INTERFACING MEMORY AND I/O PERIPHERALS TO PDSP DEVICES [09]

TMS320C54X: Memory space organization, External bus interfacing signals, Memory Interface, Parallel I/O interface, Programmed I/O, Interrupts and I/O, Direct memory access, Synchronous serial interface, CODEC interface circuit.

UNIT - V APPLICATIONS OF PDSP DEVICES [09]

DSP Based Bio-telemetry receiver - Speech processing system - Echo cancellation - Spectrum analyzer - Image processing system.

Total (L: 45) = 45 Periods

Course Outcomes: On the successful completion of the course, students will be able to

CO1: Describe DSP computational building blocks and knows how to achieve speed in DSP processor.

CO2: Outline numbering formats and errors in DSP processors for real time signals.

CO3: Illustrate the features of on-chip peripheral devices and its interfacing along with the programming in DSP TMS320C54XX.

CO4: Demonstrate Memory organization in TMS320C54X processor and interfacing of input and output devices

CO5: Identify the importance of real-time DSP for a broad class of engineering applications.

Text Books :

1 Avtar Singh and S.Srinivasan, Digital Signal Processing, Implementations using DSP Microprocessors with Examples from TMS32054xx, Cengage Learning, First Reprint, 2011.

2 B Venkataramani and M Bhaskar, Digital Signal Processors Architectures, Programming and Applications, Tata McGraw Hill, New Delhi, Second Edition, 2011.

Reference Books :

1 Sen M. Kuo and Woon-Seng S. Gan, Digital Signal Processors, Architectures, Implementations, Applications, Pearson Education, New Delhi, 2012.

2 Lapsleyand Jeff Bier, DSP Processor Fundamentals, Architectures & Features, Wiley India Pvt Ltd, Noida, First Edition, 2009.

3 John G Proakis- Dimtris G Manolakis, Digital Signal Processing Principles, Algorithms and Application, Pearson/PHI, FourthEdition, 2007.

4 Sanjit K. Mitra, Digital Signal Processing: A Computer-Based Approach, Tata McGraw-Hill Education, New Delhi, First Edition, 2013.

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SEMESTER - VIII

		L	T	P	C
18EC863	**ADHOC NETWORKS (PROFESSIONAL ELECTIVE – V)**	3	0	0	3

Prerequisite: Wireless Communication/Networks.

Objectives:

- *To understand the basics of Ad hoc networks*
- *To learn the various medium access*
- *To learn various network protocols.*
- *To familiarize Transport layer and security*
- *To familiarize cross layer design for Ad hoc networks.*

UNIT - I OVERVIEW OF ADHOC NETWORKS [09]

Introduction - Characteristics - Issues in ad hoc networks, Comparison of cellular, adhoc and sensor networks, applications - Adhoc mobility models: Random based mobility model, temporal dependency model.

UNIT - II MEDIUM ACCESS PROTOCOLS [09]

MAC protocols: - Design issues, goals - Classification: Contention based protocols with reservation and scheduling algorithms - Other MAC protocols: Multichannel, CSMA MAC protocol.

UNIT - III NETWORK ROUTING PROTOCOLS [09]

Routing protocols: - Design issues - Classification: Proactive routing, reactive routing, hybrid routing - Multicast routing: Tree based routing, energy efficient multicasting - Hierarchical routing.

UNIT - IV TRANSPORT LAYER AND SECURITY [09]

Transport layer - Issues - classification - TCP over ad hoc networks - Security: Vulnerabilities, potential attacks- Prevention techniques: Intrusion detection, key management, secure routing protocols.

UNIT - V CROSS LAYER DESIGN AND ENERGY MANAGEMENT [09]

Cross layer feedback - Design goals - Cross layer optimization subsystem - Energy management: Need for energy management - Classification: Battery management scheme, system power management.

Total (L= 45) = 45 Periods

Course Outcomes : On successful completion of the course, the student will be able to

C01: Describe the basics of Ad hoc networks.

C02: Discuss the challenges in designing MAC, routing and transport protocols for wireless ad-hoc networks.

C03: Outline the design issues and energy efficient for Ad hoc networks.

C04: Examine the network security solution and routing mechanism

C05: Describe cross layer design and energy management in Ad hoc networks.

Text Books :

1 C.Siva Ram Murthy, B.S.Manoj., Ad hoc Wireless Networks Architectures and Protocols, Pearson Education, 2nd edition, 17th impression, 2012.

2 Prasanth Mohapatra, SrikanthV.krishnamurthy, Adhoc Network Technologies and Protocols, Springer 2005.

Reference Books :

1 Charles E. Perkins, Ad hoc Networking, Addison - Wesley, 6th impression 2012.

2 T. Camp, J. Boleng, and V. Davies, "A Survey of Mobility Models for Ad Hoc Network Research", Wireless Communication and Mobile Computing, Special Issue on Mobile Ad Hoc Networking Research, Trends and Applications, vol. 2, no. 5,, pp. 483–502,2002.

3 V.T. Raisinhani and S.Iyer, Cross Layer Design Optimization in Wireless Protocol Stacks, Elsevier, Computer Communications, vol. 27 no. 8, pp 720.-724, 2004.

4 T.G.Basavaraju, C.Puttamadappa, Adhoc Mobile Wireless Networks, Auerbach Publications- Taylor and Francis group, 2016.

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SEMESTER - VIII

		L	T	P	C
18EC864	**TELECOMMUNICATION SYSTEM MODELING AND SIMULATION (PROFESSIONAL ELECTIVE – V)**	3	0	0	3

Prerequisite: Digital communication systems and Probability and stochastic process

Objectives:

- *To gain knowledge about simulation methodologies.*
- *To understand the concepts of random variables and process.*
- *To learn the modeling of communication systems.*
- *To understand the estimation of performance measure using simulation.*
- *To familiarize different modeling methodologies.*

UNIT - I SIMULATION METHODOLOGY [09]

Introduction - Aspects of methodology - Performance estimation - Sampling frequency - Low pass equivalent models for band pass signals - Multicarrier signals - Non-linear and time varying systems - Post processing - Basic graphical techniques and estimations

UNIT - II SIMULATION OF RANDOM VARIABLES AND RANDOM PROCESSES [09]

Generation of random numbers and sequence - Gaussian and uniform random numbers - Correlated random sequences - Testing of random numbers generators - Stationary and uncorrelated noise - Goodness of fit test.

UNIT – III MODELING OF COMMUNICATION SYSTEMS [09]

Radio frequency and optical sources - Analog and digital signals - Communication channel and models - Free space channels - Multipath channel and discrete channel noise interference - MIMO Channel.

UNIT – IV ESTIMATION OF PERFORMANCE MEASURE FROM SIMULATION [09]

Quality of estimator - Estimation of SNR - Probability density function and bit error rate - Monte carlo method - Importance sampling method - Extreme value theory.

UNIT – V SIMULATION AND MODELING METHODOLOGY [09]

Simulation environment - Modeling considerations - Performance evaluation techniques - Error source simulation - Validation - Case studies: Simulations of light wave communication link and satellite system

Total (L= 45) = 45 Periods

Course Outcomes : On successful completion of the course, the student will be able to

C01: Discuss different types of the simulation methodology.

C02: Describe random variables and random processes.

C03: Illustrate the modeling of communication systems.

C04: Estimate various performance metrics using simulation.

C05: Describe the various modeling methodologies..

Text Books :

1 MC.Jeruchim, P.Balaban and Sam K Shanmugam, Simulation of communication systems: Modeling, Methodology and Techniques, Plenum Press, New York, Second Edition, 2006.

2 Averill.M.Law and W.DavidKelton, Simulation Modeling and Analysis, McGraw-Hill Inc., Noida, Fifth Edition, 2014.

Reference Books :

1 Geoffrey Gorden, System Simulation, Prentice Hall of India, New Delhi, Second Edition, 2008.

2 W.Turin, Performance Analysis and Modeling of Digital Transmission Systems, Computer Science Press, New York, Second Edition, 2013.

3 Jerry banks, John S.Carson, Barry L.Nelson, David M.Nicol and S.Shahabudeen, Discrete Event System Simulation, Prentice Hall of India, New Delhi, Second Edition, Reprint 2013.

4 William H. Tranter, K. Sam shanmugam, Theodore s. Rappaport, K.KurtL.Kosbar, Principles of Communication Systems Simulation , Pearson Education Pvt Ltd, Noida, First Edition,2004.

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SEMESTER - VIII

		L	T	P	C
18EC865	**OPTICAL NETWORKS**				
	(PROFESSIONAL ELECTIVE – V)	3	0	0	3

Prerequisite: *Fiber optical communication, Computer Networks*

Objectives:

- *To understand the basics of optical system components.*
- *To familiar with the concept of various network architectures.*
- *To learn the concepts of WDM network design.*
- *To understand the packet switching and various access networks.*
- *To gain knowledge about network management functions and safety measures.*

UNIT - I OPTICAL SYSTEM COMPONENTS **[09]**

Introduction-Components: Couplers, isolators, circulators, multiplexers, filters, optical amplifiers, switches and wavelength converters.

UNIT - II OPTICAL NETWORK ARCHITECTURES **[09]**

SONET/SDH-Metropolitan Area Networks-Layered architecture-Broadcast and select networks: Topologies, media access control protocols - Test beds: Lambda net, NTT‟s, rainbow and star net.

UNIT - III WDM NETWORK DESIGN **[09]**

WDM network Elements: Optical line terminal, optical line amplifiers, optical add/drop multiplexers, optical cross connects-Wavelength routing networks: Node designs, optical layer cost tradeoffs, routing and wavelength assignment, architectural variations.

UNIT - IV PACKET SWITCHING AND ACCESS NETWORKS **[09]**

Photonic packet switching: OTDM, multiplexing and demultiplexing, synchronization, head processing, buffering, burst switching - Access network: Future access networks, optical access network architectures.

UNIT - V CONTROL AND MANAGEMENT **[09]**

Networkmanagementfunctions-Opticallayerservicesandinterference-Configurationmanagement-Performance management - Fault management - Optical safety - Service interface.

Total (L: 45) = 45 Periods

Course Outcomes: Students will be able to

CO1: Describe the fundamental of optical network elements
CO2: Interpret the various optical networks architectures
CO3: Design various optical networks and calculate routing, wavelength assignment for online and offline model
CO4: Illustrate the concept of photonic packet switching and access network
CO5: Outline the network management functions and optical safety measures in network design

Text Books :

1 Rajiv Ramaswami and Kumar N. Sivarajan, Optical Networks: A Practical Perspective, Harcourt Asia Pt Ltd., California, Third Edition, 2011.

2 C. Siva Ram Moorthy and Mohan Gurusamy, “WDM Optical Networks: Concept, Design and Algorithms”, Prentice Hall of India, New Delhi, First Edition, 2002.

