P.S.R. ENGINEERING COLLEGE

(An Autonomous Institution, Affiliated to Anna University, Chennai)

(Accredited by NBA, NAAC and Listed under 12B of the UGC Act,1956)

Sivakasi – 626140

B.E. – ELECTRONICS AND COMMUNICATION ENGINEERING

UG Regulation 2019

Curriculum and Syllabi

(1st to 8th Semester)

INSTITUTE VISION AND MISSION

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

VISION

To contribute to the society through excellence in technical education with societal values and thus a valuable resource for industry and the humanity.

MISSION

- To create an ambience for quality learning experience by providing sustained care and facilities.
- To offer higher level training encompassing both theory and practices with human and social values.
- To provide knowledge based services and professional skills to adapt tomorrow's technology and embedded global changes.

DEPARTMENT VISION AND MISSION

VISION

- The vision of the Electronics and Communication Engineering Department is to produce graduates with sound knowledge for the betterment of society and to meet the dynamic demands of industry and research.

MISSION

- Offering under graduate and post graduate programmes by providing effective and balanced curriculum and equip themselves to gear up to the ethical challenges awaiting them
- Providing the technical, research and intellectual resources that will enable the students to have a successful career in the field of electronics and communication engineering.
- Providing need based training and professional skills to satisfy the needs of society and industry.

PROGRAMME EDUCATIONAL OBJECTIVES (PEOs)

- **PEO1** Lead a professional career by acquiring the basic knowledge in the field of specialization and allied Engineering.
- **PEO2** Assess the real life problems and deal with them confidently relevance to the society.
- **PEO3** Engage in lifelong learning by pursuing higher studies and participating in professional organizations.
- **PEO4** Exhibit interpersonal skills and able to work as a team for success.

PROGRAM SPECIFIC OUTCOMES (PSOs)

1. **PSO1** Design, simulate and analyze diverse problems in the field of telecommunication.
2. **PSO2** Able to design and analyze varied electronic circuits for applications.
3. **PSO3**Apply signal and image processing techniques to analyze a system for applications.
4. **PSO4**Construct, test and evaluate an embedded system and control systems with real time constraints.

PROGRAMME OUTCOMES (POs)

- **PO1 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 modeling 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.
- **PO8Ethics:** 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.

Department: Electronics and Communication Engineering

Programme: **B.E. ELECTRONICS AND COMMNICATION AND ENGINEERING**

	Theory Courses					**Theory Cum Practical**	**Practical Courses**			**Mandatory Courses**	**Value AddedCourses / Audit Courses**	**Total Credits**
I	191HS11-Communicative English (2)	191HS12-Calculus and Linear Algebra(4)	191HS13-Engineering Physics (2)	191HS14-Engineering Chemistry (2)	191EEF1- Basic Electrical and Electronics Engineering(3)	191MEF1-Engineering Graphics(3)	191HS17-Physics & Chemistry Laboratory - I (1)	191EEF7-Basic Electrical and Electronics Laboratory (1)	-			18
2	191HS21-Technical English (2)	191HS22-Differential Equations and Numerical Methods (4)	191HS23-Physics of Materials (2)	191HS24-Environmental Science (2)	191CSF1-Programming for Problem Solving(3)	191MEF7-Mechanical Workshop (3)	191HS27-Physics & Chemistry Laboratory – II(1)	191CSF7-C Programming Laboratory(1)	-			18
3	191HS31-Transforms and Discrete Mathematics(3)	191EC31-Circuits and Electronic Devices(4)	191EC32-Linear Integrated Circuits (3)	191EC33-Networks and Transmission lines(3)	191BS31-Biology for Engineers (3)	191CS35 Data Structures and C++ (4)	191EC37-Circuits and Devices Laboratory(1)	191EC38-Linear Integrated Circuits Laboratory(1)	-	191HS37 – Communication Skills - I		22
4	191HS41-Probability and Random Process(3)	191EC41-Analog Electronics (3)	191EC42-Signals and Systems (4)	191EC43-Digital Systems (3)	191EC44-Electromagnetic Fields and waveguides (4)	191CS46-Python Programming (4)	191EC47-Analog Electronics Laboratory(1)	191EC48-Digital System Laboratory(1)	-	191HS47 – Communication Skills - II	AC	23
5	191EC51-Analog and Digital Communication(3)	191EC52-Control Systems(3)	191EC53-Antennas and Microwave Engineering (3)	191EC54-Digital Signal Processing and Architecture(4)	PE 1(3)	191EC55-Embedded Systems and IOT (4)	191EC57-Communication Systems Laboratory(1)	191EC58-DSP and Signal Processors Laboratory (1)	-	191HS57 – Business English		22
6	191EC61-Wireless Communication (3)	191EC62-Machine Learning (3)	191EC63-Data Communication Networks (3)	PE2 (3)	OE 1(3)	191EC64 – VLSI Design (4)	191EC67-Machine Learning Laboratory(1)	191EC68-Networks Laboratory(1)	191EC69-Mini Project (1)	191HS67 – Career English	AC	22
7	191EC71-Robotics and Artificial Intelligence (3)	191EC72-Digital Image Processing (3)	191ME71 – Total Quality Management	PE3(3)	OE2(3)	191EC73-Fiber Optic Communication and Networks (4)	191EC77-Robotics and Artificial Intelligence Laboratory (1)	191EC78-Digital Image Processing Laboratory(1)	191EC79-Project Work-I(2)			23
8	PE 4 (3)	PE 5 (3)		-	-		191EC89-Project Work - II(6)				AC	12
Total Number of Credits												**160**

B.E. – Electronics and Communication Engineering
R2019 Curriculum and Syllabi

Total Credits 160

SEMESTER I

S.No.	Course Code	Course Title	L-T-P	C	Category
1	191HS11	Communicative English	2-0-0	2	HSMC
2	191HS12	Calculus and Linear Algebra	3-1-0	4	BSC
3	191HS13	Engineering Physics	2-0-0	2	BSC
4	191HS14	Engineering Chemistry	2-0-0	2	BSC
5	191EEF1	Basic Electrical and Electronics Engineering	3-0-0	3	ESC
6	191MEF1	Engineering Graphics(Theory Cum Practical)	1-0-4	3	ESC
7	191HS17	Physics and Chemistry Laboratory-I	0-0-2	1	BSC
8	191EEF7	Basic Electrical and Electronics Laboratory	0-0-2	1	ESC
		TOTAL	**22**	**18**	

SEMESTER II

S.No	Course Code	Course Title	L-T-P	C	Category
1	191HS21	Technical English	2-0-0	2	HSMC
2	191HS22	Differential Equations and Numerical Methods	3-1-0	4	BSC
3	191HS23	Physics of Materials	2-0-0	2	BSC
4	191HS24	Environmental Science	2-0-0	2	BSC
5	191CSF1	Programming for Problem Solving	3-0-0	3	ESC
6	191MEF7	Mechanical Workshop (Theory Cum Practical)	1-0-4	3	ESC
7	191HS27	Physics and Chemistry Laboratory-II	0-0-2	1	BSC
8	191CSF7	C Programming Laboratory	0-0-2	1	ESC
		TOTAL	**22**	**18**	

SEMESTER III

S.No.	Course Code	Course Title	L-T-P	C	Category
1	191HS31	Transforms and Discrete Mathematics	2-1-0	3	BSC
2	191EC31	Circuits and Electronic Devices	3-1-0	4	PC
3	191EC32	Linear Integrated Circuits	3-0-0	3	PC
4	191EC33	Networks and Transmission lines	3-0-0	3	PC
5	191BS31	Biology for Engineers	3-0-0	3	BSC
6	191CS35	Data structures and C++ (Theory cum Practical)	3-0-2	4	ESC
7	191EC37	Circuits and Devices Laboratory	0-0-2	1	PC
8	191EC38	Linear Integrated Circuits Laboratory	0-0-2	1	PC
9	191HS37	Communication Skills - I	0-0-2	0	HSMC
		TOTAL	**27**	**22**	

SEMESTER IV

S.No.	Course Code	Course Title	L-T-P	C	Category
1	191HS41	Probability and Random Processes	2-1-0	3	BSC
2	191EC41	Analog Electronics	3-0-0	3	PC
3	191EC42	Signals and Systems	3-1-0	4	PC
4	191EC43	Digital Systems	3-0-0	3	PC
5	191EC44	Electromagnetic Fields and waveguides	3-1-0	4	PC
6	191CS46	Python Programming (Theory cum Practical)	3-0-2	4	ESC
7	191EC47	Analog Electronics Laboratory	0-0-2	1	PC
8	191EC48	Digital Systems Laboratory	0-0-2	1	PC
9	191HS47	Communication Skills – II	0-0-2	0	HSMC
		TOTAL	**28**	**22**	

SEMESTER V

S.No	Course Code	Course Title	L-T-P	C	Category
1	191EC51	Analog and Digital Communication	3-0-0	3	PC
2	191EC52	Control Systems (Common to ECE & EEE)	3-0-0	3	PC
3	191EC53	Antennas and Microwave Engineering	3-0-0	3	PC
4	191EC54	Digital Signal Processing and Architecture	3-1-0	4	PC
5	-	Elective I* (PE1)	3-0-0	3	PE
6	191EC55	Embedded Systems and IOT(Theory cum Practical)	3-0-2	4	PC
7	191EC57	Communication Systems Laboratory	0-0-2	1	PC
8	191EC58	DSP and Signal Processors Laboratory	0-0-2	1	PC
9	191HS57	Business English	0-0-2	0	HSMC
		TOTAL	**27**	**22**	

SEMESTER VI

S.No	Course Code	Course Title	L-T-P	C	Category
1	191EC61	Wireless Communication	3-0-0	3	PC
2	191EC62	Machine Learning	3-0-0	3	PC
3	191EC63	Data Communication Networks	3-0-0	3	PC
4	-	Elective II* (PE2)	3-0-0	3	PE
5	-	Elective III* (OE1)	3-0-0	3	OE
6	191EC64	VLSI Design (Theory cum Practical)	3-0-2	4	PC
7	191EC67	Machine Learning Laboratory	0-0-2	1	PC
8	191EC68	Networks Laboratory	0-0-2	1	PC
9	191EC69	Mini Project	0-0-2	1	PROJ
10	191HS67	Career English	0-0-2	0	HSMC
		TOTAL	**28**	**22**	

SEMESTER VII

S.No.	Course Code	Course Title	L-T-P	C	Category
1	191EC71	Robotics and Artificial Intelligence	3-0-0	3	PC
2	191EC72/ 191CSEH	Digital Image Processing (Common to CSE & ECE)	3-0-0	3	PC
3	191ME71	Total Quality Management	3-0-0	3	HS
4	-	Elective IV* (PE3)	3-0-0	3	PE
5	-	Elective V* (OE2)	3-0-0	3	OE
6	191EC73	Fiber Optic Communication and Networks (Theory Cum Practical)	3-0-2	4	PC
7	191EC77	Robotics and Artificial Intelligence Laboratory	0-0-2	1	PC
8	191EC78	Digital Image Processing Laboratory	0-0-2	1	PC
9	191EC79	Project - I	0-0-4	2	PROJ
		TOTAL	**28**	**23**	

SEMESTER VIII

S.No.	Course Code	Course Title	L-T-P	C	Category
1	-	Elective VI* (PE4)	3-0-0	3	PE
2	-	Elective VII* (PE5)	3-0-0	3	PE
3	161EC89	Project - II	0-0-12	6	PROJ
		Total	**18**	**12**	

PROGRAMME ELECTIVES

S.NO	Code	Course Title	L-T-P	C	Category
1.	191ECEA	Satellite Communication	3-0-0	3	PE
2.	191ECEB	Cognitive Radio	3-0-0	3	PE
3.	191ECEC	Electromagnetic Compatibility	3-0-0	3	PE
4.	191ECED	Smart Radar Systems	3-0-0	3	PE
5.	191ECEE	MEMS and NEMS	3-0-0	3	PE
6.	191ECEF	Mixed Signal IC Design	3-0-0	3	PE
7.	191ECEG	Low Power SoC Design	3-0-0	3	PE
8.	191ECEH	Cyber Security	3-0-0	3	PE
9.	191ECEI	Cryptography and Network Security (Common to ECE & BME)	3-0-0	3	PE
10.	191ECEJ	Mobile Robotics	3-0-0	3	PE
11.	191ECEK	Photonic Networks	3-0-0	3	PE
12.	191ECEL	Video Analytics	3-0-0	3	PE
13.	191ECEM	Virtual Reality and Augmented Reality (Common to ECE & BME)	3-0-0	3	PE
14.	191ECEN	Electronic Product Design	3-0-0	3	PE
15.	191ECEO	Wearable Electronics	3-0-0	3	PE
16.	191ECEP	Smart Structures And Smart Materials	3-0-0	3	PE
17.	191ECEQ	Satellite Remote Sensing and Data Analysis	3-0-0	3	PE
18.	191ECER	RFID and its Applications	3-0-0	3	PE

19.	191ECES	PLC and Automation	3-0-0	3	PE
20.	191ECET	CMOS Analog IC Design	3-0-0	3	PE
21.	191ECEU	Quantum Computing	3-0-0	3	PE
22.	191ECEV	Edge Computing	3-0-0	3	PE
23.	191HSEA	Professional Ethics in Engineering	3-0-0	3	PE

OPEN ELECTIVES

S.No.	Course Code	Course Title	L-T-P	C	Category
1.	191OE2A	Medical Electronics	3-0-0	3	OE
2.	191OE2B	Consumer Electronics	3-0-0	3	OE
3.	191OE2C	Multimedia Compression And Communication	3-0-0	3	OE
4.	191OE2D	Agriculture Electronics	3-0-0	3	OE

AUDIT COURSES

S.No.	Course Code	Course Title	L-T-P	C	Category
1.	191AC01	Constitution of India	2-0-0	-	MC
2.	191AC02	Disaster Management	2-0-0	-	MC
3.	191AC03	English for Research Paper Writing	2-0-0	-	MC
4.	191AC04	Sanskrit for Technical Knowledge	2-0-0	-	MC
5.	191AC05	Value Education	2-0-0	-	MC
6.	191AC06	Pedagogy Studies	2-0-0	-	MC
7.	191AC07	Stress Management by Yoga	2-0-0	-	MC
8.	191AC08	Personality Development through Enlightenment Skills	2-0-0	-	MC

CURRICULUM STRUCTURE

S. No.	Course Categories	Total Number of Credits PSREC (159)		Total Number of Credits AICTE (160)	
		Credit Distribution	% of weightage of Credits	Credit Distribution	% of weightage of Credits
1.	Humanities and Science (HS) including management	7	4.41%	12	7.5%
2.	Basic Sciences (BS) including Mathematics, Physics, Chemistry	27	16.99%	25	15.63%
3.	Engineering Sciences (ES) including basics of Civil , Electricals and Computer Engineering	22	13.84%	24	15%
4.	Programme Core (PC)	73	45.92%	48	30%
5.	Programme Elective (PE)	15	9.44%	18	11.25%
6.	Open Elective (OE)	6	3.78%	18	11.25%
7.	Employability Enhancement Courses (EEC)	9	5.67%	15	9.38%
8.	Mandatory Courses (MC)	Non Credit Courses			

191HS11	COMMUNICATIVE ENGLISH	L-T-P	C
		2-0-0	2

Programme: B.E./B.Tech. (Common to all Branches) **Sem:** 1 **Category:** HSMC

Prerequisites: -

Aim: To acquire basic Language Skills in order to communicate with English Language Speakers.

Course Outcomes:

The Students will be able to

CO1: Develop the basic reading and writing skills.
CO2: Explain actively and grasp the contents of the speech.
CO3: Develop their speaking skills and speak fluently in real contexts.
CO4: Develop vocabulary of a general kind by developing their reading skills.
CO5: Apply the grammar effectively to exhibit their speaking and writing skill.
CO6: Interpret in English with clarity.

SHARING INFORMATION RELATEDTO ONESELF, FAMILY AND FRIENDS. 9

Reading – Short comprehension passages, Practice in skimming and scanning. **Writing –** Sentence structures, Developing Hints. **Listening–** Short texts, Short formal and informal conversations. **Speaking** – Introducing oneself, Exchanging personal information. **Language Development** – WH questions, Asking and answering YES or NO questions, Parts of Speech. **Vocabulary Development –** Prefixes & Suffixes, Subject verb Agreement.

GENERAL READING AND FREE WRITING 9

Reading – **Comprehension** – Pre-reading & Post-reading. Comprehension questions (Multiple choice questions, Short questions, Open-ended questions), Short narratives and Descriptions from Newspapers including Dialogues. **Writing –** Paragraph writing, Use of Phrases and Clauses in sentences, Listening Telephonic conversations. **Speaking** – Sharing information of a personal kind, Greetings.

Language Development – Noun Pronoun agreement. **Vocabulary Development** – The Concept of Word Formation. (Norman Lewis' *Word Power Made Easy*)

GRAMMAR AND LANGUAGE DEVELOPMENT 9

Reading – Short texts & Longer passages (Cloze reading). **Writing** – Importance of proper punctuation, Jumbled sentences. **Listening –** Listening to longer texts and filling up the table, Product description, Narratives from different sources. **Speaking –** Asking about routine actions and Expressing opinions.

Language Development – Degrees of Comparison, Pronouns. **Vocabulary Development –** Misplaced modifiers, Relative clauses.

READING AND LANGUAGE DEVELOPMENT. 9

Reading- Comprehension. **Reading** longer texts- reading different types of texts. **Writing**- letter Writing, informal or personal letters-Achieving Coherence. **Listening**- listening to dialogues or conversations and completing exercises based on them. **Speaking**- Speaking about oneself- Speaking about one's friend. **Language Development**- Articles. **Vocabulary Development** – Root words from foreign languages and their use in English.

9

EXTENDED WRITING

Reading- Longer texts- close reading. **Writing**- Organizing principles of paragraphs in documents. **Listening** – Listening to talks, conversations. **Speaking** – Participating in conversations, short group conversations. **Language Development** - Cliches, Tenses. **Vocabulary Development** - Prepositions.

Total Periods: 45

Text books:

1. Board of Editors. *Fluency in English: A course book for Engineering and Technology*.Orient Blackswan, Hyderabad: 2016.
2. Kumar, Sanjay and Pushp Lata. *Communication Skills: A Workbook*. New Delhi: OUP, 2018

References:

1. www.oxfordonlineenglish.com
2. www.ielts.up.com
3. www.ted.com
4. www.testpreppractice.com
5. www.beccambridgeenglish.org

Extensive Reading

1. Shiv Khera, *You Can Win*, Macmillan Books, New Delhi, 2003.

191HS12 CALCULUS AND LINEAR ALGEBRA L-T-P C
3-2-0 4

Programme : B.E./B.Tech. (Common to all Branches) Sem: 1 Category: BSC

Prerequisites: Matrices, Differentiation and Integration.

Aim: The course is aimed at developing the basic mathematical skills of engineering students,

Course Outcomes: The students will be able to

CO1: Determine the inverse and the positive powers of a square matrix

CO2: Apply the concept of orthogonal reduction to diagonalise the given matrix

CO3: Determine the evolute of curves, Beta and Gamma Functions.

CO4: Apply Lagrangian multiplier method for finding maxima and minima of an unconstrained problem

CO5: Apply the concepts of Differentiation and Integration in Vectors.

CO6: Examine an analytic function, when its real or Imaginary part is known.

MATRICES **12**

Characteristic equation - Eigen Values and Eigen vectors of a real matrix - Properties of Eigen values - Cayley-Hamilton Theorem (without proof) and its application - Orthogonal Transformation of a Symmetric matrix to diagonal form - Quadratic form - Orthogonal reduction to canonical form.

CALCULUS **12**

Radius of Curvature - Cartesian and Parametric Coordinates - Circle of Curvature - Involutes and Evolutes –Beta and Gamma functions and their properties.

MULTIVARIABLE CALCULUS **12**

Partial Derivatives - Total Derivative - differentiation of Implicit function – Jacobian - Taylor's Expansion - Maxima/Minima for function of two variables - Method of Lagrange's multipliers.

VECTOR CALCULUS **12**

Gradient, Divergence and Curl – Directional derivative – Irrotational and Solenoidal vector fields – Vector integration – Green's theorem in a plane, Gauss divergence theorem and Stokes' theorem (excluding proofs) – Simple applications involving cubes and rectangular parallelepiped.

COMPLEX VARIABLE – DIFFERENTIATION **12**

Functions of a complex variable – Analytic functions – Necessary conditions, Cauchy– Riemann equation and Sufficient conditions (excluding proofs) – Harmonic and orthogonal properties of analytic function(without proof) – Harmonic conjugate – Construction of analytic functions – Conformal mapping : w = z + c, cz, 1/z, and bilinear transformation.

Total Periods 60

Text books:

1. B.S. Grewal, "Higher Engineering Mathematics", Khanna Publishers, New Delhi, 43rd Edition, 2014.
2. G.B. Thomas and R.L. Finney, Calculus and Analytic geometry, 9th edition, Pearson, Reprint, 2002.

References:

1. Veerarajan.*T.*, "Engineering Mathematics for first year", Fourth Edition, Tata Mc-Graw – Hill, New Delhi, 2008.
2. Erwin Kreyszig, "Advanced Engineering Mathematics", 9th Edition, John Wiley & Sons, 2006.

3. G.B. Thomas and R.L. Finney, “Calculus and Analytic Geometry” 9th Edition, Pearson, Reprint, 2002.
4. N.P. Bali and Manish Goyal, “A text book of Engineering Mathematics”, Laxmi Publications, Reprint, 2008.
5. B.S. Grewal, “Higher Engineering Mathematics”, Khanna Publishers, 36th Edition, 2010.
6. J. W. Brown and R. V. Churchill, Complex Variables and Applications, 7th Edition., Mc-Graw Hill, 2004

191HS13	ENGINEERING PHYSICS	L-T-P	C
		2-0-0	2

Programme:	**B.E./B.Tech. (Common to all Branches)**	**Sem:**	**1**	**Category:**	**BSC**

Prerequisites: School Level Physics

AIM: To endow the students with the fundamentals of Physics and apply new ideas in the field of Engineering and Technology.

Course Outcomes:

The Students will be able to

CO1: Illustrate the theory of various crystal structures.

CO2: Summarize the basic configuration of a Laser, types of lasers and the industrial applications of Laser.

CO3: Explain the principle behind fiber optic communication and the electronic devices involved in the transmission and reception of data.

CO4: Interpret the basics of properties of matter and its applications,

CO5: Determine the basic equations of Quantum mechanics and its applications.

CO6: Elaborate the basic concepts of acoustics and ultrasonics.

SOLID STATE PHYSICS **9**

Lattice – Unit cell – Bravais lattice – Lattice planes – Miller indices – d spacing in cubic lattice – Calculation of number of atoms per unit cell – Atomic radius – Coordination number – Packing factor for SC, BCC, FCC and HCP structures – Crystal Defects-point, Line and surface defects - burger vector.

WAVE OPTICS **9**

LASERS: Introduction – Principle of Spontaneous emission and stimulated emission. Population inversion, pumping. Einsteins A and B coeffcients – Derivation- Types of lasers – CO_2, Nd-YAG - Industrial Applications - Lasers in welding, cutting and Soldering

FIBER OPTICS: Optical Fiber-Classification- Principle and propagation of light in optical fibres-Numerical aperture and Acceptance angle-Fibre optical communication system- Sensors (Active and passive) –Displacement and Temperature Sensors.

PROPERTIES OF MATTER **9**

Elasticity–Stress - strain diagram and its uses -factors affecting elastic modulus and tensile strength – torsional stress and deformations – twisting couple- torsion pendulum: theory and experiment -bending of beams -bending moment –cantilever: theory and experiment–uniform and non-uniform bending: theory and experiment – I shaped girders - stress due to bending in beams.

QUANTUM PHYSICS **9**

Black body radiation – Planck's theory -Photoelectric effect - Matter waves – Schrödinger's wave equation – Time independent and time dependent equations – Physical significance of wave function – Particle in a one dimensional box.

ACOUSTICS AND ULTRASONICS **9**

ACOUSTICS: Classification of sound - loudness and intensity - Weber-Fechner Law - standard intensity and intensity level - decibel - reverberation - reverberation time - Sabine's formula - absorption coefficient and its determination – factors affecting acoustics of buildings : focusing, interference, echo, Echelon effect, resonance - noise and their remedies

Ultrasonics: Ultrasonics - production - magnetostriction and piezoelectric methods - acoustic grating - industrial applications - NDT.

Total Periods 45

Text books:

1. Gaur R. K., Gupta S. C., “Engineering Physics” Dhanpat Rai Publications, New Delhi (2016)
2. Avadhanulu M. N., Kshirsagar, P. G., “A Text book of Engineering Physics”, S.Chand and company, Ltd., New Delhi, 2017.

References:

1. Serway and Jewett., “Physics for Scientists and Engineers with Modern Physics”,6th Edition, Thomson Brooks / Cole, Indian reprint (2016)
2. Arither Beiser, Concepts of Modern Physics, Tata Mc Graw Hill, NewDelhi (2015)

191HS14 **ENGINEERING CHEMISTRY** **L-T-P-C**
2-0-0-2

Programme: **B.E./B.Tech. (Common to all Branches)** **Sem: 1** **Category:** BSC

Prerequisites: Basic Science

Aim: To impart a sound knowledge on the principles of chemistry involving the different application oriented topics required for all engineering branches.

Course Outcomes:

At the end of the course the student will be able to

CO1: Demonstrate the essential concept of water and their properties and applications.

CO2: Illustrate the water treatment process for portable and industrial purposes

CO3: Explain the operating principles and the reaction involved in electrochemistry.

CO4: Interpret the principles and application of spectroscopy

CO5: Elaborate the basic ingredients required for paint formulation

CO6: Summarize the preparation techniques of consumer products

WATER TECHNOLOGY **9**

Hardness-Types and Estimation by EDTA method- alkalinity –types of alkalinity and determination -Domestic water treatment –disinfection methods – Boiler feed water– internal conditioning– external conditioning – desalination and reverse osmosis.

ELECTROCHEMISTRY **9**

Electrochemical cells – reversible and irreversible cells – EMF –measurement of emf – Single electrode potential – Nernst equation– reference electrodes –Standard Hydrogen electrode – Calomel electrode – Ion selective electrode – glass electrode and measurement of pH – electrochemical series

SPECTROSCOPIC TECHNIQUES AND APPLICATIONS **9**

Introduction of UV-Visible and IR spectroscopy and selection rules- principles and instrumentation of UV-Visible (electronic) spectroscopy – IR (vibrational) spectroscopy - its applications. Fluorescence spectroscopy and its applications in medicine-colorimetry – estimation of iron by colorimetry .

INORGANIC&ORGANIC COATINGS **9**

Paint–Definition–Components of Paints and their functions–Varnish–Definition–Preparation of Oil Varnish–Differences between Paint and Varnish–Special Paints–Luminescent Paints, Fire Retardant Paints- Aluminium Paints - Distemper.corrosion control– electroplating (Au) and electroless (Ni) plating.

PREPARATION OF CONSUMER PRODUCTS **9**

Washing Powder- Cleaning powder-phenoyls (white, Black & coloured)-Shampoo-liquid blue-inks-blue –red-green inks – Soap - bathing & detergent – oils-Face powder and bleaching powder.

Total Periods: 45

Text books:

1. P. Kannan, A. Ravikrishnan, “Engineering Chemistry”, Sri Krishna Hi-tech Publishing Company Pvt. Ltd. Chennai, 2009.
2. P.C.Jain and Monica Jain, “Engineering Chemistry” Dhanpat Rai Pub, Co., New Delhi (2002)

References:

1. S.S. Dara, S.S. Umare, “Engineering Chemistry”, S. Chand & Company Ltd., New Delhi 2010.
2. B.K.Sharma, “Engineering chemistry” Krishna Prakasan Media (P) Ltd., Meerut (2001).
3. B.Sivasankar, “Engineering chemistry” Tata McGraw Hill Publishing Company (P) Ltd., New Delhi, 2006

191EEF1	BASIC ELECTRICAL AND ELECTRONICS ENGINEERING	L-T-P	C
		3-0-0	3

Programme B.E –Electrical and Electronics Engineering **Sem: 1** **Category** **ES**

AIM: To provide comprehensive idea about AC and D C circuit analysis, working principles and applications of basic machines in electrical engineering and protection schemes in power system.

Pre-requisite: Algebra, calculus and electrostatics

Course Outcomes:

The Students will be able to

CO1. Analyze DC circuits using basic laws.
CO2. Analyze AC circuits using basic laws.
CO3. Illustrate the operation of DC machines and its applications.
CO4. Demonstrate about AC machines and its applications.
CO5. Analyze and compare the construction, theory and characteristics of the semiconductor devices.
CO6. Design basic combinational and sequential logic circuits.

ELECTRICAL CIRCUITS & MEASUREMENTS **12**

Ohm's Law – Kirchhoff's Laws –Reduction of series and parallel circuits-Mesh and Nodal Analysis of DC circuits – Introduction to AC Circuits - RMS Value, Average value, Form factor and peak factor phasor representation – Single Phase AC series circuits with R, RL, RC -Power and Power factor. Introduction to three phase circuits- Star and delta connected balanced load.

DC MACHINES & TRANSFORMER (Qualitative treatment only) **8**

DC Generators - construction, principle of operation, Types, EMF equations and applications. DC Motors - operation, Types, Speed and torque equation – speed control of DC shunt motors. Single Phase Transformer - Constructional details and operation, Types, EMF equation, transformation ratio.

AC MACHINES (Qualitative treatment only) **8**

Single phase induction motor - construction, operation and applications - Three phase induction motor – Types, Construction and operation, Torque equation, slip torque characteristics, Synchronous generators - construction and operation, EMF equation - Synchronous motors – principle of operation.

SEMICONDUCTOR DEVICES (Qualitative treatment only) **9**

Introduction to semiconductors-PN Junction Diode – characteristics, breakdown effect and applications - Half wave and Full wave rectifiers, Zener Diode - characteristics and voltage regulator. Bipolar Junction Transistor – operation of NPN and PNP, characteristics of CB, CE, CC configurations.

DIGITAL ELECTRONICS (Qualitative treatment only) **8**

Number System – Binary, octal, hexadecimal, Logic Gates (AND, OR,NOT,NAND,NOR,XOR,XNOR), Half and Full Adders – Flip-Flops –RS, JK, T and D - Counters – synchronous up counter, synchronous down counter, asynchronous up counter, asynchronous down counter, shift registers – shift right and shift left register.

Total Periods 45

Text Books

1. Muthusubramanian R, Salivahanan S, "Basic Electrical, Electronics and Computer Engineering", McGraw Hill, New Delhi, 2009.
2. B L Theraja, AK Theraja,'A Text book of Electrical Technology: Volume 2 AC and DC Machines', S.Chand; Twenty Third edition, 2006.
3. R.S. Sedha, "A Textbook of Applied Electronics" S. Chand & Co., 2008.

References

1. V N Mittle, Arvind Mittle "Basic Electrical Engineering", McGraw Hill, New Delhi, 2005.
2. Nagsarkar T K and Sukhija M S, "Basics of Electrical Engineering", Oxford University press (2012).
3. V K Mehta, Rohitmehta "Principles of Electronics", S.Chand&Company Ltd, (2015).
4. Mahmood Nahvi and Joseph A. Edminister, "Electric Circuits", Schaum' Outline Series, McGraw Hill, (2014).
5. NPTEL Video Lecture Notes on "Basic Electronics " by Prof. M.B Patil, IIT Bombay

Course Outcomes	Program Outcomes (POs)												Program Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	3	3	1							3		3		1	3
CO2	3	3	3			1					3		3		1	3
CO3	3	2									2		3	3		3
CO4	3	2									2		3	3		3
CO5	3	2				1					3		3	2		3
CO6	3	3	3			1					3		3	2		3

191MEF1	ENGINEERING GRAPHICS			L-T-P	C
				1-0-4	3
Programme:	**B.E. ,(ECE, CSE, BME)**	**Sem:**	**I**	**Category:**	**ESC**

Prerequisites: Nil

Aim: To develop graphic skills in students

Course Outcomes:

The students will be able to

CO1: Illustrate the conventions used in engineering graphics.

CO2: Interpret plane curves and free hand sketching

CO3: Label the projections of points, lines and plane

CO4: Construct the projections of simple solids and their sectional views

CO5: Illustrate the applications of development of surfaces

CO6: Construct isometric and perspective projections

Concepts and conventions (Not for Examination)

Importance of graphics in engineering applications – Use of drafting instruments – BIS conventions and specifications – Size, layout and folding of drawing sheets – Lettering and dimensioning.

PLANE CURVES **11**

Conics – Construction of ellipse, Parabola and hyperbola by eccentricity method – Construction of cycloid – Construction of involutes of square and circle – Drawing of tangents and normal to the above curves.

PROJECTION OF POINTS, LINES AND PLANE SURFACES **12**

Projection of Points in all four quadrants - Projection of straight lines located in the first quadrant – inclined to both planes – Determination of true lengths and true inclinations – Projection of regular polygonal and circular lamina inclined to both reference planes.

