Kongunadu College of Engineering and Technology (Autonomous)

Affiliated to Anna University, Chennai
B.E. Electronics and Communication Engineering
Regulations: KNCET-UGR2020
Choice Based Credit System
I to VIII Semesters Curricula & Syllabi

Semester I							
S.No	Course Code	Course Title	Course Category	No of Hours/Week			Credit
				L	T	P	
Theory							
1	20EN101	Technical English-I	HSMC	3	0	0	3
2	20MA101	Mathematics-I	BSC	3	1	0	4
3	20PH101	Engineering Physics	BSC	3	0	0	3
4	20CY101	Engineering Chemistry	BSC	3	0	0	3
5	20GE101	Structured Programming Using C	ESC	3	0	0	3
6	20GE102	Engineering Graphics	ESC	2	0	2	3
Practicals							
7	20BS101L	Physics and Chemistry Laboratory	BSC	0	0	2	1
8	20GE103L	Structured Programming Using C Laboratory	ESC	0	0	2	1
9	20EEC101L	English for Effective Communication	EEC	0	0	2	1
			Total	**17**	**1**	**8**	**22**

Semester II							
S. No	Course Code	Course Title	Course Category	No of Hours/Week			Credit
				L	T	P	
Theory							
1	20EN201	Technical English-II	HSMC	3	0	0	3
2	20MA201	Mathematics-II	BSC	3	1	0	4
3	20PH201	Applied Physics	BSC	3	0	0	3
4	20BS201	Environmental Science	HSMC	3	0	0	3
5	20EC201	Semiconductor Devices	ESC	3	0	0	3
6	20EE201	Electric Circuit Analysis	ESC	3	0	0	3
Practicals							
7	20GE201L	Engineering Practices Laboratory	ESC	0	0	2	1
8	20EC202L	Circuits and Devices Laboratory	PCC	0	0	2	1
9	20EEC201L	Soft Skills	EEC	0	0	2	1
			Total	**18**	**1**	**6**	**22**

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Semester III							
S. No	Course Code	Course Title	Course Category	No of Hours/Week			Credit
				L	T	P	
Theory							
1	20MA302	Transforms and Partial Differential Equations	BSC	3	1	0	4
2	20EC301	Electronic Circuits-I	PCC	3	0	0	3
3	20EC302	Digital Electronics	PCC	3	0	0	3
4	20EC303	Signals and Systems	PCC	3	1	0	4
5	20IT302	C++ and Data Structures	ESC	3	0	0	3
6	20MC003	Constitution of India		2	0	0	0
Practicals							
7	20EC308L	Analog and Digital Circuits Laboratory	PCC	0	0	3	1
8	20IT303L	C++ and Data Structures Laboratory	ESC	0	0	3	1
9	20EEC301L	Soft skills Development	EEC	0	0	2	1
			Total	**17**	**2**	**8**	**20**

Semester IV							
S. No	Course Code	Course Title	Course Category	No of Hours/Week			Credit
				L	T	P	
Theory							
1	20MA403	Probability and Random Processes	BSC	3	1	0	4
2	20EC401	Electronic Circuits-II	PCC	3	0	0	3
3	20EE303	Electromagnetic Fields	ESC	3	0	0	3
4	20EC402	Linear Integrated Circuits	PCC	3	0	0	3
5	20EC403	Communication Theory	PCC	3	0	0	3
6	20EC404	Control System Engineering	PCC	3	0	0	3
Practicals							
7	20EC405L	Electronic Circuits-II Laboratory	PCC	0	0	3	1
8	20EC406L	Linear Integrated Circuits Laboratory	PCC	0	0	3	1
9	20EEC401L	Life Skills and personality Development	EEC	0	0	2	1
			Total	**18**	**2**	**8**	**22**

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Semester V							
S. No	Course Code	Course Title	Course Category	No of Hours/Week			Credit
				L	T	P	
Theory							
1	20EC501	Digital Communication	PCC	3	0	2	4
2	20EC502	Microprocessors and Microcontrollers	PCC	3	0	0	3
3	20EC503	Transmission Lines and Wave Guides	PCC	3	0	0	3
4	20EC504	Digital Signal Processing	PCC	3	0	2	4
5	20MC002	Universal Human Values 2: Understanding Harmony	HSC	3	0	0	3
6		Professional Elective -I	PEC	3	0	0	3
Practicals							
7	20EC505L	Microprocessors and Microcontrollers Laboratory	PCC	0	0	3	1
8	20EC506L	Mini Project-I	EEC	0	0	2	1
9	20EEC501L	Professional Skills Development	EEC	0	0	2	1
			Total	**18**	**0**	**11**	**23**

Semester VI							
S. No	Course Code	Course Title	Course Category	No of Hours/Week			Credit
				L	T	P	
Theory							
1	20EC601	Antenna and Wave Propagation	PCC	3	0	0	3
2	20EC602	VLSI Design	PCC	3	0	0	3
3	20CS401	Computer Networks	ESC	3	0	0	3
4	20MG501	Principles of Management	HSMC	3	0	0	3
5		Professional Elective-II	PEC	3	0	0	3
6		Open Elective-I	OEC	3	0	0	3
Practicals							
6	20EC603L	VLSI Design Laboratory	PCC	0	0	3	1
7	20EC604L	Networks Laboratory	PCC	0	0	3	1
8	20EC605L	Mini Project-II	EEC	0	0	2	1
9	20EEC601L	Employability Skills	EEC	0	0	2	1
			Total	**18**	**0**	**10**	**22**

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Semester VII							
S. No	Course Code	Course Title	Course Category	No of Hours/Week			Credit
				L	T	P	
Theory							
1	20EC701	Embedded and Real Time Systems	PCC	3	0	0	3
2	20EC702	Microwave Engineering and Optical Communication	PCC	3	0	0	3
3		Professional Elective-III	PEC	3	0	0	3
4		Professional Elective-IV	PEC	3	0	0	3
5		Open Elective-II	OEC	3	0	0	3
Practicals							
7	20EC703L	Embedded Laboratory	PCC	0	0	3	1
8	20EC704L	Microwave and Optical Communication Laboratory	PCC	0	0	3	1
			Total	**15**	**0**	**6**	**17**

Semester VIII							
S. No	Course Code	Course Title	Course Category	No of Hours/Week			Credit
				L	T	P	
Theory							
1		Professional Elective-V	PEC	3	0	0	3
2		Professional Elective-VI	PEC	3	0	0	3
Practicals							
3	20EC801L	Project work	EEC	0	0	20	10
			Total	**6**	**0**	**20**	**16**

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Professional Elective Course (PEC)
Semester- V
Elective I

S. No	Course Code	Course Title	Course Category	No of Hours/Week			Credit
				L	T	P	
1	20EC501PE	Industrial Electronics	PEC	3	0	0	3
2	20EC502PE	Introduction to VLSI Design	PEC	3	0	0	3
3	20EC503PE	Internet of Things	PEC	3	0	0	3
4	20EC504PE	Electronics Measurement and Instrumentation	PEC	3	0	0	3
5	20EC505PE	Nano Electronics	PEC	3	0	0	3
6	20CS201	Python Programming	PEC	3	0	0	3

Semester- VI
Elective II

S. No	Course Code	Course Title	Course Category	No of Hours/Week			Credit
				L	T	P	
1	20EC601PE	Digital Image Processing Techniques	PEC	3	0	0	3
2	20EC602PE	Wireless Communication	PEC	3	0	0	3
3	20EC603PE	Advanced Microcontroller	PEC	3	0	0	3
4	20EC604PE	Display Devices	PEC	3	0	0	3
5	20IT601	Artificial Intelligence	PEC	3	0	0	3
6	20EC605PE	Computer Architecture and Organization	PEC	3	0	0	3
7	20MA601PE	Quantitative and Reasoning Aptitude	BSC	3	0	0	3

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Semester- VII
Elective III

S. No	Course Code	Course Title	Course Category	No of Hours/Week			Credit
				L	T	P	
1	20EC701PE	IoT for System Design	PEC	3	0	0	3
2	20EC702PE	Advanced Electronic System Design	PEC	3	0	0	3
3	20EC703PE	Transducer Engineering	PEC	3	0	0	3
4	20EC704PE	Virtual Instrumentation	PEC	3	0	0	3
5	20EC705PE	PCB Design	PEC	3	0	0	3
6	20EC706PE	Introduction to wireless and Cellular Communication	PEC	3	0	0	3

Semester- VII
Elective IV

S. No	Course Code	Course Title	Course Category	No of Hours/Week			Credit
				L	T	P	
1	20BM705PE	Telehealth Technology	PEC	3	0	0	3
2	20EC707PE	Wireless Networks	PEC	3	0	0	3
3	20EC708PE	Introduction to MEMS and NEMS	PEC	3	0	0	3
4	20EC709PE	Network Security	PEC	3	0	0	3
5	20CS707PE	Introduction to Machine Learning	PEC	3	0	0	3
6	20EC710PE	Sensors and Actuators	PEC	3	0	0	3

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Semester- VIII
Elective V

S. No	Course Code	Course Title	Course Category	No of Hours/Week			Credit
				L	T	P	
1	20EC801PE	Satellite Communications	PEC	3	0	0	3
2	20EC802PE	High Speed Networks	PEC	3	0	0	3
3	20EC803PE	Avionics	PEC	3	0	0	3
4	20EC804PE	Mixed Signal Design	PEC	3	0	0	3
5	20EC805PE	Speech Signal Processing	PEC	3	0	0	3
6	20CS701PE	Software Testing	PEC	3	0	0	3

Semester- VIII
Elective VI

S. No	Course Code	Course Title	Course Category	No of Hours/Week			Credit
				L	T	P	
1	20EC806PE	Mobile Adhoc Networks	PEC	3	0	0	3
2	20MG701	Total Quality Management	PEC	3	0	0	3
3	20EC807PE	Radar and Navigational aids	PEC	3	0	0	3
4	20CS704PE	Soft Computing	PEC	3	0	0	3
5	20EC808PE	Electromagnetic Interference and Compatibility	PEC	3	0	0	3
6	20EC809PE	Enclosure Design of Electronics	PEC	3	0	0	3

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Open Elective Course (OEC)

Open Elective I (Semester- V)

S. No	Course Code	Course Title	Course Category	No of Hours/Week			Credit
				L	T	P	
1	20BM501OE	Basics of Biomedical Instrumentation	OEC	3	0	0	3
2	20BM502OE	Introduction to Cell Biology	OEC	3	0	0	3
3	20CE501PE	Industrial Waste Management	OEC	3	0	0	3
4	20CE502PE	Air Pollution and Control Engineering	OEC	3	0	0	3
5	20CS506OE	Fundamentals of Software Engineering	OEC	3	0	0	3
6	20CS508OE	Principles of Multimedia	OEC	3	0	0	3
7	20IT501OE	Fundamentals of Operating Systems	OEC	3	0	0	3
8	20IT502OE	Introduction to Database	OEC	3	0	0	3
9	20EE501OE	Non-Conventional Energy Resources	OEC	3	0	0	3
10	20EE502OE	Industrial Automation	OEC	3	0	0	3
11	20ME601OE	Production Technology	OEC	3	0	0	3
12	20ME602OE	Basics of Automotive Components	OEC	3	0	0	3

Open Elective II (Semester- VII)

S. No	Course Code	Course Title	Course Category	No of Hours/Week			Credit
				L	T	P	
1	20BM701OE	Bioinformatics	OEC	3	0	0	3
2	20BM702OE	Fundamentals of Nutrition	OEC	3	0	0	3
3	20CE701OE	Environmental Impact Assessment	OEC	3	0	0	3
4	20CE702OE	Building Services	OEC	3	0	0	3
5	20CS706OE	E-Commerce	OEC	3	0	0	3
6	20CS 707OE	Fundamentals of Cloud Computing	OEC	3	0	0	3
9	20EE701OE	Energy Storage Systems	OEC	3	0	0	3
10	20EE702OE	Electrical Safety Engineering	OEC	3	0	0	3
11	20ME701OE	Basics of Hydraulic and Pneumatic Systems	OEC	3	0	0	3
12	20ME702OE	Alternative Energy Fuels	OEC	3	0	0	3
13	20IT701OE	Programming in JAVA	OEC	3	0	0	3
14	20IT702OE	Web Design	OEC	3	0	0	3

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KONGUNADU COLLEGE OF ENGINEERING AND TECHNOLOGY
(AUTONOMOUS)
DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

VISION

To create highly skilled, proficient and excellent Electronics and Communication Engineers having professional ethics, passion and competence to adapt to the latest transformations in technology.