Reference Books :

1 Uyless Black. Optical Networks: Third Generation Transport Systems, Pearson Education, New York, First Edition, 2008.
2 Biswanath Mukherjee, Optical WDM Networks, Springer, Mexico, First Edition, 2006.
3 John R. Vacca, Optical networking Best practices Handbook, Wiely publications, New York, First Edition, 2007.
4 P.E. Green, Jr., Fiber Optic Networks, Prentice Hall, New Jersy, Third Edition, 1993.
5 http://nptel.ac.in/syllabus/syllabus.php?subjectId=117102011.

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SEMESTER - VIII

		L	T	P	C
18EC869	**ARM SYSTEM ARCHITECTURE (PROFESSIONAL ELECTIVE – V)**	3	0	0	3

Prerequisite: *Advanced Microprocessors and Microcontrollers*

Objectives:

- *To understand the concepts of ARM SoC architecture.*
- *To study the instruction set of ARM processor.*
- *To learn the concepts of various ARM processor cores.*
- *To gain knowledge about system development tools.*
- *To familiarize the applications of ARM processors.*

UNIT - I PROCESSOR ARCHITECTURE AND DESIGN [09]

Introduction: Processor architecture and organization - Abstraction in hardware design - MU0 a simple processor - Instruction set design - Processor design and trade-offs - Reduced Instruction Set Computer (RISC) - Design for low power consumption - ARM architecture: Acorn RISC machine - Architectural inheritance - ARM programmer‟s model - ARM development tools

UNIT - II ARM INSTRUCTION SET [09]

Introduction - Exceptions - Conditional execution - Branch, branch with link and exchange - Software interrupt - Data processing instructions - Multiply instructions - Single word and unsigned byte data transfer instructions - Half word and signed byte data transfer instructions - Multiple register transfer instructions - Swap memory and register instructions - Coprocessor instructions - Thumb instruction set.

UNIT - III ARM PROCESSOR CORES ORGANIZATION AND IMPLEMENTATION [09]

Cores: ARM7TDMI - ARM8 - ARM9TDMI - ARM10TDMI - ARM Organization: 3 stage pipeline - 5 stage pipeline - Instruction execution - Implementation - Coprocessor interface.

UNIT - IV ARCHITECTURAL SUPPORT FOR SYSTEM DEVELOPMENT [09]

ARM memory interface - Advanced Microcontroller Bus Architecture (AMBA) - ARM reference peripheral specification - Hardware system prototyping tools - ARMulator - JTAG boundary scan test architecture - ARM debug architecture - Embedded trace - Signal processing support.

UNIT - V EMBEDDED APPLICATIONS OF ARM [09]

VLSI Ruby II advanced communication processor - VLSI ISDN subscriber processor - One CTMVWS22100 GSM chip - VLSI bluetooth baseband controller - ARM 7500 and ARM 7500FE - ARM 7100 - SA 1100.

Total (L: 45) = 45 Periods

Course Outcomes : On the successful completion of the course, students will be able to

CO1: Describe the processor architecture
CO2: Develop the programming on ARM.
CO3: Demonstrate the concepts of various ARM processor cores.
CO4: Identify development tools for architectural support.
CO5: Develop the applications of ARM.

Text Books :

1 Steve Furber, ARM System-on-Chip Architecture, Pearson Education, United States, Second Edition, 2015.

2 Andrew N.Sloss, Dominic Symes, Chris Wright, ARM System Developer’s Guide, Designing and Optimizing System Software, Morgan Kaufmann, Elsevier, Netherlands, First Edition, 2011.

Reference Books :

1 David Seal, ARM Architecture Reference Manual, Pearson Education, United States, Second Edition, 2007.

2 J. R. Gibson, ARM Assembly Language - An Introduction, Lulu.com, United States, Second Edition, 2011.

3 Dave Jaggar, ARM Architecture Reference Manual, Prentice Hall PTR, United States, First Edition, 2005.

4 http://nptel.ac.in/courses/108102045/5,www.arm.com.

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SEMESTER - VIII

		L	T	P	C
18EC871	**ADVANCED SIGNAL PROCESSING (PROFESSIONAL ELECTIVE – V)**	3	0	0	3

Prerequisites: Signals and Systems, Digital Signal Processing

Objectives:

- *To review the fundamentals of random signals and noise in communication systems.*
- *To modeling of spectrum analysis using nonparametric and parametric approaches.*
- *To understand the linear estimation and prediction.*
- *To explore the concepts of multirate signal processing and filter banks.*
- *To learn the wavelet transform and its applications.*

UNIT - I **DISCRETE RANDOM PROCESS** **[09]**

Introduction to discrete random process - Ensemble averages, stationary and ergodic processes, autocorrelation and auto covariance matrices, white noise, bias and consistency, power spectral density, spectral factorization.

UNIT - II **SPECTRAL ESTIMATION** **[09]**

Nonparametric methods: Periodogram, modified periodogram, Barlett's method, Welch method - Performance comparison for nonparametric methods - Parametric methods: Autoregressive, moving average and autoregressive moving average - Levinson recursion.

UNIT - III **LINEAR ESTIMATION AND PREDICTION** **[09]**

Forward and Backward linear prediction, Filtering - FIR Wiener filter: Filtering, linear prediction and noise cancellation - IIR Wiener filters: Non causal and causal filter, discrete Kalman filter.

UNIT - IV **MULTIRATE SIGNAL PROCESSING** **[09]**

Decimation - Interpolation - Multi-stage implementation of multirate system - Filter design and implementation for sampling rate conversion - Direct form FIR filter structures - Implementation of digital filter banks - Sub band coding - Quadrature mirror filter.

UNIT - V **WAVELET TRANSFORM AND ITS APPLICATION** **[09]**

Filter banks and wavelets - Properties of wavelets and scaling functions - Construction of wavelets - Applications of wavelet: Speech and audio coding, multirate techniques with sensors.

Total (L= 45) = 45 Periods

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

CO1: Describe the fundamentals of random process.

CO2: Estimate the power spectrum using parametric methods and nonparametric methods.

CO3: Interpret the linear prediction and different types of optimum linear filters.

CO4: Illustrate the concept of sampling rate conversions and digital filter banks.

CO5: Summarize the wavelet transform and its applications.

Text Books:

1 Monson H Hayes, Statistical Digital Signal processing and Modeling, Wiley Student Edition, United States, First Edition, 2012.

2 Fliege N. J., Multirate digital signal processing: Multirate systems filter banks, wavelets, Wiley, United States, Second Edition, 2007.

Reference Books:

1 John G Proakis and Manolakis, Digital Signal Processing Principles, Algorithms and Applications, Pearson, New York, Fourth Edition, 2007.

2 R.C. Gonzalez and R.E. Woods, Digital Image Processing, Pearson, New York, Fourth Edition, 2018.

3 Dimitris G.Manolakis et al., Statistical and Adaptive Signal Processing, McGraw Hill, New Delhi, Second Edition, 2005.

4 John G. Proakis et al., Algorithms for Statistical Signal Processing, Pearson Education, New York, Fourth Edition, 2012.

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SEMESTER - VIII

		L	T	P	C
18EC873	**CRYPTOGRAPHY AND NETWORK SECURITY (PROFESSIONAL ELECTIVE – V)**	3	0	0	3

Prerequisite: *Computer Networks*

Objectives:

- *To understand about symmetric ciphers and encryption standards.*
- *To learn the various algorithms in asymmetric ciphers.*
- *To study the various types of hash functions and MAC in cryptography.*
- *To learn about key management and authentication mechanisms.*
- *To know he electronic mail and IP security over internet.*

UNIT - I SYMMETRIC CIPHERS [09]

OSI security architecture - Classical encryption techniques - Block cipher principles - Data encryption standard - Block cipher design principles - Advanced encryption standard: Structure, transformation function, key expansion.

UNIT - II ASYMMETRIC CIPHERS [09]

Introduction to number theory - Public key cryptography and RSA: Principles of public key cryptosystems, RSA algorithms - Diffie-Hellman key exchange - Elgamal cryptographic system - Elliptic curve arithmetic and elliptic curve cryptography.

UNIT - III CRYPTOGRAPHIC DATA INTEGRITY ALGORITHMS [09]

Cryptographic hash functions: Applications, two simple hash function, secure hash algorithm, SHA-3 - Message authentication codes: Requirements, functions, security of MAC, HMAC, CMAC - Digital signatures.

UNIT - IV NETWORK AUTHENTICATION [09]

Key management: Symmetric key distribution using symmetric and asymmetric encryption, X.509 certificates - Authentication: Remote user authentication principles, remote user authentication using symmetric and asymmetric encryption, kerberos - Secure socket layer and transport layer security.

UNIT - V INTERNET SECURITY [09]

Electronic mail security: Pretty good privacy, S/MIME, domain keys identified mail - IP Security: IP security overview, IP security policy and encapsulating security payload - Intrusion detection - Viruses and related threats - Firewall design principles - Wireless network security: Wireless application security overview, wireless transport layer security .

Total (L: 45) = 45 Periods

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

CO1 : *Discuss the concepts of symmetric ciphers and encryption techniques*

CO2 : *Describe the concept of cryptography key techniques for finding plain and cipher text.*

CO3 : *Compare the various cryptographic hash functions and MAC*

CO4 : *Describe the security at the network and transport layer*

CO5 *: Illustrate the concepts of electronic mail and IP*

Text Books :

1 William Stallings, Cryptography and Network Security - Principles and Practices, Pearson Education, Bengaluru Sixth Edition, 2017.

2 Behrouz A. Foruzan, Cryptography and Network Security, Tata McGraw Hill, New Delhi, Second Edition, 2015.

Reference Books :

1 Wade Trappe and Lawrence C. Washington, Introduction to Cryptography with Coding theory, Pearson Education, Bengaluru, Third Edition, 2020

2 Wenbo Mao, Modern Cryptography Theory and Practice, Pearson Education, Bengaluru ,Second Edition, 2007

3 Thomas Calabrese, Information Security Intelligence: Cryptographic Principles and Applications, Thomson Delmar Learning, First Edition, 2006

4 Charles B. P fleeger and Shari Lawrence P fleeger, Security in Computing, Pearson Education, Bengaluru, Third Edition, 2018.

5 NPTEL Link:http://nptel.ac.in/syllabus/syllabus.php?subjectId=106105031

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		L	T	P	C
18CS043	**PYTHON PROGRAMMING** (Common to CS, EC& EE) **(OPEN ELECTIVE)**	3	0	0	3

Prerequisite: *Basic knowledge of C programming.*

Objectives:

- *To impart the fundamental concepts of python programming.*
- *To know various data structures provided by python library including string, list and dictionary.*
- *To learn to write programs using class and objects.*
- *To study database system for storing and retrieving data.*
- *To learn the concept of Web and GUI design.*

UNIT – I FUNDAMENTALS OF PYTHON [09]

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

UNIT – II DATA STRUCTURES AND PACKAGES [09]

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

UNIT – III OBJECT ORIENTED PROGRAMMING [09]

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 [09]

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 [09]

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

Total (L: 45) =45 Periods

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

CO1: Illustrate basic concepts of python programming.