PROJECTION OF SOLIDS **12**

Projection of simple solids like Prisms, Pyramids, Cylinder and Cone when the axis is inclined to one reference plane

SECTION OF SOLIDS AND DEVELOPMENT OF SURFACES **12**

Sectioning of above solids in simple vertical position by cutting planes inclined to HP and perpendicular to VP – Obtaining true shape of section; Development of lateral surfaces of truncated solids – Prisms, Pyramids, Cylinder and Cone

ISOMETRIC AND ORTHOGRAPHIC PROJECTIONS **12**

Principles of isometric projection – isometric scale – isometric projections of truncated Prisms, Pyramids, Cylinder and Cone; Conversion of Isometric Views to Orthographic Views and Vice-versa.

Total Periods: 60

Text books:

1. Natrajan K.V., **"A text book of Engineering Graphics",** Dhanalakshmi Publishers, Chennai (2015)
2. Basant Agarwal and Agarwal C.M., **"Engineering Drawing",** Tata McGraw Hill Publishing Company Limited, New Delhi, (2016)

References:

1. Venugopal K. and Prabhu Raja V., **"Engineering Graphics",** New Age International (P) Limited (2016)
2. Shah M.B. and RanaB.C., **"Engineering Drawing",** Pearson Education (2009)
3. John K.C., **"Engineering Graphics for degree"** PHI Learning Pvt. Ltd., New Delhi, (2015)
4. KumarM.S., **"Engineering Graphics",** D.D. Publications, (2015)

191HS17	PHYSICS AND CHEMISTRY LABORATORY-I	L-T-P	C
		0-0-2	1

Programme:	**B.E./B.Tech. (Common to all Branches)**	**Sem: 1**	**Category:**	**BSC**

Pre/Corequisites: Engineering Physics & Engineering Chemistry

AIM: To introduce the basic Physics concepts through experiments and to impart the basic analysis in chemistry.

Course Outcomes:

The Students will be able to

CO1: Demonstrate the laser light propagation in optical fibre and the rigidity modulus of the materials

CO2: Examine the velocity of sound in liquid and propagation light in the medium

CO3: Infer the stress analysis and thermal conductivity of the material

CO4: Analyze the water quality parameters of potable water

CO5: Determine the unknown concentrations of chemicals

CO6: Apply the instrumental technique for calculating the amount of unknown substance

LIST OF EXPERIMENTS - PHYSICS PART

(A minimum of five experiments shall be offered)

S.No	NAME OF THE EXPERIMENT	
1)	(a) Determination of Particle Size using Diode LASER. (b) Determination of wavelength of the LASER source. (c) Determination of Acceptance angle and Numerical aperture ofan optical fibre.	3
2)	Torsional pendulum – Determination of rigidity modulus	3
3)	Determination of Velocity of sound and compressibility of liquid - Ultrasonic Interferometer.	3
4)	Determination of Dispersive power of a prism using Spectrometer.	3
5)	Determination of Young's modulus of the material - Non uniform bending	3
6)	Determination of thermal conductivity of a bad conductor - Lee's Disc method	3

LIST OF EXPERIMENTS – CHEMISTRY PART

S.No	NAME OF THE EXPERIMENT	
1)	Estimation of Total Hardness of their home town Water by EDTA method.	3
2)	Estimation of Alkalinity of Water sample	3
3)	Estimation of Chloride ion in water sample by Argentometric method.	3
4)	Estimation of Ferrous Ion by Potentiometric Titrations.	3
5)	Conductometric Titration of strong acid Vs strong base	3

References

1) Text book of Quantitative Inorganic Analysis, A.I.Vogel, ELBS,London,(2006)
2) "Practical A. Ravikrishnan Engineering Chemistry", Sri Krishna Publications, Chennai (2002)
3) Engineering Physics Laboratory Manual
4) Engineering Chemistry Laboratory Manual

191EEF7	ELECTRICAL AND ELECTRONICS ENGINEERING LABORATORY		L-T-P	C
			0-0-2	1
Programme:	B.E. Electronics and Communication Engineering	**Sem:** 1	**Category :**	ESC

AIM: To expose the students to basic laws, characteristics of diodes, operation of D.C and A.C machines and give them experimental skill.

Course Outcomes:

The Students will be able to

CO1. Facilitate the operation of fluorescent lamp, staircase wiring and simple wiring

CO2: Apply the circuit theory concepts and analyze the outcome.

CO3: Illustrate the VI characteristics of PN diode

CO4: Examine the V-I characteristics of a Zener diode

CO5: Infer various characteristics of DC Machines.

CO6: Model and analyze the performance characteristics of induction motors.

LIST OF EXPERIMENTS

1. Simple wiring connection
2. Staircase wiring
3. Fluorescent lamp wiring
4. Study of electronic components and equipments
5. Verifications of ohm's law and kirchoff's voltage law
6. Characteristics of semiconductor diode
7. Characteristics of zener diode
8. Speed control of dc shunt motor
9. Load test on dc shunt motor
10. Load test on single phase induction motor

Total Periods 45

Course Outcomes	Program Outcomes (POs)												Program Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	3	3	3	1				3		3		3	2	2	2
CO2	3	2		2	1				3		2		3	2		2
CO3	3	2		2	1				3		2		3	2		3
CO4	3	3	2	2	1				3		2		3	2		3
CO5	3	2		2	1				3		3		3	2	1	2
CO6	3	2		2	1				3		3		3	2	1	2

191HS21 **TECHNICAL ENGLISH** **L-T-P C**
2-0-0 2

Programme: **B.E./B.Tech. (Common to all Branches)** **Sem: 2** **Category: HSMC**

Prerequisites: Acquire Proficiency in Technical Communication

Aim: To develop the students' intellectual, personal & Professional abilities.

Course Outcomes:

The Students will be able to

CO1: Remember words and its meanings for the specific purpose.
CO2: Illustrate the basic nuances of language
CO3: Apply written communication methodologies at workplace.
CO4: Develop Listening skill to respond and to gather information.
CO5: Interpret the text using comprehending skill.
CO6: Rephrase the professional correspondences confidently.

UNIT I Introduction to Technical English **9**

Listening- Listening to talks mostly of a scientific/technical nature and completing information-gap exercises. **Speaking** – Asking for and giving directions. **Reading** – reading short technical texts, Newspapers. **Writing** - Purpose statements, Extended definitions, Writing Instructions & Recommendations, Checklists. **Vocabulary Development** - Technical Vocabulary. **Language Development** – Subject Verb Agreement.

UNIT II Reading and Study Skills **9**

Listening - Listening to longer technical talks and completing exercises based on them. **Speaking** – Describing a process. **Reading** – Reading longer technical texts, News papers identifying various transitions in a text- paragraphing. **Writing** - Techniques for writing Precisely. **Vocabulary Development** -vocabulary used in formal letters/emails and reports. **Language Development** - Personal & Impersonal Passive voice, Numerical adjectives.

UNIT III Technical Writing and Grammar **9**

Listening - Listening to classroom lectures on Engineering / Technology. **Speaking** – Introduction to Technical presentations. **Reading** – Reading longer texts both general and Technical, practice in rapid reading. **Writing**- Describing a process, Use of sequence words, Causes and Effects **Vocabulary Development** - Sequence words, Nominal compounds, Misspelled words. **Language Development** - Embedded sentences.

UNIT IV Report Writing **9**

Listening- Listening to documentaries and Making notes. **Speaking** – Mechanics of presentations. **Reading** – Reading for detailed comprehension. **Writing** - Job application, cover letter, Resume preparation. **Vocabulary Development** - Finding suitable synonyms, Paraphrasing. **Language Development** – Clauses, If conditionals.

UNIT V Group Discussion and Job Applications **9**

Listening - TED/Ink talks. **Speaking** – Participating in a Group discussion. **Reading** – Reading and Understanding Technical articles. **Writing** – Writing reports, Minutes of Meeting, Introduction and

Conclusion. **Vocabulary Development** - Verbal analogies**. Language Development** - Reported speech.

Total Periods: 45

Text books:

1. Sudharshana,N.P. and C.Savitha. English for Technical Communication. New Delhi: Oxford University Press, 2017.

References:

1. **www.bbc.co.uk/learning english**
2. **www.bec cambridge english.**org
3. **www.englishenglish101.com**
4. **www.islcollective.com**

Extensive Reading

1. Kalam, Abdul. *The Wings of Fire*. Hyderabad: UP, 1999. Print.

191HS22	DIFFERENTIAL EQUATIONS AND NUMERICAL METHODS	L-T-P	C
		3-2-0	4

Programme: **B.E./B.Tech. (Common to all branches)** **Sem:** **2** **Category:** **BSC**

Prerequisites: Engineering Mathematics-I

Aim: To analyze the engineering problems using the techniques and the mathematical skills acquired by studying ODE and PDE uses numerical methods.

Course Outcomes:

The students will be able to

CO1: Examine suitable method to solve higher order Differential Equations

CO2: Estimate suitable method to solve higher order PDE

CO3: Determine the discrete data by means of continuous function.

CO4: Elaborate Numerical integration using Trapezoidal and Simpson's $1/3^{rd}$ rules

CO5: Identify the solution for the IVPs in ODE using single step and Multistep methods

CO6: Interpret the solution of BVPs in PDE using finite difference methods

ORDINARY DIFFERENTIAL EQUATIONS **12**

Higher order linear differential equations with constant coefficients – Method of variation of parameters – Cauchy's and Legendre's linear equations – Simultaneous first order linear equations with constant coefficients.

PARTIALDIFFERENTIALEQUATIONS **12**

Formation of partial differential equations–Lagrange's linear equation–Solutions of standard types of first order partial differential equations (without reducing the standard type) –Linear homogenous partial differential equations of second and higher order with constant coefficients.

SOLUTION OF EQUATION & INTERPOLATION, NUMERICAL DIFFERENTIATION **12**

Solutions of Polynomial and transcendental equations – Newton Raphson method - Interpolation using Newton's forward and backward difference formulae - Interpolation with unequal intervals- Newton's divided difference and Lagrange's formulae - Numerical differentiation using Newton's forward and backward difference formula - Numerical Integration – Trapezoidal rule and Simpson's $1/3^{rd}$ rule..

NUMERICAL SOLUTION OF ORDINARY DIFFERENTIAL EQUATIONS **12**

Taylor's series method – Euler's method – Modified Euler's method – Fourth order Runge-Kutta method – Milne's predictor – corrector methods for solving first order equations – Finite difference methods for solving second order equation.

BOUNDARY VALUE PROBLEMS OF PARTIAL DIFFERENTIAL EQUATIONS **12**

Finite differences solution of one dimensional heat equation by explicit and implicit methods – One dimensional wave equation and two dimensional Laplace and Poisson equations.

Total Periods: 60

Text books:

1. B.S. Grewal, 'Higher Engineering Mathematics', Thirty Sixth Edition, Khanna Publishers, Delhi, 2005.
2. Grewal B.S. and Grewal J. S., "Numerical Methods in Engineering and Science", Khanna Publishers, New Delhi, (2004).

References:

1. Greenberg. *M.D*. "Advanced Engineering Mathematics, Second Edition, Pearson Education Inc. (First Indian reprint), 2002
2. Venkataraman. M.K., "Engineering Mathematics", Volume I and II Revised enlarged Fourth Edition, The National Publishing Company, Chennai, 2004.
3. Kreyszig, E., Advanced Engineering Mathematics, 8th edition, John Wiley Sons, 2001.
4. Chapra S.C. and Canale R.P., "Numerical Methods for Engineers", Tata Mc-Graw Hill, New Delhi, (2007).
5. Gerald C.F., and Wheatley P.O., "Applied Numerical Analysis", Pearson Education Asia, New Delhi, (2006).

191HS23	PHYSICS OF MATERIALS	L-T-P	C
		2-0-0	2

Programme: **B.E., (CSE, EEE,ECE & Bio Medical)** **Sem: 2** **Category: BSC**

Prerequisites: Engineering Physics

AIM: To endow the students with the fundamentals of physics, materials and apply new ideas in the field of Engineering and Technology.

Course Outcomes:

The Students will be able to

CO1: Illustrate the theory and processing of conducting, superconducting materials.
CO2: Explain the classification of semi conducting materials.
CO3: Distinguish the types of magnetic materials and their applications.
CO4: Infer the characteristics of dielectric materials and their applications
CO5: Outline the functions of optical materials for optoelectronics.
CO6: Determine the basics of quantum structures and their applications in spintronics

ELECTRICAL PROPERTIES OF MATERIALS **9**

Conductors: classical free electron theory of metals – Electrical and thermal conductivity – Wiedemann – Franz law – Lorentz number – Draw backs of classical theory –Fermi distribution function – Effect of temperature on Fermi Function – Density of energy states – carrier concentration in metals.

Super Conductors: properties - Types of super conductors - Applications of superconductors – SQUID, cryotron, magnetic levitation.

SEMICONDUCTOR PHYSICS **9**

Intrinsic semiconductor – carrier concentration derivation – Fermi level – Variation of Fermi level with temperature – Extrinsic semiconductors – carrier concentration derivation in n-type and p-type semiconductor – variation of Fermi level with temperature and impurity concentration– Hall effect – Determination of Hall coefficient – Applications.

MAGNETIC AND DIELECTRIC MATERIALS **9**

Magnetic Materials: Origin of magnetic moment – Bohr magneton – Dia and para magnetism – Ferro magnetism – Domain theory – Hysteresis – soft and hard magnetic materials – anti – ferromagnetic materials – Ferrites – applications.

Dielectric Materials: Polarization - electronic, ionic, orientational and space charge polarization – frequency and temperature dependence of polarisation –dielectric loss – dielectric breakdown – uses of dielectric materials (capacitor and transformer) – ferroelectricity and applications.

OPTICAL PROPERTIES OF MATERIALS **9**

Classification of optical materials–carrier generation and recombination processes-Absorption - emission and scattering of light in metals, insulators and Semiconductors (concepts only)- photocurrent in a P-N diode–solar cell–photo detectors-LED-optical storage techniques

NANOELECTRONIC DEVICES **9**

Introduction-electron density in bulk material–Size dependence of Fermi energy–quantum confinement–quantum structures-Density of states in quantum well, quantum wire and quantum dot structures – Zener-Bloch oscillations–resonant tunneling – Carbon nanotubes: Properties and applications.

Total Periods 45

Text books:

1. William D. Callister, Jr., **"Material Science and Engineering",** John Wiley & Sons Inc., Seventh Edition, New Delhi (2017).
2. Ragavan, V., **"Material science and Engineering"**, Prentice Hall of India (2004).
3. Kasap, S.O. **"Principles of Electronic Materials and Devices**", McGraw -Hill Education, 2016.
4. Umesh K Mishra & Jasprit Singh, "**Semiconductor Device Physics and Design**", Springer, 2014.

References:

1. Koch C., **"Nanostructured materials: processing, properties and applications",** William Andrew pub. (2011).
2. Charles P. Poole and Frank J.Ownen., **"Introduction to Nanotechnology"**, Wiley India (2016)
3. Charles Kittel., **"Introduction to solid state Physics"**, John Wiley & Sons, 7th editions, Singapore (2012)

191HS24	ENVIRONMENTAL SCIENCE	L-T-P	C
		2-0-0	2

Programme: **B.E./B.Tech. (Common to all branches)** **Sem:** II **Category:** BSC

Prerequisites: Basic Science

Aim: To Impart the social groups and individuals to acquire knowledge of pollution and environmental degradation

Course Outcomes: The student will be able to

CO1: Illustrate the basic concepts of environment and energy resources

CO2: Recall the Characteristics of various ecosystems

CO3: Identify and analyze causes, effects and control measures of various types of pollution.

CO4: Determine the types of disaster and mitigation measures

CO5 : Interpret the impact of social issues and climate change

CO6: Outline and Develop technologies to create the green environment.

ENVIRONMENT AND ENERGY RESOURCES **9**

Environment- definition, scope and importance – Need for public awareness – Forest resources-deforestation–Energy resources: Growing energy needs, renewable (solar energy and wind energy) and non renewable energy sources-Nuclear energy – fission and fusion reactions and light water nuclear reactor for power generation (block diagram only), Petroleum processing and fractions

ECOSYSTEM **9**

Ecosystem : Concept of an ecosystem – Structure and function of an ecosystem: Producers, consumers and decomposers, Energy flow in the ecosystem-Nitrogen cycle,Food chains, food webs and ecological pyramids - Introduction, types, characteristic features, structure and function of the Forest ecosystem and Aquatic ecosystems (lake and rivers)

ENVIRONMENTAL POLLUTION **9**

Definition – Causes, effects and control measures of: (a) Air pollution (b) Water pollution (c) Marine pollution (d) Noise pollution . Solid waste Management: Causes, effects and control measures of urban and industrial wastes. Role of an individual in prevention of pollution –Disaster management: floods- landslides.

SOCIAL ISSUES AND EARTH'S CLIMATE SYSTEM **9**

Population-variation among nation-Unsustainable to Sustainable development – Urban problems related to energy – Water conservation, rain water harvesting– climate change, global warming, acid rain, Ozone layer depletion.

GREEN CHEMISTRY **9**

Introduction to green chemistry- 12 principles of green chemistry-toxicology and green chemistry-energy and green chemistry-education in green chemistry. Reuse and recycling technologies-material selection for green design-recycled water technology.

Total Periods: 45

Text books:

1. A. Ravikrishnan, "Environmental Science and Engineering, Sri Krishna Hitech Publishing Company Private Limited, 2010.
2. Benny Joseph, "Environmental Science and Engineering", Tata McGraw-Hill, New Delhi, 2006.

References:

1. Anubha Kaushik, C.P. Kaushik, “Environmental Science and Engineering”, New Age International Publishers, 2016.
2. Benny Joseph, Environmental Science and Engineering, Tata McGraw-Hill Publishing Company Ltd, New Delhi, ISBN: 0070601690, 2006.
3. Raman Sivakumar, Introduction to Environmental Science and Engineering, Tata McGraw Hill Education Private Limited, New Del2010.
4. P.Meenakshi, Elements of Environmental Science and Engineering, PHI learning (P) Ltd., India.

191CSF1	PROGRAMMING FOR PROBLEM SOLVING	L-T-P	C
		3-0-0	3

Programme: **B.E., (ECE,CSE,BME)** **Sem:** **2** **Category:** **ESC**

Prerequisites: Nil

Aim: To provide an awareness to Computing and Programming.

Course Outcomes:

The students will be able to

CO1: Illustrate the basic terminologies of Computer and various Problem solving techniques.

CO2: Develop, compile and debug programs in C language.

CO3: Apply different data types in a computer program.

CO4: Design programs involving decision structures, loops and functions.

CO5: Interpret the dynamics of memory by the use of pointers.

CO6: Summarize different data structures and create/update basic data files.

INTRODUCTION **9**

Generation and Classification of Computers- Basic Organization of a Computer - Number System - Binary - Decimal - Conversion - Problems. Software - Types, Development Steps. Algorithm - Pseudo code - Flow Chart. Problem formulation - Problem Solving.

C PROGRAMMING BASICS **9**

Introduction to Unix Operating System - Introduction to ' C' programming - fundamentals - structure of a 'C' program - compilation and linking processes - Constants, Variables - Data Types - Expressions using operators in 'C' - Managing Input and Output operations - Decision Making and Branching - Looping statements - solving simple scientific and statistical problems.

ARRAYS AND STRINGS **9**

Arrays - Initialization - Declaration - One dimensional and Two dimensional arrays. String- String operations - String Arrays. Simple programs –Bubble Sort – Linear Search -Matrix Operations.

FUNCTIONS AND POINTERS **9**

Function - Definition of function - Declaration of function - Pass by value - Pass by reference - Recursion - Pointers - Definition - Initialization - Pointers arithmetic - Pointers and arrays- Example Problems.

STRUCTURES AND FILES **9**

Introduction - need for structure data type - structure definition - Structure declaration - Structure within a structure - Union - Programs using structures and Unions - File Manipulation - Storage classes - Pre-processor directives.

Total Periods 45

Text books:

1. Anita Goel and Ajay Mittal, "Computer Fundamentals and Programming in C", Dorling Kindersley (India) Pvt. Ltd., Pearson Education in South Asia, 2017.
2. Balagurusamy E, "Programming in ANSI C", Tata Mcgraw-Hill Education, 2016
3. Reema Thareja, "Computer Fundamentals and Programming in C", 2e, Oxford University Press, 2016.

References:

1. Byron S Gottfried, "Programming with C", Schaum's Outlines, 3rd Edition, McGraw-Hill, 2017.
2. Dromey R.G., "How to Solve it by Computer", Pearson Education, 4th Reprint, 2007.
3. Kernighan.B.W and Ritchie,D.M, "The C Programming language", 2nd Edition, Pearson Education, 2006.

191ME17	MECHANICAL WORKSHOP	L-T-P	C
		1-0-4	3

Programme: B.E., (ECE,CSE,BME) **Sem:** 2 **Category:** ESC

Prerequisites: Nil

Aim: To Provide exposure to the students with hands on experience on various basic Engineering Practices

Course Outcomes:

The students will be able to

CO1: Construct the square fitting, vee & step fitting

CO2: Develop simple wooden joints using wood working tools

CO3: Construct tray and funnel in sheet metal

CO4: Design simple lap, butt and tee joints using arc welding equipments

CO5: Identify the various pipe joints

CO6: Demonstrate the pipe connections

FITTING OPERATIONS & POWER TOOLS **12**

Preparation of square fitting, vee & step – fitting models

CARPENTRY **12**

Study of the joints in roofs, doors, windows and furniture; Hands-on-exercise: Dismantling & Assembling of various wooden furniture; Preparation of T Joint, dove tail joint

SHEET METAL FORMING **12**

Preparation of tray and funnel

WELDING **12**

Preparation of arc welding of butt joints and lap joints

PLUMBING **12**

Study of pipeline joints, its location and functions: valves, taps, couplings, unions, reducers, elbows in household fittings; Hands-on-exercise - basic pipe connections – Mixed pipe material connection – Connections with different joining components

Total Periods: 60

LIST OF EQUIPMENTS (For a batch of 30 students)

1. Fitting vice (fitted to work bench) - 15Nos
2. Fitting Tools – 15 set
3. Carpentry vice (fitted to work bench) - 15 Nos.
4. Models of industrial trusses, door joints, furniture joints - 5 Nos.
5. Standard woodworking tools - 15 Sets
6. Hand Shear - 01
7. Standard tools and calipers for sheet metal work - 05
8. Arc welding transformer with cables and holders - 5Nos.
9. Welding booth - 5 Nos.
10. Welding accessories like welding shield, chipping hammer, Wire brush, etc., - 5Sets
11. Assorted components for plumbing consisting of metallic pipes, Plastic pipes, flexible pipes, couplings, unions, elbows, plugs and other fittings - 15 Sets.

191HS27	PHYSICS AND CHEMISTRY LABORATORY-II	L-T-P	C
		0-0-2	1

Programme: B.E/B.Tech (Common to all Branches) **Sem: 2** **Category: BSC**

Pre/Corequisites: Engineering Physics & Engineering Chemistry

AIM: To introduce the basic Physics concepts through experiments and to impart knowledge on the application of chemistry in engineering branches.

Course Outcomes:

The Students will be able to

CO1: Demonstrate the interference of light and young's modulus of the materials
CO2: Analyze the properties of flow of the liquid.
CO3: Infer the band gap of material and resistance of the given coil.
CO4: Determine the quantity of unknown solution by instrumental technique.
CO5: Determine the concentration of an identified analyte by volumetric analysis
CO6: Analyze the characteristics of water.

LIST OF EXPERIMENTS - PHYSICS PART
(A minimum of five experiments shall be offered)

S.No	NAME OF THE EXPERIMENT	
1)	Determination of thickness of thin wire – Air wedge method	3
2)	Determination of Young's modulus of the material – Uniform bending	3
3)	Determination of viscosity of liquid – Poiseuille's method.	3
4)	Determination of wavelength of mercury spectrum- Spectrometer Grating.	3
5)	Determination of Band Gap of a semiconductor material.	3
6)	Determination of specific resistance of a given coil of wire – Carey Foster Bridge.	3

LIST OF EXPERIMENTS – CHEMISTRY PART

S.No	NAME OF THE EXPERIMENT	
1)	Esimation of HCl by pH metry	3
2)	Estimation of Copper in brass by EDTA method.	3
3)	Estimation of iodine in iodized salt with thiosulfate	3
4)	Determination of percentage of calcium in limestone by EDTA method	3
5)	Determination of DO in water (Winkler's method)	3

References

1) Text book of Quantitative Inorganic Analysis, A.I.Vogel, ELBS,London, (2006).
2) "Practical A. RaviKrishnan Engineering Chemistry", Sri Krishna Publications, Chennai (2002)
3) Engineering Physics Laboratory Manual
4) Engineering Chemistry Laboratory Manual

191CS17	C PROGRAMMING LABORATORY			L-T-P	C
				0-0-2	1

Programme: B.E.,**(ECE,CSE,BME)** **Sem: 2** **Category: ESC**

Pre/Corequisites: Nil

AIM: To provide practical knowledge in developing C Programming.

Course Outcomes:

The Students will be able to

CO1: Illustrate the fundamental concept on basics commands in Linux.
CO2: Develop, compile and debug programs in C language.
CO3: Formulate problems and implement algorithms in C.
CO4: Examine programming components to solve computing problems in real-world.
CO5: Design application oriented programs in C.
CO6: Develop programs for Structures and unions through derived dataType.

LIST OF EXPERIMENTS:

1. Draw a flowchart for various algorithms using Raptor
2. C Programming using Simple statements and expressions.
3. Scientific problem solving using decision making and looping.
4. Simple programming for one dimensional and two dimensional arrays.
5. Solving problems using String functions.
6. Programs with user defined functions - Includes Parameter Passing.
7. Program using Recursive Function and conversion from given program to flow chart.
8. Programs using pointers
9. Program using structures and unions.
10. Program using files.

Total Periods 60

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS:

Standalone desktops with C compiler 30 Nos.

(or)

Server with C compiler supporting 30 terminals or more.

191HS31 TRANSFORMS AND DISCRETE MATHEMATICS L-T-P C
2-2-0 3

Programme: B.E./B.Tech. (Common to all branches) Sem: III Category: BSC

Aim: To introduce basic mathematical ideas such as reasoning techniques, basic counting techniques and their applications .

Course Outcomes:

The students will be able to

CO1: Apply Laplace transform to solve first and second order differential equations with elementary function.

CO2: Analyze the Fourier transform and its properties.

CO3: Determine Z-inverse transform using convolution theorem and partial fraction method.

CO4: Apply mathematical induction and prove a relation.

CO5: Utilize Eulerian and Hamiltonian paths to find shortest paths

CO6: Make use of graph theoretic models to solve basic problems in networks.

LAPLACE TRANSFORMS 9

Laplace transform —Properties of Laplace Transforms – Laplace Transform of periodic functions –Inverse Laplace transforms by partial fraction method and Convolution theorem (excluding proof) – Solving ODE using Laplace transformation techniques.

FOURIER TRANSFORMS 9

Fourier integral theorem (without proof) – Fourier transform pair – Sine and Cosine transforms– Properties–Transforms of simple functions–Convolution theorem –Parseval's identity.

Z-TRANSFORMS 9

Z-transforms–Elementary properties–Inverse Z-transform–Convolution theorem– Formation of difference equations–Solution of difference equations using Z-transform.

INTRODUCTION TO COUNTING 9

Decision problems on Propositional logic – Basic counting techniques – inclusion & exclusion-Pigeonhole principle –Permutations and combinations-Recurrence relations-Solving Linear recurrence relations and generating functions

INTRODUCTION TO GRAPHS 9

Graphs and their basic properties– Graph terminology and special types of graphs - Representing graphs and graph isomorphism – Euler and Hamilton paths.

Total Periods: 45

Text Book

1. B.S.Grewal, 'Higher Engineering Mathematics', Thirty Sixth Edition, Khanna Publishers, Delhi,
2005.
2. Grewal B.S. and Grewal J. S., "Numerical Methods in Engineering and Science", Khanna Publishers, New Delhi, (2004).

Reference

1. Greenberg. M.D. "Advanced Engineering Mathematics, Second Edition, Pearson Education Inc. (First Indian reprint), 2002
2. Venkataraman.M.K., "Engineering Mathematics", Volume I and II Revised enlarged Fourth Edition, The National Publishing Company, Chennai, 2004.
3. Trembly J. P and Manohar R, "Discrete Mathematical Structures with Applications to Computer Science", Tata McGraw–Hill Pub. Co. Ltd, New Delhi, 30th Re-print (2007).
4. Dr.P.Kandasamy,Dr.K.Thilagavathy,Dr.K.Gunavathy,"Transforms and Partial Differential Equation", S.Chand & Company Ltd. Ram Nagar, New Delhi.

Course Outcomes	Program Outcomes (POs)												Program Specific Outcomes (PSOs)			
	PO 1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	3	3	2								2	3	2	3	2
CO2	3	3	2	2								2	3	3	3	2
CO3	3	3	3	2								3	3	2	3	2
CO4	3	3	2	2								2	3	2	3	2
CO5	3	3	2	2								3	3	2	3	2
CO6	3	3	2	2								3	3	2	3	2

Enter correlation levels 1, 2 or 3 as defined below: 1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

191EC31 CIRCUITS AND ELECTRONIC DEVICES L-T-P C
3-2-0 4

Programme: B.E. - Electronics and Communication Engineering **Sem: 3 Category: PC**

Aim: To enable the students to develop skills in identifying and testing of electronic components and designing circuits using BJT and FET.

Course Outcomes: The students will be able to

CO1: Apply basic electrical laws and also analyze mesh and nodal analysis for DC and AC circuits.

CO2: Analyze various network reduction and network theorems for DC and AC circuits.

CO3: Examine the transient responses of RL, RC and RLC circuits.

CO4: Demonstrate the construction and operation of Transistors. Analyze the biasing of transistor and determine the stability factor.

CO5: Construct and analyze the characteristics of FETs

CO6: Summarize the characteristics of special diodes and devices.

BASIC LAWS AND NETWORKS THEOREMS 12

Review of Kirchoff's laws, series and parallel connection of independent sources, R, L and C – Network Theorems – Thevenin, Superposition, Norton, Maximum power transfer and duality – Star-delta conversion.

TRANSIENT RESONANCE IN RLC CIRCUITS 12

RL, RC and RLC circuits and their responses to pulse and sinusoidal inputs – frequency response – Parallel and series resonances – Q factor – single tuned circuits.

12

BIPOLAR JUNCTION TRANSISTORS

Need for biasing-biasing methods - Fixed bias-Self bias- Bias Stability - Stability factor - Bias Compensation methods - NPN and PNP Transistor – Configuration - I/O Characteristics of CE,CB and CC Configurations - h-Parameters for CE configuration - Comparison of CE, CB and CC configurations.

12

FIELD EFFECT TRANSISTORS

Biasing of FET and MOSFET - Construction and Operations of JFET - Drain and Transfer Characteristics - Parameters of JFET - Saturation Drain Current - Slope of the Transfer Characteristics at IDSS- Comparison of JFET and BJT - Construction and Operation of MOSFET - Depletion Type and Enhancement Type - Comparison of MOSFET with JFET - Charge Coupled Devices(CCD).

12

SPECIAL SEMICONDUCTOR DEVICES

Tunnel diodes – PIN diode, varactor diode, Schottky diode – SCR characteristics and two transistor equivalent model – UJT – DIAC and TRIAC – Laser, Photodiode, Phototransistor, LED, LASERs, MISFETs, MESFETs, TFETs, HEMTs.

TOTAL PERIODS 60

Text Book:

1. Joseph A. Edminister, Mahmood, Nahri, "Electric Circuits" – Shaum series, Tata Mc Graw Hill, 2007

References:

1. Nandhitha Das Gupta and Amitava Das Gupta "Semiconductor Devices: Modeling and Technology" Prentice Hall of India Pvt Ltd, 4th edition, 2004.
2. Adel S. Sedra and Kenneth C.Smith, "Microelectronic Circuits", Oxford University Press, 6th edition, 2009.
3. Simon M.Sze and Kwok K.Ng, "Physics of Semiconductor Devices", John wiley& sons, 3rd edition, 2006.
4. S. Salivahanan, N. Suresh kumar and A. Vallavanraj, "Electronic Devices and Circuits",Tata McGraw Hill,
   2nd edition, (2008).
5. David A. Bell, "Electronic Devices and Circuits", Oxford University Press, 5th edition,2008.

Course Outcomes	Program Outcomes (POs)												Program Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	3	2	2	2	2						2	3	3		2
CO2	3	3	2	2	2							2	2	3		2
CO3	3	3	3	2	2							3	3	3		2
CO4	3	3	2	2	2	2						2	2	3		2
CO5	3	3	2	2	2	2						3	3	3		2
CO6	3	3	2	2	2	2						3	3	3		2

Enter correlation levels 1, 2 or 3 as defined below: 1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

191EC32	LINEAR INTEGRATED CIRCUITS			L-T-P	C
				3-0-0	3
Programme:	B.E. Electronics and Communication Engineering	**Sem:**	3	**Category:**	**PC**

AIM: To learn the basic concepts in the design of electronic circuits using linear integrated circuits and their applications in the processing of analog signals.