MISSION

- Promoting quality teaching and effective learning to face the global challenges.
- Enriching professionals of high caliber to excel in their careers through students' overall development.
- Promoting education that imparts multidisciplinary design approaches, innovation and creativity.

PROGRAM EDUCATIONAL OBJECTIVES (PEO):

- **PEO I:** Graduates shall exhibit the skills and knowledge required to design, develop and implement solutions for real life problems..
- **PEO II:** Graduates shall excel in professional career, higher education and research
- **PEO III:** Graduates shall demonstrate professionalism, entrepreneurship, ethical behavior, communication skills and collaborative team work to adapt to the emerging trends by engaging in lifelong learning.

PROGRAM OUTCOMES(PO):

1. **Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
2. **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.
3. **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.

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4. **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.
5. **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.
6. **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.
7. **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.
8. **Ethics**: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
9. **Individual and team work**: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
10. **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.
11. **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.
12. **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.

POGRAM SPECIFIC OUTCOMES (PSO's):

- **PSO1:** Students shall have skills and knowledge to work and design on PCB, analog and digital systems, adhoc and sensor networks, embedded and communication systems
- **PSO2:** Students are able to perform and design in the simulation tools and IoT related modules.

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E&E

20EN101 **TECHNICAL ENGLISH-I**

(Common to all branches)

L	T	P	C
3	0	0	3

OBJECTIVES:

The student should be made to,

- Enable learners develop basic communication skills in English.
- Enhance the speaking skills for academic, professional and social purposes.
- Enable learners make use of the electronic media such as internet and other online resources for their language development.
- Inculcate the habit of reading and writing for the purpose of effective communication.
- Develop confidence in learners to communicate in English for all purposes.

UNIT I SHARING INFORMATION **9**

Listening: Intensive and Extensive Listening, Barriers to Effective Listening; Speaking: Descriptions, Reading: Skimming and Scanning, Writing: Sentence completion - Autobiographical writing (writing about one's leisure time activities, hometown, etc.), Grammar: Parts of speech, Vocabulary: Word formation.

UNIT II INTRODUCTION TO WRITING **9**

Listening: Listening lectures/talks, Speaking: Telephonic interview, Reading: Inferring inferential and contextual meaning from literary texts, Writing: Biographical writing - Writing a paragraph (Cause and Effect/Compare and Contrast/Narrative/Analytical) - Writing a set of recommendations – Writing a set of instructions, Grammar: Prepositions - Active and Passive voice - Present Tense, Vocabulary: Confused Words.

UNIT III IMPROVING SPEAKING **9**

Listening: Listening to talks by eminent personalities - Focused audio tracks, Speaking: Role Play - Simulation - Group Interaction, Reading: Reading magazines, Writing: Business Letter (Order/Acceptance), Grammar: Past tense - Tag Questions - Subject - Verb Agreement, Vocabulary: Learning Words in Situations.

UNIT IV READING SKILLS **9**

Listening: Techniques for Effective Listening, Speaking: Speaking in job Interviews, Reading: Reading for factual and inferential meaning, Writing: Interpreting Visual Materials (Line Graphs, Pie Charts etc.), Grammar: Adverbs - Future Tense, Vocabulary: Single word substitutes.

UNIT V PRONUNCIATION **9**

Listening: Understanding different Accents, Listening to Radio and TV and taking notes, Speaking: Giving impromptu talks- Making presentations, Reading: Practice in speed reading, Writing: Business Letter (enquiry/Rejection), Grammar: Direct and Indirect Speech, Vocabulary: Phrasal Verbs.

TOTAL: 45 PERIODS

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OUTCOMES:

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

- Use suitable vocabulary with confidence and express their ideas both in speech and writing.
- Write intelligibly avoiding grammatical errors, using a range of vocabulary, organizing their ideas logically on a topic.
- Speak confidently, with one or many listeners using appropriate communicative strategies.
- Read different genres of texts adopting various reading strategies.
- Understand different spoken discourses/excerpts in different accents.

Text Book:

1. Sanjay Kumar and Pushp Lata, "Communication Skills", Oxford University Press, 2nd edition, 2015.

References:

1. P Kiranmai and Rajeevan Geeta, "Basic Communication Skills", Foundation Books, revised edition, 2013.
2. Redston, Chris & Gillies Cunningham, "Face2Face (Pre-Intermediate Student's Book & Workbook",Cambridge University Press, New Delhi, 2nd edition,2005.
3. Perumal, Lakshmana.N and Sathiseelan S, "Technical English-I", Sri Krishna Hitech Publishing Company Pvt.Ltd, Chennai: 2014.
4. Mohan, Krishna and Banerji Meera, "Developing Communication Skills", Macmillan Publishers India Ltd., Delhi, 2nd edition,2009.
5. Hewings, Martin. "Advanced English Grammar: A self study reference and Practice book for advanced South Asian students" Cambridge University Press, New Delhi, revised edition, 1999.

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20MA101	MATHEMATICS-I (COMMON TO ALL BRANCHES)	L T P C 3 1 0 4

OBJECTIVES:

The Student should be made to:

- Develop the use of matrix algebra technique for practical application
- Apply the properties of arithmetic and geometric in sequences and series
- Familiarize the students with differential calculus
- Familiarize the student with functions of several variables, this is needed in many branches of engineering
- Acquaint the student with mathematical tools needed in evaluating multiple integrals and their usage

UNIT I MATRICES **12**

Eigenvalues and Eigenvectors of a real matrix – Properties of eigenvalues and eigenvectors – Statement and applications of Cayley-Hamilton Theorem – Diagonalization of matrices – Reduction of a quadratic form to canonical form by orthogonal transformation – Nature of quadratic forms.

UNIT II SEQUENCE AND SERIES **12**

Sequences: Definition and examples – Series: Types and Convergence – Series of positive terms – Tests of convergence: Comparison test, Integral test and D'Alembert's ratio test – Alternating series – Leibnitz's test – Series of positive and negative terms – Absolute and conditional convergence.

UNIT III DIFFERENTIAL CALCULUS **12**

Representation of functions – Limit of a function – Continuity – Derivatives – Differentiation rules – Maxima and Minima of functions of one variable – Local maximum and minimum – absolute minimum and absolute maximum – increasing and decreasing – Concavity and inflection points – Rolle's theorem and mean value theorem(excluding proofs).

UNIT IV FUNCTIONS OF SEVERAL VARIABLES **12**

Limits and Continuity – Partial derivatives – Total derivative – Differentiation of implicit functions – Jacobian and properties – Taylor's series for functions of two variables – Maxima and minima of functions of two variables – Lagrange's method of undetermined multipliers.

UNIT V MULTIPLE INTEGRALS **12**

Double integrals in Cartesian and polar coordinates – Change of order of integration – Area enclosed by plane curves – Change of variables in double integrals – Triple integrals – Volume of Solids: Volume as triple integral – Cylindrical coordinates – Spherical coordinates

TOTAL: 60 PERIODS

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OUTCOMES:

On successful completion of this course, the students will be able to,

- Eigen values and eigenvectors, Diagonalization of a matrix, Symmetric matrices, Positive definite matrices and similar matrices
- Determining and describing the nth term of arithmetic and geometric sequences
- Apply differential calculus tools in solving various application problems
- Apply differentiation to solve maxima and minima problems
- Apply integration to compute multiple integrals, area, volume, integrals in polar coordinates, in addition to change of order and change of variables

TEXT BOOKS:

1. Grewal B S, "Higher Engineering Mathematics", Khanna Publishers, New Delhi, 44th Edition, 2014.
2. Narayanan S and Manicavachagom Pillay T K, "Calculus", Volume I and II, S Viswanathan Publishers Pvt. Ltd., Chennai, 2009.

REFERENCES:

1. Dass H K and Er. Rajnish Verma, "Higher Engineering Mathematics", S Chand Private Ltd., 2011.
2. Bali N P and Manish Goyal, "A Text Book of Engineering Mathematics", Eighth Edition, Laxmi Publications Pvt Ltd., 2011.
3. Peter V O'Neil, "Advanced Engineering Mathematics", Cengage Learning, 7th Edition, 2012.
4. Veerarajan T, "Engineering Mathematics", Tata McGraw Hill Publishing Company Limited, New Delhi, 2008.

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BoS (S&H)

20PH101	ENGINEERING PHYSICS (COMMON TO ALL BRANCHES)	L T P C 3 0 0 3

OBJECTIVES:

The student should be made to:

- Describe the basics of crystal structures and their growth techniques
- Explain the elastic properties of materials
- Analyze heat transfer mechanisms and their applications
- Develop an understanding of quantum mechanical concepts and their applications
- Gain fundamental knowledge of laser action, their production and fiber optics

UNIT – I CRYSTAL PHYSICS **9**

Crystalline and Amorphous materials – Crystal systems, Bravais lattices, Miller indices – Interplanar distance – Calculation of number of atoms per unit cell – Atomic radius – Coordination number – Packing factor for SC, BCC, FCC and HCP structures – Crystal growth techniques – solution, Melt (Bridgman and Czochralski methods)

UNIT – II PROPERTIES OF MATTER **9**

Elasticity – Stress–Strain diagram and its uses – Factors affecting elastic modulus – 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 and its application.

UNIT – III THERMAL PHYSICS **9**

Modes of heat transfer – Thermal capacity – Newton's law of cooling – Rectilinear heat flow – Thermal conductivity – Forbe's and Lee's disc method: Theory and Experiment – Radial flow of heat – Thermal conductivity of rubber tube – Heat conduction through compound media (Series and Parallel) – Solar power – Advantages – Solar water heater.

UNIT – IV QUANTUM PHYSICS **9**

Black body radiation – Planck's theory (derivation) – Deduction of Wien's displacement law and Rayleigh – Jean's Law from Planck's theory – de-Broglie wavelength – Properties of Matter waves – Schrodinger's wave equation – Time independent and time dependent wave equations – Physical significance of wave function – Particle in a one dimensional box – Extension to 3D – Degeneracy – Electron Microscope – Scanning Electron Microscope.

UNIT – V LASER AND FIBER OPTICS **9**

Lasers: Principles of laser – Population inversion – Einstein's A and B coefficients–derivation – Modes of vibration in CO_2 molecules – CO_2 Laser – Nd–YAG Laser – Basic principles of a homojunction semiconductor Laser – Industrial and Medical applications of Laser – Fiber optics: principle, numerical aperture and acceptance angle – Types of optical fibers (material, refractive index, mode) – Fiber optic communication system (Block diagram).

TOTAL: 45 PERIODS

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OUTCOMES:

On successful completion of this course, the students will be able to,

- Identify crystal structure types and describe their growth techniques
- Analyze the elastic properties of materials
- Evaluate the thermal properties of materials
- Explain basic quantum mechanical concepts and their applications
- Elucidate the basic concepts of lasers and their applications

TEXT BOOKS:

1. Pandey B K and Chaturvedi S, "Engineering Physics", Cengage Learning India Pvt. Ltd., Delhi, 2018.
2. Malik H K and Singh AK, "Engineering Physics" TMH, New Delhi, 2010.

REFERENCES:

1. Gaur R K and Gupta S L, "Engineering Physics", DhanpatRai Publications, New Delhi, 2014.
2. Marikani A, "Engineering Physics", PHI learning Pvt. Ltd. New Delhi, Second Edition, 2013.
3. Avadhanulu M N, "Engineering Physics", SChand and Company Ltd, New Delhi, First Edition, 2007.
4. Wahab M A, "Solid State Physics", Narosa Publishing House, New Delhi, 2nd Edition, 2005.

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20CY101	ENGINEERING CHEMISTRY (COMMON TO ALL BRANCHES)	L T P C 3 0 0 3

OBJECTIVES:

The student should be made to:

- Study the characteristics of water & to know the various treatment methods for effective applications.
- Understand the concept of electrochemistry and corrosion prevention.
- Know the significance and properties of polymers.
- Know the fundamentals of phase rule and its applications and to analyse the principle and generation of energy in batteries and fuel cells.
- Evaluate types of fuels based on calorific values and to know the significance of solid, liquid and gaseous fuels.

UNIT I WATER TECHNOLOGY **9**

Sources of water – Hard and soft water – Boiler feed water-requirements – disadvantages of using hard water in boilers (Scale- Sludge- Caustic Embrittlement - Priming - Foaming) – Estimation of hardness of water by EDTA method – Internal conditioning (Phosphate, Calgon, Colloidal and Carbonate conditioning methods) – External conditioning – Zeolite and demineralization process – desalination and reverse osmosis.