CO2: Apply the necessary data structures includes list, tuple and dictionary in the required fields.

CO3: Analyze, design and implement the problems using OOPs technology

CO4; Demonstrate the simple file operations.

CO5: Design web site using GUI.

Text Books :

1 Mark Lutz, Learning Python, O'Reilly Media, California, Fifth Edition, 2013.
2 Wesley J.Chun, Core Python Programming, Pearson Education, New Delhi, Second Edition, 2017.

References :

1 Bill Lubanovic, Introducing Python Modern Computing in Simple Packages, O'Reilly Media, California, First Edition 2014.
2 David Beazley, Brian K. Jones, Python Cookbook, O'Reilly Media, California, Third Edition, 2013.
3 Mark Lutz, Python Pocket Reference, O'Reilly Media, California, Fifth Edition, 2014.
4 www.python.org.

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		L	T	P	C
18CS002	**JAVA PROGRAMMING (OPEN ELECTIVE)**	3	0	0	3

Prerequisite: *Fundamentals of C programming concepts*

Objectives:

- *To know the fundamentals of Java programming language.*
- *To equip students with comprehensive knowledge on core concepts of java like overloading.*
- *To gain knowledge in interfaces and exception handling*
- *To get idea on threads and multithreaded programming*
- *To study the I/O operations and string manipulations and concepts of database connectivity.*

UNIT – I JAVA FUNDAMENTALS [09]

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 [09]

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 [09]

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 [09]

Java Thread Model – Main Thread – Creating a Thread – Creating Multiple Threads – is Alive 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 Print Writer Class – Reading and Writing Files – Automatically Closing a File – Scanner class.

UNIT – V STRING AND DATABASE CONNECTIVITY [09]

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

Total (L: 45) =45 Periods

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

CO1: Apply java programming fundamentals to solve real world problem.

CO2: Implement the concept of overloading and inheritances.

CO3: Examine important features of java like packages, interfaces and exception handling.

CO4: Illustrate the features of multithreaded programming and I/O operations.

CO5: Demonstrate the concepts of string manipulations and database connectivity.

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, US, 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, US, 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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		L	T	P	C
18CS003	**OPERATING SYSTEMS (OPEN ELECTIVE)**	3	0	0	3

Prerequisite: *Basic knowledge of computer architecture.*

Objectives:

- *To gain the knowledge about the basics of operating systems concepts.*
- *To know the various process, threads and CPU scheduling operations.*
- *To solve deadlocks and memory management problems.*
- *To study the virtual memory concepts and file sharing interface.*
- *To learn the file systems, disk structure and I/O Systems concepts.*

UNIT – I OPERATING SYSTEMS CONCEPTS [09]

Introduction to Operating Systems – Computer System Architecture: Single Processor Systems – Multiprocessor Systems – Clustered Systems – Operating System Structure – Operating System Services – System Calls: Types of System Calls – System Programs – Process: Process Concept – Process Scheduling – Operation on Processes – Cooperating Process – Inter Process Communication.

UNIT –II THREADS AND CPU SCHEDULING [09]

Threads: Overview – Multithreading Models – Thread Issues – CPU Scheduling: Basic Concepts – Scheduling Criteria – Scheduling Algorithms: FCFS – SJF – Priority – Round Robin – Process Synchronization: Critical Section Problem – Peterson's Solution – Synchronization Hardware – Semaphores – Classic Problems of Synchronization.

UNIT – III DEADLOCK AND MEMORY MANAGEMENT [09]

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

UNIT –IV VIRTUAL MEMORY AND FILE SHARING INTERFACE [09]

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 [09]

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.

Total (L: 45) =45 Periods

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

CO1: Identify the components and their functionalities in the operating system.
CO2: Determine the efficiency of CPU scheduling algorithms.
CO3: Examine the performance of various memory management techniques.
CO4: Summarize the virtual memory concepts and file access methods.
CO5: Evaluate the performance of disk management and file system.

Text Books :

1 Abraham Silberschatz, Peter Baer Galvin and Greg Gagne, Operating System Concepts, John Wiley & Sons, United States, Ninth Edition, 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 http://nptel.ac.in/courses/106108101.

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18CS868	ETHICAL HACKING (OPEN ELECTIVE)	L	T	P	C
		3	0	0	3

Prerequisite: *Basic knowledge of computer networks and operating systems*

Objectives:

- *To learn the basics of ethical hacking.*
- *To impart knowledge on foot printing, social engineering and port scanning.*
- *To study the concepts of Vulnerabilities in operating system.*
- *To hack web servers and wireless networks.*
- *To learn about protecting network with security devices.*

UNIT– I **FUNDAMENTALS OF ETHICAL HACKING** **[09]**

Introduction to Ethical Hacking – Legal and Illegal actions – TCP/IP concepts: Overview of TCP/IP – IP Addressing and Number systems. Networks and Computer Attacks: Malware – Protecting against Malware attacks – Intruder attacks – Physical Security Addressing.

UNIT – II **FOOT PRINTING AND PORT SCANNING** **[09]**

Using web tools for Foot Printing – Conducting competitive intelligence – Using DNS zone transfers – Social engineering, Port Scanning –Types of port scans – Scanning tools – Conducting Ping sweeps – Shell scripting.

UNIT – III **VULNERABILITIES IN OPERATING SYSTEM** **[09]**

Microsoft OS: Tools to identify vulnerabilities on Microsoft systems – Microsoft OS vulnerabilities – Vulnerabilities in Microsoft services – Linux OS: Review of Linux Fundamentals – Linux OS vulnerabilities – Remote access attacks on Linux systems – Countermeasures against Linux remote attacks.

UNIT– IV **HACKING WEB SERVICES AND WIRELESS NETWORKS** **[09]**

Web servers: Web applications, Web application vulnerabilities – Tools of web attackers and security testers – Wireless Networks: Wireless Technology – Wireless Network Standards – Authentication – War driving – Wireless Hacking.

UNIT – V **CRYPTOGRAPHY AND NETWORK SECURITY** **[09]**

Cryptography: Basics of Cryptography, Symmetric and Asymmetric algorithms – Public Key Infrastructure, Cryptography attacks – Protecting networks with security devices: Network security devices – Firewalls – Intrusion Detection Systems and Honeypots.

Total (L: 45) =45 Periods

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

CO1: Comprehend the concepts of legal and illegal activities on Internet.
CO2: Acquire knowledge on foot printing tools and port scanning concepts.
CO3: Identify vulnerabilities on OS systems and services.
CO4: Outline the concepts of hacking web server and tools to protect web oriented services.
CO5: Impart the knowledge of cryptography algorithms to provide security from attacks.

Text Books :

1 Michael T. Simpsonand 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.

References :

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://www.lynda.com/Security-tutorials/...Ethical-Hacking/455716-2.htm

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18CS869 **INTERNET OF THINGS (OPEN ELECTIVE)**

L	T	P	C
3	0	0	3

Prerequisite: *Basic knowledge of Microprocessors and Microcontrollers*

Objectives:

- *To study basic concepts of Internet of things.*
- *To know IoT platform design methodology.*
- *To learn IoT physical devices and endpoints.*
- *To gain knowledge in ARDUINO for IoT.*
- *To get the idea of Hadoop and MapReduce*

UNIT – I **BASICS OF INTERNET OF THINGS** **[09]**

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 PLATFORM DESIGN METHODOLOGY** **[09]**

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 – Case study : Weather Monitoring.

UNIT– III **IoT PHYSCIAL DEVICES** **[09]**

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** **[09]**

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 **DATA ANALYTICS FOR IoT** **[09]**

Apache Hadoop – Hadoop MapReduce for batch data analysis – Apache Oozie – apache spark – Apache storm – Real time analysis using Apache storm. Tools for IoT: Chef – Puppet.

Total (L: 45) =45 Periods

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

CO1: Comprehend the technologies and applications of IoT.
CO2: Construct IoT platform using design methodology.
CO3: Develop IoT device using Raspberry Pi Board.
CO4: Build up IoT device using Arduino Board.
CO5: Familiarize with data analytics for IoT

Text Books :

1 Arsdeep Bahga and Vijay Madisetti, Internet of Things – Hands on approach, university press India private Limited, First Edition, 2015.

References :

1 Dieter Uckelmann et.al, Architecting the Internet of Things, Springer, United States, First Edition, 2011.
2 David Easley and Jon Kleinberg, Networks, Crowds, and Markets: Reasoning About a Highly Connected World, Cambridge University Press, New York, First Edition, 2010.
3 Olivier Hersent, David Boswarthick, Omar Elloumi, The Internet of Things - Key applications and Protocols, Wiley, United States. Second Edition, 2012.
4 http://nptel.ac.in/courses/106105081/

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		L	T	P	C
18CS512	**DATABASE MANAGEMENT SYSTEMS (OPEN ELECTIVE)**	3	0	0	3

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

Objectives:

- *To expose the students to the fundamentals of database management systems and relational model.*
- *To train the students with ER diagrams and SQL.*
- *To make the students to study SQL Fundamentals and Intermediate SQL*
- *To make the students to understand the fundamentals of transaction processing and query processing.*
- *To familiarize the students with different types of databases.*

UNIT – I BASIC CONCEPTS AND RELATIONAL MODEL [09]

File Systems Organization Vs Database System – Purpose of Database System – Views of Data – Database Architecture – Data Models – Entity – Relationship model (E-R model) – Codd's Rule – Introduction to Relational Model – Keys – Relational Algebra – Fundamental and Additional Relational Algebra.

UNIT – II SQL FUNDAMENTALS AND INTERMEDIATE SQL [09]

Database Languages – 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 AND QUERY OPTIMIZATION [09]

Accessing SQL from Programming Language – Functions – Procedures – Triggers – Cursors – Recursive Queries – Advanced Aggregation Features – Embedded Structured Query Language – Query Optimization – Cost Estimation – Structure of Query Evaluation Plan.

UNIT – IV RELATIONAL DATABASE DESIGN , INDEXING AND HASHING [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 – Ordered Indices – B+ Tree Index Files – Static and Dynamic Hashing.

UNIT–V TRANSACTION PROCESSING AND RECENT TRENDS [09]

Transaction Concepts – ACID Properties – Concurrency Control – Serializability – Locking Protocols – Two Phase Locking – Deadlock – Database Recovery System – Mobile Databases – Spatial Databases.

Total (L: 45) =45 Periods

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

CO1: Use the relational algebra and ER diagrams.

CO2: Apply Structured query language to create and manipulate a relational database.

CO3: Create functions, triggers, cursors and recursive queries.

CO4: Demonstrate the purpose of normalization and indexing techniques.

CO5: Identify recovery mechanisms and different types of databases for real time applications.