Course Outcomes: The students will be able to

CO1: Examine the operational amplifier stages and its AC, DC performance characteristics.
CO2: Analyze the applications of operational amplifier.
CO3: Elaborate the concepts of analog multiplier IC and PLL IC.
CO4: Classify and explain the types of digital-to-analog and analog-to-digital converters.
CO5: Apply special function ICs to design different types of waveform generators and explain the basics of IC regulators
CO6: Analyze the astable and monostable operation of timer IC 555.

CIRCUIT CONFIGURATION FOR LINEAR ICs **9**

Advantages of ICs over discrete components –General operational amplifier stages and internal circuit diagrams of IC 741– DC and AC performance characteristics – Slew rate – Open and Closed loop configurations.

APPLICATIONS OF OPERATIONAL AMPLIFIERS **9**

Scale Changer – Adder and Subtractor – Instrumentation amplifier – Phase Shift Circuits – Voltage Follower – V-to-I and I-to-V converters – Peak detector – Clipper and Clamper –Differentiator – Integrator – Comparators – Schmitt trigger –Low-pass, high-pass and band-pass filters.

ANALOG MULTIPLIER ICs AND PLL ICs **9**

Analog Multiplier ICs and its applications — Operation of the basic PLL, Closed loop analysis of PLL, Voltage Controlled Oscillator(VCO), Block diagram of PLL IC 565 and its applications for frequency synthesizing, frequency multiplication and division.

A/D AND D/A CONVERTERS **9**

Analog and Digital Data Conversions, D/A converter – specifications - Weighted resistor type, R-2R Ladder type, Voltage Mode R-2R Ladder and Current-Mode R-2R Ladder types - Sampling Process-High speed sample and hold circuit, A/D Converters – specifications - Flash type - Successive Approximation type - Single Slope type - Dual Slope type - A/D Converter using Voltage-to-Time Conversion.

WAVEFORM GENERATORS AND SPECIAL FUNCTION ICs **9**

Sine-wave generators, Multivibrators, Triangular wave generator, Saw-tooth wave generator, ICL8038 function generator, Timer IC 555-GeneralDescription - Monostable and Astable operation of Timer IC 555 – LM317 adjustable voltage regulators.

TOTAL PERIODS 45

TEXT BOOK

1.RoyChoudhry.D, Shail Jain, Linear Integrated Circuits, New Age International Pvt. Ltd, 4th

Edition, 2014.

REFERENCES

1. Salivahanan.S & Kanchana Bhaskaran.V.S., "Linear Integrated Circuits",3rd Edition, McGraw Hill, 2018.
2. Sonde.B.S., "System design using Integrated Circuits" , New Age Pub, 2nd Edition, 2001
3. Gray and Meyer, "Analysis and Design of Analog Integrated Circuits", Wiley International, 2005.
4. Ramakant.A.Gayakwad, "OP-AMP and Linear ICs", Prentice Hall / PE, 4th edition, 2001.

Course Outcomes	Program Outcomes (POs)												Program Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	3	3	2								2	2	3		2
CO2	2	2	2									2	2	3	2	2
CO3	3	2	3	2	2	2			1			2	2	3	2	2
CO4	3	2	2		1	1			1			2	2	3		2
CO5	2	2	2	1	1	1			2			2	2	3	2	2
CO6	3	2	2	2	2	1			1			2	2	3	2	2

Enter correlation levels 1, 2 or 3 as defined below: 1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

191EC33 NETWORKS AND TRANSMISSION LINES

L	T	P	C
3	0	0	3

Programme: B.E. Electronics and Communication Engineering **Sem:**3**Category: PC**

Prerequisites

Aim: To study and analyze the Networks and Transmission line parameters.

Course Outcomes: The student will be able to

CO1: Estimate the model of two port networks and its parameters.

CO2: Examine the prototype for m-derived filters and attenuators using T and π sections.

CO3: Analyze the performance of lumped filters.

CO4: Determine the driving point impedance through Positive Real Function for network synthesis.

CO5: Design the Foster and Cauer forms of RC, LC and RL networks.

CO6: Examine the general solutions of transmission line Theory (E and I) and identify various parameters of transmission lines using smith chart.

UNIT-I SYMMETRICAL AND ASYMMETRICAL TWO PORT NETWORKS 9

Two port networks- Characterization in terms of impedance, Admittance, Hybrid and Transmission parameters - Inter relationships among parameter sets - Interconnection of two port networks - Series, parallel and cascade. Lattice Networks-Symmetrical two port networks: T and π Equivalent of a two port network - Image impedance - Characteristic impedance and propagation constant of a symmetrical two port network.

UNIT-II LUMPED FILTERS 9

The neper - the decibel - Current and voltage ratios - Propagation constant, - Filter fundamentals – Pass and Stop bands. Behaviour of the Characteristic impedance. Constant K Filters - Low pass, High pass band, pass band elimination filters - m - derived sections – Filter circuit design – Filter performance – Crystal Filters. Symmetrical and asymmetrical attenuators - T and π sections.

UNIT-III PASSIVE NETWORK SYNTHESIS 9

Synthesis: Positive real functions - Driving point functions - Brune's positive real functions - Properties of positive real functions. Testing driving point functions - Application of maximum modulus theorem - Properties of Hurwitz polynomials -Even and odd functions - Strum's theorem - Driving point synthesis - RC elementary synthesis operations - LC network synthesis - Properties of RC network functions - Foster and Cauer forms of RC and RL networks.

UNIT-IV TRANSMISSION LINE THEORY 9

A Line of cascaded T sections – Transmission lines – General Solutions , Physical Significance of the equations, The infinite line, Wavelength, Velocity of Propagation, Distortionless line, The telephone cable, Reflection on a line not terminated in Z_0, Reflection Coefficient, Open and Short Circuited Lines, Insertion loss.

UNIT-V LINE AT RADIO FREQUENCIES 9

Parameters of open wire line and co-axial line at high frequencies- Standing wave ratio-Input impedance of open and short circuited lines-Relation between VSWR and reflection co-efficient-Quarter wave transformer-Single stub matching-Smith chart and its applications.

TOTAL: 45 PERIODS

TEXT BOOK(S)

1. Sudhahar.A, Shyammohan S.P, "Circuits and Networks: Analysis and Synthesis", Tata Mc Graw Hill, New Delhi, 5th edition 2015.
2. John.D.Ryder "Network lines and fields", Prentice Hall of India Pvt. ltd, 4thEdition 2007.

REFERENCE(S)

1. Umesh Sinha "Network analysis and Synthesis", Sathya Prakashan Publishers, 2010.
2. Van Valkenburg "Introduction to modern Synthesis", Wiley Eastern Publication, 2007.
3. B.P Lathi, "Linear Systems and Signals", Oxford University Press, 2nd Edition, 2009.
4. D. Roy Choudhary, "Network and Systems", New Academic Science, 2nd Edition, 2009.

Course Outcomes	Program Outcomes (POs)												Program Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	3	2	3	2							2	3		3	2
CO2	3	3	2	3	2							2	3	2	3	2
CO3	3	3	2	2	2							2	3	2	3	2
CO4	3	3	2	2	2	1			1			2	3	2	3	2
CO5	2	3	3	2	2							2	3		3	2
CO6	3	3	2	3	2	1						2	3	2	3	2

Enter correlation levels 1, 2 or 3 as defined below: 1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

191BS31 BIOLOGY FOR ENGINEERS L-T-P C
3 -0-0 3

Programme: **B.E./B.Tech. (Common to all Branches)** **Sem: III** **Category: BSC**

Prerequisites: Basic science

Aim: To understand basic and fundamental engineering knowledge from biology.

Course Outcomes:

The Students will be able to

CO1: Analyze the various biochemical interactions and the structure and function of various biological molecules

CO2: Demonstrate the basic concepts of thermodynamics and energy transactions.

CO3: Discuss different aspects of molecular computing

CO4: Analyze the Mendelian laws of inheritance.

CO5: Elaborate the cellular architecture and utilize these concepts to design an engineering system.

CO6: Apply the fundamental concepts in sensory physiology analogy with communication systems.

INTRODUCTION. **9**

Biological analogy in engineering science, Biological elements-Carbohydrate, protein, amino acids, lipids and nucleic acids structure and function. Primary, secondary, tertiary and quaternary structure of protein. Protein as enzymes, transporter, receptors and structural elements.

METABOLISM AND ENGINEERING **9**

Engineering aspects in thermodynamics of energy transactions, exothermic and endothermic versus endergonic and exergonic reactions. ATP as an energy source, glycolysis, Krebs cycle and photosynthesis. Energy yielding and energy consuming reactions. Enzymes classification, mechanism of enzyme action, enzyme kinetics and kinetic parameters

GENETICS AND TRANSFORMATION TECHNOLOGY **9**

Molecular basis of information transfer. DNA as a genetic material. Concept of genetic code. Mendal's laws, concept of segregation and independent assortment. Concept of allele, Gene mapping, Gene interaction, Epistasis, concepts of recessiveness and dominance and their relativeness to programming. Cell multiplication. Phenotype and genotype. Single gene disorders in humans and human genetics..

CLASSIFICATION AND SYSTEM ENGINEERING **9**

Structure, function and relativeness to engineering of prokaryotes and eukaryotes. Habitats- aquatic or terrestrial. Molecular taxonomy-three major kingdoms. Microbial species and strains. Identification and classification of microorganisms. Industrial application of microorganisms. Sterilization and media compositions. Growth kinetics.

SENSOR BIOLOGY AND COMMUNICATION SYSTEMS **9**

Sensory system, circulatory system and excretory system and their relativeness to communication engineering. Hormonal regulation. General defense mechanism in human. Major human disorder and diseases.

Total Periods: 45

Text Book

1. Arthur T. Johnson, CRC Press, New York, 2011
2. Thyaga Rajan.S., Selvamurugan. N., Rajesh.M.P., Nazeer.R.A., Richard W. Thilagaraj, Barathi.S., and Jaganthan.M.K., "Biology for Engineers", Tata McGraw-Hill, New Delhi, 2012

References

1. Rajiv Singal, Gaurav Agarwal, Ritu Bir, Biology for Engineers, CBS Publisher,2019
2. Charles Molnar and Jane Gair, Concepts of Biology-1st Canadian Edition, Open Stax Publication, 2013.
3. Raven Johnson, Biology, 11th Edition, Mc Graw Hill Publication, 2017

Course Outcomes	Program Outcomes (POs)												Program Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	2	2	2	1	1	3	1			1	2				3
CO2	3	2	2	2	2	1	3	1			1	2				3
CO3	2	2	2	2	2	1	3	1			1	2				3
CO4	2	2	2	2	2	1	3	1			1	2				3
CO5	2	2	2	2	2	2	3	1			1	2	2			3
CO6	2	2	2	2	2	2	3	1	1	1	2	2	2			3

191CS35	DATA STRUCTURES AND C++		L	T	P	C
			3	0	2	4
Programme:	B.E. Electronics and Communication Engineering	**Sem:III**	**Category:**		**ESC**	
Prerequisites:	-					

AIM: To provide an in-depth knowledge in basic concepts of object oriented programming and fundamental concepts of data structures.

Course Outcomes:

The Students will be able to

CO1: Discuss the concepts of Object oriented programming.
CO2: Apply proper class protection mechanism to provide security.
CO3: Apply various object oriented features like inheritance, data abstraction, encapsulation and polymorphism to solve various computing problems using C++ language.
CO4: Discuss the importance of structure and abstract data type, and their basic usability.
CO5: Apply various data structure such as stacks, queues, linked lists, trees and graphs to Solve various computing problems.
CO6: Analyze the efficiency of algorithm and design their own data structure according to the application.

PRINCIPLES OF OBJECT ORIENTED PROGRAMMING 9

Introduction – Beginning with C++, Tokens, Expressions, Control Structures, Functions in C++, Classes and objects, Operators overloading and type conversions.

BASIC CONCEPTS OF OBJECT ORIENTED PROGRAMMING 9

Inheritance, Constructors and destructors, Pointers, Virtual functions and polymorphism, Exception handling.

LINEAR DATA STRUCTURES 9

Arrays and its representations – Stacks and Queues – Linked lists – Linked list-based implementation of Stacks and Queues – Evaluation of Expressions.

NON LINEAR DATA STRUCTURES 9

Trees – Binary trees – Binary tree representation and traversals –Binary Search Trees, Graph Algorithms – Representation – Shortest path algorithms: Dijkstra's algorithm – Minimum spanning tree.

SORTING 9

Sorting – Preliminaries – Bubble Sort, Insertion sort, Shell sort, Merge sort, Quick sort, Bucket sort.

LAB COMPONENT

LIST OF EXPERIMENTS:

1. Basic Programs for OOPS concepts.
2. Array implementation of stacks and queues.
3. Linked list implementation of stacks and queues.
4. Application of Stacks and Queues.
5. Implementation of Binary SearchTree.
6. Implementation of Sorting.

TEXT BOOKS:

1. Mark Allen Weiss, "Data Structures and Algorithm Analysis in C++", 3rd edition, Pearson Education Asia, 2014.
2. E. Balagurusamy, "Object Oriented Programming with C++", 4th edition, McGraw Hill Company Ltd., 2009

REFERENCES:

1. Michael T. Goodrich, "Data Structures and Algorithm Analysis in C++", Wiley student edition, 2007.
2. Seymour, "Data Structures", The McGraw-Hill, 2007.
3. Jean – Paul Tremblay & Paul G.Sorenson, An Introduction to data structures with applications, Tata McGraw Hill edition, 2nd Edition, 2007.
4. John R.Hubbard, Schaum's outline of theory and problem of data structure with C++, McGraw-Hill, New Delhi, 2004.

Course Outcomes	Program Outcomes (POs)												Program Specific Outcomes (PSOs)			
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O1	PS O2	PS O3	PS O4
CO1	3	2	3		2				3	1	1	2	2		2	3
CO2	3	2	2	2	2				3	1	1	2	2		2	3
CO3	2	2	2	2	2	1		1	3	1		2	2		2	3
CO4	3	2	2		2				3	1	1	2	2		2	3
CO5	3	2	2	2	2	2		1	3	1		2	2		2	3
CO6	2	2	2	2	2	2		1	3	1	2	2	2		2	3

Enter correlation levels 1, 2 or 3 as defined below: 1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

191EC37 CIRCUITS AND DEVICES LABORATORY L-T-P C

0-0-2 1

Programme: B.E. - Electronics and Communication Engineering **Sem: 3 Category: PC**

Aim: To verify the circuit theorem and study the characteristics of electronic devices.

Course Outcomes: The students will be able to

CO1: Design and construct impedance Matching Networks.

CO2: Analyze the characteristics of bridge circuits

CO3: Design and analysis of First order RC and LC Circuits as LPF & HPF and determine the Q factor of the LC circuit.

CO4: Analyze the Device behaviour of Semiconductor Diodes, BJT and FETs.

CO5: Analyze the characteristics of various types of (LED, PIN, Photo Diode) diodes.

CO6: Measure and record the experimental data, analyze the results, and prepare a formal laboratory report.

List of Experiments

1. Construct and Analysis of T, π and impedance Matching Networks using Network Theorems.
2. Analysis of Wheatstone-Bridge Circuit.
3. Design and analysis of First order RC and LC Circuits as LPF & HPF.
4. Determination of Q factor of a given LC circuit.
5. Analyze the Device behaviour of Semiconductor Diodes and FETs.
6. Analyze the Device behaviour of Bipolar Junction Transistor
7. Analyze the Device behaviour of FETs.
8. Design and Analysis of Voltage Regulators.
9. Design and analysis of Filters.
10. Analyze the characteristics of LED, LDR, Photo Diode and PIN Diode.

TOTAL PERIODS 45

Course Outcomes	Program Outcomes (POs)												Program Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	3	2	3	2				3	1		1	3	3		1
CO2	3	3	3	3	2	1			3	1	1	2	3	3		1
CO3	3	3	2	3	2	2			3	1	1	2	3	3		1
CO4	3	2	2	3	2	1			3	1	1	2	3	2		1
CO5	3	2	3	3	2	1			3	1	1	2	3	3		2
CO6	3	2	3	3	2				3	1	1	2	3	3		2
CO7	3	3	3	2	3				3	1	1	3	2	2	1	1

Enter correlation levels 1, 2 or 3 as defined below: 1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

191EC38 LINEAR INTEGRATED CIRCUITS LABORATORY L-T-P C
0-0-2 1

Programme: B.E. - Electronics and Communication Engineering **Sem: 3 Category: PC**

Aim: To acquire skills in designing and implementation of Op – Amp applications

Course Outcomes: The students will be able to

CO1: Design and implement Op- Amp Configurations.

CO2: Design, develop and implement various linear applications of Op – Amp.

CO3: Construct waveform generator circuits using Op-Amp and timer ICs.

CO4: Apply the characteristics PLL to design frequency multiplier.

CO5: Design and implement converters.

CO6: Design and implement Regulators.

List of Experiments **9**

1. Design and Implementation of Inverting, Non inverting and differential amplifiers.
2. Design and Implementation of applications of Op Amp
    a. Integrator and Differentiator.
    b. Voltage Follower
    c. V to I and I to V converters
    d. Arithmetic operations
    e. Instrumentation Amplifier,
3. Astable multivibrator and Schmitt Trigger using Op-amp.
4. Astable & Monostable multivibrators using NE555 Timers.
5. Phase shift and Wien bridge oscillators using op-amp.
6. PLL characteristics and its use as Frequency Multiplier.
7. Design and implementation of a DC-DC Converter.
8. Design and implementation of a Low Dropout Regulator.

TOTAL PERIODS 45

Course Outcomes	Program Outcomes (POs)												Program Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	2	2	2	3				3	1	2	2	2	3	3	2
CO2	3	2	2	2	3				3	1	2	2	2	3	2	2
CO3	2	3	2	3	3	2			3	1	2	2	2	3	2	3
CO4	3	3	3	3	3				3	1	2	2	2	3	3	2
CO5	2	2	2	2	3				3	1	2	2	3	3	3	2
CO6	3	3	2	2	3	1			3	1	2	2	2	3	3	2

Enter correlation levels 1, 2 or 3 as defined below: 1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

191MA41 PROBABILITY AND RANDOM PROCESSES L-T-P C
3-0-0 3

Programme: **B.E. (Common to CSE & ECE Engineering)** **Sem: 4** **Category: BSC**

Aim: This course aims at providing the necessary basic concepts in random processes and to acquire skills in analyzing queuing models.

Course Outcomes: The students will be able to

CO1: Classify the discrete and continuous random variables.
CO2: Determine strictly stationary, wide–sense stationary and Poisson process.
CO3: Analyze two dimensional Random Variables.
CO4: Analyze the binomial, Poisson, geometric, uniform, exponential and normal distribution.
CO5: Examine Wiener - khintchine relation and correlation properties
CO6: Apply the queuing models to real world problems.

RANDOM VARIABLES **9**

Discrete and continuous random variables – Moments – Moment generating functions and their properties. Binomial, Poisson, Geometric, Uniform, Exponential, Normal distribution.

TWO DIMENSIONAL RANDOM VARIABLES **9**

Joint distributions – Marginal and conditional distributions – Covariance – Correlation and Regression –Transformation of random variables – Central limit theorem (for 2D random variables).

CLASSIFICATION OF RANDOM PROCESSES 9

Definition and examples – First order, second order, strictly stationary, wide–sense stationary and ergodic processes – Markov process – Binomial, Poisson and Normal processes – Sine wave process – Random telegraph signal process.

CORRELATION AND SPECTRAL DENSITIES **9**

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

QUEUEING THEORY **9**

Markovian models – Birth and Death Queueing models- Steady state results: Single and multiple server queueing models- queues with finite waiting rooms- Little's Formula.

TOTAL PERIODS 45

Text Book

1.Balaji.G, "Probability and Queueing theory", Balaji Publishers, 12th Edition, November 2016.
2.Gross.D and Harris.C.M, "Fundamentals of Queueing Theory", Wiley Student edition, 2004.

Reference

1.Miller.S.L and Childers.D.G, "Probability and Random Processes with applications to Signal Processing and Communications, Elsevier Ine., First Indian Reprint 2007.
2.Stark.H and Woods.J.W, "Probability and Random Processes & Applications to Signal Processing", Pearson Education (Asia), 3rd Edition, 2002.
3.Hwei Hsu, "Schaum's Outline of Theory and Problems of Probability, Random Variables and Random Processes", Tata McGraw-Hill edition, New Delhi, 004.
4.Leon-Garcia,A, "Probability and Random Processes for Electrical Engineering",Pearson Education Asia, 2nd Edition, 2007.

5.Allen.A.O, “Probability, Statistics and Queueing Theory with ComputerApplications”, Elsevier, 2nd edition, 2005.

Course outcomes	Program Outcomes (POs)												Program Specific Outcomes (PSOs)			
	PO1	P02	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	3	3	2								3	3	1	3	2
CO2	2	2	2	2	2							1	3	1	3	2
CO3	3	3	2	3								3	3	1	3	2
CO4	2	2	2	3								1	3	2	3	3
CO5	3	3	2	3	2							2	3	2	3	2
CO6	3	3	2	2	2	1						3	3	2	3	2

Enter correlation levels 1, 2 or 3 as defined below: 1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

191EC41 **ANALOG ELECTRONICS** **L-T-P C**

3-0-0 3

Programme: B.E. - Electronics and Communication Engineering **Sem: 4** **Category: PC**

Aim: To enable the students to learn about the uses of transistors in analog circuits like single and multistage amplifier, feedback amplifier, Differential amplifier, power amplifier and oscillators. It also gives information about the current mirror circuits used for biasing in Integrated Circuits and their applications in the field of electronics industry.

Course Outcomes: The students will be able to

CO1: Determine Input resistance, Output resistance, Voltage gain, and Current gain of the Single stage amplifiers and Multistage Amplifiers.

CO2: Derive the expression for Q point, CMRR of differential amplifier.

CO3: Develop the expressions for voltage gain, input impedance of voltage series, voltage shunt, current series and current shunt negative feedback amplifiers.

CO4: Develop the frequency of oscillation and condition of Oscillation of RC and LC Oscillators.

CO5: Develop the equation for power output and conversion efficiency of Class A ,Class B and Class C of large signal amplifiers

CO6: Deduce the equation for 3 dB bandwidth of single tuned and double tuned amplifier.

BJT AND JFET FREQUENCY RESPONSE **9**

Low frequency response – BJT Amplifier, FET Amplifier, Miller effect capacitance, High frequency response – BJT Amplifier, FET Amplifier, Multistage Frequency Effects - Frequency response of the Differential amplifier with active load.

SINGLE STAGE AND MULTISTAGE AMPLIFIERS **9**

Single stage amplifiers – Different configurations and their frequency response – Need for multistage amplifier – Different types of multistage amplifier - RC coupled, transformer coupled, direct coupled, and their frequency response and bandwidth - Gain of multistage amplifier –Cascode amplifiers.

9

CURRENT SOURCES AND FEEDBACK AMPLIFIERS

Current sources for biasing –Current steering circuits – Current mirror with improved performance (Wilson, Widlar). Basic principles and types of feedback- Gain of an amplifier employing feedback - Effect of feedback (negative) on gain, stability, distortion and bandwidth of an amplifier.

OSCILLATORS AND TUNED AMPLIFIERS **9**

Barkhausen criterion for oscillations –Types of oscillators – Hartley, Colpitts, tuned collector, crystal oscillator, RC phase shift and Wien bridge- Single and double tuned voltage amplifiers and their frequency response.

9

LARGE SIGNAL AMPLIFIER

Difference between voltage and power amplifiers - Importance of impedance matching in amplifiers – Classification of large signal amplifiers - Class A,B,C and Class AB amplifiers - Push-pull class B amplifier and complementary symmetry push-pull amplifier.

TOTAL PERIODS 45

Text Book:

1. Adel S. Sedra and Kenneth C.Smith, “Microelectronic Circuits”, Oxford University Press, 6th Edition, 2014.

References:

1. Behzad Razavi, "Fundamentals of Microelectronics", 2nd edition, Wiley publication,2013.
2. Millman & Halkias, "Integrated Electronics", 48th reprint, Tata McGraw Hill, 2008.

Course Outcomes	Program Outcomes (POs)												Program Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	2	3	2	2	1						2	2	3		2
CO2	3	2	3	2	1	1						2	2	3		2
CO3	3	2	3	3	2	1						2	2	3	2	2
CO4	3	2	3	3	1	1						2	2	3	2	2
CO5	3	3	2	3	2	1						2	2	3	2	2
CO6	3	2	3	3	2	1						2	2	3	2	2

Enter correlation levels 1, 2 or 3 as defined below: 1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

191EC42	SIGNALS AND SYSTEMS			L-T-P	C
				3-2-0	4
Programme:	B.E. - Electronics and Communication Engineering	**Sem:**	4	**Category:**	PC

Aim: To study and analyze the characteristics of continuous, discrete signals and systems.

Course Outcomes: The students will be able to

CO1: Analyze the principles and properties of signals and systems.

CO2: Apply the Fourier series and transforms of the sinusoidal signals

CO3: Utilize CT systems in the Frequency domain using Fourier Analysis

CO4: Apply Laplace transform to Continuous Time systems.

CO5: Apply Z transform to characterize Discrete time systems.

CO6: Apply Discrete Fourier Transform for the Discrete signals and also how to reduce the computation using FFT.

CLASSIFICATION OF SIGNALS AND SYSTEMS **9**

Basic signals, Classification of signals – Continuous and Discrete signals, Periodic and Aperiadic signals, Deterministic and Random signals, Energy and Power signals – Classification of systems – Continuous and Discrete systems, Static and Dynamic, Linear and Nonlinear, Time-variant and Time-invariant, Causal and Non causal, Stable and Unstable, linear and circular convolution.

ANALYSIS OF CONTINUOUS TIME SIGNALS **9**

Fourier series analysis - Fourier and Laplace Transforms– Properties of Fourier and Laplace Transforms.

LINEAR TIME INVARIANT- CONTINUOUS TIME SYSTEMS **9**

Differential Equation-Block diagram representation-impulse response, convolution integrals-Laplace transform in Analysis of CT systems.

ANALYSIS OF DISCRETE TIME SIGNALS **9**

Baseband Sampling – Aliasing, Reconstruction of CT signal from DT signal- DTFT & its properties - Z Transform & its Properties.

LINEAR TIME INVARIANT-DISCRETE TIME SYSTEMS **9**

Difference Equations-Block diagram representation-Impulse response – Convolution sum-. Discrete Fourier Transform, Properties of DFT, FFT, Radix 2 DIF-FFT, Radix 2 DIT-FFT.

Total Periods: 45

Text Book:

1. A.V. Oppenheim, A.S. Willsky and S.H. Nawab, Signals and Systems, PHI, 2nd Edition, 2008
2. Anand Kumar, Signals and Systems - PHI; 3rdedition, 2013

References:

1. Simon Haykin and Van Veen, Signals & Systems, Wiley, 3rd Edition, 2007.
2. Michel J. Robert, Fundamentals of Signals and Systems, MGH International Edition, 2008.
3. B.P. Lathi, Signals, Systems & Communications, BS Publications, 2008.
4. Narayan Iyer and K Satya Prasad,Signals & Systems, Cenage Pub, 2011

Course Outcomes	Program Outcomes (POs)												Program Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	3	3	3	1							2	3		3	1
CO2	3	3	2	2	2							2	3		3	1
CO3	3	3	3	3	2							2	3		3	2
CO4	3	3	3	3	2							2	3		3	2
CO5	3	3	3	3	2							2	3		3	2
CO6	3	3	3	2	2							2	2	2	3	2

Enter correlation levels 1, 2 or 3 as defined below: 1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

191EC43	DIGITAL SYSTEMS			L-T-P	C
				3-0-0	3
Programme:	B.E. - Electronics and Communication Engineering	**Sem:**	**4**	**Category:**	**PC**
Aim:	The course aims at Circuit schematic development, Computer modelling, Simulation of digital system and verifies their functionality using the Hardware description Language (Verilog).				

Course Outcomes: The students will be able to

CO1: Illustrate digital systems and its application in contemporary world.

CO2: Apply the principles of Boolean algebra to manipulate and minimize logic expressions

CO3: Design and debug basic combinatorial and sequential logic circuits

CO4: Utilize state machine diagrams to design finite state machines using sequential circuits

CO5: Analyze MSI and PLD components

CO6: Design, debug and verify simple digital circuits and systems with the aid of computer software including Verilog, schematic capture tools and simulation tools.

NUMBER SYSTEM & MINIMIZATION TECHNIQUES **9**

Number system , Binary Arithmetic Operation , 1's and 2's complements,9's and 10's complement, Classification of binary Codes, Boolean logic operations and laws, De-Morgan's Theorem, Minimization of Boolean expressions , Sum of Products (SOP) , Product of Sums (POS), Karnaugh map Minimization (Three & Four variable), Quine-McCluskey method.

LOGIC GATES & COMBINATIONAL CIRCUITS **9**

Logic Gates, Mixed Logic, Half adder & Half Subtractor , Full Adder & Full Subtractor , Parallel binary adder, Parallel binary Subtractor, Fast Adder, Binary Multiplier, Binary Divider, Multiplexer / Demultiplexer, Decoder / Encoder , Parity checker, Parity generators , Code converters, Magnitude Comparator.

SEQUENTIAL CIRCUITS **9**

Flip-flops – SR, JK, D, T, and Master-Slave, Characteristic table and equation,Triggering of flip flops, Realization of one flip flop using other flip flops. Counters – Asynchronous & Synchronous Up/Down counter.Registers – Shift registers, Shift register counters. Design using Algorithmic State Machines and Finite State Machines, Design of Hazard Free Switching circuits.

MSI AND PLD COMPONENTS **9**

Registers, basics of architecture - Fixed-function devices-TTL, ECL, RTL, CMOS, RAM/ROM, Programmable devices-PROMs, PALs and PLDs, FPGAs.

COMPUTER-AIDED DESIGN **9**

Hardware description languages (HDLs) - Introduction to Verilog, Logic compilation, Two-level and multi-level logic synthesis, Technology-independent optimization, Technology mapping, Sequential-logic synthesis.

TOTAL PERIODS 45

Text Book:

1. M.Morris Mano, Digital Design, 5thEdition, Pearson Education (Singapore) Pvt. Ltd., New Delhi, 2013.

References:

1. Donald D.Givone, Digital Principles and Design, TMH, 2007.
2. Donald P.Leach, Albert Paul Malvino, Goutam Shah "Digital principles & applications",7th edition, 2011.
3. S. Salivahanan and S. Arivazhagan, Digital Circuits and Design, 3rd edition, Vikas Publishing House Pvt. Ltd, New Delhi, 2007.

Course Outcomes	Program Outcomes (POs)												Program Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	2	3	3	2	1							2	2	3		2
CO2	2	3	2	2	2							2	2	3		2
CO3	3	3	3	3	2	1			3		1	2	2	3		2
CO4	3	3	3	3	2	1			3		1	2	2	3		2
CO5	3	3	3	2	2	1						2	2	3		2
CO6	2	3	3	2	1							2	2	3		2

Enter correlation levels 1, 2 or 3 as defined below: 1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

191EC44 ELECTROMAGNETIC FIELDS AND WAVEGUIDES L-T-P C

3-2-0 4

Programme: B.E. - Electronics and Communication Engineering **Sem: 4 Category: PC**

Aim: To understand the concepts, calculations and pertaining to electric, magnetic and electromagnetic fields.

Course Outcomes: The students will be able to

CO1: Summarize the co-ordinate systems and apply conversion between them

CO2: Interpret the fundamentals of electric fields with source equations

CO3: Interpret the fundamentals of magnetic fields including potential, conductor, dielectrics and others.

CO4: Develop the Maxwell's equations for static and time varying fields.

CO5: Analyze the wave equations and waves in different media like free space, loss and lossless dielectric.

CO6: Analyze the characteristics of guided waves

ELECTROSTATIC FIELDS 9

Vector addition and subtraction, Dot and cross products, Line and surface integrals, Introduction to differential operators, Cartesian, cylindrical, and spherical coordinates, Coulomb's law and electric field intensity, The source equation; divergence, Gauss' law, Ohm's law, Electrostatic energy and potential gradient, Capacitors, Boundary condition on the normal electric field, Laplace's and Poisson's equations, Laplacian.

MAGNETIC FIELDS AND TIME VARYING FIELDS 9

Magnetic Fields: Ampere's work law in differential vector form, Ampere's law for a current element. Magnetic vector Potential, Magnetic scalar Potential, Magnetic dipole, Energy and Mechanical forces in magnetic fields, Image of current carrying conductor in the neighborhood of a magnetic plane.

Time-Varying Fields: Faraday's law, Boundary condition on the tangential electric field, Maxwell's equations, Skin effect.

ELECTROMAGNETIC WAVES 9

Derivation of the wave equation and their general solution, Reflection and refraction of plane waves at surface interface, surface impedance, Poynting Vector and Flow of Power,Poynting's theorem, Power Loss in a plane conductor.

GUIDED WAVES 9

Characteristics of TE and TM waves, wave impedance, impedance matching by means of stab lines, TE and TM waves in circular guides

WAVE GUIDES 9

Introduction to wave guides, Circuits, line and guides – a comparison, Rectangular and circular wave guides, TE and TM waves in rectangular wave guides, Impossibility of TEM waves in wave guides, Wave impedances and characteristics impedances, Attenuation and Q-factor of wave guides.