UNIT II ELECTROCHEMISTRY AND CORROSION **9**

Electrochemistry – Nernst equation and its Applications – Electrochemical series – Corrosion – Types – Dry and Wet corrosion – Galvanic corrosion – Differential aeration corrosion – Pitting corrosion – Corrosion control – sacrificial anodic method and impressed current cathodic protection method – Protective coatings – Paints and its constituents.

UNIT III POLYMERS **9**

Polymers – definition – Classification – addition – condensation polymerization and copolymerization – mechanism of polymerization – (cationic, Anionic and free Radical) – Plastics – classification – preparation, properties and uses of PVC, Teflon, Nylon-6,6 and Epoxy resin – Rubber – vulcanization of rubber – butyl rubber, Styrene Butadiene Rubber.

UNIT IV PHASE RULE AND STORAGE DEVICES **9**

Phase Rule – Terms involved – One Component system (water system) – Two component system (Lead-Silver system) – Thermal analysis – Storage devices – Cell and a battery – Alkaline battery – Lead acid battery – Nickel-Cadmium battery and lithium battery – Fuel cells – Hydrogen – Oxygen fuel cell.

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BoS (S&H)

UNIT V FUELS AND COMBUSTION 9

Fuels – Introduction – Classification of fuels – coal – Analysis of coal (proximate and ultimate) – Carbonization – Manufacture of metallurgical coke (Otto Hoffmann method) – Petroleum – Manufacture of synthetic petrol (Bergius process) – Knocking – Anti knocking – Octane number – Cetane number – Gaseous fuels – LPG, CNG – Combustion: Calorific value – higher and lower calorific values – Theoritical calculation of calorific value – Flue gas analysis (ORSAT Method).

TOTAL: 45 PERIODS

OUTCOMES:

On successful completion of this course, the students will be able to,

- Gain knowledge on the water quality parameters.
- Identify the solutions to prevent corrosion.
- Analyse the applications of polymers.
- Achieve the knowledge about types of phase diagram and storage devices.
- Evaluate the characteristics of various fuels.

TEXT BOOKS:

1. Jain P C and Monica Jain, "Engineering Chemistry", Dhanpat Rai Publishing, Company. New Delhi, 2013.
2. Dara S S, "A Text Book of Engineering Chemistry", S Chand & Co Ltd., New Delhi, 2013.

REFERENCES:

1. Shika Agarwal, "Engineering Chemistry", Cambridge University Press., Delhi, 2015.
2. Sivasankar B, "Engineering Chemistry", Tata McGraw-Hill Publishing Company, Ltd., New Delhi, 2008.
3. Palanna O G, "Engineering Chemistry" ,Tata Mc.Graw Hill Education Private Limited, New Delhi, 2011
4. Prasanta Rath, "Engineering Chemistry", Cengage Learning India Pvt. Ltd., Delhi, 2018.

CHAIRMAN
BoS (S&H)

20GE101	STRUCTURED PROGRAMMING USING C (COMMON TO ALL BRANCHES)	L	T	P	C
		3	0	0	3

OBJECTIVES:

The student should be made to:

- Know the fundamentals of Computer and Programming
- Choose appropriate programming constructs in C language
- Construct programs using array and pointer
- Write programs using string and function
- Develop programs using the concept of structure, union and files

UNIT I FUNDAMENTALS OF COMPUTER AND PROGRAMMING 9

Computer System – CPU – Memory Unit – Data Representation – Number System and Conversion – Programming Fundamentals – Program Development Life Cycle – Algorithm – Control Structures – Flowchart – Pseudocode – Programming Paradigms – Problem Formulation and Problem Solving.

UNIT II BASICS OF C PROGRAMMING 9

Overview of C – C Character Set – Identifiers and Keywords – Declaration – Data types – Type Qualifiers and Type Modifiers – Variables and Constants – Structure of a C Program – Executing a C Program – Operators and Expressions – Decision-Making and Looping Statements.

UNIT III ARRAYS AND POINTERS 8

Introduction to Arrays – Single Dimensional Arrays – Multidimensional Array – Pointers – void Pointer – Null Pointer – Relationship between Arrays and Pointers – Arrays of Pointers – Pointer to a Pointer – Pointer to an Array.

UNIT IV STRINGS AND FUNCTIONS 9

Strings – Character Arrays – Reading String input – String Library Functions – List of Strings – Command Line Arguments – Functions: Types – Declaration – Definition – Function Call – Pass by Value – Pass by Reference – Passing arrays to functions – Recursion – Pointer to function.

UNIT V STRUCTURE, UNION AND FILES 10

Structures – Pointers to Structures – Array of Structures – Structures within a Structure – Functions and Structures – typedef and Structures – Unions – Practical Applications of Unions – Enumerations – Bit fields – Storage Classes – C Preprocessor – Files: Streams – File type – File operations – Command line arguments.

TOTAL: 45 PERIODS

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BoS(IT)

OUTCOMES:

On successful completion of this course, the students will be able to,

- Understand the fundamentals of Computer and Programming
- Choose appropriate data types, variables and statements for solving simple problems
- Construct programs using arrays and pointers for a given scenario
- Write programs using strings and functions
- Develop programs using structure, union and files for a given scenario

TEXT BOOKS:

1. Anita Goel and Ajay Mittal, "Computer Fundamentals and Programming in C", Pearson India Education Services Pvt. Ltd., 2016.

REFERENCES:

1. Ajay Mital, "Programming in C - A Practical Approach", Pearson Education, 2015.
2. Dromey R G, "How to Solve it by Computer", Pearson Education, Fifteenth Impression, 2014.
3. Herbert Schildt, "C - The Complete Reference", Tata McGraw-Hill, 2013
4. Ashok N Kamthane, "Computer Programming", Pearson Education, Second Edition, 2012.
5. Juneja B L and Anita Seth, "Programming in C", Cengage Learning India Pvt. Ltd., 2011

CHAIRMAN
BoS(IT)

20GE102	ENGINEERING GRAPHICS (COMMON TO ALL BRANCHES)	L T P C 2 0 2 3

OBJECTIVES:

The Student should be made to:

- Explain the students with various concepts like dimensioning, standards, curves and free hand sketching
- Impart knowledge on projection of points, lines and plane surfaces
- Improve the visualization skills for better understanding of projection of solids
- Develop the imaginative skills of the students required to understand section of solids and development of surfaces
- Make the students to understand the viewing perception of a solid object in Isometric and Perspective projections

CONCEPTS AND CONVENTIONS (NOT FOR EXAMINATION) **2**

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

UNIT I PLANE CURVES AND FREE HAND SKETCHING **9+6**

Curves used in engineering practices: Conics – Construction of ellipse, Parabola and hyperbola by eccentricity method – Construction of cycloid, epicycloid – Drawing of tangents and normal to the above curves.

Visualization concepts and Free Hand sketching: Visualization principles – Representation of Three Dimensional objects – Layout of views – Freehand sketching of multiple views from pictorial views of objects.

UNIT II PROJECTION OF POINTS, LINES AND PLANE SURFACES **9+6**

Projection of points – Projection of straight lines (only First angle projections) inclined to both the principal planes – Determination of true length and true inclination by rotating line method – Projection of planes inclined to both the principal planes by rotating object method.

UNIT III PROJECTION OF SOLIDS **7+6**

Projection of simple solids like prisms, pyramids, cylinder, cone when the axis is inclined to one of the principal planes by rotating object method.

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BoS (MECH)

UNIT IV PROJECTION OF SECTIONED SOLIDS AND DEVELOPMENT OF SURFACES **9+6**

Sectioning of solids: prisms, pyramids, cylinder, cone in simple vertical position when the cutting plane is inclined to the one of the principal planes and perpendicular to the other – obtaining true shape of section. Development of lateral surfaces of simple and sectioned solids: prisms, pyramids, cylinder and cone.

UNIT V ISOMETRIC AND PERSPECTIVE PROJECTIONS **9+6**

Principles of isometric projection – isometric scale – isometric projections of simple solids and truncated solids: Prisms, pyramids, cylinder, cone – Perspective projection of simple solids: Prisms, pyramids and cylinder by visual ray method.

TOTAL: 75 (45+30) PERIODS

COURSE OUTCOMES:

On successful completion of this course, the students will be able to,

- Apply the concepts of dimensioning, standards, curves and free hand sketching objects
- Sketch the projection of points, straight lines and plane surfaces
- Understand the projection of solids in various positions
- Construct projection of solids and development of surfaces
- Draw isometric and perspective sections of simple solids

TEXT BOOKS:

1. Natarajan K V, "A Text Book of Engineering Graphics", Dhanalakshmi Publishers, Chennai, 2018.
2. Venugopal K and Prabhu Raja V, "Engineering Graphics", New Age International Pvt. Limited, 2015.

REFERENCES:

1. Bhatt N D and Panchal V M, "Engineering Drawing", Charotar Publishing House, 50th Edition, 2010.
2. Basant Agarwal and Agarwal C M, "Engineering Drawing", Tata McGraw Hill Publishing Company Limited, New Delhi, 2008.
3. Gopalakrishna K R, "Engineering Drawing", Vol. I and II Combined, Subhas Stores, Bangalore, 2007.

Special points applicable to End Semester Examinations on Engineering Graphics:

1. There will be five questions, each of either or type covering all units of the syllabus.
2. All questions will carry equal marks of 20 each making a total of 100.
3. The answer paper shall consist of drawing sheets of A3 size only. The students will be permitted to use appropriate scale to fit solution within A3 size.
4. The examination will be conducted in appropriate sessions on the same day.

CHAIRMAN
BoS (MECH)

20BS101L	PHYSICS AND CHEMISTRY LABORATORY (COMMON TO ALL BRANCHES)	L T P C 0 0 2 1

OBJECTIVES:

The student should be made to:

- Understand the characteristics of an engineering material
- Know the physical properties of matter
- Estimate types of ions in drinking water
- Analyze the characteristics of acids
- Know the conductivity of a solution

LIST OF THE EXPERIMENTS - PHYSICS - Any six experiments to be conducted

1. Determination of rigidity modulus – Torsion pendulum
2. Determination of Young's modulus by non-uniform bending method
3. (a) Determination of wavelength and particle size using Laser
   (b) Determination of acceptance angle in an optical fiber.
4. Determination of thermal conductivity of a bad conductor – Lee's Disc method.
5. Determination of velocity of sound and compressibility of liquid – Ultrasonic interferometer
6. Determination of wavelength of mercury spectrum – spectrometer grating
7. Determination of band gap of a semiconductor
8. Determination of thickness of a thin wire – Air wedge method.
9. Determination of Coefficient of Viscosity of liquids by Poiseuille's method.

LIST OF THE EXPERIMENTS - CHEMISTRY – Any seven experiments to be conducted

1. Estimation of HCl using Na_2CO_3 as primary standard and determination of alkalinity in water sample.
2. Determination of total, temporary & permanent hardness of water by EDTA method.
3. Determination of chloride content of water sample by Argentometric method.
4. Determination of strength of given hydrochloric acid using pH meter.
5. Determination of strength of acids in a mixture of acids using conductivity meter.
6. Estimation of iron content of the given solution using potentiometer.
7. Conductometric titration of strong acid Vs strong base.
8. Determination of molecular weight of polyvinyl alcohol using Ostwald viscometer.
9. Estimation of iron content of the water sample using spectrophotometer.
10. Determination of rate of corrosion by weight loss method.

TOTAL: 30 PERIODS

OUTCOMES:

On successful completion of this course, the students will be able to,

- Analyze the characteristics of engineering materials.
- Find out the physical properties of matter.
- Assess the water quality parameter.
- Analyze the pH of aqueous solutions.
- Gain knowledge on chemical properties of liquids.

CHAIRMAN
BoS (S&H)

20GE103L	STRUCTURED PROGRAMMING USING C LABORATORY (COMMON TO ALL BRANCHES)	L T P C 0 0 2 1

OBJECTIVES:

The student should be made to:

- Develop C programs using conditional and looping statements
- Understand the concept of functions, arrays and strings
- Learn to access memory using pointers
- Group different kinds of information related to a single entity
- Understand the manipulation of data in permanent storage

PRACTICAL SYLLABUS:

1. Programs using decision making statements.
2. Programs using looping statements.
3. Programs using user defined functions and recursive functions.
4. Programs using one dimensional and two dimensional arrays.
5. Solving problems using string functions.
6. Programs using pointers and dynamic memory allocation.
7. Programs using structures and unions.
8. Programs using pointers to structures and other data types.
9. Programs using text files.
10. Programs using binary files.