Text Books :

1 Abraham Silberschatz, Henry F. Korth and S. Sudharshan, Database System Concepts, Tata McGraw Hill, India, Sixth Edition, 2015.

2 S.K.Singh, Database Systems Concepts, Design and Applications, Pearson Education, India, Second Edition, 2011.

References :

1 Ramez Elmasri and Shamkant B. Navathe, Fundamentals of Database Systems, Pearson Education, India, Sixth Edition, 2010.

2 C.J.Date, A.Kannan and S.Swamynathan, An Introduction to Database Systems, Pearson Education, India, Eighth Edition, 2006.

3 Raghu Ramakrishnan, Database Management Systems, Tata McGraw Hill, India, Fourth Edition, 2010.

4 http://freevideolectures.com/course/2668/database-management-system#

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18CS411	SOFTWARE ENGINEERING (OPEN ELECTIVE)	L	T	P	C
		3	0	0	3

Prerequisite: *Fundamental knowledge in problem solving techniques.*

Objectives:

- *To study the different steps of the software engineering life cycle and design methods.*
- *To know the fundamental concepts of requirements engineering and Analysis Modeling.*
- *To gain the various software design methodologies.*
- *To know the role and contents of testing activities in different life cycle phases.*
- *To be initiated to develop skills for working in a group on a small software project.*

UNIT – I **FUNDAMENTALS OF SOFTWARE ENGINEERING** **[09]**

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** **[09]**

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** **[09]**

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** **[09]**

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** **[09]**

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 (L: 45) =45 Periods

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

CO1: Outline the concepts behind SDLC software engineering practices.

CO2: Identify the customer requirement and determine the appropriate life cycle model.

CO3: Apply the design methods for software development.

CO4: Evaluate the various testing techniques.

CO5: Ensure the quality of software product.

Text Books :

1 Roger S. Pressman, Software Engineering: A Practitioner Approach, McGraw-Hill, New Delhi, Fifth Edition, 2014.

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 http://nptel.ac.in/courses/106101061/1

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18CS412	DESIGN AND ANALYSIS OF ALGORITHMS (OPEN ELECTIVE)	L	T	P	C
		3	1	0	4

Prerequisite: *Basic knowledge in data structures*

Objectives:

- *To learn various algorithm design techniques for real world problems.*
- *To analyze the efficiency of various algorithm design techniques.*
- *To know the concept dynamic programming and greedy techniques.*
- *To study various backtracking methods.*
- *To gain knowledge about P and NP problems.*

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

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

CO1: Analyze the efficiency of algorithms.

CO2: Design and analyze problems using decrease, transform and conquer techniques.

CO3: Identify dynamic programming and greedy techniques.

CO4: Evaluate various backtracking, branch and bound techniques.

CO5: Summarize the knowledge about P and NP Problems.

Text Books :

1 AnanyLevitin, Introduction to the Design and Analysis of Algorithms, Addition-Wesley Professional, USA, Third Edition, 2014.

2 A.V.Aho, J.E. Hopcroft and J.D.Ullman, The Design and Analysis of Computer Algorithms, Pearson Education, India, Second Edition, 2009.

References :

1 Thomas H Cormen, Charles E Leiserson, Ronald L Rivest and Clifford Stein, Introduction to Algorithms, Prentice Hall, 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 Ellis Horowitz, Sartaj Sahni and Sanguthevar Rajasekaran, Fundamentals of Computer Algorithms, Universities Press, US, Second Edition, 2008.

4 http://www.nptelvideos.in/2012/11/design-analysis-of-algorithms.html

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		L	T	P	C
18IT662	**CLOUD COMPUTING (OPEN ELECTIVE)**	**3**	**0**	**0**	**3**

Prerequisite: *Operating Systems, Computer Networks*

Objectives:

- *To understand how Grid computing helps in solving large scale scientific problems*
- *To gain knowledge on the concept of virtualization that is fundamental to cloud computing*
- *To learn programming skill the grid and the cloud*
- *To understand the security issues in the grid and the cloud environment*
- *To understand various security measures in cloud and grid environment*

UNIT – I INTRODUCTION [09]

Evolution of Distributed computing: Scalable computing over the Internet – Technologies for network based systems – Good modeling – Clusters of cooperative computers – Grid computing Infrastructures – Cloud Computing – Service Oriented Architecture–Introduction to Grid Architecture and Standards –Elements of Grid – Overview of Grid Architecture

UNIT – II GRID SERVICES [09]

Introduction to Open Grid Services Architecture (OGSA) – Motivation – Functionality Requirements – Practical & Detailed view of OGSA/OGSI – Data intensive grid service models – OGSA services

UNIT – III VIRTUALIZATION [09]

Cloud deployment models: public, private, hybrid, community – Categories of Cloud Computing: Everything as a service: Infrastructure, platform, software – Pros and Cons of cloud computing – Implementation levels of virtualization – Virtualization structure – Virtualization of CPU – Memory and I/O devices – Virtual clusters and Resource Management – Virtualization for Data Center Automation

UNIT – IV PROGRAMMING MODEL [09]

Open Source Grid Middleware packages – Globus Toolkit (GT4) Architecture - Configuration – Usage of Globus – Main components and Programming model – Introduction to Hadoop Framework – Map Reduce – Input splitting – Map and reduce functions – Specifying input and output parameters – Configuring and running a job – Design of Hadoop file system – HDFS concepts – Command line and java interface – Dataflow of File read & File write

UNIT-V SECURITY [09]

Trust models for Grid security environment – Authentication and Authorization methods – Grid security infrastructure – Cloud Infrastructure security: network – Host and application level – Aspects of data security – Provider data and its security – Identity and access management architecture – IAM practices in the cloud – SaaS – PaaS – IaaS availability in the cloud – Key privacy issues in the cloud

Total (L: 45) =45 Periods

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

CO1: Understand the grid computing techniques to solve large scale scientific problems
CO2: Apply the grid services in various computing environment.
CO3: Learn the concept of virtualization
CO4: Use the grid and cloud tool kits
CO5: Apply the security models in the grid and the cloud environment

Text Book :

1 Kai Hwang, Geoffery C. Fox and Jack J. Dongarra, Distributed and Cloud Computing: Clusters, Grids, Clouds and the Future of Internet, First Edition, Morgan Kaufman Publisher, an Imprint of Elsevier, 2012
2 Rittinghouse, John W., and James F. Ransome, Cloud Computing: Implementation, Management and Security, CRC Press, 2017.

Reference Books :

1 Jason Venner, Pro Hadoop- Build Scalable, Distributed Applications in the Cloud, A Press, 2012
2 Tom White, Hadoop The Definitive Guide, First Edition, O'Reilly, 2012
3 Ian Foster, Carl Kesselman, The Grid: Blueprint for a New Computing Infrastructure, 2nd Edition, Morgan Kaufmann
4 Frederic Magoules and Jie Pan, Introduction to Grid Computing, CRC Press, 2009

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18IT511	DATA ANALYTICS	L	T	P	C
		3	0	0	3

(OPEN ELECTIVE)

Prerequisite: *Database Languages*

Objectives:

- *To be exposed to Big Data*
- *To learn the different ways of Data Analysis*
- *To be familiar with Data Streams*
- *To learn the Mining and Clustering*
- *To be familiar with the Visualization*

UNIT – I INTRODUCTION TO BIG DATA [09]

Introduction to Big Data Platform – Challenges of conventional systems – Web Data – Evolution of Analytic Scalability– Analytic processes and tools – Analysis vs Reporting – Modern Data Analytic Tools – Statistical concepts: Sampling Distributions– Re sampling – Statistical Inference – Prediction Error

UNIT – II DATA ANALYSIS [09]

Regression Modeling – Multivariate Analysis – Bayesian Modeling – Inference and Bayesian Networks – Support Vector and Kernel Methods – Analysis of Time Series: Linear Systems Analysis – Nonlinear Dynamics – Rule Induction – Neural Networks – Learning and Generalization – Competitive Learning – Principal Component Analysis and Neural Networks – Fuzzy Logic: Extracting Fuzzy models from Data – Fuzzy Decision Trees – Stochastic Search Methods

UNIT – III MINING DATA STREAMS [09]

Introduction to Streams Concepts – Stream Data Model and Architecture – Stream Computing– Sampling data in a stream – Filtering Streams – Counting distinct elements in a stream – Estimating moments – Counting oneness in a window – Decaying window – Real–Time Analytics Platform(RTAP) applications – Case Studies – Real Time Sentiment Analysis – Stock Market Predictions

UNIT – IV FREQUENT ITEMSETS AND CLUSTERING [09]

Mining Frequent item sets – Market based model – Apriori Algorithm – Handling large data sets in Main memory – Limited Pass Algorithm – Counting Frequent item sets in a stream – Clustering Techniques – Hierarchical – K- Means Clustering High Dimensional Data – CLIQUE and PROCLUS – Frequent Pattern based Clustering Methods – Clustering in non–Euclidean Space –Clustering for Streams and Parallelism

UNIT – V FRAMEWORKS AND VISUALIZATION [09]

Map Reduce – Hadoop – Hive – MapR – Sharding – NoSQL Databases – S3 – Hadoop Distributed File Systems – Visualizations – Visual Data Analysis Techniques – Interaction Techniques – Systems and Applications

Total (L: 45) =45 Periods

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

CO1: Apply the Statistical Analysis Methods

CO2: Compare and contrast various Soft Computing Frameworks

CO3: Design distributed File Systems

CO4: Apply Stream Data Model

CO5 : Use Visualization Techniques

Text Book :

1 Michael Berthold, David J. Hand, Intelligent Data Analysis, Springer, 2013

2 Anand Rajaraman and Jeffrey David Ullman, Mining of Massive Data sets, Cambridge University Press, 2012

Reference Books :

1 Bill Franks, Taming the Big Data Tidal Wave: Finding Opportunities in Huge Data Streams with advanced analytics, John Wiley & sons, 2012

2 Glenn J. Myatt,Making Sense of Data, John Wiley & Sons, 2007 Pete Warden, Big Data Glossary, O" Reilly, 2011

3 Jiawei Han- Micheline Kamber ,Data Mining Concepts and Techniques, Second Edition, Elsevier, Reprinted 2012

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18EE413	CONTROL SYSTEMS (OPEN ELECTIVE)	L	T	P	C
		3	1	0	4

Prerequisite: *Applied Mathematics*

Objectives :

- *To realize the representation of systems and obtain transfer function models.*
- *To provide adequate knowledge in the time response of systems.*
- *To accord basic knowledge of the frequency domain analysis of control systems.*
- *To recognize the concept of stability and its analysis.*
- *To design the compensator and controller for various networks.*

UNIT - I SYSTEM AND THEIR REPRESENTATION [12]

Basic elements in control system – Types of system–Open and closed loop systems– Electrical analogous of mechanical translational and rotational system –Thermal system– Transfer function–AC and DC servomotors – Block diagram reduction techniques – Signal flow graphs.