TOTAL PERIODS 45

Text Book:

1. Jordon E C and Balmain K G, "Electromagnetic waves and Radiating System", Prentice Hall New Delhi (2003).
2. Hayt W H, "Engineering Electromagnetics", McGraw Hill Book Co, Eighth Edition, NY (2010)

References:

1. F.T. Ulaby and U. Ravaioli, Fundamentals of Applied Electromagnetics, 7th edition, Pearson, 2015
2. Griffiths, David J. Introduction to electrodynamics, 4th edition., international edition: Boston: Pearson, cop. 2013
3. Mathew N.O.Sadiku, "Principles of Electromagnetics", Oxford Press Int. Edition, 2009.
4. Jian –Ming Jin, "Theory and Computation of Electromagnetic Fields", IEEE Press 2015.

Course Outcomes	Program Outcomes (POs)												Program Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	3	2	3		2							3	2	3	2
CO2	3	3	2	2		2						1	3	2	3	2
CO3	3	3	2	2		2						2	3	2	3	2
CO4	3	3	3	2	2	2						2	3	2	3	2
CO5	3	3	3	2	2	2						2	3	2	3	2
CO6	3	3	2	2	2	2						2	3	2	3	2

Enter correlation levels 1, 2 or 3 as defined below: 1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

191CS46 **PYTHON PROGRAMMING** **L T P C**
3 0 2 4

Programme: BIOTECH / ECE / EEE **Sem: 4 Category: ESC**

Aim: To provide students with the programming knowledge and to develop python programs.

Course Outcomes: The Students will be able to

CO1: Illustrate the fundamentals of python programming.
CO2: Develop functions in python.
CO3: Explain strings and lists in python programs.
CO4: Analyze OOPS Concept in python.
CO5: Demonstrate tubles, dictionaries, files and exceptions in python.

INTRODUCTION **9**

Python Overview - Comments - Identifiers - Keywords - Variables - Data types - Operators - Statement and Expressions - String Operations - Boolean Expressions - Control Statements - Iterations - Input from Keyboard.

FUNCTIONS IN PYTHON **9**

Built-in Functions - Composition of Functions - User defined functions - Parameters and Arguments - Function calls - The return statement - Python recursive function - Anonymous Functions.

STRINGS AND LISTS **9**

Strings - Compound Data Types - String slices - String Traversal - Escape Characters - String formatting operator, functions - Lists-Traversing a List - Built-in list operators, methods.

CLASSES AND OBJECTS **9**

Class, Objects in python - Built-in Class attributes - Inheritance - Method Overriding - Data Encapsulation - Data hiding.

DICTIONARIES AND FILES **9**

Tubles-Values - Operations - Functions - Dictionaries - Values - Update - Properties Operations - Files - Text Files - Exceptions - Exception with arguments - User defined Exceptions.

Lab Component:

Write the programs for the following topics using python:

1. Operators
2. Control Statements
3. Built-In and User defined functions
4. String functions
5. List functions.
6. Classes and their attributes.
7. Inheritance and method overriding.
8. Data Encapsulation and hiding.
9. File Operations and Exception handling.

Total Periods(45+15): 60

Text Books:

1. E.Balagurusamy, ”Introduction to Computing And Problem Solving Using Python”, Mc-Graw Hill Education (India) Private Ltd., 2016.

References:

1. MarkLutz, ”Programming Python”, Fourth Edition, 2010.

2. John V.Guttag, ”Introduction to Computation and Programming using Python”, Second Edition, 2016.
3. John Paul Mueller, ”Beginning Programming with python For DUMMLES”, 2014.

191EC47 ANALOG ELECTRONICS LABORATORY L-T-P C
0-0-2 1

Programme: B.E. - Electronics and Communication Engineering **Sem: 4 Category: PC**

Aim: To design and implement analog electronic circuits.

Course Outcomes: The students will be able to

CO1: Explain the relationship between electron transport properties and operation of semi conductor devices like Diode, Bipolar Junction Transistors and Field Effect transistors.

CO2: Investigate the different configuration and obtain the device small signal model of BJTs and FETs.

CO3: Determine the advancements in development of low dimensional semiconductor hetero structures and their operation.

CO4: Apply the concepts of transistor biasing to study the small signal behaviour of BJT and MOSFET for Amplification application.

CO5: Design and Simulate power amplifiers

CO6: Measure and record the experimental data, analyze the results, and prepare a formal laboratory report.

List of Experiments

1. Design, simulation and hardware realization of Single Stage common emitter amplifier for given specification
2. Design and simulation of Differential pair circuit with active load and current references and its frequency analysis.
3. Design and hardware realization of Multistage Amplifier for given specification.
4. Simulation of different types of feedback amplifiers and its frequency analysis.
5. Design, Simulation and Hardware realization of sinusoidal waveform generators.
   a) RC Oscillators
   b) LC Oscillators
6. Frequency Response characterization of Tuned amplifier circuit.
7. Design and simulation of Power amplifiers.
8. Miniproject

TOTAL PERIODS 45

Course Outcomes	Program Outcomes (POs)												Program Specific Outcomes (PSOs)			
	PO 1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	2	3	3	2	2			3	1		2	2	3		2
CO2	3	2	3	3	2	3			3	2		2	2	3	2	3
CO3	3	2	3	3	2	2			3	2	2	2	2	3	2	2
CO4	3	2	3	3	2	2			3	2	2	2	2	3	3	2
CO5	3	3	2	3	2	2			3	2	2	2	2	3	3	2
CO6	3	2	3	3	2	3			3	2	2	2	2	3	3	2
CO7	3	3	3	3	3	2			3	2		2	3	3	3	2

Enter correlation levels 1, 2 or 3 as defined below: 1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

191EC48 DIGITAL SYSTEMS LABORATORY L-T-P C

0-0-2 1

Programme: B.E. - Electronics and Communication Engineering **Sem: 4 Category: PC**

Aim: To design, simulate and implement combinational and sequential circuits.

Course Outcomes: The students will be able to

CO1: Construct arithmetic and logic circuits using logic gates

CO2: Build various combinational logic circuits using logic gates

CO3: Design the sequential logic circuits by using flip flops

CO4: Implement various types of code converters like binary to gray code converter and seven segment display code converter.

CO5: Design and Implement parity generators and counters

CO6: Design and simulate adders, multiplexers and counters using behavioural level modeling

List of Experiments

Software Experiments using HDL

1. Design and Simulation of Full adder circuit using Gate level modeling.

2. Design and Simulation of 2X2 multiplier circuit using structural level modeling.

3. Design and Simulation of 8 to 1 Multiplexer circuit using behaviourallevelmodeling.

4. Design and Simulation of up-down counter using behavioural level modeling.

Hardware Experiments

1. Implementation of Full Adder using(a) Decoder(b) Multiplexer

2. Implementation of various types of code converters like binary to gray codeconverter and seven segment display code converter.

3. Implementation of SR, D, T, and JK flipflops and basic counters.

4. Implementation of odd and even parity generators.

TOTAL PERIODS 45

Course Outcomes	Program Outcomes (POs)												Program Specific Outcomes (PSOs)			
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
CO1	3	2	2	2	3				3	1	2	2	2	3	3	2
CO2	3	2	2	2	3				3	1	2	2	2	3	2	2
CO3	2	3	2	3	3	2			3	1	2	2	2	3	2	3
CO4	3	3	3	3	3				3	1	2	2	2	3	3	2
CO5	2	2	2	2	3				3	1	2	2	3	3	3	2
CO6	3	3	2	2	3	1			3	1	2	2	2	3	3	2

Enter correlation levels 1, 2 or 3 as defined below: 1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

191EC51 ANALOG AND DIGITAL COMMUNICATION L T P C
3 0 0 3

Programme: B.E. Electronics and Communication Engineering **Sem: 5 Category: PC**

AIM: To analyze the various analog and digital modulation and demodulation techniques, transmitters & receivers used in communication systems.

Course Outcomes

CO1: Examine the principles of communication system and analog modulation techniques

CO2: Design the angle modulation circuits in communication systems

CO3: Evaluate the practical limitations in Communication Techniques such as aliasing and inter symbol interference (ISI)

CO4: Compare the performance of different digital modulation techniques.

CO5: Analyze the Performance of spread spectrum communication system

CO6: Utilize the multiple access techniques

AMPLITUDE MODULATION **9**

Need for modulation, Amplitude modulation, Virtues and limitations of Amplitude modulation, Linear modulation schemes, DSB-SC Modulation, Coherent detection, Costas receiver, Quadrature carrier multiplexing, SSB Modulation, vestigial side band modulation, Television signals, Frequency translation, Comparison of amplitude modulation systems.

ANGLE MODULATION **9**

Frequency and phase modulation. spectrum of FM Wave, modulation index and Bandwidth of FM Signal, NBFM and WBFM, Comparison between FM and PM Signals, FM and AM signals, AM and NBFM Signals, Generation of FM signals, Demodulation of FM signals, slope detector, ratio detector, Foster Seeley discriminator, Pre-emphasis & De-emphasis, – Capture effect, threshold effect, Super heterodyne radio receiver and its characteristics.

DIGITAL TRANSMISSION AND DATA COMMUNICATION **9**

Introduction, pulse modulation, PCM – PCM sampling, sampling rate, signal to quantization noise rate, companding – analog and digital – percentage error, delta modulation, adaptive delta modulation, differential pulse code modulation, pulse transmission – ISI, eye pattern, source and error control coding, Entropy, Source encoding theorem, Shannon Fano coding, Huffman coding, mutual information, channel capacity, channel coding theorem, Error control coding, linear block codes, cyclic codes, convolution codes, viterbi decoding algorithm.

DIGITAL COMMUNICATION **9**

Introduction, Shannon limit for information capacity, digital amplitude modulation, frequency shift keying, FSK bit rate and baud, FSK transmitter, BW consideration of FSK, FSK receiver, phase shift keying – binary phase shift keying – QPSK, Quadrature Amplitude modulation, bandwidth efficiency, carrier recovery – squaring loop, Costas loop, DPSK.

SPREAD SPECTRUM AND MULTIPLE ACCESS TECHNIQUES **9**

Introduction, Pseudo-noise sequence, DS spread spectrum with coherent binary PSK, processing gain, FH spread spectrum, multiple access techniques – wireless communication, TDMA and FDMA, wireless communication systems, source coding of speech for wireless communications.

TOTAL PERIODS: 45

TEXT BOOKS

1. Wayne Tomasi, "Advanced Electronic Communication Systems", 6th Edition, Pearson Education, 2009.

REFERENCES

1. Simon Haykin, "Communication Systems", 4th Edition, John Wiley & Sons, 2004
2. Rappaport T.S, "Wireless Communications: Principles and Practice", 2nd Edition, Pearson Education, 2007
3. H.Taub, D L Schilling and G Saha, "Principles of Communication", 3rd Edition, Pearson Education, 2007.
4. B. P.Lathi, "Modern Analog and Digital Communication Systems", 3rd Edition, Oxford University Press, 2007.
5. Blake, "Electronic Communication Systems", Thomson Delmar Publications, 2002.
6. Martin S.Roden, "Analog and Digital Communication System", 3rd Edition, Prentice Hall of India, 2002.
7. B.Sklar, "Digital Communication Fundamentals and Applications" 2nd Edition Pearson Education 2007.

Course Outcomes	Program Outcomes (POs)												Program Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	2	2	3	3							2	3	3	2	2
CO2	3	2	2	2								2	3	2	2	2
CO3	3	2	2	2	3	2	2					2	3	3	2	2
CO4	3	2	2	2								2	3	2	2	2
CO5	3	3	2	2	2	3	2					2	3	2	2	2
CO6	3	2	2	2	3	2						3	3	3	2	2

Enter correlation levels 1, 2 or 3 as defined below: 1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

191EC52	CONTROL SYSTEMS	L-T-P	C
		3-0-0	3

Programme: B.E. – Electronics and Communication Engineering **Sem: 5 Category: PC**

AIM: To illustrsate concepts related to the operation analysis and stabilization of Linear and Digital control systems.

Course Outcomes: The students will be able to

CO1: Design the models of various physical systems.
CO2: Analyze the time domain responses of first and second-order systems.
CO3: Illustrate the transient and steady state performance of a system
CO4: Examine the control system performance in the frequency-domain.
CO5: Analyze the stability criterion and elaborate the compensators
CO6: Design and analyze the state-variable models.

CONTROL SYSTEM MODELING **9**

Basic Elements of Control System – Open loop and Closed loop systems - Differential equation - Transfer function, Modeling of Electric systems, Translational and rotational mechanical systems - Block diagram reduction Techniques - Signal flow graph.

TIME DOMAIN ANALYSIS **9**

Standard test signals- First order system - step, ramp and impulse response analysis-Second order system – step response analysis- steady state error – generalized error co-efficient - Principle of PI, PD and PID controllers

FREQUENCY DOMAIN ANALYSIS **9**

Frequency Response - Bode Plot, Polar Plot. - Frequency Domain specifications from the plots - Constant M and N Circles

CONCEPTS OF STABILITY ANALYSIS

Concept of stability-Bounded - Input Bounded - Output stability-Routh stability criterion-Relative stability-Root locus concept-Guidelines for sketching root locus-Nyquist stability criterion- lag, lead, lag-lead compensator.

STATE VARIABLE ANALYSIS **9**

Concepts of state, state variables and state model -State space representation of continuous time systems – State equations – Transfer function from state variable representation – Solutions of the state equations.

TOTAL PERIODS 45

TEXT BOOK

1. Nagrath.J and Gopal.M, “Control System Engineering”, New Age International Publishers, 5th Edition, 2009.

REFERENCES

1. Benjamin.C.Kuo, “Automatic Control Systems”, Prentice Hall of India, 9th Edition, 2009.
2. Gopal.M, “Control System – Principles and Design”, Tata McGraw Hill, 2nd Edition, 2002.
3. Schaum’s Outline Series, “Feedback and Control Systems”, Tata McGraw-Hill, 2007.
4. Katsuhiko Ogata, “Modern Control Engineering”, Prentice Hall, 2010.

Course Outcomes	Program Outcomes (POs)												Program Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	3	3	3	2							2	2	2	2	3
CO2	3	3	3	2	2							2	2		2	3
CO3	3	3	3	3	2							2	2		2	3
CO4	3	3	3	3	2							2	2		2	3
CO5	3	3	3	3	2							2	2		2	3
CO6	3	3	3	3	2							2	2		2	3

Enter correlation levels 1, 2 or 3 as defined below: 1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

191EC53 ANTENNAS AND MICROWAVE ENGINEERING L T P C
3 0 0 3

Programme: B.E. Electronics and Communication Engineering **Sem: 5 Category: PC**

AIM: To enable the student to understand the basic principles in antenna and microwave system design

Course Outcomes

CO1: Apply the basic principles and evaluate antenna parameters and link power budgets
CO2: Design and assess the radiation mechanism and design aspects of various antennas
CO3: Analyze the applications of various antenna arrays
CO4: Develop knowledge of Microwave Passive Components
CO5: Elaborate about Microwave Semiconductor Devices
CO6: Design a microwave system given the application specifications

INTRODUCTION TO MICROWAVE SYSTEMS AND ANTENNAS

Microwave frequency bands, Physical concept of radiation, Near- and far-field regions, Fields and Power Radiated by an Antenna, Antenna Pattern Characteristics, Antenna Gain and Efficiency, Aperture Efficiency and Effective Area, Antenna Noise Temperature and G/T, Impedance matching, Friis transmission equation, Link budget and link margin, Noise Characterization of a microwave receiver.

RADIATION MECHANISMS AND DESIGN ASPECTS

Radiation Mechanisms of Linear Wire and Loop antennas, Aperture antennas, Reflector antennas, Microstrip antennas and Frequency independent antennas, Design considerations and applications.

ANTENNA ARRAYS AND APPLICATIONS

Two-element array, Array factor, Pattern multiplication, Uniformly spaced arrays with uniform and non-uniform excitation amplitudes, Smart antennas.

PASSIVE AND ACTIVE MICROWAVE DEVICES

Microwave frequencies- Microwave Systems-Microwave Applications -Scattering matrix - Concept of N port scattering matrix representation- Properties of S matrix - S matrix formulation of two-port junction- Microwave Passive components: Directional Coupler, Power Divider, Magic Tee, attenuator, resonator, Principles of Microwave Semiconductor Devices: Gunn Diodes, IMPATT diodes, Schottky Barrier diodes, PIN diodes, Microwave tubes: Klystron, TWT, Magnetron.

MICROWAVE DESIGN PRINCIPLES

Impedance transformation, Impedance Matching, Microwave Filter Design, RF and Microwave Amplifier Design, Microwave Power amplifier Design, Low Noise Amplifier Design, Microwave Mixer Design, Microwave Oscillator Design.

TOTAL PERIODS 45

TEXT BOOKS

1. John D Krauss, Ronald J Marhefka and Ahmad S. Khan, "Antennas and Wave Propagation: Fourth Edition, Tata McGraw-Hill, 2006.

REFERENCES

1. David M. Pozar, "Microwave Engineering", Fourth Edition, Wiley India, 2012.

2. Constantine A.Balanis, ―Antenna Theory Analysis and Design‖, Third edition, John Wiley India Pvt Ltd., 2005. 2. R.E.Collin, "Foundations for Microwave Engineering", Second edition, IEEE Press, 2001

Course Outcomes	Program Outcomes (POs)												Program Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	3	3	2	2							1	3	2		2
CO2	3	3	3	2	2							2	3	2		2
CO3	3	3	3	3	2	2						2	3	2		2
CO4	3	3	2	2	2							2	3	2	2	2
CO5	3	2	3	2	2	2						2	3	2	2	2
CO6	3	3	3	2	2	3						2	3	2	2	2

Enter correlation levels 1, 2 or 3 as defined below: 1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

191EC54 **DIGITAL SIGNAL PROCESSING AND ARCHITECTURE**

L	T	P	C
3	2	0	4

Programme: B.E. Electronics and Communication Engineering **Sem: 5** **Category: PC**

AIM: To design and implement IIR and FIR filters in digital signal processors

Course Outcomes

CO1: Design digital IIR Butterworth and Chebyshev filters.

CO2: Construct digital FIR filters using windowing technique.

CO3: Interpret the effects of finite precision representation on digital filters

CO4: Analyze the power spectrum using parametric and non-parametric methods.

CO5: Apply adaptive filters appropriately in communication systems

CO6: Illustrate the architecture and programming of TMS processors

INFINITE IMPULSE RESPONSE FILTERS **12**

Review of DFT, FFT, 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, BPF, BRF) - Approximation of derivatives, Impulse invariance method, Bilinear transformation. Frequency transformation in the analog domain. Structure of IIR filter - direct form I, direct form II, Cascade, parallel realizations.

FIR FILTER DESIGN **12**

Symmetric and Antisymmetric FIR filters - Linear phase FIR filter - Filter design using windowing techniques (Rectangular Window, Hamming Window, Hanning Window and Blackmann Windows), Frequency sampling techniques - Realization of FIR filters – Transversal, Linear phase and Polyphase structures.

POWER SPECTRUM ESTIMATION **12**

Estimation of spectra from Finite duration observation of signals, non- parametric methods for power spectrum estimation -Welch, Bartlett methods, parametric methods for power spectrum estimation - Yule-Walker method for the AR model parameters

FINITE WORD LENGTH EFFECTS **12**

Fixed point and floating point number representation - ADC - quantization - truncation and rounding - quantization noise - input / output quantization - coefficient quantization error - product quantization error - overflow error - limit cycle oscillations due to product quantization and summation - scaling to prevent overflow.

INTRODUCTION TO DIGITAL SIGNAL PROCESSORS **12**

DSP functionalities - circular buffering – DSP architecture – Fixed and Floating point architecture principles, Introduction to ADSP- 2100 family of processors – Programming – Architecture of DSP chip TMS320C54x and TMS320C55x, TMS320C6X DSP chip CPU Operation

TOTAL PERIODS 60

TEXT BOOKS

1. John G. Proakis& Dimitris G.Manolakis, Digital Signal Processing – Principles, Algorithms & Applications, Fourth Edition, Pearson Education / Prentice Hall, 2007.

REFERENCES

1. Emmanuel C.Ifeachor& Barrie. W. Jervis, Digital Signal Processing, Second Edition, Pearson Education / Prentice Hall, 2002.
2. A. V. Oppenheim, R.W. Schafer and J.R. Buck, Discrete-Time Signal Processing, 8thIndian Reprint, Pearson, 2004.
3. Sanjit K. Mitra, Digital Signal Processing – A Computer Based Approach, Tata Mc Graw Hill, 2007.
4. Andreas Antoniou, Digital Signal Processing, Tata Mc Graw Hill, 2006.

Course Outcomes	Program Outcomes (POs)												Program Specific Outcomes (PSOs)			
	PO 1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	3	3	3	3							2	2		3	
CO2	3	3	3	3	3							2	2	2	3	2
CO3	3	3	3	3	3							2	2	2	3	2
CO4	3	3	2	2	2							2	2		3	
CO5	3	3	2	3	3							2	2	2	2	2
CO6	3	3	2	3	3							2	2	2	2	2

Enter correlation levels 1, 2 or 3 as defined below: 1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

191EC55 EMBEDDED SYSTEMS AND IOT

L	T	P	C
3	0	2	4

Programme: B.E. Electronics and Communication Engineering **Sem: 5** **Category: PC**

AIM: To design and develop embedded computer systems to adopt IoT.

Course Outcomes

CO1: Analyze the differences between the general computing system and the embedded system, also recognize the classification of embedded systems.

CO2: Develop various device drivers for embedded products.

CO3: Apply knowledge on the architecture and software aspects of ARM processor

CO4: Construct real time embedded systems using the concepts of RTOS.

CO5: Identify the internal design process of real time embedded products.

CO6: Elaborate the real-life case studies of embedded systems.

INTRODUCTION TO EMBEDDED SYSTEMS **9**

Review of 8085, 8086, 8051 –Definition and Classification – Characteristics of embedded systems –Challenges of embedded systems – Overview of processors and hardware units in an embedded system – Software embedded into the system – Exemplary embedded Systems –Embedded system design process.

DEVICES DRIVERS ,BUSES AND INTERRUPT SERVICING MECHANISM **9**

Overview of Embedded programming in ALP and C – Device drivers – Parallel port device drivers in a system- Serial port device drivers in a system- Device drivers for internal programmable timing devices – Embedded Buses – 1^2C- USB and CANBuses- Interrupt servicing mechanism – Context and period for context switching- Deadline and Interrupt latency

REAL TIME OPERATING SYSTEMS **9**

Definitions of process, tasks and threads –Operating system services- Goals and structures - Kernel services – Concept of semaphores - RTOS task scheduling models – Co-operative Round Robin scheduling – Cyclic scheduling with time slicing– Preemptive scheduling model – Critical section service by a preemptive scheduler – Fixed (static) real time scheduling of tasks – Priority inversion problem and deadlock situations.

INTERNET OF THINGS **9**

Definition – phases – Foundations – Policy– Challenges and Issues - identification - security – privacy. Components in internet of things: Control Units – Sensors – Communication modules – Power Sources – Communication Technologies – RFID – Bluetooth – Zigbee – Wifi – Rflinks – Mobile Internet – Wired Communication

PROGRAMMING THE MICROCONTROLLER FOR IOT **9**

Basics of Sensors and actuators – examples and working principles of sensors and actuators – Cloud computing and IOT – Arduino/ Equivalent Microcontroller platform – Setting up the board - Programming for IOT – Reading from Sensors Communication: Connecting microcontroller with mobile devices – communication through Bluetooth and USB – connection with the internet using wifi / Ethernet

LIST OF EXPERIMENTS:

1. Simple Assembly language programming using 8051.
2. Configuring and interfacing 8051 I/O ports using KEIL IDE.
3. Interfacing, Programming of Stepper Motor /Servo Motor& DC Motor Speed control.

4. Making different LED pattern design using Arduino Board.
5. Buzzer/LCD interface using Arduino Board
6. Basic RTOS Application Design.
7. Mobile server Hacking using IoT
8. Client Server Model using IoT
9. Basic Robotic Kit using TIVA processor and IoT
10. Voice Activate Robot using IoT

TOTAL PERIODS 60

TEXT BOOKS

1. Rajkamal, "Embedded Systems Architecture, Programming and Design", Tata McGraw-Hill, 2nd Edition , 2009.
2. Dieter Uckelmann et.al, "Architecting the Internet of Things", Springer, 2011.

REFERENCES

1. Steve Heath, "Embedded Systems Design", 2nd Edition, Elsevier Publications, 2002.
2. David E-Simon, "An Embedded Software Primer", Pearson Education, 2007.
3. Frank Vahid and Tony Gwasrgie, "Embedded system Design", John Wiley and Sons, 2002.
4. Wayne Wolf, "Computers as Components – Principles of Embedded Computer System Design", 3rd Edition Morgan Kaufmann Publisher, 2006.
5.Cuno Pfister, "Getting Started with the Internet of Things", O'Reilly, 2011.

Course Outcomes	Program Outcomes (POs)												Program Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	2	3	2	2	2			2			2	2	2		3
CO2	3	2	3	2	2	2			2			2	2	2		3
CO3	2	3	3	3	3	2			2			2	2	2		3
CO4	3	3	3	2	3	3			2		2	2	2	2		3
CO5	2	3	2	2	2	2			2			2	2	2		3
CO6	2	3	2	2	2	2			2			2	2	2	3	3

Enter correlation levels 1, 2 or 3 as defined below: 1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

191EC57 COMMUNICATION SYSTEMS LABORATORY L-T-P C
0-0-2 1

Programme: B.E. Electronics and Communication Engineering **Sem:** 5 **Category:** **PC**

AIM: To develop analog communication and digital communication systems

Course Outcomes: The students will be able to

CO1: Analyze the operation of sampling and time division multiplexing.

CO2: Design different Modulation and demodulation circuits in analog communication

CO3: Demonstrate their knowledge in base band signaling schemes through implementation of FSK, PSK and DPSK

CO4: Apply various channel coding schemes & demonstrate their capabilities towards the improvement of the noise performance of communication system

CO5: Construct end-to-end Communication Link

CO6: Simulate & validate the various functional modules of a communication system

LIST OF EXPERIMENTS

1. Signal Sampling and reconstruction
2. Time Division Multiplexing
3. AM Modulator and Demodulator
4. Pre-emphasis and De- emphasis
5. FM Modulator and Demodulator
6. Pulse Code Modulation and Demodulation
7. Delta Modulation and Demodulation
8. Observation (simulation) of signal constellations of BPSK, QPSK and QAM
9. Line coding schemes
10. FSK, PSK and DPSK schemes (Simulation)
11. Error control coding schemes - Linear Block Codes (Simulation)
12. Communication link simulation
13. Equalization – Zero Forcing & LMS algorithms(simulation)

TOTAL PERIODS: 45

Course Outcomes	Program Outcomes (POs)												Program Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	3	3	2	2				3	1	2	2	3		3	2
CO2	3	3	2	2	2	1			3	1	2	2	3	2	3	2
CO3	3	3	3	2	2				3	1	2	2	2	2	3	2
CO4	3	3	2	2	3	1			3	1	2	2	2		2	2
CO5	3	3	2	2	2				3	1	2	2	3		2	2
CO6	3	3	2	2	2	1			3	2	2	2	3	2	3	2

Enter correlation levels 1, 2 or 3 as defined below: 1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

191EC58 DSP AND PROCESSORS LABORATORY L-T-P C
0-0-2 1

Programme: B.E. Electronics and Communication Engineering **Sem:** 5 **Category: PC**

AIM: The purpose of this course is to develop skills of the students in implementing Digital signal Processing techniques using MATLAB and Processors.

Course Outcomes: The students will be able to

CO1: Construct algorithms of Digital Signal Processing techniques like convolution and Fourier Transform.

CO2: Experiment with Integrated Development Environment (Code Composer Studio)for Digital Signal Processor.

CO3: Interpret the architecture of Digital Signal Processors.

CO4: Implement linear and circular convolution.

CO5: Analyze the different types of filters using DSP Processor and Matlab.

CO6: Design adaptive filters for various applications of DSP.

LIST OF EXPERIMENTS:

MATLAB / EQUIVALENT SOFTWARE PACKAGE

1. Generation of sequences (functional & random)
2. Linear and Circular Convolutions
3. FIR filter design
4. IIR filter design
5. Multirate Filters
6. Determination of Power Spectrum of a given signal

DSP PROCESSOR BASED IMPLEMENTATION

1. Study the architecture of DSP chips – TMS320C5X/6X Instructions and its addressing modes
2. Generation of sine, square and triangular waveforms
3. Implementation of linear and circular convolution
4. Sampling of input signal and display
5. Implementation of FIR filter
6. Implementation of IIR filter
7. Implementation of Radix – 2 FFT using ADSP 21XX processor.
8. Adaptive filter for noise cancellation
9. Implementation of Multirate signal processing – Decimation and Interpolation filter

(Note: Experiments may be done using any one of the TMS320C5X/ TMS320C67XX/ ADSP21XX family of processors)

TOTAL PERIODS 45

Course Outcomes	Program Outcomes (Pos)												Program Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	3	3	2	2				3	1	2	2	3	2	3	3
CO2	3	3	3	3	2				3	1	2	2	3	2	3	3
CO3	3	3	3	2	2				3	1	2	2	2	2	3	3
CO4	3	3	3	3	2				3	1	2	2	3	2	3	3
CO5	3	3	3	2	2				3	1	2	2	3	2	3	3
CO6	3	3	3	3	2	2			3	1	2	2	3	2	3	3

Enter correlation levels 1, 2 or 3 as defined below: 1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

191EC61 **WIRELESS COMMUNICATION** **L-T-P C**
3-0-0 3

Programme: B.E. Electronics and Communication Engineering **Sem:** 6 **Category:** **PC**

AIM: To analyze and construct various Wireless communication systems

Course Outcomes: The students will be able to

CO1: Build the idea about modern wireless network.

CO2: Elaborate the cellular concepts such as frequency reuse, handoff, interference and problems in frequency reuse.

CO3: Analyze the Large scale path loss in Propagation mechanisms and idea about Wireless Standards.

CO4: Construct and Analyze the small scale radio propagation models and predicts their effects.

CO5: Develop the solutions for various analog and digital modulation techniques.

CO6: Justify how the SNR and BER are minimized by Equalization and diversity techniques.

MODERN WIRELESS COMMUNICATION SYSYTEMS **9**

Introduction to Wireless Communication Systems, 2G and 3G Wireless Networks, WLL, LMDS, WLAN, Bluetooth and PAN, Principles of Cellular networks- Frequency reuse, Channel Assignment Strategies, Handoff Strategies, Interference and System Capacity, Trunking and Grading of Service, Improving coverage and capacity in cellular systems.

LARGE SCALE PATH LOSS & WIRELESS STANDARD **9**

Free Space Propagation, Relating Power to Electric Field, Three Basic Propagation Mechanisms – Reflection, Diffraction and Scattering, Ground Reflection Model**,** Wireless Standard – GSM, IS 95.

SMALL SCALE FADING AND MULTIPATH PROPAGATION **9**

Small Scale Multipath propagation, Parameters of mobile multipath channels, types of small scale fading, Rayleigh and Rician Distributions, Clarke's Model for flat fading.

SIGNAL PROCESSING IN WIRELESS SYSTEMS **9**

Principle of Diversity, Macro diversity, Micro diversity, Signal Combining Techniques, Transmit diversity, Equalizers- Linear and Decision Feedback equalizers, Review of Channel coding and Speech coding techniques.

4G NETWORK ARCHITECTURE AND MIMO SPATIAL MULTIPLEXING **9**

LTE – Evolution to 4G – Network Architecture -MIMO Spatial Multiplexing – MIMO capacity – Code words and Layer Mapping – Downlink MIMO transmission chain – MIMO Precoding – CDD based precoding – Open loop spatial multiplexing, 5G architecture.

TOTAL PERIODS 45

TEXT BOOK

1. Rappaport. T.S., "Wireless communications", Pearson Education,2nd edition, 2010.

REFERENCES

1. Andreas.F. Molisch, “Wireless Communications”, John Wiley – India, Reprint 2008.
2. Sanjay Kumar ,’Wireless Communications Fundamental & Advanced Concepts’, River Publishers, 2015
2. SimonHaykin& Michael Moher, “Modern Wireless Communications”, Pearson Education, 2007.
3. Gordon L.Stuber, “Principles of Mobile Communication”, Springer International Ltd.,3rd edition, 2011.
4. Andrea Goldsmith, Wireless Communications, Cambridge University Press, 2007.

Course Outcomes	Program Outcomes (POs)												Program Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	2	3	2	2	1						2	3		3	2
CO2	3	2	3	2	3	2						2	3		3	
CO3	3	3	2	2	2	1						2	3		3	
CO4	3	3	3	2	2	2	1					2	3		3	
CO5	3	3	3	2	2							2	3		3	2
CO6	3	2	2	2	2	1						2	3		3	2

Enter correlation levels 1, 2 or 3 as defined below: 1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

191EC62 **MACHINE LEARNING** **L T P C**
3 0 0 3

Programme: B.E. Electronics and Communication Engineering **Sem: 6** **Category: PC**

AIM: To understand the new approaches in machine learning to design appropriate algorithms for problem solving

Course Outcomes

CO1: Distinguish between supervised, unsupervised, semi-supervised machine learning approaches.