TOTAL: 30 PERIODS

OUTCOMES:

On successful completion of this course, the students will be able to,

- Implement C programs using control statements
- Write C programs using functions, arrays and strings
- Access data in memory using pointers
- Use structures and other user defined data structures to manipulate heterogeneous data
- Manipulate data stored on permanent storage

CHAIRMAN
BoS(IT)

20EEC101L	ENGLISH FOR EFFECTIVE COMMUNICATION (COMMON TO ALL BRANCHES)	L T P C 0 0 2 1

OBJECTIVES:

The student should be made to:

- Develop and understand verbal and non-verbal communication
- Acquire grammar for effective communication
- Enable learners express different functions using appropriate language
- Enable learners develop their ability to converse in different situations
- Impart skills in using English at workplace effectively

UNIT I UNDERSTANDING COMMUNICATION **6**

Role and Importance of Communication – Verbal and Non-verbal Communication – Barriers to Communication – Communication Mediums – Effective Communication – Group Communication.

UNIT II VOCABULARY AND GRAMMAR **6**

Aspects of vocabulary learning – Word formation – Sentence formation - Short forms of verbs - Common Grammatical Errors – Connective sentences - usage of Idioms and Phrases.

UNIT III EXPRESSING VARIED FUNCTION **6**

Introducing yourself – Greeting – Conversation between stranger – permission – opinion – information – Refusing – Agree/disagree – Apology – Praising – Requesting.

UNIT IV CONVERSATION LANGUAGE **6**

Understanding conversation – Chunking –Telling a story – Understanding public speech – Recognize Instructions – Persuasive Speech –Introduction to emphatic stress – Intensifying important words – Emphasizing corrections.

UNIT V CORPORATE COMMUNICATION **6**

Listening to Videos – Telephone and Email Etiquette – Extempore – Drafting and Delivering a Speech – Making Presentations – Group Discussion.

TOTAL: 30 PERIODS

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BoS (S&H)

OUTCOMES:

On successful completion of this course, the students will be able to,

- Create a group and discuss efficiently in a group communication
- Understand the Sentence formation with proper Vocabulary
- Sort out the language functions to foster a good conversation
- Get the proper pronunciation and usage of language
- Build Communication at workplace in various situations

REFERENCES:

1. Hancock Mark, "English Pronunciation in Use: Intermediate", Cambridge University Press, New Delhi, 2009.
2. Cheepen Christine and James Monaghan, "Spoken English: A Practical Guide", London: Pinter, 1990.
3. Sasikumar V and Dhamija P V, "Spoken English-A Self-Learning Guide to Conversation Practice", TMH, 1995.
4. Singh Ashish, "How to Communicate Effectively", Patridge, New Delhi, 2014.
5. Wilkinson Andrew M, "Spoken English", Edgbaston: University of Birmingham, 1966.

CHAIRMAN
BoS (S&H)

ECE

20EN201 **TECHNICAL ENGLISH -II**

(Common to all branches)

L	T	P	C
3	0	0	3

OBJECTIVES:

The students should be made to

- Improve the reading skills for the purpose of effective communication.
- Make learners acquire listening and speaking skills in both formal and informal contexts.
- Enable learners improve their reading skills from online sources.
- Equip the learners with writing skills needed for academic as well as work place.
- Help the learners improve language skills at their own pace by using the language lab.

UNIT I CONVERSATIONS **9**

Listening: Barriers to Effective Listening- Listening to informal conversations, Speaking: Short conversations in varied situations in student life, Reading: Reading Short text and longer passages for comprehension at deeper levels, Writing: Writing reviews (book / film), Grammar: Compound Nouns - Numerical Expression, Vocabulary: Homonyms-Homophones.

UNIT II INFORMAL USE OF LANGUAGE **9**

Listening: Listening to Situation based Dialogues, Speaking: Using dictionary for learning pronunciation, stress, and syllable divisions. Reading: Reading a short story for appreciation and understanding, Writing: Informal Letter writing- Dialogue writing Grammar: Definition - Purpose expressions- Relative Pronouns, Vocabulary: Technical Vocabulary - Count/Un count nouns.

UNIT III GENERAL READING **9**

Listening: Listening strategies for deeper understanding, Speaking: Asking about Routine actions and giving directions, Reading: an article from Newspaper- Critical reading, Writing: Minutes of meeting - Essay writing, Grammar: Degrees of Comparison, Vocabulary: Collocations.

UNIT IV ENGLISH FOR CAREER **9**

Listening: Listening strategies for Effective conversation, Speaking: Group Discussion skills, Reading: pre reading and post reading tasks, Writing: Applying for a Job - Cover Letter -Resume preparation, Grammar: Articles, Vocabulary: Synonyms and Antonyms.

UNIT V REPORT WRITING **9**

Listening: Listening and making notes, Speaking: Discussion on problems and solutions, Reading: Reading Journal Articles, Writing: Types of Reports - Feasibility / Accident /Project Report, Grammar: If Clause, Vocabulary: Idioms and their Meanings.

TOTAL: 45 PERIODS

Chairman
BoS/S&H

OUTCOMES:

On successful completion of this course, the students will be able to,

- Speak fluently, express their opinions clearly, initiate a discussion, negotiate, and argue using appropriate communicative strategies.
- Listen/view and comprehend different spoken excerpts critically and infer unspoken and implied meanings.
- Read different genres of texts, infer implied meanings and critically analyze and evaluate them for ideas as well as for method of presentation.
- Make effective presentations using power point and participate successfully in Group Discussions.
- Write efficiently and persuasively and create different types of writing such as narration, description, exposition and argument as well as creative, critical, analytical and evaluative writing.

Text Book:

1. Bhatnagar, Nitin and Bhatnagar, Mamta, "Communicative English for Engineering and Professionals", Pearson Education India, 1st edition, 2010.

References:

1. Raman Meenakshi and Sharma Sangeetha, "Technical Communication Principles and Practice", Oxford University Press: New Delhi, 3rd edition, 2015.
2. Andrea J, Rutherfoord, "Basic Communication Skills for Technology" Pearson Education, Inc., 2nd edition, 2000.
3. Rizvi M, Ashraf. "Effective Technical Communication "Tata McGraw Hill Education Pvt.Ltd., NewDelhi,11th edition, 2001.
4. Perumal, Lakshmana N and Sathiseelan S, "Technical English-II", Sri Krishna Hitech Publishing Company Pvt.Ltd, Chennai, 2014.

Chairman
BoS/S&H

20MA201	MATHEMATICS-II (COMMON TO ALL BRANCHES)	L T P C 3 1 0 4

OBJECTIVES:

The student should be made to:

- Make the student acquire sound knowledge of techniques in solving ordinary differential equations obtained from engineering problems
- Acquaint the student with the concepts of vector calculus that is needed for problems in engineering disciplines
- Understand the Analytic Functions can be widely used for modelling the various laws of physics
- Familiarize the students with complex integration techniques and contour integration techniques which can be used in real integrals.
- Make the student for appreciating the purpose of using transforms to create a new domain in which it is earlier to handle the problem that is being investigated

UNIT I ORDINARY DIFFERENTIAL EQUATIONS **12**

Higher order linear differential equations with constant coefficients $(e^{ax}V, x^nV)$ – Method of variation of parameters – Cauchy's and Legendre's linear equations – Simultaneous first order linear equations with constant coefficients.

UNIT II VECTOR CALCULUS **12**

Gradient, Divergence and Curl – Directional derivative – Irrotational and Solenoidal vector fields – Vector integration: line integral – surface integral – Green's theorem in a plane, Gauss divergence theorem and Stoke's theorem (excluding proofs)

UNIT III ANALYTIC FUNCTIONS **12**

Functions of a complex variable – Analytic functions: Necessary conditions – Cauchy-Riemann equations and sufficient conditions (excluding proofs) – Harmonic and orthogonal properties of analytic function – Harmonic conjugate – Construction of analytic functions – Conformal mapping $(w = z^2, z + k, 1/z, kz)$ and bilinear transformation.

UNIT IV COMPLEX INTEGRATION **12**

Complex integration – Statement and applications of Cauchy's integral theorem and Cauchy's integral formula – Taylor's and Laurent's series expansions – Singular points – Residues – Cauchy's residue theorem – Evaluation of real definite integrals as contour integrals around unit circle and semi-circle (excluding poles on the real axis).

UNIT V LAPLACE TRANSFORM **12**

Transforms of elementary functions – Transform of unit step function and unit impulse function – Basic properties – Shifting theorems – Transforms of derivatives and integrals – Initial and final value theorems – Transform of periodic functions – Inverse transforms – Convolution theorem – Solution of linear second order ordinary differential equations with constant coefficients.

TOTAL: 60 PERIODS

CHAIRMAN
BoS (S&H)

OUTCOMES:

On successful completion of this course, the students will be able to,

- Apply various methods of solving differential equation which arise in many application problems
- Calculate grad, div and curl and use Gauss, Stokes and Greens theorems to simplify calculations of integrals
- Examine analytic functions and its properties, conformal mapping and its applications
- Evaluate real and complex integrals using the Cauchy's integral formula and residue theorem
- Use knowledge of Laplace transform and its properties, inverse Laplace transform to solve linear differential equations

TEXT BOOKS:

1. Grewal B S, "Higher Engineering Mathematics", Khanna Publishers, New Delhi, 44th Edition, 2014.
2. Bali N P and Manish Goyal, "A Text Book of Engineering Mathematics", Eighth Edition, Laxmi Publications Pvt Ltd., 2011.

REFERENCES:

1. Dass H K and Er. Rajnish Verma, "Higher Engineering Mathematics", S Chand Private Ltd., 2011.
2. Glyn James, "Advanced Modern Engineering Mathematics", Pearson Education, 3rd Edition, 2012.
3. Jain R K and Iyengar S R K, "Advanced Engineering Mathematics", Narosa Publications, New Delhi, 3rd Edition, 2007.
4. Veerarajan T, "Engineering Mathematics", Tata McGraw Hill Publishing Company Limited, New Delhi, 2008.

CHAIRMAN
BoS (S&H)

20PH201	APPLIED PHYSICS (COMMON TO ECE, EEE, CSE & IT)	L T P C 3 0 0 3

OBJECTIVES:

The student should be made to:

- Apply classical and quantum theories to explain transport properties of conductors.
- Analyze properties of semiconductors and their characterization.
- Understand dielectric properties of materials and their applications.
- Explain the magnetic and superconducting properties of materials.
- Gain knowledge on the properties of new engineering materials.

UNIT I CONDUCTING MATERIALS **9**

Classical free electron theory of metals – Electrical conductivity and Thermal conductivity of metals – Wiedemann-Franz law – Lorentz number – Drawbacks of classical free electron theory – Quantum free electron theory – Fermi distribution function – Temperature dependence – Density of energy states – Carrier concentration in metals.

UNIT II SEMICONDUCTOR PHYSICS **9**

Band theory (Qualitative) – Effective mass of an electron – Semiconductor and its type – Carrier concentration in intrinsic semiconductors – Fermi level of intrinsic semiconductor–variation with temperature – Extrinsic semiconductors: carrier concentration in *n*-type and *p*-type semiconductors – Fermi energy level of extrinsic semiconductor – Variation of Fermi energy levels with respect to temperature and impurity concentration – Hall effect and its applications.

UNIT III DIELECTRIC MATERIALS **9**

Dielectric materials – Polarization – Electronic polarization – Ionic polarization – Orientation polarization – Space charge polarization – Langevin-Debye equation – Temperature and Frequency effects on polarization – Internal field – Clausius Mosotti relation – Dielectric breakdown – Dielectric loss – Ferroelectric materials – Uses of dielectric materials

UNIT IV MAGNETIC AND SUPERCONDUCTING MATERIALS **9**

Origin of Magnetic moment – Bohr Magneton – Classification of magnetic materials – Ferromagnetism – Domain theory – Hysteresis – Hard and Soft magnetic materials and its applications – Superconducting materials and their properties – Type-I and Type-II superconductor – BCS theory of superconductors – Applications of superconductors – High temperature superconductor (qualitative).

UNIT V NEW ENGINEERING MATERIALS **9**

Metallic glasses – Types – Preparation – Properties and applications – Shape Memory Alloys (SMA) – Characteristics and applications – Advantages and disadvantages of shape memory alloys – Synthesis of nanomaterials – Top down approaches (Ball Milling) and Bottom up approaches (CVD).