UNIT - II TIME RESPONSE ANALYSIS [12]

Types of test signal – First and second order time response –Time domain specification of second order underdamped systems- Types and Order of systems– Generalized error series–Steady state error and error constants.

UNIT - III FREQUENCY RESPONSE ANALYSIS [12]

Frequency response of the system – Bode plot – Polar plot – Constant M and N circles – Determination of closed loop response from open loop response - Correlation between frequency and time response.

UNIT - IV STABILITY OF CONTROL SYSTEM [12]

Characteristics equation – Routh Hurwitz criterion – Root locus construction - Nyquist stability criterion - Effect of pole, zero addition.

UNIT - V COMPENSATOR AND CONTROLLER DESIGN [12]

Performance criteria – Lag, lead and lag-lead networks – Compensator design using bode plots - P, PI, PID controllers.

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

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

CO1: Obtain the transfer function of basic elements, servo motors.
CO2: Determine the time-domain response of first and second order systems.
CO3: Find the stability of the open loop systems using bode / polar plot.
CO4: Examine the stability of the system by the Root locus, Nyquist stability and Routh Hurwitz criterion.
CO5: Design lag, lead, lag-lead compensator using bode plot.

Text Books :

1 J. Nagrath and M. Gopal, 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 K. Ogata, Modern Control Engineering, PHI Learning, 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 D.Roychoudhury, Modern control engineering, PHI Learning, New Delhi, Second Edition, 2005.

K.S.R. COLLEGE OF ENGINEERING (Autonomous) **R 2018**

18EE868	ELECTRONIC INSTRUMENTATION (OPEN ELECTIVE)	L	T	P	C
		3	0	0	3

Prerequisite: *Electric Circuit Analysis, Analog Electronics, Measurements and Instrumentation*

Objectives:

- *To introduce different types of electronic meters and their applications.*
- *To educate on various Digital instruments and its applications.*
- *To provide knowledge on various types of cathode ray oscilloscopes and signal analyzers.*
- *To impart knowledge about different types of waveform generators.*
- *To give exposure to telemetry, modulation techniques and multiplexing.*

UNIT - I ELECTRONIC INSTRUMENTS [09]

Introduction – Functional elements of a measurement system – Electronic Voltmeter and their advantages – Types: Differential amplifier, rectifier, multirange – True RMS voltmeter – Ohmmeter – Electronic multimeter – Current measurement – Power measurement – Microprocessor based DMM with auto ranging and self-diagnostic features.

UNIT - II DIGITAL INSTRUMENTS [09]

Digital Voltmeter, Types: Ramp, Integrating and Dual slope – Digital Multimeter – Digital Frequency meter – Digital Time Measurement – Digital Tachometer and pH meter – Automation in digital instruments – Microprocessor based instruments.

UNIT - III CATHODE RAY OSCILLOSCOPE & SIGNAL ANALYZERS [09]

General purpose cathode ray oscilloscope – Dual trace, dual beam and sampling oscilloscopes– Analog and digital storage oscilloscope - frequency selective and heterodyne wave analyzer – Harmonic distortion analyzer – Spectrum analyzer.

UNIT - IV WAVEFORM GENERATORS [09]

Wien's bridge and phase shift oscillators – Hartley and crystal oscillators – Square wave and pulse generators – Triangular wave-shape generator – Signal and function generators – Q meter – Electronic Counters.

UNIT - V TELEMETRY [09]

General telemetry system – voltage, current and position telemetry systems – Radio frequency telemetry – Frequency modulation, pulse-amplitude modulation and pulse-code modulation telemetry – Frequency and time multiplexing.

Total (L=45) = 45 Periods

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

CO1: Explain different types of electronic meters and their applications.

CO2: Describe various Digital instruments and its applications.

CO3: Explain the working of various types of cathode ray oscilloscopes and signal analyzers.

CO4: Discuss the functional operation of different types of waveform generators.

CO5: Outline the principle of telemetry, modulation techniques and multiplexing.

Text Books :

1 Kalsi, H.S., Electronic Instrumentation, Tata McGraw-Hill, New Delhi, Second Edition, 2019.

2 Helfrick, A.D. and Cooper,W.D., Modern Electronic Instrumentation and Measurement Techniques, Prentice Hall India Private Ltd., New Delhi, First Edition, 2013.

Reference Books :

1 David A Bell, Electronic Instrumentation and Measurements, Oxford University Press, London, Third Edition, 2013.

2 Prithiwiraj Prukait, Budhaditya Biswas, Santanu Das and Chiranjib Koley, Electrical and Electronics Measurement and Instrumentation, Tata McGraw Hill, New Delhi, First Edition, 2013.

3 J.J. Carr, Elements of Electronic Instrumentation and Measurement, Pearson Education India, New Delhi, Third Edition, 2011.

4 Sawhney, A.K., Electrical, Electronic measurement & Instrumentation, Dhanpat Rai & sons, New Delhi, Eighteenth edition, 2012.

K.S.R. COLLEGE OF ENGINEERING (Autonomous) **R 2018**

		L	T	P	C
18EE768	**SOFT COMPUTING TECHNIQUES (OPEN ELECTIVE)**	**3**	**0**	**0**	**3**

Prerequisite:- *NIL*

Objectives:

- *To acquire basic knowledge about neural networks.*
- *To understand the concept of different neural networks.*
- *To impart knowledge on fuzzy logic system.*
- *To gain knowledge about various soft computing techniques.*
- *To apply soft computing techniques to classical problems.*

UNIT - I INTRODUCTION [07]

Fundamental concept to Neural Networks and its basic models of Artificial Neural Network, Weights, Bias and thresholds, Common activation functions, Learning rules, Learning methods, McCulloch–Pitts neuron, Linear Separability, Hebb Network, Perceptron Networks.

UNIT - II ARTIFICIAL NEURAL NETWORKS [11]

Adaptive Linear Neuron, Back-Propagation Network, Auto associative Memory Network, Hopfield Networks, Kohonen Self-Organizing Feature Maps and Boltzmann Machine.

UNIT - III FUZZY LOGIC SYSTEM [09]

Introduction to crisp sets and fuzzy sets, basic fuzzy set operation and approximate reasoning. Introduction to fuzzy logic modeling and control. Fuzzification, inferencing and defuzzification. Fuzzy knowledge and rule bases.

UNIT - IV OPTIMIZATION ALGORITHMS [09]

Genetic algorithm – operators - stopping condition – constraints – classification - Advantages and Limitations of Genetic Algorithm, Simulated Annealing, Ant colony optimization.

UNIT - V APPLICATIONS OF SOFT COMPUTING [09]

Stability Analysis using Artificial Neural Networks, Fuzzy Logic in Control Systems, Neural Network Toolbox, Fuzzy Logic MATLAB Toolbox and Genetic Algorithm MATLAB Toolbox.

Total (L: 45) = 45 Periods

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

CO1: Infer the concepts of artificial neural network.
CO2: Outline the various types of neural network.
CO3: Discuss the basic concepts of fuzzy logic system.
CO4: Illustrate the fundamentals of different soft computing techniques.
CO5: Apply the knowledge of neural networks and fuzzy logic controller for classical applications.

Text Books :

1 Sivanandam S.N and Deepa S.N, Principles of soft computing techniques, John Wiley and Sons Ltd, United States, Third Edition, 2011.

2 Jacek M.Zurada, Introduction to Artificial Neural Systems, Jaico Publishing Home, Mumbai, First Edition, 2002.

Reference Books :

1 Laurance Fausett Englewood cliffs, N.J., Fundamentals of Neural Networks, Pearson Education, New Delhi, First Edition, 1992.

2 Kosko, B. Neural Networks And Fuzzy Systems, Prentice-Hall of India Pvt. Ltd., New Delhi, Third Edition, 1994.

3 David E. Goldberg, Genetic Algorithm in Search Optimization and Machine Learning, Pearson Education, New Delhi, Thirteenth Edition, 2013.

4 Simon Haykin, Neural Networks Comprehensive Foundation, Pearson Education, New Delhi, Second Edition, 2005.

K.S.R. COLLEGE OF ENGINEERING (Autonomous) **R 2018**

18ME773	RENEWABLE SOURCES OF ENERGY (OPEN ELECTIVE)	L	T	P	C
		3	0	0	3

Prerequisite: *Power Plant Engineering.*

Objectives :

- *To study the working principles of solar power plant.*
- *To learn about the wind energy conversion principle and its applications.*
- *To acquire bio mass gasification and tits conversion techniques.*
- *To understand the geothermal and tidal energy conversion principles.*
- *To recognize the advances in alternate energy resources.*

UNIT – I SOLAR ENERGY [09]

Solar radiation and its measurements, solar energy conversion, solar energy collectors - flat plate collector, concentrating collector, advantages and disadvantages, storage systems, applications, solar thermal power plants.

UNIT – II WIND ENERGY [09]

Introduction, classifications, energy conversion principles, advantages and disadvantages. wind energy generators, forces acting on the blades, storage systems, applications, safety systems.

UNIT – III BIO ENERGY [09]

Bio mass - conversion techniques, thermal gasification, photosynthesis. bio gas – types of plants, materials, site selection, design consideration, properties, utilization, pyrolysis, thermo chemical process, liquid fuels.

UNIT – IV GEO THERMAL AND TIDEL ENERGY [09]

Geo thermal energy - introduction, hydrothermal resources and geo pressured resources, hot dry rock resources, magma resources and prime movers, materials selection, advantages and disadvantages. tidel energy – introduction, ocean thermal electric conversion (OTEC), energy from tides, mini and micro hydel plants.

UNIT – V ADDITIONAL ALTERNATE ENERGY SOURCES [09]

Magneto hydro dynamic (MHD) power generation- principles, design and developments, materials. thermo nuclear fusion energy – nuclear fusions, reactions, requirements, types, advantages and disadvantages, fusion hybrids.

Total (L: 45) =45 Periods

Course Outcomes: On completion of this course, the students will be able to

CO1: Apply solar energy principles to obtain electric power.
CO2: Explore wind energy generation techniques.
CO3: Demonstrate the Bio gas energy. Conversion principles.
CO4: Identify the Geo thermal and tidal energy conversion techniques.
CO5: Review the advances in alternate energy sources.

Text Books:

1. Chetan Singh Solanki, Renewable Energy Technologies, PHI Learning Private Limited., New Delhi, Second Edition, 2011.
2. G.D. Rai, Non-Conventional Energy Sources, Khanna Publishers, New Delhi, Second Edition, 1999.

Reference Books:

1. Twidell, J.W. & Weir, A., Renewable Energy Sources, EFN Spon Ltd., UK, Second Edition,1986
2. B.H. Khan, Non-Conventional Energy Resources, Tata McGraw Hill Publishing Company Ltd., New Delhi, Second Edition, 2006.
3. G.S. Sawhney, Non-Conventional Energy Resources, PHI Learning Private Limited., New Delhi, Second Edition, 2012.
4. D.S. Chauhan, S.K. Srivastava, Non-Conventional Energy Resources, New Age International (P) Ltd. New Delhi, Second Edition, 2009.