CO2: Apply specific supervised or unsupervised machine learning algorithm for a particular problem.

CO3: Analyze and suggest the appropriate machine learning approach for the various types of problem.

CO4: Design and make modifications to existing machine learning algorithms to suit an individual application.

CO5: Summarize useful case studies on the advanced machine learning algorithms.

CO6: Design appropriate machine learning algorithms for problem solving.

INTRODUCTION **9**

Learning Problems – Perspectives and Issues – Concept Learning – Version Spaces and Candidate Eliminations – Inductive bias – Decision Tree learning – Representation – Algorithm – Heuristic Space Search.

NEURAL NETWORKS AND GENETIC ALGORITHMS **9**

Neural Network Representation – Problems – Perceptrons – Multilayer Networks and Back Propagation Algorithms – Support Vector Machine

BAYESIAN AND COMPUTATIONAL LEARNING **9**

Bayes Theorem – Concept Learning – Maximum Likelihood – Minimum Description Length Principle – Bayes Optimal Classifier – Gibbs Algorithm – Naïve Bayes Classifier – Bayesian Belief Network – EM Algorithm – Probability Learning – Sample Complexity – Finite and Infinite Hypothesis Spaces – Mistake Bound Model.

INSTANT BASED LEARNING **9**

K- Nearest Neighbour Learning – Locally weighted Regression – Radial Bases Functions – Case Based Learning.

ADVANCED LEARNING **9**

Learning Sets of Rules – Sequential Covering Algorithm – Learning Rule Set – First Order Rules – Sets of First Order Rules – Induction on Inverted Deduction – Inverting Resolution – Analytical Learning – Perfect Domain Theories – Explanation Base Learning – FOCL Algorithm – Reinforcement Learning – Task – Q-Learning – Temporal Difference Learning

TOTAL PERIODS 45

TEXT BOOKS

1. Tom M. Mitchell, ―Machine Learning, McGraw-Hill Education (India) Private Limited, 2013.

REFERENCES

1. Ethem Alpaydin, ―Introduction to Machine Learning (Adaptive Computation and Machine Learning), The MIT Press 2004.
2. Stephen Marsland, ―Machine Learning: An Algorithmic Perspective, CRC Press, 2009

Course Outcomes	Program Outcomes (POs)												Program Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	3	2	2								1	2	2	3	2
CO2	2	2	2	2	2	1						1	2		3	2
CO3	2	2	2	2	2	1						1	2		3	2
CO4	3	2	2	2	2							1			3	2
CO5	3	2	2	2	2	1						1	2		3	2
CO6	2	2	2	2	1							1			3	2

Enter correlation levels 1, 2 or 3 as defined below: 1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

191EC63	DATA COMMUNICATION NETWORKS	L-T-P	C
		3-0-0	3

Programme: B.E. Electronics and Communication Engineering **Sem:** 6 **Category:** PC

AIM: To elaborate the concept, terminologies, and technologies used in modern data communication and computer networking.

Course Outcomes: The students will be able to

CO1: Identify the components required to build different types of networks.
CO2: Examine the require functionality at each layer for given application.
CO3: Identify solution for each functionality at each layer.
CO4: Illustrate the flow of information from one node to another node in the network.
CO5: Compare and classify various internal routing protocols.
CO6: Elaborate about sub netting, routing mechanisms and connection-oriented and connectionless protocol at the transport layer.

FUNDAMENTAL AND PHYSICAL LAYER **9**

Data Communications – Networks - Networks models – OSI model – Layers in OSI model – TCP / IP protocol suite – Addressing – Guided and Unguided Transmission media, Switching: Circuit switched networks – Data gram Networks – Virtual circuit networks.

DATA LINK LAYER **9**

Data link control: Framing – Flow and error control –Protocols for Noiseless and Noisy Channels – HDLC -Wired LANS : Ethernet – IEEE standards – standard Ethernet – changes in the standard – Fast Ethernet – Gigabit Ethernet– 10 Gigabit Ethernet. Wireless LANS : IEEE 802.11–Bluetooth–WiMAX.

NETWORK LAYER **9**

Logical addressing: IPv4, IPv6 , Internet Protocol: Internetworking – IPv4– ICMPv4 – Next generation IP: IPv6– ICMPv6–LoRaWAN, Delivery - Forwarding – Routing – Unicast, routing protocols-Distance Vector Routing and Link State Routing.

TRANSPORT LAYER **9**

Process-to-Process delivery - User Datagram Protocol (UDP) – Transmission Control Protocol (TCP) – Congestion Control – Quality of services (QoS) – Techniques to improve QoS.

APPLICATION LAYER **9**

Domain Name System (DNS) – E-mail (MIME,SMTP, POP3, IMAP4) – FTP – WWW – HTTP - Digital signature

TOTAL PERIODS45

TEXT BOOK

1. Behrouz A. Foruzan, "Data communication and Networking", Fifth Edition,Tata McGraw-Hill, 5th edition 2013.

REFERENCES

1. Wayne Tomasi, "Introduction to Data Communication and Networking", 1/e, Pearson Education.2009
2. James .Kurose.F & Rouse.W, "Computer Networking: A Topdown Approach Featuring",3/e, Pearson Education.2010
3. Greg Tomshon, Ed Tittel, David Johnson. "Guide to Networking Essentials", fifth edition, Thomson India Learning, 2007.
4. William Stallings, "Data and Computer Communication", Eighth Edition, Pearson Education, 2000.

Course Outcomes	Program Outcomes (POs)												Program Specific Outcomes (PSOs)			
	PO 1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	3	2	3					2			3	3	2		3
CO2	3	3	2	2								2	3			2
CO3	3	3	3	2	3				2			2	3			2
CO4	3	2	3	3								2	3			2
CO5	3	3	2	3	2	1			3			2	3			2
CO6	3	3	3	3		1						2	3			2

Enter correlation levels 1, 2 or 3 as defined below: 1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

191EC64	VLSI DESIGN		L-T-P	C
			3-0-2	4
Programme:	B.E. Electronics and Communication Engineering	**Sem: 6**	**Category:**	**PC**

AIM: To elaborate theConcepts of VLSI design using the CMOS technology and CMOS Design.

Course Outcomes: The students will be able to

CO1: Apply mathematical methods and circuit analysis models in analysis of CMOS circuits.
CO2: Apply CMOS technology-specific layout rules in the placement and routing of transistors and interconnect, and to verify the functionality, timing, power, and parasitic effects.
CO3: Design a significant VLSI design project having a set of objective criteria and design constraints.
CO4: Construct static and dynamic CMOS combinational and sequential logic at the transistor level, including mask layout. Ability to Compare the tradeoffs of sequencing elements including flip-flops, transparent latches, and pulsed latches.
CO5: Utilize the system design methods in standard and full custom design.
CO6:Infer the different testing techniques for chip level and system level.

MOS TRANSISTOR THEORY AND CMOS PROCESSING TECHNOLOGY **9**

Introduction,MOS Device Design Equation,CMOS Inverter DC transfer characteristics , Pseudo NMOS inverter ,Transmission gate,Tristate inverter,nwell CMOS process technology ,CMOS process Enhancement, Layout Design Rules,Latchup,Technology related CAD issues.

DEVICE CHARACTERIZATION AND PERFORMANCE ESTIMATION **9**

Resistance and Capacitance Estimation, Switching Characteristics,CMOS Transistor sizing, Power dissipation, Charging,Design margin, Reliability and Scaling of MOS transistor circuit.

COMBINATIONAL AND SEQUENTIAL LOGIC DESIGN IN CMOS **9**

Static and Dynamic CMOS Design, Power Consumption in CMOS gates, Static and Dynamic Sequential circuits,Non-Bistable Sequential circuits.

SYSTEM DESIGN AND DESIGN METHODS **9**

Design Strategies,CMOS Chip Design-Programmable Logic, Programmable Interconnect, Programmable Gate Arrays, Gate Array Design, Standard Cell Design, Full Custom Design, Design methods-Design Capture and Verification tools,Arthimetic Circuits in CMOS-Bit Adder, Ripple Carry Adder Circuits,CLA,Multiplier,FSM.

CMOS TESTING **9**

Need for Testing, Manufacturing Test Principles, Design Strategies for Test, Chip Level and System Level Test Techniques.

LIST OF EXPERIMENTS: **15**

1. Design and implementation of adders and subtractors.
   a.Half adders
   b.Half Subtractor
   c.Full adder
   d.Full Subtractor.
2. Design and implementation of fast adder.

3. Design and implementation of Combinational Circuits.
   a.Multiplexer &Demultiplexer
   b.Encoder &Decoder
   c.Parity generator and checker
   d.Magnitude Comparator
4. Design and implementation of flip flops (SR,D,JK,T)
5. Design and implementation of Shift registers(SISO,SIPO,PISO,PIPO)
6. Design and implementation of Asynchronous and Synchronous up/down Counter.
7. Design and implementation of Sequence generator.
8. Design and implementation of FSM.
9. Study of Placing, Rooting and Back annotation for FPGAs.
10. Study of FPGA board and testing on board LEDs and switches using Verilogcode.
11. Design a Layout for CMOS inverter, CMOSNAND, CMOS NOR using layout tool.

TOTAL PERIODS: 60

TEXT BOOKS

1.Neil H.E Weste&KamaranEshraghian,Principles of CMOS VLSI Design,2nd Edition,Pearson Education,2010

2.John P.Uyemura,Introduction to VLSI Circuits and Systems,John Wiley & Sons Private Ltd,2002

REFERENCES

1.Weste and Harris: CMOS VLSI DESIGN (fourth edition) Pearson Education, 2010

2.Pucknell. D.A&K.Eshraghian Basic VLSI Design, Third edition, PHI, 2003

3.Samura Palnitkar –verilog HDL –Guide to digital design and synthesis , 3rd edition , Pearson Education 2003

4.Jan Rabaey.M,Digital Integrated Circuits :A design Perspective, secong Edition fifth reprint Prentice Hall 2002.

Course Outcomes	Program Outcomes (POs)												Program Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	3	3	2	2	2						2	3	3		2
CO2	3	3	3	1	2	2						2	3	3		2
CO3	3	3	3	3	3	3			3		2	2		3	3	3
CO4	3	3	3	3	3	2			3		2	2		3		3
CO5	3	3	3	1	2	2						2		3		3
CO6	3	3	3	3	3	2						2		3		3

Enter correlation levels 1, 2 or 3 as defined below: 1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

191EC67 **MACHINE LEARNING LABORATORY** **L T P C**
0 0 2 1

Programme: B.E. Electronics and Communication Engineering **Sem: 6** **Category: PC**
AIM: Enable students to identify the Data sets in implementing the machine learning algorithms

Course Outcomes: The students will be able to
CO1: Illustrate the implementation procedures for the machine learning algorithms
CO2: Utilize data sets for implementing machine learning algorithms
CO3: Design Java/Python programs for various Learning algorithms.
CO4: Apply appropriate data sets to the Machine Learning algorithms
CO5: Identify and apply Machine Learning algorithms to solve real world problems
CO6: Implement the machine learning concepts and algorithms in any suitable language of choice.

LIST OF EXPERIMENTS
1. Implement and demonstrate the FIND-S algorithm for finding the most specific hypothesis based on a given set of training data samples. Read the training data from a .CSV file
2. For a given set of training data examples stored in a .CSV file, implement and demonstrate the Candidate-Elimination algorithm to output a description of the set of all hypotheses consistent with the training examples
3. Write a program to demonstrate the working of the decision tree based ID3 algorithm. Use an appropriate data set for building the decision tree and apply this knowledge to classify a new sample.
4. Build an Artificial Neural Network by implementing the Backpropagation algorithm and test the same using appropriate data sets.
5. Write a program to implement the naïve Bayesian classifier for a sample training data set stored as a .CSV file. Compute the accuracy of the classifier, considering few test data sets.
6. Assuming a set of documents that need to be classified, use the naïve Bayesian Classifier model to perform this task. Built-in Java classes/API can be used to write the program. Calculate the accuracy, precision, and recall for your data set.
7. Write a program to construct a Bayesian network considering medical data. Use this model to demonstrate the diagnosis of heart patients using standard Heart Disease Data Set. You can use Java/Python ML library classes/API.
8. Apply EM algorithm to cluster a set of data stored in a .CSV file. Use the same data set for clustering using k-Means algorithm. Compare the results of these two algorithms and comment on the quality of clustering. You can add Java/Python ML library classes/API in the program.
9. Write a program to implement k-Nearest Neighbour algorithm to classify the iris data set. Print both correct and wrong predictions. Java/Python ML library classes can be used for this problem.
10. Implement the non-parametric Locally Weighted Regression algorithm in order to fit data points. Select appropriate data set for your experiment and draw graphs

TOTAL PERIODS 45

Course Outcomes	Program Outcomes (POs)												Program Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	3	2	2					3		1	1	2	2	3	2
CO2	2	2	2	2	2	1			3		1	1	2		3	2
CO3	2	2	2	2	2	1			3		1	1	2		3	2
CO4	3	2	2	2	2			1	3			1			3	2
CO5	3	2	2	2	2	1			3			1	2		3	2
CO6	2	2	2	2	1			1	3		1	1			3	2

Enter correlation levels 1, 2 or 3 as defined below: 1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

191EC68 **COMPUTER NETWORKS LABORATORY** **L-T-P C**
0-0-2 1

Programme: B.E. Electronics and Communication Engineering **Sem:** 7 **Category: PC**

AIM: To understand the concept, terminologies, and technologies used in modern data communication and computer networking.

Course Outcomes: The students will be able to
CO1: Develop Communication between two computers.
CO2: Design the different protocols.
CO3: Develop Program using Sockets
CO4: Construct and compare the various routing algorithms
CO5: Analyze Simulation Tool
CO6: Analyze Data encryption and decryption

LIST OF EXPERIMENTS

1. PC to PC Communication
   Parallel Communication using 8 bit parallel cable Serial communication using RS 232C
2. Ethernet LAN protocol
   To create scenario and study the performance of CSMA/CD protocol through simulation
3. Token bus and token ring protocols
   To create scenario and study the performance of token bus and token ring protocols through simulation
4. Wireless LAN protocols
   To create scenario and study the performance of network with CSMA / CA protocol and compare with CSMA/CD protocols.
5. Implementation and study of stop and wait protocol
6. Implementation and study of Go back-N and selective repeat protocols
7. Implementation of distance vector routing algorithm
8. Implementation of Link state routing algorithm
9. Implementation of Data encryption and decryption
10. Transfer of files from PC to PC using Windows / UNIX socket processing.
11. Study of Network simulator (NS) and simulation of Congestion Control Algorithms using NS
12. Implementation of Encryption and Decryption algorithms using any programming language

TOTAL PERIODS: 45

Course Outcomes	Program Outcomes (POs)												Program Specific Outcomes (PSOs)			
	PO 1	PO2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO12	PSO1	PSO2	PSO 3	PSO4
CO1	3	3	3	3	2				3		1	2	3		3	2
CO2	3	3	2	2	2				3		1	2	3		2	2
CO3	3	3	2	2	2				3		1	2	2	2	2	2
CO4	3	2	2	2	2			1	3			2	2		2	2
CO5	3	2	2	3	2				3			2	2		2	2
CO6	3	2	2	3	2	2		1	3		1	2	3		3	3

Enter correlation levels 1, 2 or 3 as defined below: 1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

191EC69	**MINI PROJECT**	**L-T-P**	**C**
		0-0-2	**1**

Programme: B.E. Electronics and Communication Engineering **Sem 6 Category EEC**

AIM: To develop a simplified electronic circuits and communication systemmodel suitable for any application

The students will be able to

CO1. Identify suitable problem in electronic circuits and communication systems
CO2. Apply the knowledge of fundamental engineering
CO3. Design and Develop a suitable solution for the problem
CO4. Elaborate the technical and non-technical Knowledge
CO5. Evaluate the performance cost
CO6. Develop documentation of observed results and maintain team work

Total Periods 30

Course Outcomes	**Program Outcomes (POs)**												**Program Specific Outcomes (PSOs)**			
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
CO1	3	3	2	2	2	1	1	1	3	1	2	2	3	2	2	3
CO2	3	2	2	2	2	1			3	1	2	2	3	2	2	3
CO3	3	3	2	2	2		1	1	3	1	2	1	3	2	2	3
CO4	3			2	2	1			3	1	2	2	3	2	2	3
CO5	3	3	3	2	2	1	1		3	1	2	2	3	2	2	3
CO6	3				2				3	1	2	2	3	2	2	3

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

191EC71 ROBOTICS AND ARTIFICIAL INTELLIGENCE L T P C
3 0 0 3

Programme: B.E. Electronics and Communication Engineering **Sem: 7 Category: PC**

AIM: To design the robotic systems using artificial intelligence concepts.

Course Outcomes

CO1: Identify problems that are amenable to solution by AI methods.
CO2: Identify appropriate AI methods to solve a given problem.
CO3: Estimate a given problem in the language/framework of different AI methods.
CO4: Implement basic AI algorithms.
CO5: Design and carry out an empirical evaluation of different algorithms on a problem formalization .
CO6: Elaborate ethics and risks of AI in robotics.

INTRODUCTION

Types of Robot–Technology-Robot classifications and specifications-Design and control issues-Various manipulators – Sensors - Need for AI in Robotics. Thinking and acting humanly, intelligent agents, structure of agents. PROBLEM SOLVING: Solving problems by searching –Informed search and exploration–Constraint satisfaction problems–Adversarial search, knowledge and reasoning–knowledge representation – first order logic.

PLANNING

Planning with forward and backward State space search – Partial order planning – Planning graphs–Planning with propositional logic – Planning and acting in real world.

REASONING

Uncertainty – Probabilistic reasoning–Filtering and prediction–Hidden Markov models–Kalman filters–Dynamic Bayesian Networks, Speech recognition, making decisions.

LEARNING

Forms of learning – Knowledge in learning – Statistical learning methods –reinforcement learning, communication, perceiving and acting, Probabilistic language processing, perception.

AI IN ROBOTICS

Robotic perception, localization, mapping- configuring space, planning uncertain movements, dynamics and control of movement, Ethics and risks of artificial intelligence in robotics.

TOTAL PERIODS 45

TEXT BOOKS

1. Stuart Russell, Peter Norvig, “Artificial Intelligence: A modern approch”, Pearson Education, India2003.
2. Negnevitsky, M, “Artificial Intelligence: A guide to Intelligent Systems”,. Harlow: Addison-Wesley, 2002.

REFERENCES

1. David Jefferis, “Artificial Intelligence: Robotics and Machine Evolution”, Crabtree Publishing Company, 1992.

Course Outcomes	Program Outcomes (POs)												Program Specific Outcomes (PSOs)			
	PO 1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	2	3	2	2	2						2	2	2		3
CO2	3	2	3	2	2	2						2	2	2		3
CO3	2	3	3	3	3	2						2	2	2		3
CO4	3	3	3	2	3	3			2		2	2	2	2		3
CO5	2	3	2	2	2	2						2	2	2		3
CO6	2	3	2	2	2	2						2	2	2	3	3

Enter correlation levels 1, 2 or 3 as defined below: 1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

191EC72	DIGITAL IMAGE PROCESSING	L-T-P	C
		3-0-0	3

Programme: B.E. Electronics and Communication Engineering **Sem:** 7 **Category:** PC

AIM: To analyze digital image fundamentals and familiar with image compression and segmentation techniques

Course Outcomes: The Students will be able to

CO1: Elaborate the basic concepts of sampling and quantization.
CO2: Apply the different types of image transforms and analyze its properties.
CO3: Analyze the different techniques employed for the enhancement of images.
CO4: Evaluate the methodologies for image segmentation and restoration
CO5: Analyze compression techniques and the standards.
CO6: Examine different feature extraction techniques for image analysis and recognition.

DIGITAL IMAGE FUNDAMENTALS **9**

Introduction – Origin – Steps in Digital Image Processing – Components – Elements of Visual Perception – Image Sensing and Acquisition – Image Sampling and Quantization – Relationships between pixels - Color image fundamentals -RGB, HSI models, Two-dimensional mathematical preliminaries, 2D transforms - DFT, DCT.

IMAGE ENHANCEMENT **9**

Spatial Domain: Gray level transformations – Histogram processing – Basics of Spatial Filtering– Smoothing and Sharpening Spatial Filtering – **Frequency Domain:** Introduction to Fourier Transform– Smoothing and Sharpening frequency domain filters – Ideal, Butterworth and Gaussian filters.

IMAGE RESTORATION AND SEGMENTATION **9**

Noise models – Mean Filters – Order Statistics – Adaptive filters – Band reject Filters – Band pass Filters – Notch Filters – Optimum Notch Filtering – Inverse Filtering – Wiener filtering Segmentation: Detection of Discontinuities–Edge Linking and Boundary detection – Region based segmentation-Morphological processing- erosion and dilation - Segmentation by morphological watersheds.

WAVELETS AND IMAGE COMPRESSION **9**

Wavelets – Subband coding - Multiresolution expansions - Compression: Fundamentals – Image Compression models – Error Free Compression – Variable Length Coding – Bit-Plane Coding – Lossless Predictive Coding – Lossy Compression – Lossy Predictive Coding – Compression Standards.

IMAGE REPRESENTATION AND RECOGNITION **9**

Boundary representation – Chain Code – Polygonal approximation, signature, boundary segments – Boundary description – Shape number – Fourier Descriptor, moments- Regional Descriptors Topological feature, Texture - Patterns and Pattern classes - Recognition based on matching.

TOTAL PERIODS 45

TEXT BOOKS

1.Rafael C. Gonzales, Richard E. Woods, “Digital Image Processing”, Third Edition, Pearson Education, 2010.
2.Anil Jain K. “Fundamentals of Digital Image Processing”, PHI Learning Pvt. Ltd., 2011.

REFERENCES

1. Rafael C. Gonzalez, Richard E. Woods, Steven L. Eddins, “Digital Image Processing Using MATLAB”, Third Edition Tata Mc Graw Hill Pvt. Ltd., 2011.
2. Willlliam K Pratt, “Digital Image Processing”, John Willey, 2002.
3. Malay K. Pakhira, “Digital Image Processing and Pattern Recognition”, First Edition, PHI Learning Pvt. Ltd., 2011.
4. http://eeweb.poly.edu/~onur/lectures/lectures.html.
5. http://www.caen.uiowa.edu/~dip/LECTURE/lecture.html

Course Outcomes	Program Outcomes (POs)												Program Specific Outcomes (PSOs)			
	PO 1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	3	2	2								1	2	2	3	2
CO2	2	2	2	2	2	1						1	2		3	2
CO3	2	2	2	2	2	1						1	2		3	2
CO4	3	2	2	2	2							1			3	2
CO5	3	2	2	2	2	1						1	2		3	2
CO6	2	2	2	2	1							1			3	2

Enter correlation levels 1, 2 or 3 as defined below: 1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

191EC73	FIBER OPTIC COMMUNICATION AND NETWORKS	L-T-P	C
		3-0-2	4

Programme: B.E. Electronics and Communication Engineering **Sem:** 7 **Category:** PC

AIM: To analyze and design the various optical fiber concepts and its associated parameters on system performance.

Course Outcomes: The students will be able to

CO1: Elaborate about the basic elements of optical fiber transmission link, Fiber modes Configurations and structures.
CO2: Examine the different fiber optical sources and photo detectors.
CO3: Compare and analyze the performance of different photo detectors.
CO4: Categorize Fiber Power Launching and Fiber Coupling.
CO5: Construct optical transmission media and Optical receiver.
CO6: Analyze the basic SONET/SDH, WDM &CDMA concepts in optical networks.

INTRODUCTION TO OPTICAL FIBERS **9**

Overview of Optical Fiber Communication : Evolution of Fiber Optic Systems-Elements of an Optical Fiber Transmission Link – Basic Optical Laws and Definitions - Optical Fiber Modes and Configurations-Mode Theory for Circular Waveguides - System performance .Mode Single Mode Fibers - Graded Index fiber structure - Losses in optical fibers-Attenuation & Dispersion.

9

FIBER OPTICAL SOURCES & PHOTO DETECTORS

Light Emitting Diodes - Laser Diodes - Comparison and Applications - Physical principles of Photodiodes, Photo detector Noise, Detector Response Time - Avalanche Multiplication Noise - Comparisons of Photo detectors.

POWER LAUNCHING AND COUPLING **9**

Source to Fiber Power Launching- Lensing Schemes for Coupling Improvement – Fiber to Fiber Joints-LED Coupling to Single Mode Fibers-Fiber Splicing-Optical Fiber Connectors

DIGITAL TRANSMISSION SYSTEMS & OPTICAL RECEIVERS **9**

Point to Point links - Noise effect on System Performance – Fundamental Receiver Operations – Digital Receiver Performance –Detailed Performance Calculations- Pre amplifier Types - Analog receiver

WDM CONCEPTS AND OPTICAL NETWORKS **9**

Operational Principles of WDM – SONET/SDH Transmission Formats and Speeds- Optical Interfaces-SONET/SDH Rings- SONET/SDH Networks-Broadcast and Select WDM Networks -Wavelength Routed Networks - Nonlinear Effects on Network Performance- Solitons - Optical CDMA-Ultrahigh Capacity Networks

LIST OF EXPERIMENTS:

1. Measurement of connector, bending and fiber attenuation losses.
2. Numerical Aperture and Mode Characteristics of Fibers.
3. DC Characteristics of LED and PIN Photo diode.
4. Fiber optic Analog and Digital Link Characterization - frequency response(analog), eye diagram and BER (digital)

TOTAL PERIODS **60**

TEXT BOOK

1.Gerd Keiser "Optical Fiber Communications", McGraw Hill, New Delhi, 3rd edition, 2008.

REFERENCES

1. Franz J.H. Jain V.K, "Optical Communication, Components and systems", Narosa publications, New Delhi, 2000.
2. Mynbaev.K and Lowell L Scheiner, "Fiber Optic Communication Technology", Pearson Education Asia, New Delhi, 2001.
3. Gower, J "Optical Communication Systems", PHI, New Delhi, 2nd edition, Fifth reprint,1995.
4. John M. Senior, "Optical Fiber Communication" Pearson Education – Second Edition. 2007

Course Outcomes	Program Outcomes (POs)												Program Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	2	3	3	2				3			1	3	2	1	2
CO2	3	2	3	2	2	1			3			1	3	2	2	2
CO3	3	3	2	2	2	1			3			1	2	2	2	2
CO4	3	2	2	2	2	1			3			2	2	2	2	2
CO5	3	3	2	3	2	1			3			1	2	2	3	2
CO6	3	3	3	2	2	2			3			2	2	2	2	2

Enter correlation levels 1, 2 or 3 as defined below: 1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

191EC77	ROBOTICS AND ARTIFICIAL INTELLIGENCE LABORATORY	L	T	P	C
		0	0	2	1

Programme: B.E. Electronics and Communication Engineering **Sem: 7** **Category: PC**

AIM: To develop robotics systems using AI

Course Outcomes: The Students will be able to

CO1: Determine the position links

CO2: Infer the transformation with respect to gripper and co-ordinate system

CO3: Evaluate the performance of the robot.

CO4: Develop programming for colour and shape identification

CO5: Develop robots for industry process

CO6: Design robots for multiprocess

LIST OF EXPERIMENTS

1. Determination of maximum and minimum position of links.
2. Verification of transformation (Position and orientation) with respect to gripper and world coordinate system
3. Estimation of accuracy, repeatability and resolution.
4. Robot programming and simulation for pick and place
5. Robot programming and simulation for Colour identification
6. Robot programming and simulation for Shape identification
7. Robot programming and simulation for machining (cutting, welding)
8. Robot programming and simulation for writing practice
9. Robot programming and simulation for any industrial process (Packaging, Assembly)
10. Robot programming and simulation for multi process.

TOTAL PERIODS 45

Course Outcomes	Program Outcomes (POs)												Program Specific Outcomes (PSOs)			
	PO 1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	2	3	3	3	2			3	1	2	2	2	2		3
CO2	3	2	2	2	2	2			3	2	2	2	2	2		3
CO3	3	2	2	3	2	2			3	1	2	2	2	2		3
CO4	3	3	2	2	3	2			3	1	2	3	2	2		3
CO5	2	2	3	2	3	2			3	2	2	2	2	2		3
CO6	2	2	3	2	3	2			3	1	2	2	2	2		3

Enter correlation levels 1, 2 or 3 as defined below: 1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

191EC78 DIGITAL IMAGE PROCESSING LABORATORY L T P C
0 0 2 1

Programme: B.E. Electronics and Communication Engineering **Sem: 7 Category:PC**

AIM: To analyze and estimate the various image processing methods

Course Outcomes: The Students will be able to

CO1: Experiment with enhancing operations on the image using spatial filters and frequency domain filters.

CO2: Utilize transforms and analyse the characteristics of the image

CO3: Apply segmentation operations in the images

CO4: Estimate the efficiency of the compression technique on the images.

CO5: Apply image processing technique to solve real health care problems.

CO6: Elaborate the DICOM standards

LIST OF EXPERIMENTS

Simulation using MATLAB

1.Image sampling and quantization
2.Analysis of spatial and intensity resolution of images.
3.Intensity transformation of images.
4.DFT analysis of images
5.Transforms (Walsh, Hadamard, DCT, Haar)
6.Histogram Processing and Basic Thresholding functions
7.Image Enhancement-Spatial filtering
8.Image Enhancement-Filtering in frequency domain
9.Image segmentation–Edge detection, line detection and point detection.
10.Basic Morphological operations and Segmentation using watershed transformation
11.Region based Segmentation
12.Analysis of images with different color models.
13.Study of DICOM standards
14.Image compression and Image restoration techniques

TOTAL PERIODS 45

Course Outcomes	Program Outcomes (POs)												Program Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	3	2	2					3	1	1	1	2	2	3	2
CO2	2	2	2	2	2	1			3	1	1	1	2		3	2
CO3	2	2	2	2	2	1			3	1	1	1	2		3	2
CO4	3	2	2	2	2				3	1	1	1			3	2
CO5	3	2	2	2	2	1			3	1	1	1	2		3	2
CO6	2	2	2	2	1				3	1	1	1			3	2

Enter correlation levels 1, 2 or 3 as defined below: 1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

191EC79 **PROJECT WORK – I** **L T P C**

0 0 4 2

Programme: B.E Electronics and Communication Engineering **Sem: 7** **Category: EEC**

Aim: To develop a simplified electronics and communication model suitable for any application.

Course Outcomes: The Students will be able to

CO1: Make use of new tools and apply it.

CO2: Create new ideas for solving problems.

CO3: Outline the works under different persons (Project Management skills).

CO4: Develop the skill to communicate effectively and demonstrate the work.

CO5: Develop and analyze solutions for critical real-world Problem.

CO6: Plan to work as an individual and also as a team.

Course Outcomes	Program Outcomes (POs)												Program Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	2	3	2	3	1		2	3	1	2	2	3	3	3	3
CO2	3	3	3	3	2	2	2		3		2	2	3	3	3	3
CO3	3	2			2	2	1	2	3	3	3	2	2	2	2	2
CO4	3	2	2	1	1			2	3	3	3	2	2	2	2	2
CO5	3	3	2	2	2				3		3	2	3	3	3	3
CO6						1			3	2	3	1	3	2	2	3

Enter correlation levels 1, 2 or 3 as defined below: 1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

191EC87 **PROJECT WORK – II** **L T P C**

0 0 12 6

Programme: B.E Electronics and Communication Engineering **Sem: 8** **Category: EEC**

Aim: To develop a simplified electronics and communication model suitable for any application.

Course Outcomes: The Students will be able to

CO1: Make use of new tools and apply it.

CO2: Create new ideas for solving problems.

CO3: Schedule the works under different persons (Project Management skills).

CO4: Develop the skill to communicate effectively and demonstrate the work.

CO5: Develop and analyze solutions for critical real-world Problem.

CO6: Adapt work as an individual and as a team.

Course Outcomes	Program Outcomes (POs)												Program Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	2	3	2	3	1		2	3	1	2	2	3	3	3	3
CO2	3	3	3	3	2	2	2		3		2	2	3	3	3	3
CO3	3	2			2	2	1	2	3	3	3	2	2	2	2	2
CO4	3	2	2	1	1			2	3	3	3	2	2	2	2	2
CO5	3	3	2	2	2				3		3	2	3	3	3	3
CO6						1			3	2	3	1	3	2	2	3

Enter correlation levels 1, 2 or 3 as defined below: 1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

PROGRAMME ELECTIVES

191ECEA	**SATELLITE COMMUNICATION**	**L-T-P**	**C**
		3-0-0	**3**

Programme: B.E. Electronics and Communication Engineering **Sem:** - **Category:** **PE**

AIM: To become familiar with satellites and satellite services.

Course Outcomes: The students will be able to

CO1: Identify the fundamentals of orbital mechanics and the characteristics of common orbits used by communications and other satellites.

CO2: Illustrate launching methods and technologies, Overview of Spacecraft subsystem.

CO3: Evaluate accurate link budget for a satellite or other wireless communications link& Calculate the reliability of the satellite.