TOTAL: 45 PERIODS

CHAIRMAN
BoS (S&H)

OUTCOMES:

On successful completion of this course, the students will be able to,

- Explain the theories relating to the electrical properties of conducting materials.
- Analyze the semiconducting properties of materials.
- Identify the required dielectric properties of materials for engineering applications
- Gain knowledge on the properties of magnetic and superconducting materials.
- Describe the behaviour of new engineering materials.

TEXT BOOKS:

1. Bhattcharya D K and PoonamTandom, "Engineering Physics", Oxford University Press, New Delhi, 2017.
2. Pillai S O, "Solid State Physics", New Age International Publishers, Chennai, 2015.
3. Marikani A, "Engineering Physics", PHI Learning Pvt. Ltd., New Delhi, 2nd Edition, 2013.

REFERENCES:

1. Malik K and Singh A K, "Engineering Physics", TMH, New Delhi, 2010.
2. Avadhanulu M N, "Engineering Physics", S Chand and Company Ltd, New Delhi, 1st Edition, 2007.
3. Kasap S O, "Principles of Electronic Materials and Devices", McGraw Hill Education, 2007.
4. Salivahanan S, Rajalakshmi A, Karthie S and Rajesh N P, "Physics for Electronics Engineering and Information Science ", McGraw Hill Education, 2018.

CHAIRMAN
BoS (S&H)

20BS201	ENVIRONMENTAL SCIENCE (COMMON TO ALL BRANCHES)	L T P C 3 0 0 3

OBJECTIVES:

The student should be made to:

- Study the interrelationship between living organism and environment
- Understand and tackle the impacts of pollution.
- Attain sustainable development by conserving natural resources.
- Find and implement scientific, technological, economic and political solutions to environmental problems
- Analyze the problems faced by the over population.

UNIT I ENVIRONMENT, ECOSYSTEMS AND BIODIVERSITY **9**

Definition, scope and importance of environment – concept of an ecosystem – structure and function of an ecosystem – Ecological succession – food chain – food web – structure and function of the (a) forest ecosystem (b) desert ecosystem (c) aquatic ecosystem – (pond and ocean) – Biodiversity – Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts – Values of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values – Endangered, Extinct and Endemic species – conservation of biodiversity: In-situ and ex-situ methods.

UNIT II ENVIRONMENTAL POLLUTION **9**

Definition – causes, effects and control measures of: (a) Air pollution (b) Water pollution (c) Marine pollution (d) Noise pollution (e) Thermal pollution (f) Nuclear hazards- solid waste Management – role of an individual in prevention of pollution – disaster management: floods, earthquake, cyclone and landslides.

UNIT III NATURAL RESOURCES **9**

Forest resources: deforestation – mining, dams and their effects on forests and tribal people – Water resources: Use and over-utilization of surface and ground water – dams-benefits and problems – Mineral resources: environmental effects of extracting and using mineral resources – Food resources: World food problems – Effects of modern agriculture – fertilizer-pesticide problems, water logging, salinity – Energy resources: renewable and non-renewable energy sources (Solar, wind, Coal, Petrol, Nuclear) Land resource: land degradation, Soil erosion and desertification – role of an individual in conservation of natural resources.

UNIT IV SOCIAL ISSUES AND THE ENVIRONMENT **9**

Sustainable development – Water conservation – rain water harvesting – resettlement and rehabilitation of people; its problems and concerns – environmental ethics – global warming – acid rain , ozone layer depletion – wasteland reclamation – consumerism – Air (Prevention and Control of Pollution) act – Water (Prevention and control of Pollution) act – Wildlife protection act – Forest conservation act – Role of NGO's in environmental protection.

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BoS (S&H)

UNIT V HUMAN POPULATION AND THE ENVIRONMENT 9

Population growth, variation among nations – population explosion – family welfare programme – environment and human health – human rights – value education – HIV / AIDS – women and child welfare – role of information technology in environment and human health.

TOTAL: 45 PERIODS

OUTCOMES:

On successful completion of this course, the students will be able to,

- Acquire knowledge on public awareness & about the environment & ecosystem.
- Able to identify the impacts of pollution.
- Frame solutions to achieve sustainable development.
- Able to analyze about the social issues in the environment.
- Apply the acquired knowledge to tackle the problems of over population.

TEXT BOOKS:

1. Benny Joseph, "Environmental Science and Engineering", Tata McGraw-Hill, New Delhi, 2006.
2. Gilbert M Masters, "Introduction to Environmental Engineering and Science", Pearson Education Pvt., Ltd., 2nd Edition, 2004.

REFERENCES:

1. Tyler Miller G and Scott Spoolman, "Introduction to Environmental Science", Cengage Learning India Pvt., Ltd., 2009.
2. Dharmendra S Sengar, "Environmental Law", Prentice hall of India Pvt Ltd, New Delhi, 2007.

CHAIRMAN
BoS (S&H)

20EC201	SEMICONDUCTOR DEVICES	L	T	P	C
		3	0	0	3

OBJECTIVES:

The student should be made to:

- Understand the fundamentals of semiconductor devices
- Learn the working principle of BJT along with their performance characteristics and applications
- Study and analyze the performance of FETs and MOSFETs on the basis of their operation and applications
- Learn the working principle of special semiconductor devices
- Explain the working principle of power electronic and opto-electronic devices with its V-I characteristics

UNIT I SEMICONDUCTOR DIODE 9

Classification of semiconductor – Mass action law – Diffusion and drift currents – PN junction diode – Forward and reverse bias characteristics – Energy Band structure of open circuited PN Junction – Diode Current equation – Transition and Diffusion Capacitances – Switching Characteristics – Breakdown in PN Junction Diodes.

UNIT II BIPOLAR JUNCTION TRANSISTOR 9

Construction of BJT – Operation of NPN and PNP transistor – Input and Output characteristics of CE, CB, CC configuration – Comparison of CB,CE and CE – Ebers-Moll Model – h-parameter model.

UNIT III FIELD EFFECT TRANSISTORS 9

JFET: P channel JFET and N channel JFET – Construction – Operation – Drain and Transfer characteristics – Saturation Drain Current equation – Comparison of JFET with BJT.

MOSFET: Depletion MOSFET, Enhancement MOSFET – Characteristics – Channel length modulation – Comparison of MOSFET with JFET – Dual Gate MOSFET

UNIT IV SPECIAL SEMICONDUCTOR DEVICES 9

Construction, Operation, Characteristics and Applications of Schottky barrier diode, Zener diode, Varactor diode, Tunnel diode, LASER diode, LDR.

UNIT V POWER DEVICES AND DISPLAY DEVICES 9

Power Devices: Construction, Operation, Characteristics and Applications of UJT, SCR, DIAC, TRIAC. Optoelectronic Devices: Photodiode, Phototransistor, Optocoupler, LED, CCD.

TOTAL: 45 PERIODS

CHAIRMAN
BoS(ECE)

OUTCOMES:

On successful completion of this course, the students will be able to,

- Apply the knowledge of basic semiconductor diode in electronics
- Analyze the characteristics of various transistor configurations
- Classify and analyze the various characteristics of FETs
- Use the special semiconductor devices in projects
- Illustrate the characteristics and applications of power devices and optoelectronic devices.

TEXT BOOKS:

1. Salivahanan S, "Electronic Devices", Tata McGraw Hill, First Reprint Edition, 2014.

REFERENCES :

1. David A Bell, "Electronic Devices and Circuits", Oxford University Press, 5th Edition, 2008.
2. Robert T Paynter, "Introducing Electronics Devices and Circuits", Pearson Education, 7th Edition, 2006.
3. William H Hayt, Jack J V, Kemmebly E and Steven M Durbin, "Engineering Circuit Analysis", Tata McGraw Hill, 6th Edition, 2002.
4. Millman J and Halkins, Satyebranta Jit, "Electronic Devices and Circuits", Tata McGraw Hill, 2nd Edition, 2008.

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20EE201	ELECTRIC CIRCUIT ANALYSIS (COMMON TO BME, ECE AND EEE)	L T P C 3 0 0 3

OBJECTIVES:

The students should be made to:

- Solve AC and DC circuit using network reduction technique
- Impart knowledge on solving circuit using network theorems
- Introduce the phenomenon of resonance in coupled circuits
- Understand about the two port networks and parameters
- Develop the transient response of various AC and DC circuits

UNIT I BASIC CIRCUITS ANALYSIS **9**

Electrical Quantities - Network elements – R, L, C parameters - Energy sources - Ohm's law - Kirchhoff's laws - Power in series circuits - Resistors in series - Resistors in parallel - Mesh and Nodal analysis for AC and DC circuits.

UNIT II NETWORK REDUCTION AND THEOREMS FOR DC AND AC CIRCUITS **9**

Network reduction: Voltage and current division, source transformation and star delta conversion. Thevenin's and Norton'stheorems – Superposition theorem – Maximum power transfer theorem - Millman'stheorem - Tellegan'stheorem.

UNIT III RESONANCE AND COUPLED CIRCUITS **9**

Resonance: Series and parallel resonance – Resonant frequency of tank circuit – Quality factor and Bandwidth – Coupled circuits: Self and mutual inductance – Coefficient of coupling – Tuned circuits: Single tuned circuits - Analysis of magnetic circuits - Composite series and parallel magnetic circuits.

UNIT IV TWO PORT NETWORKS **9**

Two port networks - Z parameters - Y parameters - Transmission parameters - Hybrid (h) parameters – Inverse hybrid (g) parameters - Inter relationships of different parameters - Interconnection of two port network - Symmetrical properties of T and π networks - Lattice networks.

UNIT V TRANSIENT RESPONSE ANALYSIS **9**

Transient response of RL, RC and RLC Circuits using Laplace transform for DC input and AC sinusoidal input - Introduction to Laplace transform for step, impulse and periodic functions.

TOTAL: 45 PERIODS

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OUTCOMES:

On successful completion of this course, the students will be able to,

- Understand the fundamentals of electric circuits
- Apply various theorems for the analysis of DC and AC circuits
- Understand the concept of resonant, tuned and coupled circuits
- Interpret the concepts of two port networks
- Obtain the transient response of electrical circuits

TEXT BOOK:

1. Sudhakar A and Shyam Mohan SP, "Circuits and Network Analysis and Synthesis", 5th Edition, McGraw Hill, 2015.

REFERENCES:

1. Chakrabarti A, "Circuit Theory (Analysis and synthesis), Revised Edition, DhanpatRaiand Sons, New Delhi, 2017.
2. Cunningham D R and Stuller J A, "Basic circuit Analysis", 3rdEdition, Jaiho publishing house, New Delhi, 2005.
3. Charles A Desoer and Ernest S Kuh, "Basic Circuit Theory", McGraw Hill, 2015.

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BoS (EEE)

20GE201L	ENGINEERING PRACTICES LABORATORY (COMMON TO ALL BRANCHES)	L T P C 0 0 2 1

OBJECTIVES:

The student should be made to:

- Access the areas of knowledge in application criteria's for plumbing, carpentry through practical manner
- Develop the engineering basis work in welding, machining and sheet metal works
- Make the specified skills in foundry, smithy and fitting operations
- Study the various basic domestic wiring circuits and measure the electrical parameters
- Impart the knowledge of basic electronic components and assemble simple electronic circuits in printed circuit boards

GROUP A (CIVIL AND MECHANICAL)

I. CIVIL ENGINEERING PRACTICE 5

1. Buildings
   (a) Study of plumbing and carpentry components of residential and industrial buildings, Safety aspects.
2. Plumbing Works
   (a) Study of pipeline joints, its location and functions: valves, taps, couplings, unions, reducers, elbows in household fittings.
   (b) Study of pipe connections requirements for pumps and turbines.
   (c) Preparation of plumbing line sketches for water supply and sewage works.
   (d) Hands-on-exercise:
      (i) Basic pipe connections - Mixed pipe material connection - Pipe connections with different joining components.
      (ii) Demonstration of plumbing requirements of high-rise buildings.
3. Carpentry using Power Tools only
   (a) Study of the joints in roofs, doors, windows and furniture.
   (b) Hands-on-exercise: Wood work, joints by sawing, planning and cutting.

II. MECHANICAL ENGINEERING PRACTICE 10

1. Welding:
   (a) Arc Welding
      (i) Butt joints.
      (ii) Lap joints.
      (iii) T-joints.
   (b) Gas welding practice.
2. Basic Machining
   (a) Simple Turning, Facing.
   (b) Drilling Practice.
3. Sheet Metal Work
   (a) Model making-Cylinder, Funnel and Tray.
   (b) Different type of joints.