K.S.R. COLLEGE OF ENGINEERING (Autonomous) **R 2018**

18EE513	POWER ELECTRONICS (OPEN ELECTIVE)	L	T	P	C
		3	0	0	3

Prerequisite: *Electric Circuit Analysis, Analog Electronics*

Objectives:

- *To get an overview of different types of power semiconductor devices and their switching characteristics.*
- *To understand the operation, characteristics and performance parameters of phase controlled converters.*
- *To study the operation, switching techniques and basic topology of DC chopper.*
- *To study the operation, switching techniques and basic topology of AC chopper.*
- *To study the operation of single phase and three phase inverters.*

UNIT - I POWER SEMICONDUCTOR DEVICES [09]

Introduction – V-I and switching characteristics of power semiconductor devices: Power Diode, Thyristor, Power BJT, Power MOSFET, Power IGBT and TRIAC – SCR protection circuits – SCR firing circuits – SCR Commutation techniques – Gate drive circuits: Power MOSFET and IGBT.

UNIT - II PHASE CONTROLLED CONVERTERS [09]

Principle of phase controlled converter – Single phase semi and fully controlled converter with R, RL, RLE load – Freewheeling diode – Three phase semi and fully controlled converter with R, RL, RLE load – Effect of source inductance.

UNIT - III DC TO DC CONVERTER [09]

Classification: step down chopper, step up chopper, step down/step up chopper – CUK Converter – Control Techniques: Time ratio control and current limit control – Types: Class A, Class B, Class C, Class D and Class E chopper.

UNIT - IV AC TO AC CONVERTER [09]

Introduction: Principle of ON-OFF control and phase angle control - Single phase and three phase AC voltage controllers with R and RL load – Single phase and three phase step up and step down cycloconverters – Operation of single phase matrix converter.

UNIT - V INVERTER [09]

Principle of operation: Single phase voltage source inverter, Three phase voltage source inverters (120° and 180° mode) – Single phase and Three phase current source inverter – PWM techniques.

Power Electronic Applications: UPS, SMPS and HVDC transmission systems.

Total (L: 45) =45 Periods

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

CO1: Describe the characteristics of power semiconductors devices and firing scheme, protection and commutation techniques for SCR.

CO2: Analyze the electrical parameter of different AC to DC phase controlled converters with various loads and summarize the effect of source inductance for various converters.

CO3: Make use of the DC chopper for various quadrant operations and analyze the performance.

CO4: Analyze the performance of AC to AC Converters.

CO5: Explain the principle of various inverter topologies and employing power electronics devices in utility related applications.

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 Dubey.G.K, Doradla.S.R, Joshi.A and Sinha.R.M, Thyristorised Power Controllers, John Wiley and Sons Ltd, United States, First Reprint, 2005.

K.S.R. COLLEGE OF ENGINEERING (Autonomous) **R 2018**

		L	T	P	C
18EE099	**ELECTRICAL WIRING, ESTIMATION AND COSTING** (Common to AU, CE, EC & ME) **(OPEN ELECTIVE)**	3	0	0	3

Prerequisite: *-*

Objectives:

- *To describe the specifications of various wiring accessories.*
- *To describe the materials used for internal wiring and illumination.*
- *To comprehend various wiring systems used in domestic wiring.*
- *To describe the preparation of the estimate and cost of materials used for internal wiring.*
- *To prepare the estimate of wiring materials and cost of wiring for single phase and three phase supplies.*

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.

UNIT - II INTERNAL WIRING SYSTEM AND ILLUMINATION [09]

Design and Drawing of Internal wiring system for various types of Residential, Commercial and Industrial buildings- Electrical layout- Different types of circuits, Light circuit, Power circuit, Sub-main wiring, Main wiring, Single Line diagram- Introduction to Illumination, Nature of light, Different types of Lamps used in Residential, Commercial and Industrial buildings- Lighting schemes.

UNIT - III EXTERNAL WIRING SYSTEM AND EARTHING [09]

Introduction, Different types of Under Ground (UG) Cables- Cable Laying- Electrical Control Panels- Feeder Pillar- External Electrical Distribution System- Single Line Diagram- Load Calculations- General Specifications of Generating Set, Transformer, Circuit Breakers- 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 of control switches-main switch- size of earth continuity conductor and earthing conductor- Preparation of schematic diagrams and wiring diagrams-Single line and multiline- 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) = 45 Periods

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

CO1: Describe the various wiring materials and protective devices.

CO2: Discuss the internal wiring system and illumination.

CO3: Outline the external wiring system and installations.

CO4: Explain the electrical estimation for domestic installation.

CO5: Describe the electrical estimation details for industrial installation.

Text Books :

1 Raina,K.B. and Bhattacharya, S.K., Electrical Design Estimating and Costing, New Age International, New Delhi, Second Edition, 2017.

2 Gupta, J.B., A Course in Electrical Installation Estimating and Costing, S K Kataria & Sons, New Delhi, Reprint Edition, 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, Ahmedabad, First Edition, 2017.

4 Bureau of Indian Standards, I.E. rules for wiring, Electricity Supply Act-1948.

K.S.R. COLLEGE OF ENGINEERING (Autonomous) **R 2018**

		L	T	P	C
18ME712	**MECHATRONICS (OPEN ELECTIVE)**	3	0	0	3

Prerequisite: *Electronics and Microprocessor, Hydraulics and pneumatics.*

Objectives :

- *To study the various components of mechatronics, measurement and control* systems.
- *To apply m*echanical actuation systems for hydraulic and electric systems.
- *To model control systems for mechanical and electromechanical systems.*
- *To identify suitable PLC for mechatronics systems.*
- *To design a microprocessor based control system for machinery.*

UNIT - I MECHATRONICS , SENSORS AND TRANSDUCERS [09]

Introduction to mechatronics systems - measurement systems - control systems - microprocessor based controllers. Sensors, transducers - performance terminology - sensors for displacement, position, proximity, velocity, force, fluid pressure, liquid flow, liquid level, temperature, light sensor-selection of sensor.

UNIT - II ACTUATION SYSTEMS [09]

Pneumatic hydraulic systems - directional control valves - rotary actuators. Mechanical actuation systems - cams - gear train - ratchet and pawl - belt and chain drives - bearing electrical actuation systems -mechanical switches - solid state switches - solenoids - construction and working principle of AC and DC motors - speed control of AC and DC drives, stepper motors - switching circuitries for stepper motor - AC and DC servo motors.

UNIT - III SYSTEM MODELS AND CONTROLLERS [09]

Building blocks of mechanical, electrical, fluid and thermal systems, rotational-translational systems, electromechanical systems - hydraulic-mechanical systems. Continuous and discrete process controllers -control mode - two-step mode - proportional mode - Derivative mode-Integral mode - PID controllers-digital controllers - velocity control - adaptive control - digital logic control.

UNIT - IV PROGRAMMABLE LOGIC CONTROLLERS [09]

Basic structure - input/output processing-programming - mnemonics - timers, internal relays , counters - shift registers - master and jump controls - data handling - analog input/output - selection of a PLC.

UNIT - V DESIGN OF MECHATRONICS SYSTEMS [09]

Stages in designing mechatronics systems - traditional, possible design solutions. Case studies of mechatronics systems - pick and place robot - autonomous mobile robot - wireless surveillance balloon - engine management systems.

Total (L:45) = 45 Periods

Course Outcomes: On completion of this course, the students will be able to

CO1: Identify appropriate sensors and transducers to control mechatronics systems.
CO2: Demonstrate suitable actuator for mechanical and electrical drives.
CO3: Model control systems for electro mechanical systems.
CO4: Analyze PLC program for mechatronics systems.
CO5: Formulate a automated mechatronics system management control.

Text Books :

1. Bolton.W, Mechatronics, Pearson education, New Delhi, second Edition, 2017.
2. Rajput.R.K., A text book of Mechatronics, S. Chand and Co, Delhi, Second Edition, 2018.

References :

1. Nitaigor Premchand Mahadik., Mechatronics, Tata McGraw-Hill publishing company Ltd, New Delhi, Second Edition, 2007.
2. David G. Alciatore Michael B. Histand., Introduction to mechatronics and measurement system, TMH, Delhi, Second edition, 2019.
3. Michael.B.histand and David G. Alciatore, Introduction to mechatronics systems, TMH, Delhi, Second edition, 2018.
4. Dan necsulesu, Mechatronics, Pearson education Asia, Delhi, Second Edition, 2002.
5. http://nptel.ac.in

K.S.R. COLLEGE OF ENGINEERING (Autonomous) **R 2018**

		L	T	P	C
18EE712	**INDUSTRIAL AUTOMATION AND CONTROL (OPEN ELECTIVE)**	3	0	0	3

Prerequisites: *Digital Electronics, Control Systems*

Objectives:

- *To introduce the basic concepts of PLC.*
- *To study the logic fundamentals, PLC timer and counter.*
- *To gain knowledge in PLC programming.*
- *To understand the basic concepts of DCS.*
- *To categorize the applications of PLC and DCS.*

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 – PLC Programming Languages.

UNIT - II LOGIC FUNDAMENTALS, TIMER AND COUNTER [09]

Logic functions – Boolean instructions and functions – Hardwired logic Vs Programmed Logic – Developing circuits from Boolean instructions –Programming Word Level Logic 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 – Low and high level operator interfaces – Operator displays – Low and high level engineering interfaces – General purpose computers in DCS – Introduction to SCADA.

UNIT - V APPLICATIONS OF PLC AND DCS [09]

PLC interfaces – PLC applications: Automatic Control of Ware House 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) =45 Periods

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

CO1: Explain the major components of programmable logic controller and its applications.

CO2: Summarize the logical functions, timers and counters of PLC.

CO3: Discuss the various instructions and modes of operation related to PLC.

CO4: Realize the architecture and various interfacing techniques of Distributed Control Systems.

CO5: Examine the different applications of PLC and Distributed Control Systems.

Text Books :

1 Frank D.Petruzella, Programmable Logic controllers, Tata McGraw Hill Publishing Co Ltd., New Delhi, Fifth Edition, 2017.

2 Lucas, M.P., Distributed Control System, Van Nostrand and Reinhold Co., Newyork, First Edition, 1986.

Reference Books :

1 Gary Dunning, Introduction to Programmable Logic Controllers, Delmar Thomson Learning, Third Edition, 2010.

2 John W.Webb and Ronald A.Reis, Programmable Logic Controllers: Principles and Applications, PHI learning private limited, New Delhi, Fifth Edition, 2003.