CO4: Analyze modern modulation and multiple access techniques in satellite systems.

CO5: Examine the radio propagation channel for Earth station to satellite and satellite to satellite communications links.

CO6: Elaborate the mobile satellite services such as GSM and GPS, Know about various satellite application such as DTH , BTV and GRAMSAT

SATELLITE ORBITS 9

Introduction – Frequency Allocations for Satellite Services – Intelsat – U.S.Domsats – Polar Orbiting Satellites – Kepler's First Law – Kepler's Second Law – Kepler's Third Law – Definitions of Terms for Earth-orbiting Satellites – Orbital Elements – Apogee and Perigee Heights – Orbital Perturbations – Effects of a Nonspherical Earth – Atmospheric Drag – Inclined Orbits The Sub-satellite Point .

SPACE SEGMENT AND SATELLITE LINK DESIGN 9

Introduction – Antenna Look Angels – The Polar Mount Antenna – Limits of Visibility – Near Geostationary Orbits – Earth Eclipse of Satellite – Sun Transit Outage – Launching Orbits – Problems – Power Supply – Attitude Control – Spinning Satellite Stabilization – Momentum Wheel Stabilization – Station Keeping – Thermal Control – TT&C Subsystem – Transponders – Wideband Receiver – Input Demultiplexer – Power Amplifier – Antenna Subsystem.

SATELLITE ACCESS 9

Introduction – Receive-Only Home TV Systems – Outdoor Unit – Indoor Unit for Analog (FM) TV – Master Antenna TV System – Community Antenna TV System – Transmit-Receive Earth Stations– Equivalent Isotropic Radiated Power – Transmission Losses – Free-Space Transmission – Feeder Losses – Antenna Misalignment Losses – Fixed Atmospheric and Ionospheric Losses – Link Power Budget Equation – System Noise – Antenna Noise – Amplifier Noise Temperature – Amplifiers in Cascade – Noise Factor – Noise Temperature of Absorptive Networks – Overall System Noise Temperature – Carrier-to-Noise Ratio – Uplink – Saturation Flux Density – Input Back Off – The Earth Station HPA – Downlink – Output Back off – Satellite TWTA Output – Effects of Rain – Uplink rain-fade margin – Downlink rain-fade margin – Combined Uplink and Downlink C/N Ratio – Intermodulation Noise.

EARTH SEGMENT 9

Single Access – Preassigned FDMA, Demand-Assigned FDMA, SPADE System.Bandwidth-limited a Power-limited TWT amplifier operation, FDMA downlink analysis.
TDMA : Reference Burst; Preamble and Postamble, Carrier recovery, Network synchronization, unique word detection, Traffic Date, Frame Efficiency and Channel capacity, preassigned TDMA, Demand assigned TDMA, Speech Interpolation and Prediction,
Code-Division Multiple Access – Direct-Sequence spread spectrum – code signal c(t) – autocorrelation function for c(t) – Acquisition and trackling – Spectrum spreading and dispreading – CDMA throughput.

9

SATELLITE APPLICATIONS

Introduction – Orbital Spacings – Power Rating and Number of Transponders – Frequencies and Polarization – Transponder Capacity – Bit Rates for Digital Television – MPEG Compression Standards – Forward Error Correction – Home Receiver Outdoor Unit (ODU) – Home Receiver Indoor Unit (IDU) – Downlink Analysis – Uplink - Satellite Mobile Services – VSATs – Radarsat – Global Positioning Satellite System .

TOTAL PERIODS45

TEXT BOOK

1. Dennis Roddy, 'Satellite Communication', McGraw Hill International, 4th Edition, 2006.

REFERENCES

1. Timothy Pratt – Charles Bostian & Jeremy Allmuti, Satellite Communications, John Willy & Sons (Asia) Pvt. Ltd. 2004
2. Wilbur L. Pritchars Henri G.Suyder Hond Robert A.Nelson, Satellite Communication Systems Engineering, Pearson Education Ltd., Second edition 2003.
3. Richharia.M : Satellite Communication Systems (Design Principles Macmillan Press Ltd. Second Edition 2003.

Course Outcomes	Program Outcomes (POs)												Program Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	3	2	2								2	3		2	2
CO2	3	3	3	3	1				2			2	3	2	2	2
CO3	3	3	3	2	1							2	3	2	2	2
CO4	3	3	2	2	2				2			2	3		3	3
CO5	3	3	3	2	2				1			2	3		2	3
CO6	3	3	3	3	3	2			2			2	3	2	3	3

Enter correlation levels 1, 2 or 3 as defined below: 1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

191ECEB	COGNITIVE RADIO	L-T-P	C
		3-0-0	3

Programme: B.E. Electronics and Communication Engineering **Sem:** - **Category:** PE

AIM: To know the basics of the software defined radios and understand the concepts of wireless networks and next generation wireless networks.

Course Outcomes: The students will be able to

CO1: Elaborate the basics of the software defined radios.
CO2: Analyze the various design principles of software defined radio.
CO3: Construct the wireless networks based on the cognitive radios.
CO4: Examine the concepts behind the artificial intelligence techniques.
CO5: Build the architecture of cognitive radio
CO6: Analyze the next generation wireless networks.

INTRODUCTION TO SOFTWARE DEFINED RADIO **9**

Definitions and potential benefits, software radio architecture evolution, technology tradeoffs andarchitecture implications.

SDR ARCHITECTURE **9**

Essential functions of the software radio, basic SDR, hardware architecture, Computational processing resources, software architecture, top level component interfaces, interface topologies among plug and play modules.

INTRODUCTION TO COGNITIVE RADIOS **9**

Marking radio self-aware, cognitive techniques – position awareness, environment awareness incognitive radios, optimization of radio resources, Artificial Intelligence Techniques.

COGNITIVE RADIO ARCHITECTURE **9**

Cognitive Radio - functions, components and design rules, Cognition cycle - orient, plan, decide and act phases, Inference Hierarchy, Architecture maps, Building the Cognitive Radio Architecture onSoftware defined Radio Architecture.

NEXT GENERATION WIRELESS NETWORKS **9**

The XG Network architecture, spectrum sensing, spectrum management, spectrum mobility, spectrum sharing, upper layer issues, cross – layer design.

TOTAL PERIODS45

TEXT BOOKS

1. Joseph Mitola,"Software Radio Architecture: Object-Oriented Approaches to Wireless System Engineering", John Wiley & Sons Ltd. 2000.
2. Thomas W.Rondeau, Charles W. Bostain, "Artificial Intelligence in Wireless communication", ARTECH HOUSE .2009.

REFERENCES

1.Simon Haykin, "Cognitive Radio: Brain –Empowered Wireless Communications", IEEE Journal on selected areas in communications, Feb 2005.
2.Hasari Celebi, Huseyin Arslan, "Enabling Location and Environment Awareness in Cognitive Radios", Elsevier Computer Communications, Jan 2008.
3.Markus Dillinger, Kambiz Madani, Nancy Alonistioti, "Software Defined Radio", John Wiley, 2003.
4.Huseyin Arslan, "Cognitive Radio, SDR and Adaptive System", Springer, 2007.
5.Alexander M. Wyglinski, Maziarnekovee, Thomas Hu Y., "Cognitive Radio Communication and Networks", Elsevier, 2010.
6.Bruce A. Fette, "Cognitive Radio Technology", Elsevier, 2009.
7.Ian F. Akyildiz, Won – Yeol Lee, Mehmet C. Vuran, Shantidev Mohanty, "Next generation / dynamic spectrum access / cognitive radio wireless networks: A Survey" Elsevier Computer Networks, May 2006

Course Outcomes	Program Outcomes (POs)												Program Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	3	2	2	1							2	3	1	3	2
CO2	3	3	2	2	2	1						2	3	1	3	2
CO3	3	3	2	2	2	1	1					2	3	1	3	2
CO4	3	3	2	2	2	2						2	3	1	3	2
CO5	3	3	2	2	2	2	2					2	3	1	3	2
CO6	3	3	2	2	2	2	2					2	3	1	3	2

Enter correlation levels 1, 2 or 3 as defined below: 1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

191ECEC	ELECTROMAGNETIC COMPATIBILITY	L-T-P	C
		3-0-0	3

Programme: B.E. – Electronics and Communication Engineering **Sem: - Category:** PE

AIM: To lay good foundation on electromagnetic interference, control and compatibility in system design.

Course Outcomes: The students will be able to

CO1: Elaborate EMI concepts and different EMC standards
CO2: Conduct various emission measurements and interpret test reports
CO3: Examine different testing methods and evaluate the results
CO4: Design different types of filters and reduce the effect of radiation
CO5: Analyze Electromagnetic interference effects in PCBs
CO6: Develop PCB design for Electromagnetic compatibility

EMI/EMC CONCEPTS AND STANDARDS **9**

Introduction and history of EMI, problems and effects of EMI, need for EMC, realization of EMC, EMC tests and measurement, elements of EMI , coupling mechanisms , EMI victims, types of EMC standards, civilian EMC standards, military EMC standards, introduction to EMC testing

EMISSION MEASUREMENTS **9**

Basic and laboratory test setup, measurement instrumentation, EMI receiver, units of measurement,conducted emission limits, EUT configuration, discontinuous emission or clicks, measurement of clicks, low frequency conducted emissions, frequency range of measurement , limits, measurement site, disturbance power measurement , near field emission measurement , test reports

IMMUNITY AND SUSCEPTIBILITY TESTING **9**

General test setup, electrical fast transients / burst (EFT/B),surge testing, conducted susceptibility – continuous wave (CW), electrostatic discharge test

Shileded enclosures, antennas and radiating systems, signal generators and amplifiers, measuring equipment ,ancillary equipment, severity levels and frequency ranges, rf electromagnetic field immunity test, magnetic field immunity test, evaluation of test results and test reports

FILTERING AND SHIELDING **9**

Basic elements of filters and filter components, filter types, filter impedance, power line filter design, multistage power line filters, transient suppression in relays and motors, ferrite beads, filters for dc lines,filter installation, filter performance evaluation

Mechanism of radiation, shielding mechanisms, choice of shield material, shielding and equipment enclosures, penetrations and apertures, leakages at seams, shielding for connector openings, shielding of plastic enclosures, shields for cables

PCB DESIGN FOR EMC **9**

Need for EMC design at PCB level, printed circuit board (PCB), board zoning, aspects of a good PCB design, common impedance coupling in PCBs, general considerations for a PCB, multilayer board and high speed PCB design, power and ground planes , plane and cavity resonance, cavity resonance between planes, fringing fields and their reduction, openings and discontinuities in ground plane, optimising anti-pad design, routing traces close to antipads, issues with a split plane, traces crossing and changing layers, connection of

devices to planes ,placement of decoupling capacitors, advantages of multiple decaps, position of devices, layer stacking in boards, high density interconnect (HDI) technology, board segregation

Total Periods 45

Text Book

2. ChetanKathalay, "A Practical Approach to Electromagnetic Compatibility", 1st Edition, EMC Publications, 2014.

References

1. Bemhard Keiser, "Principles of Electromagnetic Compatibility", 3rdEd, Artech house, Norwood, 1998.
2. C.R.Paul,"Introduction to Electromagnetic Compatibility", John Wiley and Sons, 2nd Edition, 2006.
3. Don R. J.White Consultant Incorporate, "Handbook of EMI/EMC", Vol I-V, 1988.

Course Outcomes	Program Outcomes (POs)												Program Specific Outcomes (PSOs)			
	PO 1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3			2		1						2	3	3		3
CO2	2	3	3		2	1							2	2		1
CO3	2	2	2		1								2	3		
CO4	2	3	3		1								3	2		
CO5	2	3	3		2								2	1		
CO6	2	3	3		1	1							2	1		

191ECED	SMART RADAR SYSTEMS	L-T-P	C
		3-0-0	3

Programme: B.E. Electronics and Communication Engineering **Sem:-** **Category:** **PE**

AIM: To make the students understand the basic concepts of Radar and its applications in wireless smart systems

Course Outcomes: The students will be able to

CO1: Examine the basic concepts of RADAR systems.
CO2: Demonstrate the detection of signals in noise and RADAR signals.
CO3: Analyze the characteristics of RADAR transmitter and receiver.
CO4: Illustrate the characteristics of antenna used in RADAR systems.
CO5: Analyze the effect of errors on radiation patterns
CO6: Elaborate the operation of MTI and Pulse Doppler RADAR.

INTRODUCTION TO RADAR **9**

Basics of radar, EM Waves & properties- applications of radar, radar frequencies-radar block diagram, Radar Coordinates, Radar equation for hard targets and the SNR-radar cross section of targets, Radar Resolution Elements, Pulse, CW and FMCW Radars–configurations, transmitter power- pulse repetition frequency, Duty Ratio, Pulse Compression, Coding.

DETECTION OF SIGNALS IN NOISE AND RADAR SIGNALS **9**

Introduction to Noise in detail, probability density functions – probabilities of detection and false alarm-matched filter receiver-detection criteria – integration of radar pulses – constant-false alarm rate receivers – Radar Wave forms, Pulse Compression, Ambiguity Diagram.

RADAR TRANMIMTTER AND RECEIVER **9**

Introduction- Types of Transmitters – linear-beam power tubes- solid-state RF power sources- magnetron-Klystron, crossed-filed amplifier- radar receiver- receiver noise figure- super heterodyne receiver, Digital Receivers, duplexers and receiver protectors- radar displays-Human Machine Interface (HMI).

RADAR ANTENNA **9**

Functions of radar antenna- antenna parameters- antenna radiation pattern and aperture illumination – reflector antennas- electronically steered phased array antennas- phase shifters – frequency – scan arrays– architectures for phased arrays , radiators for phased arrays- mechanically steered planar array antennas-radiation pattern synthesis –effect of errors on radiation patterns – low side lobes antennas.

MTI AND PULSE DOPPLER RADAR **9**

Introduction to Doppler and MTI radar- delay –line cancellers- staggered pulse repetition frequencies-104oppler filter banks- digital MTI processing – Moving target detector- limitations to MTI performance-pulse Doppler radar-MTD, Tracking radar- monopulse tracking- conical scan and sequential lobing-comparison of trackers. Tracking accuracylow-angle tracking- Atmospheric & Weather Radars: Precipitation Radars, Doppler Weather Radar, Polarimetric Radar, Clear Air Radars.

TOTAL PERIODS 45

TEXT BOOKS

1. Merrill I. Skolnik ," Introduction to Radar Systems", Tata McGraw-Hill (3rd Edition) 2008.
2. Richard J Doviak and Dusan S Zrnic, "Doppler Radar and Weather Observations", Dover Publications,1993.

REFERENCES

1. Bringi V. N and Chandrasekar V, "Polarimetric Doppler Weather Radar ", Cambridge University Press,2001.
2. Richards M. A, Scheer J A and Holm W A, "Principles of Modern Radar", Yes Dee Publishing Pvt. Ltd., 2012.

Course Outcomes	Program Outcomes (Pos)												Program Specific Outcomes (PSOs)			
	PO 1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	3	2	2								2	3	2		3
CO2	2	3	2	2	1							2	3	2	2	3
CO3	3	2	2	3	1							2	3	2	2	3
CO4	3	3	2	2	1	1						2	3	2	2	3
CO5	3	2	2	2	2	1						2	3	2	2	3
CO6	2	2	2	2	2	1						2	3	2	2	3

Enter correlation levels 1, 2 or 3 as defined below: 1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

191ECEE	MEMS AND NEMS	L-T-P	C
		3-0-0	3

Programme: B.E. Electronics and Communication Engineering **Sem:** - **Category: PE**

AIM: The aim of the course is to exposure the concepts of Micro and Nano Electromechanical systems.

Course Outcomes: The students will be able to

CO1: Apply MEMS sensor working principles with their fabrication.
CO2: Apply the mechanical characteristics and mechanical design.
CO3: Design the electro static design of MEMS sensors.
CO4: Demonstrate the modeling of MEMS sensor and actuator.
CO5: Analyze the MEMS problems and software design.
CO6: Demonstrate the Optical and RF MEMS with their applications.

INTRODUCTION TO MEMS **9**

MEMS and Microsystems, Miniaturization, Typical products, Micro sensors, Micro actuation, MEMS with micro actuators, Micro accelerometers and Micro fluidics, MEMS materials, Micro fabrication.

MECHANICS FOR MEMS DESIGN **9**

Elasticity, Stress, strain and material properties, Bending of thin plates, Spring configurations, torsional deflection, Mechanical vibration, Resonance, Thermo mechanics – actuators, force and response time, Fracture and thin film mechanics.

9

ELECTRO STATIC DESIGN

Electrostatics: basic theory, electro static instability. Surface tension, gap and finger pull up, Electrostatic actuators, Comb generators, gap closers, rotary motors, inch worms, Electromagnetic actuators. Bi-stable actuators.

9

CIRCUIT AND SYSTEM ISSUES

Electronic Interfaces, Feedback systems, Noise, Circuit and system issues, Case studies –Capacitive accelerometer, Piezo electric pressure sensor, Modeling of MEMS systems, CAD for MEMS.

INTRODUCTION TO OPTICAL AND RF MEMS **9**

Optical MEMS, - System design basics – Gaussian optics, matrix operations, resolution. Casestudies, MEMS scanners and retinal scanning display, Digital Micro mirror devices. RF Memes –design basics, case study – Capacitive RF MEMS switch, performance issues.

TOTAL PERIODS 45

TEXT BOOK

1.Stephen Santuria," Microsystems Design", Kluwer publishers, 2006.

REFERENCES

1. Nadim Maluf," An introduction to Micro electro mechanical system design", Artech House, 2000
2. Mohamed Gad-el-Hak, editor," The MEMS Handbook", CRC press Baco Raton, 2000.
3. Tai Ran Hsu," MEMS & Micro systems Design and Manufacture" Tata McGraw Hill, New Delhi, 2002.

Course Outcomes	Program Outcomes (POs)												Program Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO1	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	3	3	3	1							2		3		3
CO2	3	3	3	2	1							2		2		3
CO3	3	3	3	2	2	3						2		2		2
CO4	3	3	2	3	2	2						2		2		3
CO5	3	2	2	3	1							2				3
CO6	3	3	3	2	2	2						2	2	2		2

Enter correlation levels 1, 2 or 3 as defined below: 1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

191ECEF	MIXED SIGNAL IC DESIGN	L	T	P	C
		3	0	0	3

Programme: B.E. Electronics and Communication Engineering **Sem:-** **Category: PE**

Aim: To study the mixed signal of submicron CMOS circuits and understand the various integrated based filters and topologies.

Course Outcomes: The students will be able to

CO1: Apply the concepts for mixed signal MOS circuit.
CO2: Analyze the characteristics of IC based CMOS filters.
CO3: Elaborate the various integrated based filters and topologies.
CO4: Design of various data converter architecture circuits.
CO5: Analyze the signal to noise ratio and modeling of mixed signals.
CO6: Design of oscillators and phase lock loop circuit.

SUBMICRON CMOS CIRCUIT DESIGN **9**

Submicron CMOS: Overview and Models, CMOS process flow, Capacitors and Resistors. Digital circuit design: The MOSFET Switch, Delay Elements, An Adder. Analog Circuit Design: Biasing, Op-Amp Design, Circuit Noise.

INTEGRATOR BASED CMOS FILTERS **9**

Integrator Building Blocks- low pass filter, Active RC integrators, MOSFET-C Integrators, gm-C integrators, Discrete time integrators. Filtering Topologies: The Bilinear transfer function, The Biquadratic transfer function, Filters using Noise shaping.

DATA CONVERTER ARCHITECTURES **9**

DAC Architectures- Resistor string, R-2R ladder Networks, Current Steering, Charge Scaling DACs, Cyclic DAC, and Pipeline DAC. ADC Architectures- Flash, Two-step flash ADC, Pipeline ADC, Integrating ADC‘s, Successive Approximation ADC.

DATA CONVERTER MODELING AND SNR **9**

Sampling and Aliasing: A modeling approach, Impulse sampling, The sample and Hold, Quantization noise. Data converter SNR: An overview, Clock Jitter, Improving SNR using Averaging, Decimating filter for ADCs, Interpolating filter for DACs, Band pass and High pass sinc filters - Using feedback to improve SNR.

OSCILLATORS AND PLL **9**

LC oscillators, Voltage Controlled Oscillators. Simple PLL, Charge pumps PLLs, Non ideal effects in PLLs, Delay Locked Loops.

TOTAL PERIODS 45

TEXT BOOK

1. CMOS Mixed Signal Circuit Design by R.Jacob Baker, Wiley India, IEEE Press, reprint 2008

REFERENCES

1. CMOS Circuit Design, Layout and Simulation by R.Jacob Baker, Wiley India, IEEE Press, Second Edition, reprint 2009.
2. Design of Analog CMOS Integrated Circuits by Behzad Razavi, McGraw Hill, 33rd Re-print, 2016.

Course Outcomes	Program Outcomes (Pos)												Program Specific Outcomes (PSOs)			
	PO 1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	3	3	2	2	2						2	3	3		2
CO2	3	3	3	1	2	2						2	3	3		2
CO3	3	3	3	3	3	3			3		2	2		3	3	3
CO4	3	3	3	3	3	2			3		2	2		3		3
CO5	3	3	3	1	2	2						2		3		3
CO6	3	3	3	3	3	2						2		3		3

Enter correlation levels 1, 2 or 3 as defined below: 1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

191ECEG	LOW POWER SoC DESIGN	L	T	P	C
		3	0	0	3

Programme: B.E. Electronics and Communication Engineering **Sem:-** **Category:**PE

Aim: To analyze and design low-power VLSI circuits using various circuit technologies for system on chip design

Course Outcomes: The students will be able to

CO1: Develop techniques to design low power circuits.
CO2: Illustrate the principles and concepts of SoC designs.
CO3: Elaborate the power optimization and sequential testing.
CO4: Design Low Power Circuits for Sub System on a SoC.
CO5: Demonstrate I/O architecture and PAD design.
CO6: Elaborate system on chip design principles of low power design.

POWER CONSUMPTION IN CMOS **9**

Physics of power dissipation in CMOS FET devices – Hierarchy of limits of power – Sources of power consumption – Static Power Dissipation, Active Power Dissipation - Designing for Low Power, Circuit Techniques for Leakage Power Reduction - Basic principle of low power design, Logic level power optimization – Circuit level low power design.

SYSTEM-ON-CHIP DESIGN **9**

System-on-Chip Concept, Design Principles in SoC Architecture, SoC Design Flow, Platform-based and IP based SoC Designs, Basic Concepts of Bus-Based Communication Architectures. High performance algorithms for ASICs/ SoCs as case studies – Canonic Signed Digit Arithmetic, KCM, Distributed Arithmetic, High performance digital filters for sigma-delta ADC

POWER OPTIMIZATION OF COMBINATIONAL AND SEQUENTIAL LOGIC MACHINES FOR SOC **9**

Introduction to Standard Cell-Based Layout – Simulation - Combinational Network Delay - Logic and interconnect Design - Power Optimization - Switch Logic Networks. Introduction - Latches and Flip-Flops - Sequential Systems and Clocking Disciplines - Sequential System Design - Power Optimization - Design Validation - Sequential Testing.

DESIGN OF LOW POWER CIRCUITS FOR SUB SYSTEM ON A SOC **9**

Subsystem Design Principles - Combinational Shifters – Adders – ALUs – Multipliers – High Density Memory – Field Programmable Gate Arrays - Programmable Logic Arrays - Computer arithmetic techniques for low power system – low voltage low power static Random access and dynamic Random access memories, low power clock, Inter connect and layout design

FLOOR PLANNING **9**

Floor-planning Methods – Block Placement & Channel Definition - Global Routing - switchbox Routing - Power Distribution - Clock Distributions - Floor-planning Tips - Design Validation - Off-Chip Connections – Packages, The I/O Architecture - PAD Design

TOTAL PERIODS 45

TEXT BOOK

1. J.Rabaey, ―Low Power Design Essentials (Integrated Circuits and Systems)‖, Springer, 2009
2. Wayne Wolf, ―Modern VLSI Design – System – on – Chip Design‖, Prentice Hall, 3rd Edition, 2008.

REFERENCES

1. J.B.Kuo & J.H.Lou, ―Low-voltage CMOS VLSI Circuits‖, Wiley, 1999.
2. A.Bellaowar & M.I.Elmasry,‖Low power Digital VLSI Design, Circuits and Systems‖, Kluwer, 1996.
3. Wayne Wolf, ―Modern VLSI Design – IP based Design‖, Prentice Hall, 4th Edition, 2008.
4. M.J.S. Smith : Application Specific Integrated Circuits, Pearson, 2003
5. Sudeep Pasricha and Nikil Dutt, On-Chip Communication Architectures System on Chip Interconnect, Elsevier, 2008
6. Recent literature in Low Power VLSI Circuits.
7. Recent literature in Design of ASICs

Course Outcomes	Program Outcomes (Pos)												Program Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	3	3	2	1	1						2	3	3		2
CO2	3	3	3	2	2						2	2	3	3		2
CO3	3	3	3	3	3				3		2	2		3	3	3
CO4	3	3	3	3	3	2			3		2	2		3		3
CO5	3	3	3	2	2							2		3		3
CO6	3	3	3	3	3							2		3		3

Enter correlation levels 1, 2 or 3 as defined below:1: Slight (Low) 2: Moderate (Medium) 3:Substantial (High)

191ECEH	CYBER SECURITY	L	T	P	C
		3	0	0	3

Programme: B.E. Electronics and Communication Engineering **Sem:-** **Category:** PE

Aim: To understand issues associated with the nature of cybercrime, digital evidence, detection methods and proof in a variety of digital forensic contexts

Course Outcomes: The students will be able to

CO1: Clarify the concepts of cybercrime.
CO2: Outline the various issues of cybercrime.
CO3: Summarize the methods and tools of cybercrime investigation.
CO4: Develop the procedures of digital and network forensics.
CO5: Analyse Iris and Fingerprint Recognition
CO6: Estimate various laws and regulation dealing with cybercrime and digital forensics.

INTRODUCTION **9**

Introduction and overview of Cyber Crime, Nature and Scope of Cyber Crime, Types of Cyber Crime: Social Engineering, Categories of Cyber Crime, Property Cyber Crime.

CYBER CRIME ISSUES **9**

Unauthorized Access to Computers, Computer Intrusions, White collar Crimes, Viruses and Malicious Code, Internet Hacking and Cracking, Virus Attacks, Pornography, Software Piracy, Intellectual Property, Mail Bombs, Exploitation ,Stalking and Obscenity in Internet, Digital laws and legislation, Law Enforcement Roles and Responses.

INVESTIGATION **9**

Introduction to Cyber Crime Investigation, Investigation Tools, eDiscovery, Digital Evidence Collection, Evidence Preservation, E-Mail Investigation, E-Mail Tracking, IP Tracking, E-Mail Recovery, Hands on Case Studies. Encryption and Decryption Methods, Search and Seizure of Computers, Recovering Deleted Evidences, Password Cracking.

DIGITAL FORENSICS **9**

Introduction to Digital Forensics, Forensic Software and Hardware, Analysis and Advanced Tools, Forensic Technology and Practices, Forensic Ballistics and Photography, Face, Iris and Fingerprint Recognition, Audio Video Analysis, Windows System Forensics, Linux System Forensics, Network Forensics.

LAWS AND ACTS **9**

Laws and Ethics, Digital Evidence Controls, Evidence Handling Procedures, Basics of Indian Evidence ACT IPC and CrPC , Electronic Communication Privacy ACT, Legal Policies.

TOTAL PERIODS 45

TEXT BOOK

1. Nelson Phillips and Enfinger Steuart, "Computer Forensics and Investigations", Cengage Learning, New Delhi, 2009.

REFERENCES

1. Kevin Mandia, Chris Prosise, Matt Pepe, "Incident Response and Computer Forensics ", Tata McGraw –Hill, New Delhi, 2006.
2. Robert M Slade," Software Forensics", Tata McGraw – Hill, New Delhi, 2005.
3. Bernadette H Schell, Clemens Martin, "Cybercrime", ABC – CLIO Inc, California, 2004."Understanding Forensics in IT", NIIT Ltd, 2005.

Course Outcomes	Program Outcomes (Pos)												Program Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	2	2	2	2	1		2			2	2	2			1
CO2	3	2	2	2	2	1	2	2			2	2	2			1
CO3	3	2	2	2	2	2		2			2	2	3		3	2
CO4	3	2	2	2	2	2		2			2	2	3		3	2
CO5	3	2	2	2	2	2		2			2	2	3		3	2
CO6	3	2	2	2	2	2		2			2	2	2			1

Enter correlation levels 1, 2 or 3 as defined below: 1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

191ECEI	CRYPTOGRAPHY AND NETWORK SECURITY	L-T-P	C
		3-0-0	3

Programme:	B.E. Electronics and Communication Engineering	**Sem:** -	**Category:**	**PE**

AIM: To implement the principles of public key cryptosystems, hash functions and digital signature.

Course Outcomes: The students will be able to

CO1: Summarize the concept of number theory.

CO2: Analyze block ciphers and public key cryptography.

CO3: Illustrate hash functions and digital signatures.

CO4: Examine security practice and system security .

CO5: Classify the types of firewalls.

CO6: Apply the tools and techniques of quality management to manufacturing and services processes.

INTRODUCTION & NUMBER THEORY 9

Services, Mechanisms and attacks-the OSI security architecture-Network security model-Classical Encryption techniques (Symmetric cipher model, substitution techniques, transposition techniques, steganography).Finite fields and number theory: Groups, Rings, Fields-Modular arithmetic-Euclid's algorithm-Finite fields- Polynomial Arithmetic –Prime numbers-Fermat's and Euler's theorem-Testing for primality –The Chinese remainder theorem- Discrete logarithms.

BLOCK CIPHERS & PUBLIC KEY CRYPTOGRAPHY 9

Data Encryption Standard-Block cipher principles-block cipher modes of operation-Advanced Encryption Standard (AES)-Triple DES-Blowfish-RC5 algorithm. Public key cryptography: Principles of public key cryptosystems-The RSA algorithm-Key management – Diffie Hellman Key exchange-Elliptic curve arithmetic-Elliptic curve cryptography.

HASH FUNCTIONS AND DIGITAL SIGNATURES 9

Authentication requirement – Authentication function – MAC – Hash function – Security of hash function and MAC –MD5 – SHA – HMAC – CMAC – Digital signature and authentication protocols –DSS – EI Gamal – Schnorr.

SECURITY PRACTICE & SYSTEM SECURITY 9

Authentication applications – Kerberos – X.509 Authentication services – Internet Firewalls for Trusted System: Roles of Firewalls – Firewall related terminology- Types of Firewalls – Firewall designs – SET for E-Commerce Transactions. Intruder – Intrusion detection system – Virus and related threats – Countermeasures – Firewalls design principles – Trusted systems – Practical implementation of cryptography and security.

E-MAIL, IP & WEB SECURITY9

E-mail Security: Security Services for E-mail-attacks possible through E-mail – establishing keys privacy-authentication of the source-Message Integrity-Non-repudiation-Pretty Good Privacy-S/MIME. IP Security: Overview of IPSec – IP and Ipv6-Authentication Header-Encapsulation Security Payload (ESP)-Internet Key Exchange (Phases of IKE, ISAKMP/IKE Encoding). Web Security: SSL/TLS Basic Protocol-computing the keys- client authentication-PKI as deployed by SSLAttacks fixed in v3- Exportability-Encoding-Secure Electronic Transaction (SET).

TOTAL PERIODS 45

TEXT BOOK

1. William Stallings, Cryptography and Network Security, 6th Edition, Pearson Education, March 2013.

REFERENCES

1. Behrouz A. Ferouzan, "Cryptography & Network Security", Tata Mc Graw Hill, 2007.
2. Man Young Rhee, "Internet Security: Cryptographic Principles", "Algorithms and Protocols", Wiley Publications, 2003.
3. Charles Pfleeger, "Security in Computing", 4th Edition, Prentice Hall of India, 2006.
4. Ulysess Black, "Internet Security Protocols", Pearson Education Asia, 2000.
5. Charlie Kaufman, Radia Perlman and Mike Speciner, "Network Security", Prentice Hall of India,2002.

Course Outcomes	Program Outcomes (Pos)												Program Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	3	2	1								3	3			3
CO2	3	3	3	2	2							2	3			2
CO3	3	3	3	2	3				2			2	3		2	2
CO4	3	2	3	3	2	2			2			2	3		3	2
CO5	3	3	2	3	2				2			2	3			2
CO6	3	3	2	3	2	2		2	2		2	2	3		2	2

Enter correlation levels 1, 2 or 3 as defined below: 1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

191ECEJ	MOBILE ROBOTICS	L-T-P	C
		3-0-0	3

Programme: B.E.-Electronics and Communication Engineering **Sem** - **Category:** PE

AIM: The aim of the course is to demonstrate the concepts and basic algorithms needed to make a mobile robot function reliably and effectively

Course Outcomes:

The Students will be able to

CO1: Design a Robot for specific application.
CO2: Design the distributed and centralized controls for robot.
CO3: Model the sensors for different environments.
CO4: Make a robot for a specific application.
CO5: Elaborate navigation architecture.
CO6: Design swarm of robots for a task.