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BoS(MECH)

4. Machine assembly practice:
   (a) Study of Centrifugal pump
   (b) Study of Air conditioner
5. Demonstration on:
   (a) Smithy operations, upsetting, swaging, setting down and bending.
   Example: Exercise – Production of hexagonal headed bolt.
   (b) Foundry operations like mould preparation for gear and step cone pulley.
   (c) Fitting – Exercises – Preparation of square fitting and V-fitting models.

GROUP B (ELECTRICAL AND ELECTRONICS)

III. ELECTRICAL ENGINEERING PRACTICE **10**

1. a) Residential house wiring using switches, fuse, indicator, lamp and Energy meter.
   b) Study of different type of electrical wiring joints systems.
   c) Stair case wiring.
2. Industrial wiring using switches, fuse, indicator and Energy meter.
3. Measurement of electrical quantities - voltage, current, power & power factor in RLC circuit.
4. Measurement of energy using single phase energy meter.
5. Measurement of earth resistance using Megger.
6. Assembling of ceiling fan.

IV. ELECTRONICS ENGINEERING PRACTICE **5**

1. Study of Electronic components and equipments – Resistor colour coding, measurement of AC signal parameter (peak-peak, rms period, frequency) using CRO.
2. Study of logic gates AND, OR, NOT, NAND and NOR.
3. Soldering practice - Components Devices and Circuits - Using general purpose PCB.
4. Design of HWR and FWR.

TOTAL: 30 PERIODS

COURSE OUTCOMES:

On successful completion of this course, the students will be able to,

- Apply the tasks of work in plumbing and carpentry in application areas regard to pipeline joints, household fittings, water supply and sewage works, joints in roofs, doors, windows and furniture
- Analyze the engineering knowledge through welding, sheet metal forming, bending and basic machining operations
- Understand the assembly works on study of pump, Air conditioner and demonstration works on Smithy, foundry and fitting operation
- Understand the basic domestic wiring circuits and measure the various electrical parameters
- Analyse the basic concept of digital circuits and assemble electronic circuits

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20EC202L **CIRCUITS AND DEVICES LABORATORY** **L T P C**
0 0 2 1

Course Objective:
The student should be made to:

- Learn the characteristics of basic electronic devices such as Diode, FET, SCR
- Analyze the characteristics of transistors
- Verify the Kirchhoff's laws
- Gain hand on experience in various network theorems
- Understand the working of RLC circuits

List of the Experiments

1. Characteristics of PN Junction Diode
2. Characteristics of Zener diode
3. Common Emitter input-output Characteristics
4. Common Base input-output Characteristics.
5. FET and SCR Characteristics
6. Verification of KVL and KCL
7. Verification of Thevinin's theorem
8. Verification of Norton's theorem
9. Verification of Super Position Theorem
10. Verification of Maximum power transfer theorem
11. Verification of Reciprocity theorem
12. Determination of Resonance Frequency of Series and Parallel RLC Circuits

TOTAL: 30 PERIODS

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

- Gain the knowledge about characteristics of semiconductor diodes
- Understand the working of different types of transistors and their characteristics
- Apply the knowledge to verify the Kirchhoff's laws
- Analyze and verify various types of network theorems
- Investigate the frequency response using resonance circuits.

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20EEC201L	SOFT SKILLS (COMMON TO ALL BRANCHES)	L T P C 0 0 2 1

OBJECTIVES:

The student should be made to:

- Develop in learners a deep sense of self- esteem
- Enhance learners' self-motivation
- Impart leadership skills
- Help learners enhance critical, creative and analytical skills
- Felicitate learners acquire problem solving skills

UNIT I IDENTITY CONSTRUCTION **6**

Identity formation – Theories of moral Development(Kohlberg) – Cultural heritage – Physical appearance – Problem of Identity Correspondence –Self acceptance– Knowing oneself – Self-confidence –Positive thinking – Self-development – Perception, attitude and Behavioural change, Personality development – Self-esteem.

UNIT II MOTIVATION AND MORALE **6**

Definition – types (Intrinsic and Extrinsic) – Theories (Maslow's hierarchical needs) – Factors that affect motivation – Motivational strategies – Motivational plan – Interruption and Distractions – Motivation in the Business World.

UNIT III PROFESSIONAL THEORIES **6**

Communication – Functions of leadership – Work pressure handling – Creative and critical thinking – Career planning and management – Emotional intelligence – Time management – Negotiation – Conflict management

UNIT IV APPLICATION SKILLS **6**

Visionary thinking – formulating strategies – shaping strategies – building organizations relationships – change management – Project Management Skills – Independent working skills - Writing skills – Public Speaking –Analytical skills – Neo Research and Development.

UNIT V PROBLEM SOLVING SKILLS **6**

Problem solving approaches and its components – Teamwork – Innovative and creative thinking– Tools and Techniques – Application of SMART analysis – Adaptability and flexibility– Decision making.

TOTAL: 30 PERIODS

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OUTCOMES:

On successful completion of this course, the students will be able to,

- Know the detail information of individuals
- Increase the self-confidence and develop the moral identity
- Accumulate the learner's career building skills
- Improve professional and life skills
- Engage the imagination to explore new possibilities, Formulate and articulate ideas.

REFERENCES:

1. Covey Sean, "Seven Habits of Highly Effective Teens", New York, Fireside Publishers, 1998.
2. Thomas A Harris, "I am Ok, You Are Ok", Harper and Row,New York, 1972.
3. Daniel Coleman, "Emotional Intelligence", Bantam Book, 2006.

CHAIRMAN
BoS(S&H)

ECE

20MA302 TRANSFORMS AND PARTIAL DIFFERENTIAL EQUATIONS

(Common to AGE, BME, CIVIL, ECE, EEE & MECH) **L T P C**

3 1 0 4

OBJECTIVES:

The student should be made to,

- Introduce the basic concepts of PDE for solving standard partial differential equations.
- Introduce Fourier series analysis which is central to many applications in engineering apart from its use in solving boundary value problems.
- Acquaint the student with Fourier series techniques in solving heat flow problems used in various situations.
- Acquaint the student with Fourier transform techniques used in wide variety of situations.
- Introduce the effective mathematical tools for the solutions of partial differential equations that model several physical processes and to develop Z transform techniques for discrete time systems.

UNIT I PARTIAL DIFFERENTIAL EQUATIONS 12

Formation of partial differential equations –Singular integrals -Solutions of standard types of first order partial differential equations -Lagrange's linear equation -Linear partial differential equations of second and higher order with constant coefficients of both homogeneous and non-homogeneous types.

UNIT II FOURIER SERIES 12

Dirichlet's conditions –General Fourier series –Odd and even functions –Half range sine series –Half range cosine series –Complex form of Fourier series –Parseval's identity – Harmonic analysis.

UNIT III APPLICATIONS OF PARTIAL DIFFERENTIAL EQUATIONS 12

Classification of PDE –Method of separation of variables -Fourier Series Solutions of one dimensional wave equation –One dimensional equation of heat conduction –Steady state solution of two dimensional equation of heat conduction.

UNIT IV FOURIER TRANSFORMS 12

Statement of Fourier integral theorem –Fourier transform pair –Fourier sine and cosine transforms –Properties –Transforms of simple functions –Convolution theorem –Parseval's identity.

UNIT V Z -TRANSFORMS AND DIFFERENCE EQUATIONS 12

Z-transforms -Elementary properties –Inverse Z-transform (using partial fraction and residues) –Initial and final value theorems -Convolution theorem -Formation of difference equations–Solution of difference equations using Z-transform.

TOTAL: 60 PERIODS

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BoS/S&H

OUTCOMES:

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

- Understand how to solve the given standard partial differential equations.
- Solve differential equations using Fourier series analysis which plays a vital role in engineering applications.
- Appreciate the physical significance of Fourier series techniques in solving one and two dimensional heat flow problems and one dimensional wave equations.
- Understand the mathematical principles on transforms and partial differential equations would provide them the ability to formulate and solve some of the physical problems of engineering.
- Use the effective mathematical tools for the solutions of partial differential equations by using Z transform techniques for discrete time systems.

Text Books:

1. Grewal B S, "Higher Engineering Mathematics",Khanna Publishers, New Delhi, 43rd edition, 2014.
2. Narayanan S,Manicavachagom Pillay T K and Ramanaiah G, "Advanced Mathematics for Engineering Students", S Viswanathan Publishers Pvt. Ltd, Chennai, Vol. II & III, 1998.

References:

1. Bali N P and Manish Goyal, "A Textbook of Engineering Mathematics", Laxmi Publications Pvt. Ltd, 9th edition, 2014.
2. Erwin Kreyszig, "Advanced Engineering Mathematics ",John Wiley, India, 10th edition, 2016.
3. James G, "Advanced Modern Engineering Mathematics", Pearson Education, 3rd edition, 2007.
4. Ramana B V, "Higher Engineering Mathematics", McGraw Hill Education Pvt. Ltd, New Delhi, 11th edition, 2015.
5. Wylie R C and Barrett L C, "Advanced Engineering Mathematics "Tata McGraw Hill Education Pvt. Ltd, New Delhi, 6th edition, 2012.

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BoS/S&H

20EC301	ELECTRONIC CIRCUITS-I	L	T	P	C
		3	0	0	3

OBJECTIVES:

The student should be made to:

- Study the basic biasing methods of BJT amplifier
- Learn the small signal parameters and frequency response of BJT amplifier
- Understand the small signal parameters and frequency response of FET amplifier
- Design various types of large signal power amplifiers
- Illustrate the design and analyze the regulated DC power supplies

UNIT I BIASING OF DISCRETE BJT **9**

Need for biasing – DC Load Line – AC Load Line and Bias Point – Thermal Runaway – Stability factor – Method of Transistor biasing – Fixed Bias – Collector to base bias – Self Bias – Bias compensation – Diode Compensation, thermistor and sensistor compensation.

UNIT II SMALL SIGNAL ANALYSIS AND FREQUENCY RESPONSE OF BJT AMPLIFIERS **9**

Small Signal Hybrid equivalent circuit of CE Amplifier – Analysis of CE Amplifier with fixed bias, Unbypassed Emitter Resistor, Voltage Divider Bias – CB Amplifier – CC Amplifier – BJT frequency response – short circuit current gain – cut off frequency – $f\alpha$, $f\beta$ and $f\theta$.

UNIT III SMALL SIGNAL ANALYSIS AND FREQUENCY RESPONSE OF FET AMPLIFIERS **9**

FET Amplifiers – FET Small signal model – Analysis of CS, CD and CG amplifiers using Hybrid – π equivalent circuits – FET differential amplifier – FET Model at high frequency – High frequency analysis of CS and CD amplifier – FET Frequency Response.

UNIT IV LARGE SIGNAL POWER AMPLIFIERS **9**

Introduction – Class A large signal Amplifier – Harmonic Distortion – Generation – Transformer Coupled Class A power amplifier – Class B – Complementary Symmetry – Push pull – Class D – Class S – MOSFET Power Amplifiers – Distortion in amplifiers.

UNIT V RECTIFIERS AND POWER SUPPLIES **9**

Linear Mode power supply – Rectifiers – Half-Wave Rectifier – Full-Wave Rectifier – Bridge Rectifier – Filters – L filter – C filter – LC and CLC filter – RC filter – Voltage regulators: Zener Voltage regulator – Transistorized series, shunt – SMPS.

TOTAL: 45 PERIODS

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BoS (ECE)

OUTCOMES:

On successful completion of this course, the students will be able to,

- Acquire the knowledge of characteristics and applications of BJT amplifier
- Analyze the small signal parameters and frequency response characteristics of BJT amplifier
- Evaluate the small signal parameters and frequency response characteristics of FET amplifier
- Analyze the performance of Large signal power amplifiers
- Apply the knowledge gained in the design of Electronic circuits in various applications

TEXT BOOKS:

1. Salivahanan S and Suresh Kumar N, "Electronic Devices and Circuits", Mc Graw Hill Education India Private Ltd., 4th Edition, 2017.

REFERENCES :

1. Rajput R K, "Electronic Measurements and Instrumentation", S Chand and Company Ltd., 2009.
2. Donald A Neamen, "Electronic Circuit Analysis and Design", Tata Mc Graw Hill, 2nd Edition, 2009.
3. Robert L Boylestad and Louis Nasheresky, "Electronic Devices and Circuit Theory", Pearson Education, 11th Edition, 2013.
4. Millman J, Halkias C and Sathyabrada Jit, "Electronic Devices and Circuits", Mc Graw Hill Education India Private Ltd., 4th Edition, 2015.
5. Floyd, "Electronic Devices", Pearson Education, 9th Edition, 2012.
6. David A Bell, "Electronic Devices and Circuits", Oxford University Press, 5th Edition, 2008.