3 Krishna Kant, Computer - Based Industrial Control, PHI learning private limited, New Delhi, Second Edition, 2011.

4 Madhuchhanda Mitra and Smarajit Sen Gupta, Programmable Logic Controllers and Industrial Automation, Penram International Publishing (India) Pvt. Ltd., Mumbai, First Edition, 2008.

K.S.R. COLLEGE OF ENGINEERING (Autonomous) **R 2018**

18ME097	**INDUSTRIAL SAFETY ENGINEERING (OPEN ELECTIVE)**	L	T	P	C
		3	0	0	3

Prerequisites : *No Pre requisite needed in this course*

Objectives :

- *To study the importance of personal and industrial safety hazards in industry*
- *To explore the safety aspect of industrial machines.*
- *To demonstrate the Safety measures in welding and gas handling equipment*
- *To apply health and welfare measures during inspection and testing of industrial environment*
- *To estimate the hazardous and risks in industries through various techniques*

UNIT – I INTRODUCTION [09]

Concepts of safety - hazard classification - chemical, physical, mechanical, ergonomics, biological and noise hazards - fire properties - solid, liquid and gases- fire chemistry and its control - first aid - cardio pulmonary resuscitation (CPR) - personal protection.

UNIT – II SAFETY IN MAINTENANCE OF MACHINES [09]

Basic principle of machine guarding during maintenance - machine guarding, types, fixed guard, interlock guard, automatic guard, trip guard, electron eye, positional control guard, fixed guard fencing - guard construction - guard opening - lathe - drilling - boring - milling - grinding – shaping - sawing – shearing - presses - forge hammer – flywheels – shafts – couplings – gears - sprockets wheels and chains - pulleys and belts - authorized entry to hazardous installations - benefits of good guarding systems.

UNIT – III SAFETY IN WELDING AND GAS CUTTING [09]

Gas welding and oxygen cutting, resistances welding, arc welding and cutting - common hazards -training, safety precautions in brazing, soldering and metalizing - explosive welding, selection, care and maintenance of the associated equipment and instruments - safety in generation, distribution and handling of industrial gases - colour coding - leak detection-pipe line safety- storage and handling of gas cylinders.

UNIT – IV SAFETY IN INSPECTION AND TESTING [09]

Heat treatment operations, electro plating, paint shops, sand and shot blasting, safety in inspection and testing, hydro testing, valves, boiler drums and headers, pressure vessels, air leak test, steam testing, safety in radiography, personal monitoring devices, radiation hazards, engineering and administrative controls, health and welfare measures in engineering industry.

UNIT – V HAZARD ANALYSIS AND RISK MANAGEMENT [09]

Hazard identification and control - HAZOP, job safety analysis - fault tree analysis - event tree analysis - failure modes and effect analysis - safety audit - safety survey - plant inspection - past accident analysis.

Overall risk analysis - disasters management plan - emergency planning - onsite and offsite emergency planning - risk management.

Total (L:45) = 45 Periods

Course Outcomes: On completion of this course, the students will be able to

CO1: Identify the safety and hazards risk for personal and industrial environment
CO2: Apply safety aspects to industrial machine functional environments
CO3: Construct the Safety measures in welding and gas handling equipment
CO4: Demonstrate the health and hazardous risk in inspection and testing in industry
CO5: Evaluate hazard and risks using various techniques in industries.

Text Books:

1 Blake, R.P., Industrial Safety, PHI Publications, New Delhi, Second Edition, 2000.

2 Raghavan, K.V. and Khan A.A., Methodologies in Hazard Identification and Risk Assessment Manual by CLRI, Second Edition, 2019.

References:

1 Lees, F.P., Loss Prevention in Process Industries, Butterworth Heinemann, Second Edition, 1996.

2 Health and safety in welding and allied processes, welding Institute Hi tech publishing Limited, UK, 1989.

3 Major hazard control - A practical manual, ILO, Jeneva, 1988.

4 Krishnan, N.V., Safety management in industry, Jaico publishing house, Bombay, 1977.

K.S.R. COLLEGE OF ENGINEERING (Autonomous) **R 2018**

18AU811	ELECTRIC AND HYBRID VEHICLES (OPEN ELECTIVE)	L	T	P	C
		3	0	0	3

Prerequisite: *-*

Objectives:

- *To comprehend general aspects of Electric and Hybrid Vehicles (EHV), including architectures, modelling, sizing, sub system design and hybrid vehicle control.*
- *To acquire the knowledge on subsystems of hybrid and electric vehicles.*
- *To design the required energy storage devices.*
- *To select the suitable electric propulsion systems.*
- *To infer the design consideration for electric vehicles.*

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. Case study on specification of electric and hybrid vehicles.

UNIT – II SUBSYSTEMS OF HYBRID AND ELECTRIC VEHICLES [09]

Power Split devices for Hybrid Vehicles - Operation modes - Control Strategies for Hybrid Vehicle- Economy of hybrid Vehicles. Steering and Suspension system. Choice of Tires.

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 (L:45) = 45 Periods

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

CO1: Summarize the electric and hybrid vehicle operation and architectures.
CO2: Design and develop the systems of electric and hybrid vehicles.
CO3: Demonstrate the energy requirement for vehicles.
CO4: Identify the vehicle characteristics, operating modes, and performance parameters of the vehicle.
CO5: Explain the different subsystems of electric and hybrid vehicles.

Text Book :

1 Iqbal Husain, Electric and Hybrid Vehicles-Design Fundamentals, CRC Press, USA, Second Edition, 2010.
2 Mehrdad Ehsani, Modern Electric, Hybrid Electric and Fuel Cell Vehicles, CRC Press, USA, Second Edition, 2009.

Reference Books :

1 James Larminie and John Lowry, Electric Vehicle Technology Explained, John Wiley & Sons, USA, Second Edition, 2012.
2 Lino Guzzella, Vehicle Propulsion System, Springer, Berlin, Heidelberg, 2013
3 Ron HodKinson, Light Weight Electric/ Hybrid Vehicle Design, Butterworth Heinemann Publication, 2001
4 Ronald K Jurgen, Electric and Hybrid – Electric Vehicles, SAE International, 2011.

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		L	T	P	C
18AU769	**INTELLIGENT VEHICLES TECHNOLOGY (OPEN ELECTIVE)**	3	0	0	3

Prerequisite: *-*

Objectives:

- *To become familiar with various driver assistance systems.*
- *To comprehend the telematics in automotive systems.*
- *To recognize the automotive safety and security systems.*
- *To study about the comfort systems.*
- *To acquire the knowledge in various adaptive control systems.*

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 & 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 (L:45) = 45 Periods

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

CO1: Identify the various systems involved in driver support systems and their working principle.

CO2: Familiarize with global positioning systems, geographical information systems and navigation systems.

CO3: Comprehend the constructional and working features of safety systems and security systems

CO4: Recognize about the various comfort systems.

CO5: Acquire about the various adaptive control systems.

Text Book :

1 Ljubo Vlacic, Michel Parent and Fumio Harashima, Intelligent Vehicle Technologies, Butterworth-Heinemann publications, Oxford, 2001.

2 Ronald K Jurgen, Navigation and Intelligent Transportation Systems – Progress in Technology, Automotive Electronics Series, SAE, USA, 1998.

Reference Books :

1 Richard Bishop, Intelligent Vehicle Technology and Trends, Artech House, London, 2005.

2 William B Riddens, Understanding Automotive Electronics, Butterworth-Heinemann, Woburn, Eighth Edition, 2017.

3 Robert Bosch, Automotive Handbook, Bently Publishers, Cambridge, Ninth Edition, 2014.

4 Bechhold, Understanding Automotive Electronics, SAE, 1998.

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18CE664 **REMOTE SENSING AND GIS (OPEN ELECTIVE)**

L	T	P	C
3	0	0	3

Prerequisite: -

Objectives:

- *To provide background knowledge on basic principles of remote sensing,*
- *To explain the concepts of Geographical Information System.*
- *To illustrate the Image processing techniques using in real time applications, motivates towards innovations in the relevant fields.*
- *To study about analysis and interpretation of GIS result.*
- *To know the advancements and applications of remote sensing and GIS in Civil Engineering.*

UNIT - I PRINCIPLES OF REMOTE SENSING [09]

Definition - Components of Remote sensing - EMR Spectrum - EMR interactions with atmosphere - EMR interactions with Earth - Spectral signature curves of Earth surface features - Platforms and Sensors: Evolution of different types of satellites and their characteristics - Sensor types and properties - Resolution concepts.

UNIT - II GEOGRAPHICAL INFORMATION AYSTEM [09]

Definition and Components of GIS - GIS Data Types - Non spatial data: Field and statistical data, Spatial data: Maps and Map projection methods, Aerial photographs and satellite data - Vector and Raster data types - Merits and demerits - Hard ware: Data entry, Scanners and Digitizers, Commonly available GIS Software- Open source.

UNIT - III GIS DATA PROCESSING AND MANAGEMENT [09]

Digital Image- Characteristics - Image pre-processing techniques - Image Enhancements techniques - Classification methods - Database concepts - Data structures: Run Length Encoding, Block encoding, Chain encoding and Quad tree, Topology - Data storage formats: BIL, BSQ and BIP, Topology - Data compression techniques - File formats.

UNIT - IV GIS DATA ANALYSIS AND INTERPRETATION [09]

Data Retrieval: Querying - Raster data analysis: Spatial analysis - Reclassification - Vector data analysis: Overlay, Buffer and Network analysis –Modeling surfaces: TIN, DTM, DEM, Slope model: Slope, Aspect, Hill shades - Types of Data products - Image Interpretation: Visual Interpretation keys and techniques.

UNIT - V ADVANCEMENTS AND APPLICATIONS OF REMOTE SENSING AND GIS [09]

LIDAR and Microwave Remote sensing with its applications, Basics of Hyper spectral Remote sensing - Fields of Applications and case studies: LIS and Cadastral mapping - Urban and Regional planning - Natural resources management - Climate studies and Disaster monitoring (Natural and Manmade) - Ocean studies- Concept of Online GIS and Mobile GIS.

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

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

CO1: Make use the principles of EM spectrum to categories the earth features in an image and the sensor properties for various applications of remote Sensing.

CO2: Recommend suitable GIS elements for storing and analyzing different remote sensing dataset.

CO3: Apply the data pre-processing techniques to remove the errors and recommend suitable GIS database for different remote sensing imageries.

CO4: Perform raster and vector data analyses on different remote sensing images.

CO5: *Familiarize and maximize the fields of applications of remote sensing and GIS with the recent advancement techniques.*

Text Books :

1 Anji Reddy, Remote Sensing and Geographical Information Systems, BS Publications, Hyderabad, Fourth Edition, 2019.

2 Lillisand. and Kiefer, Chipman., Remote Sensing and Image Interpretation, Willey Publications, London, Sixth Edition, 2011.