LOCOMOTION AND KINEMATICS **9**

Legged Mobile robots- Wheel mobile robots- Ariel mobile robots-Kinematic Models and constraints-Mobile robot maneuverability-Mobile robot workspace- Motion control

PERCEPTION, NON VISUAL SENSORS AND ALGORITHMS **9**

Sensors for mobile robots-Fundamentals for computer vision- Feature extraction- Place recognition-Range data-contact sensors- inertial sensors- infrared- sonar, radar, Laser, satellite based positioning-Data fusion - biological sensing.

MOBILE ROBOT LOCALIZATION **9**

Noise aliasing- Belief Representation- probabilistic Map based localization- Autonomous Map building Landmark based Localization, globally unique localization, Position beacons and Route based localizations.

PLANNING AND NAVIGATION AND SYSTEM CONTROL **9**

Planning and reacting - Path planning- Obstacle avoidance - bug algorithm- Vector field histogram-bubble band technique - Curvature velocity technique - Dynamic window approach- Schlegel approach-Nearness diagram - gradient Method- Navigation Architectures- horizontal and vertical decomposition - Hybrid control architectures.

ROBOT APPLICATIONS **9**

Artificial intelligence in robotics - Line follower-wall follower - pick and place - Flying robots - Swarm robotics-Social Economic Application - Future of Mobile robotics.

TOTAL PERIODS: 45

TEXT BOOKS:

1. Illah Reza Nourbakhsh, Roland Siegwart, “Introduction to Autonomous Mobile Robots, MIT press, Cambridge, London, 2011.

REFERENCES:

1. Gregory Dudek, Michael Jenkin, "Computational Principles of Mobile Robotics", Cambridge university press, 2010.
2. Y Joseph L. Jones, Bruce A. Seiger, "Mobile Robots: Inspiration to Implementation", AK peters Ltd., 2002.

Course Outcomes	Program Outcomes (POs)												Program Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	3	3	2	2							3		2		3
CO2	3	2	3	3	3							2		2		3
CO3	2	2	2	2	2							1		2		3
CO4	2	3	2	3	3							3		2		3
CO5	2	3	3	3	2							3		2		3
CO6	2	3	3	3	2							3		2		3

191ECEK	PHOTONIC NETWORKS	L	T	P	C
		3	0	0	3

Programme: B.E. Electronics and Communication Engineering **Sem:-** **Category:** PE

Aim: To understand the importance of the photonic networks infrastructure for our present and future communication needs and familiarize them.

Course Outcomes: The students will be able to

CO1: Analyze the various components of optical systems.
CO2: Illustrate the architectures and the protocol stack.
CO3: Elaborate the architectural variations of routing networks.
CO4: Explain the advances in networking and switching domains and the future trends.
CO5: Demonstrate the design of data plane and the control plane.
CO6: Analyze and manage the network to optimize their performance.

OPTICAL SYSTEM COMPONENTS **9**

Light Propagation in optical fibers – Loss & bandwidth, System limitations, Nonlinear effects; Solitons; Optical Network Components – Couplers, Isolators & Circulators, Multiplexers & Filters, Optical Amplifiers, Switches, Wavelength Converters.

OPTICAL NETWORK ARCHITECTURES **9**

Introduction to Optical Networks; SONET / SDH, Metropolitan-Area Networks, Layered Architecture; Broadcast and Select Networks – Topologies for Broadcast Networks, Media-Access Control Protocols, Wavelength Routing Architecture.

WAVELENGTH ROUTING NETWORKS **9**

The optical layer, Optical Network Nodes, Routing and wavelength assignment, Traffic Grooming in Optical Networks, Architectural variations- Linear Light wave networks, Logically Routed Networks.

PACKET SWITCHING AND ACCESS NETWORKS **9**

Photonic Packet Switching – OTDM, Multiplexing and Demultiplexing, Synchronization, Broadcast OTDM networks, Switch-based networks, Contention Resolution Access Networks – Network Architecture overview, Optical Access Network Architectures and OTDM networks.

NETWORK DESIGN AND MANAGEMENT **9**

Transmission System Engineering – System model, Power penalty - transmitter, receiver, Optical amplifiers, crosstalk, dispersion, Wavelength stabilization, Overall design considerations, Control and Management – Network management functions, Configuration management, Performance management, Fault management, Optical safety, Service interface.

TOTAL PERIODS 45

TEXT BOOK

1. Rajiv Ramaswami and Kumar N. Sivarajan, ―Optical Networks: A Practical Perspective‖, Harcourt Asia Pte Ltd., Second Edition 2004.
2. C. Siva Ram Moorthy and Mohan Gurusamy, ―WDM Optical Networks: Concept, Design and Algorithms‖, Prentice Hall of India, Ist Edition, 2002.
3. P.E. Green, Jr., ―Fiber Optic Networks‖, Prentice Hall, NJ, 1993.
4. Biswanath Mukherjee, ―Optical WDM Networks‖, Springer Series, 2006.

Course Outcomes	Program Outcomes (Pos)												Program Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	3	3	3	1							2		3		3
CO2	3	3	3	2	1							2		2		3
CO3	3	3	3	2	2	3						2		2		2
CO4	3	3	2	3	2	2						2		2		3
CO5	3	2	2	3	1							2				3
CO6	3	3	3	2	2	2						2	2	2		2

Enter correlation levels 1, 2 or 3 as defined below: 1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

191ECEL	VIDEO ANALYTICS	L	T	P	C
		3	0	0	3

Programme: B.E. Electronics and Communication Engineering **Sem:-** **Category:**PE

Aim: To understand the need for video Analytics and the basic configuration of video analytics

Course Outcomes: The students will be able to

CO1: Design custom made video analytics system for the given target application
CO2: Demonstrate the various models of video analytics
CO3: Elaborate various classifiers for video analytics
CO4: Develop techniques in video analytics for security
CO5: Design video analytic algorithms for business intelligence
CO6: Design video analytic algorithms for security applications

VIDEO ANALYTIC COMPONENTS

Need for Video Analytics-Overview of video Analytics- Foreground extraction- Feature extraction-classifier - Preprocessing- edge detection- smoothening- Feature space-PCA-FLD-SIFT features

FOREGROUND EXTRACTION

Background estimation- Averaging- Gaussian Mixture Model- Optical Flow based- Image Segmentation- Region growing- Region splitting-Morphological operations- erosion-Dilation- Tracking in a multiple camera environment

CLASSIFIERS

Neural networks (back propagation) - Deep learning networks- Fuzzy Classifier- Bayesian classifier-HMM based classifier

VIDEO ANALYTICS FOR SECURITY

Abandoned object detection- human behavioral analysis -human action recognition- perimeter security-crowd analysis and prediction of crowd congestion

VIDEO ANALYTICS FOR BUSINESS INTELLIGENCE & TRAFFIC MONITIRING AND ASSISTANCE

Customer behavior analysis - people counting- Traffic rule violation detection- traffic congestion identification for route planning- driver assistance- lane change warning

TOTAL PERIODS 45

TEXT BOOK

1.Graeme A. Jones (Editor), Nikos Paragios (Editor), Carlo S. Regazzoni (Editor) Video-Based Surveillance Systems: Computer Vision and Distributed Processing , Kluwer academic publisher, 2001

REFERENCES

1. Nilanjan Dey (Editor), Amira Ashour (Editor) and Suvojit Acharjee (Editor), Applied Video Processing in Surveillance and Monitoring Systems (IGI global) 2016
2. Zhihao Chen (Author), Ye Yang (Author), Jingyu Xue (Author), Liping Ye (Author), Feng Guo (Author), The Next Generation of Video Surveillance and Video Analytics: The Unified Intelligent Video Analytics Suite, Create Space Independent Publishing Platform, 2014
3. Caifeng Shan (Editor), Fatih Porikli (Editor), Tao Xiang (Editor), Shaogang Gong (Editor) Video Analytics for Business Intelligence, Springer, 2012

Course Outcomes	Program Outcomes (Pos)												Program Specific Outcomes (PSOs)			
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PO1 2	PSO 1	PS O2	PS O3	PS O4
CO1	3	3	3	2	2							3	2	2		3
CO2	3	2	3	3	3							2	2	2		3
CO3	2	2	2	2	2							1	2	2		3
CO4	2	3	2	3	3							3	2	2		3
CO5	2	3	3	3	2							3	2	2		3
CO6	3	2	3	3	3							2	2	2		3

Enter correlation levels 1, 2 or 3 as defined below: 1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

191ECEM	SPEECH PROCESSING	L-T-P	C
		3-0-0	3

Programme: B.E. Electronics and Communication Engineering **Sem:** - **Category:** PE

AIM: To analyze different speech modeling procedures such as Markov and their implementation issues.

Course Outcomes: The students will be able to

CO1: Construct speech production system and describe the fundamentals of speech.
CO2: Illustrate the production and classification of speech sounds.
CO3: Analyze different speech parameters.
CO4: Choose an appropriate statistical speech model for a given application.
CO5: Design a speech recognition system.
CO6: Apply different speech synthesis techniques.

BASIC CONCEPTS

Speech Fundamentals: Articulatory Phonetics – Production and Classification of Speech Sounds; Acoustic Phonetics – Acoustics of speech production; Review of Digital Signal Processing concepts; Short-Time Fourier Transform, Filter-Bank and LPC Methods.

SPEECH ANALYSIS

Features, Feature Extraction and Pattern Comparison Techniques: Speech distortion measures– mathematical and perceptual – Log–Spectral Distance, Cepstral Distances, Weighted Cepstral Distances and Filtering, Likelihood Distortions, Spectral Distortion using a Warped Frequency Scale,LPC, PLP and MFCC Coefficients, Time Alignment and Normalization – Dynamic Time Warping,Multiple Time – Alignment Paths.

SPEECH MODELING

Hidden Markov Models: Markov Processes, HMMs – Evaluation, Optimal State Sequence – ViterbiSearch, Baum-Welch Parameter Re-estimation, and Implementation issues.

SPEECH RECOGNITION

Large Vocabulary Continuous Speech Recognition: Architecture of a large vocabulary continuous speech recognition system – acoustics and language models – n-grams, context dependent sub-wordunits; Applications and present status.

SPEECH SYNTHESIS

Text-to-Speech Synthesis: Concatenative and waveform synthesis methods, sub-word units for TTS,intelligibility and naturalness – role of prosody, Applications and present status.

TOTAL PERIODS 45

TEXT BOOKS

1. Lawrence Rabiner and Biing-Hwang Juang, “Fundamentals of Speech Recognition”, Pearson Education, 2003.
2. Daniel Jurafsky and James H Martin, “Speech and Language Processing – An Introduction to Natural Language Processing, Computational Linguistics, and Speech Recognition”, Pearson Education, 2002.

REFERENCES

1. Steven W. Smith, “The Scientist and Engineer’s Guide to Digital Signal Processing”, California Technical Publishing, 1997.
2. Thomas F Quatieri, “Discrete-Time Speech Signal Processing – Principles and Practice”, Pearson Education, 2004.
3. Claudio Becchetti and Lucio Prina Ricotti, “Speech Recognition”, John Wiley and Sons, 1999.
4. Ben Gold and Nelson Morgan, “Speech and Audio Signal Processing, Processing and Perception of Speech and Music”, Wiley- India Edition, 2006.
5. Frederick Jelinek, “Statistical Methods of Speech Recognition”, MIT Press, 1997.

Course Outcomes	Program Outcomes (POs)												Program Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	2	2	2	1							2	3		3	
CO2	3	2	2	2								2	3		3	
CO3	3	3	2	2	2							2	3		2	
CO4	3	2	3	2	2							2	3		3	
CO5	3	3	2	2	2							2	3		3	
CO6	3	2	3	2	2							2	3		3	

Enter correlation levels 1, 2 or 3 as defined below: 1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

191ECEN	ELECTRONIC PRODUCT DESIGN	L-T-P	C
		3-0-0	3

Programme: B.E. Electronics and Communication Engineering **Sem:** - **Category** PE

AIM: To acquire knowledge in PCB design, fabrication and EMI reduction techniques

Course Outcomes: The students will be able to

CO1: Familiarize with the electronic product design methodology and manufacturing process.
CO2: Enumerate the PCB design and fabrication process.
CO3: Illustrate EMI and signal integrity
CO4: Demonstrate electronic system packaging
CO5: Summarize different approaches in electronic product design.
CO6: Analyze the issues in electronic product design

MANUFACTURING PROCESS &INTERCONNECTION TECHNIQUES 9

Design Overview, Design Process, Product Design Methodology, Anatomy of Design Process and Translation of product concepts to manufacturing process, Elements of Interconnection, Wires, Cables, Connectors, Termination Methods. Maintainability and Serviceability Considerations, Electrical, Mechanical and other Aspects.

PCB DESIGN & FABRICATION 9

Overview of PCB Design, Guidelines, General Considerations for PCB Layout, Artwork, Photo Printing, Screen Printing, Plating, Etching, Soldering and Assembly Techniques, Emerging PCB Technology Trends, Overview of Design rules for Analog circuit PCB, Digital circuit PCB, Power circuit PCB, Application of Heat Sink concepts.

ELECTRO MAGNETIC INTERFERENCE (EMI) REDUCTION TECHNIQUES 9

Occurrence of EMI, Electromagnetic Compatibility (EMC), Safety Ground, Grounding Schemes, Differences between Analog and Digital Ground, Shielding Techniques, Line Impedance Stabilization, Network (LISN), Conducted Noises,Common Mode Noises (CM), Differential Mode Noises (DM), EMI filter Design.

OVERVIEW OF ELECTRONIC SYSTEMS PACKAGING

System and history of semiconductors, Products and levels of packaging, handheld products, PWB, Semiconductor and Process flowchart, Wafer fabrication, Wafer packaging; Inspection and testing, Packaging evolution; Chip connection choices, Wire bonding, TAB and flip chip.

ELECTRONIC PRODUCT DESIGN 9

Overview of Electronic Product Design, Top-Down and Bottom-Up Approach, Considering Power Supply Design as an example, Ergonomic and Aesthetics Definition with Example, issues in Designing Electronic Products, Design of Controls and Display.

TOTAL PERIODS 45

TEXT BOOKS

1. Walter C Bosschard, “PCB design & Technology”, McGraw Hill, New Delhi.
2. Ronald A. Reis, “Electronic Project Design and Fabrication”, Prentice Hall.

REFERENCES

1.Harper, “Handbook of Electronic Packaging”, Mc Graw Hill, New York 1979.
2.R. S. Khandpur, “Printed Circuit Boards: Design, Fabrication, Assembly and Testing”, Tata Mc Graw Hill Book Co
3.Tim Williams, EMC for Product Designers, 4th ed.-Newnes.
4.V.S.Bagad, “Electronic Product Design”, Technical Publications.

Course Outcomes	Program Outcomes (POs)												Program Specific Outcomes (PSOs)			
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4
CO1	3	3	2	2	2							2	3	3		2
CO2	2	3	2	2	2							2	3	3		2
CO3	2	2	2	2	2	1	2					2	2	3	3	2
CO4	3	2	3	3	2							2	2	3		2
CO5	3	3	2	2	2		2					2	3	3		2
CO6	3	3	2	2	2	1	1					2	2	3		2

Enter correlation levels 1, 2 or 3 as defined below: 1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

191ECEO	WEARABLE ELECTRONICS	L-T-P	C
		3-0-0	3

Programme: B.E. Electronics and Communication Engineering **Sem: - Category:** PE

AIM: To design and implement various wearable electronics systems.

Course Outcomes: The students will be able to

CO1: Classify the wearable electronics technology.
CO2: Categorize the wearable electronics materials
CO3: Apply the methods of wearable sheet type and manufacturing
CO4: Acquire the knowledge about the display circuits
CO5: Apply the various wearable electronics applications
CO6: Analyze the wearable electronics fabrication process.

OVERVIEW WEARABLE ELECTRONIICS TECHNOLOGY **9**

History of Flexible Electronics - Materials for Flexible Electronics - Degrees of Flexibility – Substrates Backplane Electronic – Front plane Technologies – Encapsulation - Fabrication Technology for Flexible Electronics - Fabrication on Sheets by Batch Processing - Fabrication on Web by Roll-to-Roll Processing - Additive Printing.

WEARABLE ELECTRONICS MATERIALS **9**

Introduction of Materials Considerations for Flexible Electronics - Overview - Inorganic Semiconductors and Dielectrics - Organic Semiconductors and Dielectrics – Conductors- materials issue Issues of organic photovoltaicbasic operation -photocurrent - dark current.

WEARABLE SHEET TYPE **9**

Introduction - Sheet-type Image Scanners - Methods - Device Structure and Manufacturing Process Electronic Performance of Organic Photodiodes Organic Transistors Photo sensor Cells Issues Related to Device Processes: Pixel Stability and Resolution A Hierarchal Approach for Slow Organic Circuits The Double-Wordline and Double-Bitline Structure - A New Dynamic Second-Wordline Decoder Higher Speed Operation with Lower Power Consumption - Sheet Type Braille Displays - Manufacturing Process Electronic Performance of Braille Cells .

FLEXIBLE DISPLAY AND CIRCUITS **9**

Introduction - Enabling Technologies for Flexible Backplanes and Flexible Substrate Technologies TFT Technologies for Flexible Backplanes Display Media for Flexible Displays (LCD, reflective-EP, OLED) Barrier Layers - Important Organic TFT Parameters for Electronic Systems Field-Effect Mobility - Threshold Voltage - Leakage Currents - Liquid Crystal and Electrophoretic Displays Active Matrix OLED .

APPLICATION OF WEARABLE NEARABLE **9**

Photovoltaic cells – Solar cells - Photo sensor Cells - lithography - LED –LCD - OLED- Active Matrix OLED.

TOTAL PERIODS **45**

TEXT BOOK

1. Alberto Salleo and William S. Wong, “Flexible Electronics Materials and Applications”, Springer, 2009.

REFERENCES

1. Mario Caironi and Yong-Young Noh, “Large Area and Flexible Electronics“, Wiley, 2015.
2. Guozhen Shen, “Flexible Electronics from materials to devices”, World Scientific,2015.

Course Outcomes	Program Outcomes (POs)												Program Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PS
CO1	3	3	3	3	2							2		3		2
CO2	3	3	2	2	2							2		3		2
CO3	3	3	3	3	2							2		3		2
CO4	3	3	2	2	2	1						2		3		2
CO5	3	3	2	2	2	2						2		3		2
CO6	3	3	3	2	2							2		3		2

Enter correlation levels 1, 2 or 3 as defined below: 1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

191ECEP SMART STRUCTURES AND SMART MATERIALS L-T-P C

3-0-0 3

Programme: B.E. Electronics and Communication Engineering **Sem: - Category** PE

AIM: To illustrate the latest developments regarding smart materials and apply them in designing smart structures.

Course Outcomes: The students will be able to

CO1: Familiarize with the smart materials and sensing systems.
CO2: Demonstrate the measurement techniques using transducer and strain gauges.
CO3: Interpret the various measurements using sensors.
CO4: Illustrate the actuation techniques.
CO5: Elaborate the role of actuators and Actuator Materials.
CO6: Enumerate signal processing and control Systems.

INTRODUCTION 9

Introduction to Smart Materials and Structures – Instrumented structures functions and response – Sensing systems – Self diagnosis – Signal processing consideration – Actuation systems and effectors.

MEASURING TECHNIQUES 9

Strain Measuring Techniques using Electrical strain gauges, Types – Resistance – Capacitance – Inductance – Wheatstone bridges – Pressure transducers – Load cells – Temperature Compensation – Strain Rosettes.

SENSORS 9

Sensing Technology – Types of Sensors – Physical Measurement using Piezo Electric Strain measurement – Inductively Read Transducers – The LVOT – Fiber optic Techniques. Chemical and Bio-Chemical sensing in structural Assessment – Absorptive chemical sensors – Spectroscopes – Fibre Optic Chemical Sensing Systems and Distributed measurement.

ACTUATORS 9

Actuator Techniques – Actuator and actuator materials – Piezoelectric and Electrostrictive Material – Magnetostructure Material – Shape Memory Alloys – Electro orheological Fluids– Electro magnetic actuation – Role of actuators and Actuator Materials.

SIGNAL PROCESSING AND CONTROL SYSTEMS 9

Data Acquisition and Processing – Signal Processing and Control for Smart Structures – Sensors as Geometrical Processors – Signal Processing – Control System – Linear and Non-Linear.

TOTAL PERIODS 45

TEXT BOOK

1 Mel Schwartz,"Smart Materials", Tata McGraw-Hill 2008

REFERENCES

1 . L. S. Srinath – Experimental Stress Analysis – Tata McGraw-Hill, 2000.
2. J. W. Dally & W. F. Riley – Experimental Stress Analysis – Tata McGraw-Hill, 2002.

Course Outcomes	Program Outcomes (Pos)												Program Specific Outcomes (PSOs)			
	PO 1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	3	3	2	1		2					2	2	2	2	3
CO2	3	2	3	2	2	1						2		3	2	3
CO3	3	3	3	2	2							2		2		2
CO4	3	2	3	2	2							2		2		3
CO5	3	3	3	2	2	1						2		2		3
CO6	3	3	3	2	2	1						2	2	2	3	3

Enter correlation levels 1, 2 or 3 as defined below: 1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

191ECEQ	SATELLITE REMOTE SENSING AND DATA ANALYSIS	L-T-P	C
		3-0-0	3

Programme: B.E. Electronics and Communication Engineering **Sem:** - **Category:** OE

AIM: To analyze image acquisition and preprocessing of satellite images

Course Outcomes: The Students will be able to

The Students will be able to

CO1. Describe the basic concepts of remote sensing process.

CO 2. Illustrate the satellite data preprocessing techniques.

CO 3. Analyze the satellite image enhancement techniques.

CO 4. Discuss the data transformation techniques in remote sensing.

CO 5. Compare the performance of various data analysis techniques

CO 6. Analyze various data compression techniques

REMOTESENSING PROCESS **9** Definition, Remote sensing process, Radiation principles, Spectral reflectance curve, EMR interactions with atmosphere- earth surface features.

SATELLITE DATA 9 Satellite image characteristics, Resolution types, Preprocessing-Geometric correction, Radiometric correction.

SATELLITEIMAGE ENHANCEMENT 9

Radiometric Enhancement-Histogram Based Enhancements, Density Slicing, Stretching, Geometric Enhancement – Neighborhood Operations, Template Operators.

DATA TRANSFORMATION **9**

Spectral Transform – Multispectral Ratios – vegetation Indexes, Principal Components, Tasseled – Cap Components, Color – Space transforms, Spatial transforms – Convolution, Fourier transform, Scale Space Transforms.

IMAGE ANALYSIS AND UNDERSTANDING **9**

Feature Extraction – Statistical, Structural Spectral, Training – Supervised, Unsupervised, Hybrid Training, Data Fusion-Feature Space fusion, Spatial domain fusion, Scale space fusion, Data Compression: compression by coding fractal compression, wavelet Compression.

TOTAL PERIODS 45

TEXT BOOK

1.Thomas M.Lillesand, Ralph W.Kiefer, ‘Remote Sensing and Image Interpretation’, Fifth Edition, 2004.

REFERENCES

1. Robert A. Schowengerdt, ‘Remote Sensing Models & Methods For Image Processing, third Edition, 2004

2. J. A. Richards, ‘Remote Sensing Digital Image Analysis: An Introduction’, second Revised Edition, 1993

3. John R. Jensen, ‘Remote Sensing Of The Environment – An Earth Resource Perspective’, Pearson Education Series, 2003

4. Rafael C.Gonzalez, Richard E.Woods, ‘Digital Image Processing’ (third Edition), Prentice Hall, 2007.

Course Outcomes	Program Outcomes (POs)												Program Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	3	3	2	2							2	2		2	2
CO2	3	3	3	2	2	2						2		2	2	2
CO3	3	3	3	2	2	2						2	1	2	3	2
CO4	3	3	3	2	2	1						2	3	2	2	2
CO5	3	3	3	2	2	2	2					2	2	2	3	2
CO6	3	3	3	2	2	2	2	1			2	2	3	3	2	2

Enter correlation levels 1, 2 or 3 as defined below: 1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

191ECER	RFID AND ITS APPLICATIONS	L-T-P	C
		3-0-0	3

Programme: B.E. Electronics and Communication Engineering **Sem:** - **Category:** PE

AIM: This course aims to elaborate the concepts, architecture of RFID and its applications.

Course Outcomes: The students will be able to
CO1: Extend knowledge about the RFID fundamental concept.
CO2: Elaborate the components of RFID system.
CO3: Develop knowledge about the RFID system architecture
CO4: Analyze the RFID code and command structure.
CO5: Illustrate the technical concept of memory organization
CO6: Demonstrate the applications of RFID.

RF FUNDAMENTALS **9**

RF operating principle – Frequency divider –Coupling – Inductive coupling, Electromagnetic back scatter coupling, close coupling, Electrical coupling – Frequency ranges used in RF Coding- Digital Modulation – ASK,FSK,PSK.

RFID SYSTEM PRINCIPLES **9**

RFID systems – Component of an RFID System – Frequency, Range & Coupling – Transponder & Reader System – Equivalent Circuit – RFID Antennas: Antenna Parameters – Gain & directional effect, EIRP & ERP, Input impedance, Effective aperture and scatter aperture Effective length Antenna types – Dipole antennas, Yagi – Uda Antenna, Patch or micro strip antenna & slot antenna

RFID SYSTEM ARCHITECTURE **9**

Architecture of Transponder – HF interface, Address & Security logic, Memory architecture Microprocessors. Architecture of Reader - Components, Control Unit, Example – Reader IC U2270B, Connection of Antennas for inductive systems

RFID STANDARDIZATION AND MEMORY ORGANIZATION **9**

Animal Identification – ISO 11784 Code structure — ISO 11785 — Technical concept – Full/half duplex system - Sequential system – ISO 14223 — Advanced transponders – Air interface — Code and command structure - Read-only transponder - Writable transponder-Transponder with crypto logical function.

RFID APPLICATIONS **9**

Example Applications – Contact less Smart Cards, Public Transport, Ticketing, and Access control Transport Systems, Animal Identification. Electronic immobilization, Container Identification, Identification, Waste Disposal, Industrial Automation, Medical Applications.

TOTAL PERIODS45

TEXT BOOK

1. Finkenzeller.K, RFID Handbook: Fundamentals and Applications in contact less smart cards and identifications, John Wiley and sons Ltd, 2003

REFERENCES

1. Bill Glover and Himanshu Bhatt, RFID Essentials, Oreilly, 2006.
2. Patrick J.Sweeney II, RFID for Dummies, Wiley Publishing, Inc .
3. Sandip Lahiri, RFID Handbook, IBM, 2006.

Course Outcomes	Program Outcomes (POs)												Program Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	2	3	3		1						2	2			2
CO2	3	3	2	3		1						2	2	2		2
CO3	2	2	3	2	1	1						2	2	2		2
CO4	3	2	2	2	1							2	2	2	1	2
CO5	3	2	2	3	1							2	2	2	1	2
CO6	3	2	2	2	1	1						2	2	2	1	2

Enter correlation levels 1, 2 or 3 as defined below: 1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

191ECES	PLC AND AUTOMATION	L-T-P	C
		3-0-0	3

Programme: B.E. Electronics and Communication Engineering **Sem: -** **Category: PE**

AIM: Toanalyze the essential elements and practices needed to develop and implement the Engineering Automation using PLC approach.

Course Outcomes: The students will be able to

CO1: Illustrate PLC architecture, PLC addressing concepts.

CO2: Develop PLC ladder programs for simple industrial applications

CO3: Design Automation systems for industrial applications

CO4: Elaborate advanced topics such as SCADA, DCS Systems, Digital Controller, CNC Machines

CO5: Analyze industrial control problems suitable for PLC control

CO6: Demonstrate the Controllers and Actuators

PROCESS CONTROL & AUTOMATION **9**

Process control principles, Servomechanisms, Control System Evaluation,Analog control, Digital control,

Types of Automation; Architecture of Industrial Automation Systems,Advantages and limitations of Automation, Effects of modern developments in automation on global competitiveness.

TRANSMITTERS AND SIGNAL CONDITIONING **9**

Need of transmitters, Standardization of signals, Current, Voltage and Pneumatic signal standards, 2-Wire & 3-Wire transmitters, Analog and Digital signal conditioning for RTD, Thermocouple, DPT etc , Smart

and Intelligent transmitters

CONTROLLERS AND ACTUATORS **9**

PID Controller, Cascade PID control,Microprocessor Based control, PAC (Programmable automation controller),Mechanical switches, Solid state switches,Electrical actuators: Solenoids, Relays and Contactors, AC Motor, VFD, energy conservation schemes through VFD, DC Motor, BLDC Motor, Stepper Motor, Servo Motor, Pneumatic and hydraulic Actuators.

PLC AND HUMAN MACHINE INTERFACE (HMI) **9**

Functions of PLC, Advantages, Architecture, working of PLC, Selection of PLC,Networking of PLCs,Ladder Programming, Interfacing Input and Output devices with PLC, PLC based automated systems. High frequency inputs. PLC programming standard IEC61131, Soft PLC techniques. IT Interfaces required:for ERP, MIS, MES. Supporting Applications interfaces: RFID, Barcode, Vision Systems. HMI:Block Diagram, Types, Advantages, Applications.

SCADA & DISTRIBUTED CONTROL SYSTEM **9**

Elements of SCADA, Features of SCADA, MTU-functions of MTU, RTU-Functions of RTU, Applications of SCADA, Communications in SCADA-types & methods used, Mediums used for communication, Introduction to DCS, Architecture of DCS, Input and output modules, communication module, Specifications of DCS.

TOTAL PERIODS: 45

TEXT BOOK

1.Curtis Johnson, "Process Control Instrumentation Technology"; 8th Edition, Pearson Education
2.MadhuchhandaMitra, SamarjitSen Gupta, "Programmable Logic controllers and Industrial Automation"; Penram International Publishing India Pvt. Ltd

REFERENCES

1.John W. Webb, Ronold A Reis, "Programmable Logic Controllers, Principles and Applications"; 5th Edition, Prentice Hall of India Pvt. Ltd
2.Kilian, "Modern control technology: components & systems, Delmar 2nd edition.
3.Bela G Liptak, Process software and digital networks, 3rd edition, 2002.
4.Pollack. Herman, W & Robinson., T. "Computer Numerical Control", Prentice Hall. NJ.
5.Stuart A. Boyer, SCADA supervisory control and data acquisition, ISA Publication

Course Outcomes	Program Outcomes (POs)												Program Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	2	3	3		1						2	2			2
CO2	3	3	2	3		1						2	2	2		2
CO3	2	2	3	2	1	1						2	2	2		2
CO4	3	2	2	2	1							2	2	2	1	2
CO5	3	2	2	3	1							2	2	2	1	2
CO6	3	2	2	2	1	1						2	2	2	1	2

Enter correlation levels 1, 2 or 3 as defined below: 1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

191ECET	CMOS ANALOG IC DESIGN	L	T	P	C
		3	0	0	3

Programme: B.E. Electronics and Communication Engineering **Sem:-** **Category:**PE

Aim: To design and implement Analog ICs using CMOS techniques

Course Outcomes: The students will be able to

CO1: Illustrate the concepts of Analog MOS devices and current mirror circuits.
CO2: Design different configuration of Amplifiers and feedback circuits.
CO3: Analyze the characteristics of frequency response of the amplifier.
CO4: Analyze the types of noises in Analog IC design.
CO5: Examine the performance of the stability and frequency compensation techniques.
CO6: Construct switched capacitor circuits and PLLs.

INTRODUCTION TO ANALOG IC DESIGN AND CURRENT MIRRORS

Concepts of Analog Design - General consideration of MOS devices – MOS I/V Characteristics – Second order effects – MOS device models. Basic current mirrors- Cascode current mirrors- Active current mirrors- Large and Small signal analysis- Common mode properties.

AMPLIFIERS AND FEEDBACK

Basic Concepts – Common source stage- Source follower- Common gate stage- Cascode stage. Single ended and differential operation- Basic Differential pair- Common mode response- Differential pair with MOS loads- Gilbert Cell. Feedback- General Consideration of feedback circuits- Feedback topologies- Effect of loading- Effect of feedback on Noise.

FREQUENCY RESPONSE OF AMPLIFIERS AND NOISE

General considerations- Miller Effect and Association of Poles with Nodes, Common source stage- Source followers- Common gate stage- Cascode stage- Differential pair. Noise- Statistical characteristics of noise- Types of noise- Representation of noise in circuits- Noise in single stage amplifiers- Noise in differential pairs- Noise Bandwidth.

OPERATIONAL AMPLIFIER STABILITY AND FREQUENCY COMPENSATION

General Considerations- One and Two Stage Op Amps- Gain Boosting- Comparison- Common mode feedback- Input range limitations- Slew rate- Power Supply Rejection- Noise in Op Amps- General consideration of stability and frequency compensation- Multipole system- Phase margin- Frequency compensation- Compensation of two stage op Amps- Other compensation techniques.

SWITCHED CAPACITOR CIRCUITS AND PLLS

General Considerations- Sampling switches- Switched Capacitor Amplifiers- Switched Capacitor Integrator- Switched Capacitor Common mode feedback. Phase Locked Loops-Simple PLL- Charge pump PLLs - Non ideal Effects in PLLs- Delay locked loops- its Applications.