CHAIRMAN
BoS (ECE)

20EC302	DIGITAL ELECTRONICS (COMMON TO BME, ECE AND EEE)	L T P C 3 0 0 3

OBJECTIVES:

The student should be made to:

- Study the Digital fundamentals, Boolean algebra, Logic circuit minimization techniques and its applications in digital systems
- Construct various combinational digital circuits using logic gates
- Analyzethe design procedures for synchronous sequential circuits with flipflop elements
- Analyzethe design procedures for asynchronous sequential circuits
- Learn various semiconductor memories and related technology

UNIT I DIGITAL FUNDAMENTALS **9**

Number Systems – Decimal, Binary, Octal, Hexadecimal, radix conversion, 1's and 2's complements, Codes – Binary, BCD, Excess 3, Gray, Alphanumeric codes, Boolean theorems and Postulates, Logic gates – Universal gates – Sum of products and product of sums – Minterms and Maxterms – Karnaugh Map Minimization.

UNIT II COMBINATIONAL CIRCUIT DESIGN **9**

Design of Half and Full Adders, Subtractors, Binary Parallel Adder – Carry look ahead Adder, BCD Adder, Binary Multiplier, Multiplexer, Magnitude Comparator, Decoder, Encoder, Priority Encoder, Parity Checker and Generator, Introduction to HDL – HDL Models of Combinational circuits.

UNIT III SYNCHRONOUS SEQUENTIAL CIRCUITS **9**

Latches, Flip flops – SR, JK, T, D, Master/Slave FF – operation and excitation tables, Triggering of FF, Analysis and design of clocked sequential circuits – Design – Moore/Mealy models, state minimization, state assignment, circuit implementation – Design of Counters – Ripple Counters, Synchronous Counter, Ring Counters, Shift registers, Universal Shift Register. HDL Models of Sequential Circuits.

UNIT IV ASYNCHRONOUS SEQUENTIAL CIRCUITS **9**

Stable and Unstable states, output specifications, cycles and races, state reduction, race free assignments, Hazards, Essential Hazards, Pulse mode sequential circuits, Design of Hazard free circuits.

UNIT V MEMORY DEVICES AND DIGITAL INTEGRATED CIRCUITS **9**

Basic memory structure – ROM – PROM – EPROM – EEPROM – EAPROM, RAM – Static and dynamic RAM – Programmable Logic Devices – Programmable Logic Array (PLA) – Programmable Array Logic (PAL) – Field Programmable Gate Arrays (FPGA) – Implementation of combinational logic circuits using PLA, PAL. Digital integrated circuits: Logic levels, propagation delay, power dissipation, fan-out and fan-in, noise margin, logic families and their characteristics – RTL, TTL, ECL, CMOS.

TOTAL: 45 PERIODS

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BoS (ECE)

OUTCOMES:

On successful completion of this course, the students will be able to,

- Know about Digital logic fundamentals and minimization of logic circuits
- Design various combinational digital circuits using logic gates
- Examine various synchronous sequential circuits
- Design various asynchronous sequential circuits
- Understand semiconductor memories and related technology with Programmable Logic devices

TEXT BOOKS:

1. Morris Mano M and Michael D Ciletti, "Digital Design", Pearson, 6th Edition, 2018.

REFERENCES :

1. Charles H Roth, "Fundamentals of Logic Design", Thomson Learning, 6th Edition, 2013.
2. Thomas L Floyd, "Digital Fundamentals", Pearson Education Inc, 10th Edition, 2011
3. Salivahanan S and Arivazhagan S, "Digital Electronics", Vikas Publishing House Pvt Ltd, 1st Edition, 2012.
4. Anil K Maini, "Digital Electronics", Wiley, 2014.
5. Anand Kumar A, "Fundamentals of Digital Circuits", PHI Learning Private Limited, 4th Edition, 2016.
6. Soumitra Kumar Mandal, "Digital Electronics", McGraw Hill Education Private Limited, 2016.

CHAIRMAN
BoS (ECE)

20EC303	SIGNALS AND SYSTEMS (Common to BME & ECE)	L T P C 3 1 0 4

OBJECTIVES:

The student should be made to:

- Understand the basic properties of signals and systems
- Learn the methods of characterization of Laplace transform and Fourier Transform
- Analyze LTI Continuous time systems using Laplace Transform
- Study the methods of characterization of Z transform and Fourier Transform
- Analyze LTI Discrete time systems using Z-Transform

UNIT I CLASSIFICATION OF SIGNALS AND SYSTEMS 12

Introduction to Signals and Systems – Continuous Time(CT) Signals – Discrete Time(DT) Signals – Standard Signals: Impulse, Step, Ramp, Exponential and Sinusoidal Signals – Basic operations on Signals: Amplitude Scaling, Signal Addition, Signal Multiplication, Time Shifting, Time Reversal and Time Scaling - Classification of CT and DT signals: Deterministic and Random, Periodic and Aperiodic, Even and Odd, Energy and Power, Causal and Non Causal – Classification of CT and DT systems: Static and Dynamic, Time Invariant and Time Variant, Linear and Nonlinear, Causal and Non Causal, Stable and Unstable.

UNIT II ANALYSIS OF CONTINUOUS TIME SIGNALS 12

Introduction to Fourier series – Dirichlet's conditions – Trigonometric form of Fourier series – Laplace Transform – Region of Convergence (ROC) – Properties of Laplace Transform – Inverse Laplace Transform using Partial Fraction Expansion method – Continuous Time Fourier Transform(CTFT) – Properties of CTFT – Relation between Laplace transform and CTFT.

UNIT III LINEAR TIME INVARIANT CONTINUOUS TIME SYSTEMS 12

Impulse Response: Causality and Stability of LTI CT systems – Convolution Integral using Analytical method – Solution of Differential equations using Laplace Transform – Analysis of LTI Continuous Time systems using Laplace Transform: Transfer function, Impulse response, Step response and Output response – Block diagram representation: Direct form-I, Direct form-II, Cascade and Parallel forms.

UNIT IV ANALYSIS OF DISCRETE TIME SIGNALS 12

Sampling Theorem – Aliasing – Z-Transform – Region of Convergence (ROC) – Properties of Z-Transform – Inverse Z-Transform using Partial Fraction Expansion and Power Series Expansion method-Discrete Time Fourier Transform (DTFT) – Properties of DTFT – Relation between Z-Transform and DTFT.

UNIT V LINEAR TIME INVARIANT DISCRETE TIME SYSTEMS 12

Impulse Response: Causality and Stability of LTI DT systems – Convolution Sum using Analytical, Graphical and Tabulation method – Solution of Difference equations using Z-Transform – Analysis of LTI Discrete Time systems using Z-Transform: Transfer function, Impulse response, Step response and Output response – Block diagram representation: Direct form-I, Direct form-II, Cascade and Parallel forms.

TOTAL: 60 PERIODS

CHAIRMAN
BoS (ECE)

OUTCOMES:

On successful completion of this course, the students will be able to,

- Classify and Identify the types of signals and systems based on their properties
- Apply Fourier series, Laplace transform and Fourier transform for CT signals
- Design the LTI CT systems using Laplace Transform and realize its structure
- Apply Z-Transform and Fourier transform for DT signals
- Solve the LTI DT systems using Z-Transform and realize its structure

TEXT BOOKS:

1. Nagoor Kani A, "Signals and Systems(Simplified)", Tata Mc Graw Hill, 2016.

REFERENCES :

1. Allan V Oppenheim, Alan S Wilsky and Hamid Nawab S, "Signals and Systems", Pearson, Second Edition, 2019.
2. Lathi B P, "Principles of Linear Systems and Signals", Oxford, Second Edition, 2009.
3. Anand Kumar A, "Signals and Systems", Prentice Hall India, Third Edition, 2013.
4. Palani S, "Signals and Systems", Ane's Book Pvt. Ltd., First Edition, 2009.
5. Zeimer R E, Tranter W H and Fannin R D, "Signals and Systems - Continuous and Discrete", Pearson, 2015.

CHAIRMAN
BoS (ECE)

20IT302	C++ AND DATA STRUCTURES (FOR BME& ECE DEPARTMENT ONLY)	L	T	P	C
		3	0	0	3

OBJECTIVES:

The student should be made to:

- Understand the fundamentals of object oriented programming in C++
- Gain knowledge in object oriented programming concepts
- Be familiar with the advanced features of C++ programming language
- Learn the various algorithms of nonlinear data structures
- Acquire the knowledge in different algorithms for graph implementation

UNIT I OBJECT ORIENTED PROGRAMMING FUNDAMENTALS **9**

C++ Programming features – Data Abstraction – Encapsulation – Class – Object – Constructors – Static members – Constant members – Member functions – Pointers – References – Role of this pointer – Storage classes – Function as arguments.

UNIT II OBJECT ORIENTED PROGRAMMING CONCEPTS **9**

String Handling – Copy Constructor – Polymorphism – Compile time and run time polymorphisms – Function overloading – Operators overloading – Dynamic memory allocation – Nested classes – Inheritance – Virtual functions.

UNIT III C++ PROGRAMMING ADVANCED FEATURES **9**

Abstract class – Exception handling – Standard libraries – Generic Programming – Templates – Class template – Function template – STL – Containers – Iterators – Function adaptors – Allocators – Parameterizing the class – File handling concepts.

UNIT IV ADVANCED NON-LINEAR DATA STRUCTURES **9**

AVL trees – B-Trees – Red-Black trees – Splay trees – Binomial Heaps – Fibonacci Heaps – Disjoint Sets – Amortized Analysis – Accounting method – Potential method – Aggregate analysis.

UNIT V GRAPHS **9**

Representation of Graphs – Breadth-first search – Depth-first search – Topological sort – Minimum Spanning Trees – Kruskal and Prim algorithm – Shortest path algorithm – Dijkstra's algorithm – Bellman-Ford algorithm – Floyd-Warshall algorithm.

TOTAL: 45 PERIODS

CHAIRMAN
BoS (IT)

OUTCOMES:

On successful completion of this course, the students will be able to,

- Understand the concept of object oriented programming in C++
- Develop solutions for real-world problems using OOP concepts
- Utilize the features of templates, exception and file handling mechanisms
- Analysis the algorithms of nonlinear data structures
- Describe the different algorithms for graph implementation

TEXT BOOKS:

1. Bjarne Stroustrup, "The C++ Programming Language", Pearson Education, 4th Edition, 2013.
2. Mark Allen Weiss, "Data Structures and Algorithm Analysis in C++", Pearson Education, 4th Edition, 2013.

REFERENCES:

1. Balagurusamy E, "Object Oriented Programming with C++", Tata McGraw Education Hill, 8th Edition, 2020.
2. Ashok N Kamthane, "Object oriented Programming with ANSI and Turbo C++", Pearson India, 1st Edition, 2006.
3. Thomas H Cormen, Charles E Leiserson, Ronald L Rivest and Clifford Stein, "Introduction to Algorithms", McGraw Hill, 3rd Edition, 2009.
4. Michael T Goodrich, Roberto Tamassia and David Mount, "Data Structures and Algorithms in C++", Wiley Publishers, 7th Edition, 2004.

CHAIRMAN
BoS (IT)

20MC003	CONSTITUTION OF INDIA	L	T	P	C
		2	0	0	0

OBJECTIVES:

The student should be made to:

- To teach history and philosophy of Indian constitution.
- To summarize powers and functions of Indian government.
- To explain structure and functions of local administration.
- To demonstrate the organization and working of the Judiciary.
- To discuss financial power and emergency provisions.

UNIT I INTRODUCTION **6**

Historical background – Government of India act – Indian councils act – Making of the constitution -Philosophy of the Indian constitution – Preamble.

UNIT II GOVERNMENT OF THE UNION **6**

Powers and Functions of President and Prime Minister - Council of Ministers – President in relation to his council - Legislature structure and functions of Loksabha and Rajyasabha – Speaker.

UNIT III GOVERNMENTS OF THE STATES AND LOCAL GOVERNMENT **6**

The state executive: General structure – Governor – Council of ministers – State legislature. Local government - Panchayat –Municipality– Powers, Authority and Responsibilities of municipalities.

UNIT IV THE JUDICATURE **6**

Organization and Composition of Judiciary – Constitution – Appointment - Qualifications - Powers and functions of the supreme court– High courts – Control over subordinate courts.