Reference Books :

1 Joshi, D. C.,Remote Sensing and GIS Applications, Scientific Publishers, Jodhpur, First Edition, 2019.

2 Ialn H., Woodhouse, Introduction to Microwave Remote Sensing, Taylore and Francise Group, New Delhi, First Edition, 2005.

3 Burrough, P.A. and McDonell, Rachel A., Principles of Geographical Information Systems, Oxford Publication, England, First Edition, 2004.

4 Todd, D.K. and Larry W. Mays., Remote Sensing and GIS John Wiley and Sons, Sankalp Publication, Mumbai, Third Edition, 2020.

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18CE867	MUNICIPAL WASTE AND MANAGEMENT (OPEN ELECTIVE)	L	T	P	C
		3	0	0	3

Prerequisite: *Environmental Engineering II*

Objectives:

- *To provide comprehensive overview of municipal waste and management.*
- *To learn about on-site storage and processing of solid waste.*
- *To provide knowledge on collection and transportation of waste.*
- *To impart knowledge about the processing of municipal solid waste.*
- *To impart knowledge about safe disposal of municipal solid waste.*

UNIT - I SOURCES AND TYPES OF MUNICIPAL SOLID WASTES [09]

Sources and types of solid wastes - Quantity – factors affecting generation of solid wastes-characteristics – methods of sampling and characterization- Effects of improper disposal of solid wastes – public health effects- Principle of solid waste management – social & economic aspects - Public awareness-Role of NGOs- Legislation.

UNIT - II ON-SITE STORAGE & 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]

Methods of Collection – types of vehicles – Manpower requirement – collection routes; transfer stations – selection of location, operation & maintenance; options under Indian conditions – Usage GPS in route optimization – Application of GIS in collection and transfer of waste.

UNIT - IV OFF-SITE PROCESSING [09]

Objectives of waste processing – Physical Processing techniques and Equipment; Resource recovery from solid wastes – composting, incineration, Pyrolysis - options under Indian conditions.

UNIT - V TREATMENT &DISPOSAL [09]

Dumping of solid waste, Building Demolition and Construction Waste; sanitary landfills – site selection, design and operation of sanitary landfills – Leachate collection & treatment.

Total (L: 45) = 45 Periods

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

CO1: Characterize the solid waste based on source, type and composition and also emphasize the effects of its improper disposal.
CO2: Identify and suggest suitable on-site processing methods.
CO3: Identify the suitable method for collection, segregation and transportation of solid waste.
CO4: Select and adopt the suitable off-site processing techniques according to Indian conditions.
CO5: Identify and suggest appropriate disposal methods for solid and wastes.

Text Books :

1. Tchobanoglous, G. and Frank Kreith., Hand Book of Solid Waste Management, McGraw-Hill, Inc, New Delhi, Second Edition, 2002.
2. Ramachandra, T. V., Management of Municipal Solid Waste, TERI Press, New Delhi, First Edition, 2009.

Reference Books :

1. Worrell, William A. and AarneVesilind, P., Solid Waste Engineering, Cengage Learning Asia PTE Limited, Singapore, Second Edition, 2012.
2. Rao, M.N, Sultana, Razia Kota, and 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, Florida, Second Edition, 2014.
4. Freeman, H. M., Standard Handbook of Hazardous Waste Treatment and DisposalII, McGraw-Hill, Inc, Noida, Second Edition, 1997.

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		L	T	P	C
18CE766	**ENVIRONMENTAL IMPACT ASSESSMENT (OPEN ELECTIVE)**	3	0	0	3

Prerequisite: *-*

Objectives:

- *To diagnose the importance of Environmental Impact Assessment (EIA) &various types of EIA.*
- *To describe different methods of EIA.*
- *To illustrate the impact on various environments and role of stake holders in EIA.*
- *To explain the environmental impact management plans for mitigation of adverse impact on environment.*
- *To fathom out case studies of environmental impact assessment for different* infrastructure *projects.*

UNIT - I INTRODUCTION [09]

Impact of development projects – Sustainable development- Need for Environmental Impact Assessment (EIA) - Environmental Impact Statement (EIS) – EIA capability and limitations – Legal provisions on EIA-Stages of EIA, Types of EIA.

UNIT - II METHODOLOGIES [09]

Methods of EIA – Check lists – Matrices – Networks – Cost-benefit analysis – Analysis of alternatives.

UNIT - III PREDICTION AND ASSESSMENT [09]

Assessment of impact on land, water, air, social cultural activities and on flora &fauna – Mathematical models – Public participation.

UNIT - IV ENVIRONMENTAL MANAGEMENT PLAN [09]

Plan for mitigation of adverse impact on environment – Options for mitigation of impact on water, air, land and on flora & fauna - Addressing the issues related to the Project Affected People Post project monitoring.

UNIT - V CASE STUDIES [09]

EIA for infrastructure projects – Dams – Highways – Multi-storey Buildings – Water Supply and Drainage Projects – Waste water treatment plants, STP.

Total (L: 45) = 45 Periods

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

CO1: Carry out scoping and screening of developmental projects for environmental and social assessments.
CO2: Analyze different methodologies for environmental impact assessment.
CO3: Evaluate the impact on various environments and role of stake holders in EIA.
CO4: Promote environmental impact management plans for mitigation of adverse impact on environment.
CO5: Prepare and evaluate case studies of environmental impact assessment reports for different infrastructure *projects.*

Text Books :

1 Canter, R.L., Environmental Impact Assessment, McGraw-Hill Higher Education, New Delhi, Second Edition, 1995.
2 Shukla, S.K. and Srivastava, P.R., Concepts in Environmental Impact Analysis, Common Wealth Publishers, New Delhi, Second Edition, 2017.

Reference Books :

1 Rau,John G. and Hooten, David.C., Environmental Impact Analysis Handbook, McGraw Hill Book Company, New Delhi, 1990.
2 Environmental Assessment Source book, Vol. I, II & III. The World Bank, Washington, D.C, 1991.
3 Judith Petts., Handbook of Environmental Impact Assessment Vol. I & II, Blackwell Science, Boston, 1999.
4 http://nptel.ac.in/courses/120108004/module3/lecture3.pdf.

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18MA434	OPERATIONS RESEARCH (OPEN ELECTIVE)	L	T	P	C
		3	1	0	4

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

Objectives:

- *To study the concepts of optimization techniques for decision making problem in engineering fields.*
- *To acquire knowledge in Transportation and Assignment problems.*
- *To study the concepts of project scheduling by network analysis.*
- *To enumerate the concepts in stock control models,*
- *To study the concepts of sequencing and replacement problems in mechanical engineering.*

UNIT - I LINEAR PROGRAMMING PROBLEM [12]

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 [12]

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 [12]

Network - Fulkerson's rule - Construction of a network - Critical path method (CPM) - Programme Evaluation and Review Techniques (PERT) - Project scheduling by PERT analysis.

UNIT - IV INVENTORY MODEL [12]

Types of Inventory - Deterministic inventory models - Purchase and manufacturing models with and without shortages - Quantity discount model - Price breaks (up to 3 price breaks) - Probabilistic inventory model.

UNIT - V REPLACEMENT MODELS AND SEQUENCING [12]

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: 15) = 60 Periods

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

CO1: Develop the decision making during the uncertain situations by linear programming approach.

CO2: Identify to minimize the Transportation and Assignment cost and maximize the profit in industries.

CO3: Develop the network techniques in project scheduling.

CO4: Study the importance of stock controlling to maximize the profit.

CO5: *Apply the Replacement and sequencing methods in manufacturing engineering.*

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 & Co, New Delhi ,Tenth edition, 2015

2 Taha. H.A, Operation Research, Pearson Education, New Delhi, Sixth edition, 2016.

3 J.K Sharma, Operations Research theory and Applications, New Delhi, Eleventh edition, 2017.

4 https://en.wikipedia.org/wiki/Resource_management

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		L	T	P	C
18HS094	**DISASTER MANAGEMENT** (Common to All Branches) **(OPEN ELECTIVE)**	3	0	0	3

Objective(s):

1. To Understand the students to learn about the aspects of disaster and risk management
2. To understand the different types of Disaster
3. To know the different kinds disaster relief Organization
4. To study the Disaster policy in India
5. To create the awareness about disaster Management

UNIT - I INTRODUCTION ABOUT DISASTER [09]

Introduction, Nature and Dimension of the challenge, Linking Disaster and Development, Sustainable development, Disruption of development by disasters, causes of Disasters – Development opportunities afforded by disasters – Varied impact on states in India. HAZARDS: Definition, principles, Impact of Disasters, Levels of Disaster, Effect of Disasters, Causal factors, Phases of Disaster.

UNIT - II DIFFERENT TYPES OF DISASTERS [09]

Different calamities – Typology of Disasters: Earthquakes, Tsunamis, Volcanoes, Landslides Tropical cyclones, Floods, Environmental pollution, Deforestation – Desertification, Pest Infestations, Epidemics, Chemical and industrial accidents, Trends in climatology, meteorology and hydrology - seismic activity - Case Study.

UNIT – III DISASTER PREVENTION AND CONTROL [09]

United Nations Disaster Relief Coordinator (UNDRO): Disaster relief and management, prevention, preparedness, Stand by capacity – Coordination, cooperation and leadership Continuum from relief to rehabilitation and development – Checklists and reporting formats by UNDMT and international emergency assistance requirement.

UNIT - IV DISASTER MANAGEMENT IN INDIA [09]

Issues – National policy – Historical Framework – Funding mechanisms – Calamity Relief Fund (CRF) – The Disaster management Act 2005 – Indian Agencies for disaster management – National Civil Defense Organization.

UNIT - V DISASTER PREPAREDNESS AND PLANNING [09]

Introduction, Objectives – Disaster planning, Strategies for disaster preparedness and planning – Principles, Myths, Factors influencing disaster risk - Assessing risk in a context of uncertainty - Disaster insurance – use of the media in information dissemination – Types of media and their information needs.

Total (L: 45) = 45 Periods

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

CO1: Explain the nature and causes of disaster
CO2: Describe the Various risk and take steps to mitigate various types of disaster
CO3: Illustrate the various Disaster prevention and control methods
CO4: Describe the Various policies and act in Management in India
CO5: Explain recent strategies towards disasters preparedness and planning.

Text Books :

1. Satish Modh, Introduction to Disaster Management, Macmillian publishers india ltd, New Delhi, Second Edition, 2019
2. Pardeep Sahni, Disaster Risk Reduction in South Asia, PHI Learning, New Delhi, Fourth Edition 2018.

Reference Books :

1. M. Saravana kumar, Disaster Management, Himalaya Publishing House, New Delhi, Second Edition, 2017
2. Singh, Disaster Management: Future Challenges, IK International, New Delhi, Second Edition ,2017.
3. Arvind Kumar Disaster Management – Recent Approaches Anmol Publications, New Delhi, First Edition , 2016.
4. SathishModh, Introduction to Disaster Management, Macmillan, New Delhi, Seventh Edition, 2014