TOTAL PERIODS 45

TEXT BOOK

1. Behzad Razavi, ―Design of Analog CMOS Integrated Circuits‖, Tata McGraw Hill, 2001, 33rd reprint, 2016.

REFERENCES

1. Phillip Allen and Douglas Holmberg ―CMOS Analog Circuit Design‖ Second Edition, Oxford University Press, 2004.
2. Paul R. Gray, Paul J. Hurst, Stephen H. Lewis, Robert G. Meyer, Analysis and Design of Analog Integrated Circuits, 5th Edition, Wiley, 2009
3. Grebene, ―Bipolar and MOS Analog Integrated circuit design‖, John Wiley & sons, Inc., 2003

Course Outcomes	Program Outcomes (Pos)												Program Specific Outcomes (PSOs)			
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PS O2	PS O3	PS O4
CO1	3	3	3	2	1	1						2	3	3		2
CO2	3	3	3	2	2						2	2	3	3		2
CO3	3	3	3	3	3				3		2	2		3	3	3
CO4	3	3	3	3	3	2			3		2	2		3		3
CO5	3	3	3	2	2							2		3		3
CO6	3	3	3	3	3							2		3		3

Enter correlation levels 1, 2 or 3 as defined below: 1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

191ECEU	QUANTUM COMPUTING	L-T-P	C
		3-0-0	3

Programme: B.E – Electronics and Communication Engineering **Sem:** - **Category:** PE

AIM: To study various quantum algorithms and error correcting codes

Course Outcomes: The Students will be able to

CO1: Illustrate the basics of quantum computing.

CO2: Elaborate the operation of quantum gates and circuits

CO3: Summarize quantum algorithms

CO4: Elaborate quantum communication and its complexity

CO5: Examine quantum error correcting codes

CO6: Analyze quantum key generation and cryptographic protocols

QUANTUM BASICS 9

Introduction, Axioms of Quantum mechanics, quantum states andnotation, unitaries, quantum bit (qubit), measurements, quantum gates, classical reversible circuits, quantum circuits, universality

QUANTUM ALGORITHMS 9

Teleportation, Deutsch's algorithm, Simon's algorithm, Hidden subgroup problems, Quantum Fourier transform, Shor's algorithm for factoring, Grover's algorithm

QUANTUM COMMUNICATION 9

Definition of models, Equality, Disjointness with quantum communication, Simultaneous message passing and finger prints, quantum communication complexity

QUANTUM ERROR CORRECTING CODES 9

Quantum dynamics and decoherence, Error Correction, Shor's nine-qubit error correcting code, A seven – qubit quantum error correcting code, A five-qubit error – correcting code, Stabilizers and the five-qubit code, theoretical aspects of stabilizer codes, CSS codes, Abstract quantum error correction

QUANTUM CRYPTOGRAPHY 9

Quantum Key generation, Quantum cryptographic protocols, quantum teleportation and superdense coding

TEXT BOOK

1. Jozef Gruska," Quantum Computing",Mc Graw Hill,2005

REFERENCES

1. M. A. Nielson and I. L. Chuang, "Quantum Computation and QuantumInformation", Cambr. Univ. Press, 2000.

2. A. Yu. Kitaev, A.H. Shen, M.N. Vyalyi, "Classical and Quantum Computation",Amer. Mathematical Society, 2002.

3. R. de Wolf, "Quantum Communication and Complexity", Theoretical ComputerScience,2002.

4.Arthur O.Pittenger,"An Introduction to Quantum Computing Algorithms", progress in computer science and applied logic; vol.19 ISBN 0-8176-4127-0

Course Outcomes	Program Outcomes (POs)												Program Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	3	3	3	2							2	2	3		2
CO2	3	2	2	2	2							2	2	3		2
CO3	3	2	2	3	2							2	2	3		2
CO4	3	3	2	2	2							2	2	3		2
CO5	3	2	2	2	2							2	2	3		2
CO6	3	3	2	2	2							2	2	3		2

Enter correlation levels 1, 2 or 3 as defined below: 1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

OPEN ELECTIVES

191OE2A	**MEDICAL ELECTRONICS**	**L-T-P**	**C**
		3-0-0	**3**

Programme: B.E. Electronics and Communication Engineering **Sem:** - **Category:** OE

AIM: To understand the applications of electronics in diagnostic and therapeutic area.

Course Outcomes: The Students will be able to

CO1: Explain about bio potentials and their typical waveforms & characteristics
CO2: Interpret measurements of biochemical & nonelectrical parameters.
CO3: Illustrate the working of Heart assist devices &Biotelemetry
CO4: Discuss about the working of biotelemetry & tele medicine.
CO5: Analyze about radiation & their uses in the medical field.
CO6: Summarize the principles of electrical safety in instrumentation of modern hospital care.

ELECTRO-PHYSIOLOGY AND BIO-POTENTIAL RECORDING **9**

The origin of Bio-potentials; Biopotential electrodes, Biological amplifiers, ECG, EEG,EMG, PCG, EOG, lead systems and recording methods, typical waveforms and signal characteristics.

BIO-CHEMICAL AND NON ELECTRICAL PARAMETER MEASUREMENT **9**

Colorimeter, photometer, Spectrophotometer, pH, pO2, pCO2, Complete Blood gas analyzers, Blood flow meter, cardiac output, Pulmonary function analyzers , Blood pressure, temperature, pulse, Blood cell counters.

ASSIST DEVICES AND BIO-TELEMETRY **9**

Cardiac pacemakers, Cardiac Defibrillators, Wireless telemetry, single channel telemetry systems, Multichannel telemetry systems, Implantable Telemetry Systems, Telemedicine

MODERN IMAGING SYSTEMS **9**

X-ray Machines and Digital radiography, X ray Computed Tomography, Nuclear Medical Imaging Systems, Magnetic Resonance Imaging System

RECENT TRENDS IN MEDICAL INSTRUMENTATION **9**

Laserapplications in biomedical field, Physiotherapy and Electrotherapy equipment, Electrical safety in medical equipment.

TOTAL PERIODS 45

TEXT BOOK

1. Khandpur, R.S., "Handbook of Biomedical Instrumentation", TATA McGraw-Hill, NewDelhi, 2010.

REFERENCES

1. Leislie Cromwell, "Biomedical instrumentation and measurement", Prentice Hall of India, New Delhi, 2007.
2. Joseph J.Carr and John M.Brown, "Introduction to Biomedical equipment Technology", John Wiley and Sons, New York, 2004.

Course Outcomes	Program Outcomes (POs)												Program Specific Outcomes (PSOs)			
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
CO1	3	3	3	2	2							2	2		2	2
CO2	3	3	3	2	2	2						2		2	2	2
CO3	3	3	3	2	2	2						2	1	2	3	2
CO4	3	3	3	2	2	1						2	3	2	2	2
CO5	3	3	3	2	2	2	2					2	2	2	3	2
CO6	3	3	3	2	2	2	2	1			2	2	3	3	2	2

Enter correlation levels 1, 2 or 3 as defined below: 1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

191OE2B	CONSUMER ELECTRONICS	L-T-P	C
		3-0-0	3

Programme: B.E. Electronics and Communication Engineering **Sem** - **Category:** OE

AIM: To illustrate the domestic consumer and entertainment electronics.

Course Outcomes: The Students will be able to

CO1: Classify different types of loudspeaker and microphones.
CO2: Explain the various component of TV system.
CO3: Acquire knowledge about processing and reconstruction of audio and video signals.
CO4: Analyze various network services.
CO5: Illustrate the various home appliances.
CO6: Discuss the functions of cam coder and shooting a video and saving them in various system.

LOUDSPEAKERS AND MICROPHONES **9**

Dynamic Loudspeaker, Electrostatic loudspeaker, Permanent Magnet Loudspeaker, Woofers and Tweeters - Microphone Characteristics, Carbon Microphones, Dynamic Microphones and Wireless Microphones.

MAGNETIC RECORDING AND REPRODUCTION **9**

Magnetic recording and playback – magnetic erasing – recording medium – cassettes – tape speeds – MUF – Track Configuration – Tape transport mechanism – mechanical and electronic controls – TAPE Vs Disc

OPTICAL RECORDING AND REPRODUCTION **9**

Audio Disc – Processing of the Audio signal –read out from the Disc – Reconstruction of the audio signal – Video Disc – Video disc formats- recording systems – Playback Systems, The CD player, CD-ROM, Digital Audio tape,Video Cassette Recorders: Comparison to audio tape recording, Encoding, The conceptual VCR, Non idealities and their solutions, Remaining VCR Circuitry, a real VCR, special effects, enhancements.

TELEVISION STANDARDAND SYSTEMS **9**

Components of a TV system – interlacing – composite video signal. Colour TV –Luminance and Chrominance signal; Monochrome and Colour Picture Tubes - Colour TV systems – NTSC, PAL, SECAM - Components of a Remote Control, HDTV

HOME APPLIANCES **9**

Basic principle and block diagram of microwave oven; washing machine hardware and software; components of air conditioning and refrigeration systems.

TOTAL PERIODS 45

TEXT BOOKS

1. S.P.Bali, “Consumer Electronics”, Pearson Education,4th impression, 2011.
2. B.R.Gupta, “Consumer Electronics”, S.K.Kataria&Sons, 2011

REFERENCES

1. R.G.Gupta, “Audio and Video Systems”, Tata McGraw Hill, 2010.
2. K. Blair, Benson “Audio Engineering Hand book”, 2001
3. R.R Gulati, “Complete Satellite & Cable Television”, New age International Publisher, 2008
4. Philip Hoff, ”Consumer Electronics for Engineers”, Cambridge University Press ISBN 9780521582070, 1998

Course Outcomes	Program Outcomes (POs)												Program Specific Outcomes (PSOs)			
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
CO1	3	2	3	3	1							2	2	3	2	3
CO2	3	3	3	2	2	2						2	2	3	2	3
CO3	3	2	2	2	1	1						2		3	3	
CO4	3	2	2	2								2	2	3		
CO5	3	2	2	2	1	2						2	2	3	2	2
CO6	3	2	2	2	2	2						2		3	2	3

Enter correlation levels 1, 2 or 3 as defined below: 1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

191OE2C	MULTIMEDIA COMPRESSION AND COMMUNICATION	L-T-P	C
		3-0-0	3

Programme: B.E. Electronics and Communication Engineering **Sem:** - **Category** OE

AIM: To develop the concepts of multimedia communication.

Course Outcomes: The Students will be able to

CO1: Identify basic components of a multimedia project.
CO2: Summarize various audio and video compression standards.
CO3: Analyze different methods of text and image compression.
CO4: Discuss the issues in providing QOS.
CO5: Illustrate the concept of multimedia networking and its services.
CO6: Analyze the protocols used for multimedia communication.

MULTIMEDIA COMPONENTS 9

Introduction - Multimedia skills - Multimedia components and their characteristics - Text, sound, images, graphics, animation, video, hardware.

AUDIO AND VIDEO COMPRESSION 9

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, and 4.

TEXT AND IMAGE COMPRESSION 9

Compression principles-source encoders and destination encoders-lossless and lossy compressionentropy encoding –source encoding -text compression –static Huffman coding– arithmetic coding –Lempel ziv-welsh Compression-image compression

VOIP TECHNOLOGY 9

Basics of IP transport, VoIP challenges, H.323/ SIP –Network Architecture, Protocols,Call establishment and release, Quality of Service- CODEC Methods- VOIP applicability

MULTIMEDIA NETWORKING 9

Multimedia networking -Applications-streamed stored and audio-making the best Effort serviceprotocols for real time interactive Applications-distributing multimedia-beyond best effort servicescheduling and policing Mechanisms-integrated services-differentiated Services-RSVP.

TOTAL PERIODS 45

TEXT BOOKS

1. Fred Halshall “Multimedia communication - Applications, Networks, Protocols and Standards”,Pearson Education, 2007.
2. Kurose and W.Ross “Computer Networking “a Top Down Approach”, Pearson Education,2005

REFERENCES

1.Tay Vaughan, "Multimedia: Making it work", 7th Edition, TMH 2008
2. Marcus Goncalves "Voice over IP Networks", Mc Graw Hill 1999.
3. KR. Rao,Z S Bojkovic, D A Milovanovic, "Multimedia Communication Systems: Techniques, Standards, and Networks", Pearson Education 2007.
4. R. Steimnetz, K. Nahrstedt, "Multimedia Computing, Communications and Applications", Pearson Education Ranjan Parekh, "Principles of Multimedia", TMH 2007.

Course Outcomes	Program Outcomes (POs)												Program Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	3	2	2								2	3	2	3	2
CO2	3	3	2	2								2	3		3	2
CO3	3	2	2	2	2	2						2	3		3	2
CO4	3	3	2	2	2			2				2	3		2	2
CO5	3	3	2	2	2							2	3	3	2	2
CO6	3	3	2	2								2	3		2	2

Enter correlation levels 1, 2 or 3 as defined below: 1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

191OE2D **AGRICULTURE ELECTRONICS** **L-T-P** **C**

3-0-0 **3**

Programme: B.E. Electronics and Communication Engineering **Sem:** - **Category:** **OE**

AIM: To develop an electronicsplatform to raise the standards ofagriculture

Course Outcomes: The students will be able to

CO1: Acquire knowledge about the basics of agriculture.

CO2: Examine the functionality of transducers used in agriculture.

CO3: Acquire knowledge about various meteorological instruments utilized in agriculture

CO4: Analyze the functionalities of computer technologies used in agriculture

CO5: Illustrate the concept of various information technologies in agriculture

CO6: Analyze the functionality of microprocessor in agriculture applications

BASICS OF AGRICULTURE **9**

Introduction to Soil Science- Soil structure, Soil properties, Soil processes, Formation of Soil, types of soils, Soil as a medium for plant growth, Soil moisture & efficiency, soil pH values, Chemical analysis of soil, water bearing capacity, Soil erosion and conservation, measurement of soil parameters. Basic principles and advances in photosynthesis. Role of fertilizers, Different types of crops eg. Floriculture, Horticulture

9

AGRICULTURE TRANSDUCERS

Introduction - transducer-functions and characteristics of transducer - displacement and motion transducer - temperature transducer - pressure transducer - grain moisture transducer - soil moisture transducer - humidity transducer - pH transducer - Gas transducer - intelligent sensors.

INTRODUCTION TO AGRO METEOROLOGY **9**

Agro meteorological instruments: Anemometer, Use of PLDs, Microprocessors and Microcontroller, Data converters, Display devices, in agricultural automation. Use of opto-electronic devices for measurement and control of physical parameters in agri - Automatic drip irrigation- Green House Instrumentation: Green House Technology introduction, instrumentation required for tissue culture techniques.

COMPUTERS AND SPECIAL INFORMATION TECHNOLOGY IN AGRICULTURE **9**

SIT, GIS/ GPS software's Applications for Ground water modeling-crop forecasting & estimate-soil erosion etc-Use of Digital Image processing-Satellite missions-Hyper spectral remote sensing-physics of optical & microwave remote sensing-thermal mapping.-imulators used for study of crop growth-Data logger, features of data loggers-data loggers for dedicated use in agriculture-Computer based automatic weather station.

MICROPROCESSOR APPLICATIONS IN AGRICULTURE **9**

Microprocessor based systems- Microprocessor based grain moisture measurements-Microprocessor based safe grain storage system monitoring- Microprocessor based soil nutrient estimation systems-drip irrigation instruments-supervisory control and data acquisition systems-Introduction to precision agriculture.

Total Periods 45

TEXT BOOK

1. Krishna kant, "Microprocessor-Based Agri Instrumentation",1st edition, PHI, 2008

REFERENCES

1.George Joseph, "Fundamentals of remote sensing", Second Edition, University Press, 2005.
2.V.N. Sahi, "Fundamentals of Soil" Kalyani Publication, 2004
3.T.P.Ojha and A.M. Michale, "Principles of Agricultural Engineering", Jain Brothers Publications, 2005.
4. I.V. Muralikrishna , "Spatial information technology " Volume I & II, B.S.Publications, 2001

Course Outcomes	Program Outcomes (POs)												Program Specific Outcome (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PS
CO1	3	3	2	2	2		2					2		3		3
CO2	3	2	2	2	2	1	2					2		3		3
CO3	3	3	2	2	2	1	2					2		3		3
CO4	3	2	2	2	2	2	2					2		3		3
CO5	3	3	2	2	2	2	2					2		3		3
CO6	3	2	2	2	2	2	2					2		3		3

Enter correlation levels 1, 2 or 3 as defined below: 1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

AUDIT COURSES

191AC01	CONSTITUTION OF INDIA	L-T-P	C
		2-0-0	0

Programme: M.E.(Applied Electronics) **Sem:** **Category:** **AC**

AIM: Understand the premises informing the twin themes of liberty and freedom from a civil rightsperspective.

COURSE OUTCOMES:

Students will be able to:

CO1: Recall the growth of the demand for civil rights in India for the bulk of Indians before the arrival of Gandhi in Indian politics.

CO2: Discuss the intellectual origins of the framework of argument

CO3: Interpret the conceptualization of social reforms leading to revolution in India.

CO4: Identify the circumstances surrounding the foundation of the Congress Socialist Party [CSP] under the leadership of Jawaharlal Nehru and the eventual failure of the proposal of direct elections through adult suffrage in the Indian Constitution.

CO5: Illustrate the passage of the Hindu Code Bill of 1956.

CO6: Summarize the role of Election commission

HISTORY OF MAKING OF THE INDIAN CONSTITUTION

History ,Drafting Committee, (Composition & Working)

PHILOSOPHY OF THE INDIAN CONSTITUTION

Preamble, Salient Features

CONTOURS OF CONSTITUTIONAL RIGHTS & DUTIES

Fundamental Rights:Right to Equality, Right to Freedom,Right against Exploitation, Right to Freedom of Religion Cultural and Educational Rights, Right to Constitutional Remedies, Directive Principles of State Policy, Fundamental Duties.

ORGANS OF GOVERNANCE

Parliament, Composition, Qualifications and Disqualifications, Powers and Functions, Executive, President, Governor, Council of Ministers, Judiciary, Appointment and Transfer of Judges, Qualifications, Powers and Functions

LOCAL ADMINISTRATION

District's Administration head: Role and Importance,Municipalities: Introduction, Mayor and role of Elected Representative, CEO of Municipal Corporation,Pachayati raj: Introduction, PRI: Zila Pachayat,Elected officials and their roles, CEO Zila Pachayat: Position and role.Block level: Organizational Hierarchy (Different departments),Village level: Role of Elected and Appointed officials, Importance of grass root democracy

ELECTION COMMISSION:

Election Commission: Role and Functioning, Chief Election Commissioner and Election Commissioners, State Election Commission: Role and Functioning,Institute and Bodies for the welfare of SC/ST/OBC and women.

Lecture: 24 Tutorial:0 Total Periods:24

References

1. The Constitution of India, 1950 (Bare Act), Government Publication.
2. Dr. S. N. Busi, Dr. B. R. Ambedkar "framing of Indian Constitution", 1st Edition, 2015.
3. M. P. Jain, "Indian Constitution Law" , 7thEdn., Lexis Nexis, 2014.
4. D.D. Basu, "Introduction to the Constitution of India" , Lexis Nexis, 2015.

191AC02 **DISASTER MANAGEMENT** **L-T-P C**

2-0-0 0

Programme: M.E.(Applied Electronics) **Sem:** **Category:** **AC**

AIM: To through knowledge, experience and research build capacities that will reduce disaster risks and contribute to better and more targeted public health based relief following disasters.

Course Objectives:

Students will be able to:

CO1: Demonstrate a critical understanding of key concepts in disaster risk reduction and humanitarian response.

CO2: Evaluate disaster risk reduction and humanitarian response policy and practice from multiple perspectives.

CO3: Develop an understanding of standards of humanitarian response.

CO4: Develop practical relevance in specific types of disasters and conflict situations.

CO5: Examine the strengths and weaknesses of disaster management approaches,planning and programming in different countries, particularly their home country or the countriesthey work in.

CO6: Explain more about disaster mitigation.

INTRODUCTION

Disaster: Definition, Factors And Significance; Difference Between Hazard And Disaster; Natural And Manmade Disasters: Difference, Nature, Types And Magnitude.

REPERCUSSIONS OF DISASTERS AND HAZARDS

Economic Damage, Loss of Human And Animal Life, Destruction Of Ecosystem. Natural Disasters: Earthquakes, Volcanisms, Cyclones, Tsunamis, Floods, Droughts And Famines,Landslides And Avalanches, Manmade disaster: Nuclear Reactor Meltdown, Industrial Accidents, Oil Slicks And Spills, Outbreaks Of Disease And Epidemics, War And
Conflicts.

DISASTER PRONE AREAS IN INDIA

Study Of Seismic Zones; Areas Prone To Floods And Droughts, Landslides And Avalanches; Areas Prone To Cyclonic And Coastal Hazards With Special Reference To Tsunami; Post-Disaster Diseases And Epidemics.

DISASTER PREPAREDNESS AND MANAGEMENT

Preparedness: Monitoring Of Phenomena Triggering A Disaster Or Hazard; Evaluation Of Risk: Application Of Remote Sensing, Data From Meteorological And Other Agencies, Media Reports: Governmental And Community Preparedness.

RISK ASSESSMENT

Disaster Risk: Concept And Elements, Disaster Risk Reduction, Global And National Disaster Risk Situation. Techniques of Risk Assessment, Global Co-Operation In Risk Assessment And Warning, People's Participation In Risk Assessment. Strategies for Survival.

Disaster Mitigation

Meaning, Concept And Strategies Of Disaster Mitigation, Emerging Trends In Mitigation. Structural Mitigation And Non-Structural Mitigation, Programs Of Disaster Mitigation In India.

Lecture: 24 Tutorial:0 Total Periods:24

References

1. R. Nishith, Singh AK, “Disaster Management in India: Perspectives, issues and strategies “ New Royal book Company, 2014.
2. Sahni, Pardeep Et.Al. (Eds.),” Disaster Mitigation Experiences And Reflections”, Prentice Hall Of India, New Delhi, 2001.
3. Goel S. L. , Disaster Administration And Management Text And Case Studies” ,Deep &Deep Publication Pvt. Ltd., New Delhi,2009.

191AC03	ENGLISH FOR RESEARCH PAPER WRITING	L-T-P	C
		2-0-0	0

Programme: M.E.(Applied Electronics) **Sem:** **Category:** **AC**

AIM: To learn the skills required for Research paper writing

Course Objectives:

Students will be able to:

CO1: Examine that how to improve your writing skills and level of readability

CO2: Estimate about what to write in each section.

CO3: Illustrate the skills needed when writing a Title.

CO4: Evaluate the good quality of paper at very first-time submission.

CO5: Examine the writing skills.

CO6: Compile the manuscript for first time submission.

INTRODUCTION

Planning and Preparation, Word Order, Breaking up long sentences, Structuring Paragraphs and Sentences, Being Conciseand Removing Redundancy, Avoiding Ambiguity and Vagueness.

CLARIFICATION

Clarifying Who Did What, Highlighting Your Findings, Hedging and Criticising, Paraphrasing and Plagiarism, Sections of a Paper, Abstracts. Introduction.

LTERATURE SURVEY

Review of the Literature, Methods, Results, Discussion, Conclusions, The Final Check.

ESSENTIAL SKILLS

Key skills are needed when writing a Title, key skills are neededwhen writing an Abstract, key skills are needed when writing an Introduction, skills needed when writing a Review of the Literature.

VERIFICATION

Skills are needed when writing the Methods, skills needed when writing the Results, skills are needed when writing the Discussion, skills are needed when writing the Conclusions. Useful phrases, how to ensure paper is as good as it could possibly be the first- time submission.

Lecture: 24 Tutorial:0 Total Periods:24

References

1. Goldbort R “Writing for Science”, Yale University Press ,2006.
2. Day R , “How to Write and Publish a Scientific Paper” , Cambridge University Press, 2006.
3. Highman N “Handbook of Writing for the Mathematical Sciences” , SIAM. Highman’s book ,1998.
4. Adrian Wallwork , “English for Writing Research Papers”, Springer New York Dordrecht Heidelberg London, 2011.

191AC04	SANSKRIT FOR TECHNICAL KNOWLEDGE	L-T-P	C
		2-0-0	0

Programme: M.E.(Applied Electronics) **Sem:** **Category:** **AC**

AIM: To Learn Sanskrit through Technical Education

Course Outcomes: Students will be able to:

CO1: Interpret basic Sanskrit language

CO2: Extend a working knowledge in illustrious Sanskrit, the scientific language in the world

CO3: Make use of Sanskrit to improve brain functioning

CO4: Develop the logic in mathematics, science & other subjects enhancing the memory power.

CO5: Illustrate the ancient Sanskrit literature about science & technology.

CO6: Being a logical language will help to develop logic in students

UNIT 1

Alphabets in Sanskrit, Past/Present/Future Tense, Simple Sentences

UNIT 2

Order, Introduction of roots, Technical information about Sanskrit Literature

UNIT 3

Technical concepts of Engineering-Electrical, Mechanical, Architecture, Mathematics

Lecture: 24 Tutorial:0 Total Periods:24

References

1. Dr.Vishwas “Abhyaspustakam” Samskrita-Bharti Publication, New Delhi,2012.
2. Prathama Deeksha-Vempati Kutumbshastri “Teach Yourself Sanskrit”, Rashtriya Sanskrit Sansthanam, New Delhi Publication,2012.
3. Suresh Soni “India’s Glorious Scientific Tradition”, Ocean books (P) Ltd., New Delhi,2009.

191AC05	VALUE EDUCATION	L-T-P	C
		2-0-0	0

Programme: M.E.(Applied Electronics) **Sem:** **Category:** **AC**

AIM: To Understand value of education and self- development

Course Outcomes:

Students will be able to

CO1: Interpret the knowledge of self-development

CO2: Infer the importance of Human values

CO3: Develop the overall personality

CO4: Identify moral and ethics of value Education

CO5: Construct the positive mind to Avoid fault thinking

CO6: Outline the role of human values and equality

MORALS AND ETHICS

Values and self-development –Social values and individual attitudes, Work ethics, Indian vision of humanism, Moral and non- moral valuation. Standards and principles, Value judgments.

CULTIVATION OF VALUES

Importance of cultivation of values, Sense of duty, Devotion, Self-reliance. Confidence, Concentration. Truthfulness, Cleanliness.Honesty, Humanity. Power of faith, National Unity. Patriotism. Love for nature , Discipline.

PERSONALITY AND BEHAVIOR DEVELOPMENT

Personality and Behavior Development - Soul and Scientific attitude, Positive Thinking, Integrity and discipline-Punctuality, Love and Kindness-Avoid fault Thinking-Free from anger, Dignity of labour-Universal brotherhood and religious tolerance-True friendship-Happiness Vs suffering, love for truth-Aware of self-destructive habits- Association and Cooperation-Doing best for saving nature.

SCIENCE OF REINCARNATION-

Character and Competence –Holy books vs Blind faith, Self-management and Good health, Science of reincarnation- Equality, Nonviolence ,Humility, Role of Women- All religions and same message,- Mind your Mind, Self-control -Honesty, Studying effectively

Lecture: 24 Tutorial:0 Total Periods:24

Reference

1. Chakroborty, S.K. “Values and Ethics for organizations Theory and practice”, Oxford University Press, New Delhi,1998.

191AC06	PEDAGOGY STUDIES	L-T-P	C
		2-0-0	0

Programme: M.E.(Applied Electronics) **Sem:** **Category:** **AC**

AIM: To review existing evidence on the review topic to inform programme design and policy making undertaken by the DfID, other agencies and researchers

Course Outcomes:

Students will be able to

CO1: Construct a platform of teaching and learning, between professors and students.
CO2: Develop student's attempt to learn by using Pedagogy practices.
CO3: Enable them to truly master the content of the course.
CO4: Analyze different teaching approaches from teaching students to learning.
CO5: Describe the measurable skills, abilities, knowledge or values.
CO6: Demonstrate as a result of a completing a course.

INTRODUCTION AND METHODOLOGY

Aims and rationale, Policy background, Conceptual framework andterminology**,** Theories of learning, Curriculum, Teacher education, Conceptual framework, Research questions**,** Overview of methodology and Searching.

THEMATIC OVERVIEW

Pedagogical practices are being used by teachers in formal and informal classrooms in developing countries, Curriculum, Teacher education.

PEDAGOGICAL PRACTICES

Evidence on the effectiveness of pedagogical practices,Methodology for the in depth stage: quality assessment of included studies, How can teacher education (curriculum and practicum) and the school curriculum and guidance materials best support effective pedagogy? Theory of change, Strength and nature of the body of evidence for effective pedagogical Practices,Pedagogic theory and pedagogical approaches,Teachers' attitudes and beliefs and Pedagogic strategies.

PROFESSIONAL DEVELOPMENT

Alignment with classroom practices and follow-up support,Peer support,Support from the head teacher and the community, Curriculum and assessment, Barriers to learning: limited resources and large class sizes.

RESEARCH GAPS AND FUTURE DIRECTIONS

Research design,Contexts**,**Pedagogy**,** Teacher education**,**Curriculum and assessment**,**Dissemination and research impact.

Lecture: 24 Tutorial:0 Total Periods:24

References

1. Ackers J, Hardman F "Classroom interaction in Kenyan primary schools", Compare, 31 (2): 245-261, 2001.
2. Agrawal M "curricular reform in schools: The importance of evaluation", Journal of Curriculum Studies, 36 (3): 361-379,2004.

3. Akyeampong K , Teacher training in Ghana - does it count? Multi-site teacher education research",2003.project (MUSTER) country report 1. London: DFID.
4. Akyeampong K, Lussier K, Pryor J, Westbrook J " Improving teaching and learning of basic maths and reading in Africa: Does teacher preparation count?" International Journal Educational Development, 33 (3): 272–282,2013.

		L-T-P	C
191AC07	**STRESS MANAGEMENT BY YOGA**	**2-0-0**	**0**

Programme: M.E.(Applied Electronics) **Sem:** **Category:** **AC**

AIM: To achieve overall health of body and mind

Course Objectives: To Develop healthy mind in a healthy body thus improving social health also Improve efficiency

Course Outcomes:

Students will be able to:

CO1: Develop healthy mind in a healthy body thus improving social health
CO2: Classify Yoga Ashtanga
CO3: Illustrate Do`s and Don't's in life
CO4: Differentiate between Yam and Niyam
CO5: Regularize of breathing techniques
CO6: Implement various yoga poses and their benefits for mind and body

UNIT 1

Definitions of Eight parts of yog. (Ashtanga)

UNIT 2

Yam and Niyam.
Do`s and Don't's in life.
i) Ahinsa, satya, astheya, bramhacharya and aparigraha
ii) Shaucha, santosh, tapa, swadhyay, ishwarpranidhan

UNIT 3

Asan and Pranayam
i) Various yog poses and their benefits for mind & body
ii)Regularization of breathing techniques and its effects-Types of pranayam

Lecture: 24 Tutorial: 0 Total Periods:24

References

1. Janardan Swami Yogabhyasi Mandal "Yogic Asanas for Group Tarining-Part-I" , Nagpur , 2014.
2. "Rajayoga or conquering the Internal Nature" Swami Vivekananda, Advaita Ashrama (Publication Department), Kolkata

191AC08	PERSONALITY DEVELOPMENT THROUGH LIFE ENLIGHTENMENT SKILLS	L-T-P	C
		2-0-0	0

Programme: M.E.(Applied Electronics) **Sem:** **Category:** **AC**

AIM: To become a person with stable mind, pleasing personality and determination

Course Outcomes:

Students will be able to

CO1: Illustrate Shrimad-Bhagwad-Geeta

CO2: Develop personality and achieve the highest goal in life.

CO3: Develop the nation and mankind to peace and prosperity.

CO4: Infer Neetishatakam for developing versatile personality

CO5: Summarize Do`s and Don't's in life

CO6: Plan and prioritize day to day work and duties

UNIT 1

Neetisatakam-Holistic development of personality,Verses- 19,20,21,22 (wisdom), Verses- 29,31,32 (pride & heroism),Verses- 26,28,63,65 (virtue), Verses- 52,53,59 (dont's), Verses- 71,73,75,78 (do's)

UNIT 2

Approach to day to day work and duties, Shrimad Bhagwad Geeta : Chapter 2-Verses 41, 47,48, Chapter 3-Verses 13, 21, 27, 35, Chapter 6-Verses 5,13,17,23, 35, Chapter 18-Verses 45, 46, 48.

UNIT 3

Statements of basic knowledge, Shrimad Bhagwad Geeta: Chapter2-Verses 56, 62, 68, Chapter 12 -Verses 13, 14, 15, 16,17, 18,Personality of Role model, Shrimad Bhagwad Geeta:Chapter2-Verses 17, Chapter 3-Verses 36,37,42, Chapter 4-Verses 18, 38,39,Chapter18 – Verses 37,38,63

Lecture: 24 Tutorial:0 Total Periods:24

References

1. Swami Swarupananda Advaita Ashram "Srimad Bhagavad Gita" by (Publication Department), Kolkata
2. P.Gopinath, Rashtriya Sanskrit Sansthanam "Bhartrihari's Three Satakam (Niti-sringar-vairagya)" , New Delhi.