UNIT V THE FEDERAL SYSTEM **6**

Distribution of financial powers: Need, principles-Underlaying distribution of tax revenues-Distribution of legislative power – Interstate relation - Emergency provisions.

TOTAL: 30 PERIODS

Chairman
BoS/S&H

OUTCOMES:

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

- Understand history and philosophy of Indian constitution
- Realize powers and functions of Indian government
- Acquire awareness on structure and functions of local administration
- Enhance knowledge about organization and composition of judiciary
- Explore the distribution of financial powers and emergency provisions

TEXT BOOKS:

1. Basu D.D,"Introduction to Indian Constitution",Prentice Hall of India,New Delhi,2015.
2. Gupta D.C,"Indian Government and Politics",Vikas Publishing House,New Delhi, 2010.

REFERENCES:

1. Pylee M.V,"Introduction to the Constitution of India",Vikas Publishing House,NewDelhi, 2011.
2. Kashyap S, "Our Constitution", National Book Trust, New Delhi, 2010.
3. The Constitution of India, 1950 (Bare Act), Government Publication.
4. Jain M P, Indian Constitution Law, Seventh Edition, Lexis Nexis, 2014.
5. Busi S N, Ambedkar B R framing of Indian Constitution, First Edition, 2015.

Chairman
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20EC308L ANALOG AND DIGITAL CIRCUITS LABORATORY

L	T	P	C
0	0	3	1

OBJECTIVES:

The student should be made to:

- Understand the design concepts of regulated power supply and frequency response of BJT and FET amplifiers
- Learn the transfer characteristics of Darlington amplifier
- Analyze the performance of single stage and multistage amplifiers
- Design and implement the combinational and sequential logic circuits
- Evaluate SPICE simulation of Electronic circuits

LIST OF THE ANALOG EXPERIMENTS:

1. Design of Regulated Power supplies
2. Frequency Response of CE, CB and CC amplifiers
3. Frequency Response of CS, CD and CG amplifiers
4. Darlington Amplifier
5. Determination of bandwidth of single stage amplifier
6. Determination of bandwidth of multistage amplifier

LIST OF DIGITAL EXPERIMENTS:

1. Design and implementation of code converters using logic gates
   (i) BCD to excess-3 code and vice versa
   (ii) Binary to gray and vice-versa
2. Design and implementation of 4 bit binary Adder/ Subtractor and BCD adder using IC 7483
3. Design and implementation of Multiplexer and De-multiplexer using logic gates
4. Design and implementation of encoder and decoder using logic gates
5. Construction and verification of 4 bit ripple counter and Mod-10 / Mod-12 Ripplecounters
6. Design and implementation of 3-bit synchronous up/down counterSimulation

SIMULATION EXPERIMENTS:

1. Design CE, CB and CC Amplifiers using Spice
2. Design Darlington Amplifier using Spice
3. Design single stage and multistage amplifiers using Spice

TOTAL: 45 PERIODS

OUTCOMES:

On successful completion of this laboratory course, the students will be able to,

- Design and evaluate the performance of regulated power supplies using BJT
- Analyze the frequency response of various types of BJT and FET Amplifiers
- Estimate the bandwidth of single stage and multistage amplifiers
- Apply the fundamental of digital theory and implement various types of combinational and sequential logic circuits
- Evaluate the performance of various amplifier circuits using Spice

CHAIRMAN
BoS (ECE)

20IT303L	C++ AND DATA STRUCTURES LABORATORY (FOR BME & ECE DEPARTMENT ONLY)	L	T	P	C
		0	0	2	1

OBJECTIVES:

The student should be made to:

- Get a clear understanding of C++ concepts
- Understand the object oriented programming in C++
- Understand the mechanism of file handling and templates
- Implement the different data structures
- Develop the applications using different data structures

LIST OF EXPERIMENTS:

1. Basic Programs for C++ Concepts.
2. Develop the classes for understanding objects, member functions and constructors
    a. Classes with primitive data members,
    b. Classes with arrays as data members
    c. Classes with pointers as data members
    d. Classes with constant data members
    e. Classes with static member functions
3. Write a C++ code to implement the polymorphism.
4. Write a C++ code to implement the file handling.
5. Array implementation of List Abstract Data Type (ADT)
6. Linked list implementation of List ADT
7. Stack ADT – Array and linked list implementations
8. Queue ADT – Array and linked list implementations
9. Search Tree ADT– Binary Search Tree
10. Graph Traversal

TOTAL: 30 PERIODS

OUTCOMES:

On successful completion of this course, the students will be able to,

- Create simple programs in C++ programming language
- Develop applications using object oriented programming concepts in C++
- Utilize the concept of file handling and templates in application development
- Implement the data structures concepts using C++
- Design and implement C++ programs for manipulating trees and graphs

CHAIRMAN
BoS (IT)

20EEC301L	SOFT SKILLS DEVELOPMENT (COMMON TO ALL BRANCHES)	L T P C 0 0 2 1

OBJECTIVES:

The Student should be made to:

- Enhance the development of students by focusing on soft skills
- Develop skills of the students through individualand group activities
- Shape students attitude and behavior through activities
- Analyze the characteristics of the students for self-development
- Prepare themselves for the recruitment processes

UNIT ISOFT SKILLS ARE IMPORTANT FOR SUCCESS **6**

Importance of Soft Skills – Types – Industrial needs – Development of skills – Employees Expectation – Success of Employees.

UNIT II CORPORATE COMMUNICATION **6**

Needs and Development of Communication – Customers Relationship – Improving Informal Communication – Formation of Presentations – Public Speaking – Telephone and Email Etiquettes.

UNIT III DISCUSSIONS **6**

Introduction to Discussion – Importance and types of Discussion – Spontaneous conversation – Plan for Discussions – Panel Discussions – Visual Aid Discussions – Debate.

UNIT IV SELF ANALYSIS **6**

Who am I –Identifying or searching one's own Strength, Weakness –, opportunities and threats (SWOT Analysis) – Benefits of SWOT Analysis – Importance of Self Confidence, Self Esteem, Self Development and Self Introspection.

UNIT V CREATIVITY AND GOAL SETTING **6**

Thinking out of the box – Lateral Thinking – Positive Thinking – Results of Smart Work – Application of Creativities – Short Term and Long term Goals – Life Time Goals.

TOTAL: 30 PERIODS

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BoS(S&H)

OUTCOMES:

On successful completion of this course, the students will be able to,

- Learners will recognize the importance of Soft skills in Professional life
- Improve oral and Listening Skills
- Enhance students' ability in GDs, Presentations and interviews
- Develop one's strength in setting of goals and developing creative
- Become a good team worker in the society

TEXT BOOKS:

1. "Soft Skills", Career Development Centre, Green Pearl Publications, 2015.

REFERENCES :

1. Covey Sean, "Seven Habits of Highly Effective Teens", New York, Fireside Publishers, 1998.
2. Carnegie Dale, "How to Win Friends and Influence People", New York: Simon and Schuster, 1998.
3. Jeff Butterfield, "Soft Skills for Everyone", Cengage Learning, 2011.

CHAIRMAN
BoS(S&H)

20MA403	PROBABILITY AND RANDOM PROCESSES (FOR ECE ONLY)	L	T	P	C
		3	1	0	4

OBJECTIVES:

The student should be made to:

- Exposure of various distribution functions and help in acquiring skills in handling situations involving more than one variable
- Analyze the response of random inputs to linear time invariant systems.
- Understand the basic concepts of probability and random processes
- Develop the use of random signals in communication engineering
- Expose the linear systems in communication engineering

UNIT I RANDOM VARIABLES **12**

Discrete and continuous random variables – Moments – Moment generating functions – Binomial, Poisson, Geometric, Uniform, Exponential, Gamma and Normal distributions.

UNIT II TWO - DIMENSIONAL RANDOM VARIABLES **12**

Joint distributions – Marginal and conditional distributions – Covariance – Correlation and Linear regression – Transformation of random variables.

UNIT III RANDOM PROCESSES **12**

Classification – Stationary process – Markov process – Poisson process – Random telegraph process.

UNIT IV CORRELATION AND SPECTRAL DENSITIES **12**

Auto correlation functions – Cross correlation functions – Properties – Power spectral density – Cross spectral density – Properties.

UNIT V LINEAR SYSTEMS WITH RANDOM INPUTS **12**

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

TOTAL: 60 PERIODS

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OUTCOMES:

On successful completion of this course, the students will be able to,

- Understand the basic concepts of probability to solve real-life applications
- Utilize Correlation and Linear regression to solve real-life applications
- Apply random signals to solve real-life applications
- Understand and characterize phenomena which evolve with respect to time in probabilistic manner
- Utilize linear systems in communication engineering

TEXT BOOKS:

1. Ibe O C, "Fundamentals of Applied Probability and Random Processes", Elsevier, 1st Indian Reprint, 2007.
2. Peebles P Z, "Probability, Random Variables and Random Signal Principles", Tata Mc Graw Hill, 4th Edition, New Delhi, 2002.

REFERENCES:

1. Yates R D and Goodman D J, "Probability and Stochastic Processes", Wiley India Pvt. Ltd., Bangalore, 2nd Edition, 2012.
2. Veerarajan T, "Probability, Statistics and Random with Queueing Theory and Queueing Networks", Tata McGraw Hill Publishing Company Limited, New Delhi, 3rd Edition, 2010.
3. Miller S L and Childers D G, "Probability and Random Processes with Applications to Signal Processing and Communications", Academic Press, 2004.
4. Moorthy M B K, Subramani K and Santha A, "Probability Random Process and Queuing Theory", Scitech Publications India Pvt Ltd, 2010.
5. Cooper G R and Mc Gillem C D, "Probabilistic Methods of Signal and System Analysis", Oxford University Press, New Delhi, 3rd Edition, 2012.

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20EC401	ELECTRONIC CIRCUITS-II	L	T	P	C
		3	0	0	3

OBJECTIVES:

The Student should be made to:

- Study the basics of various feedback amplifiers and analyze their structures.
- Understand positive feedback concept and analyze the performance of oscillator.
- Analyze the frequency response of the various tuned amplifiers.
- Impart knowledge of transistor based Multi-vibrators and Schmitt trigger circuit.
- Make in depth knowledge in Blocking oscillators and time base generators.

UNIT I FEEDBACK AMPLIFIERS **9**

Introduction - Basic Feedback concept - Effect of Negative feedback - Types of Negative feedback Connections - voltage series feedback, voltage shunt feedback, current series feedback and current shunt feedback - Method of identifying feedback Topology - Stability of feedback amplifier.

UNIT II OSCILLATORS **9**

Classification of Oscillators - Barkhausen Criterion - General form an LC oscillator - Analysis of LC oscillators - Hartley, Colpitts, Clapp - Analysis of RC oscillators - phase shift using high pass filter - Low pass filter - Wien bridge Oscillator , Crystal Oscillator - Miller and Pierce Crystal oscillators, frequency stability of oscillators.

UNIT III TUNED AMPLIFIERS **9**

Introduction - Q factor - unloaded Q and Loaded Q - Analysis of capacitor coupled Single tuned amplifier - Analysis of Double tuned amplifier - Effect of cascading single tuned amplifiers on Bandwidth - Stagger tuned amplifiers - Class C Tuned Amplifier - Stability of tuned amplifiers - Neutralization - Hazeltine neutralization method.

UNIT IV WAVE SHAPING AND MULTIVIBRATOR CIRCUITS **9**

RC Circuits - RL Circuits - Transistor Switching Time - Diode clippers, Clampers and Comparators - Multivibrators - Bistable multivibrator - Triggering methods for Bistable multivibrator - Monostable multivibrator - Astable multivibrator - Schmitt trigger.

UNIT V BLOCKING OSCILLATORS AND TIME BASE GENERATORS **9**

UJT Relaxation Oscillator, Blocking Oscillator - Free running blocking oscillator - Astable Blocking Oscillators with base timing - Push-pull Astable blocking oscillator with emitter timing - Monostable blocking oscillator with base timing - Monostable blocking oscillator with emitter timing, Time base circuits - Voltage-Time base circuit, Current-Time base circuit

TOTAL: 45 PERIODS

OUTCOMES:

On successful completion of this course, the students will be able to,

- Gain knowledge on basic structure of feedback amplifiers and design the various feedback amplifier circuits.
- Understand the design procedure of various oscillator circuits based on feedback circuits such as RC,LC components.

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- Analyze the frequency response of tuned amplifiers with the help of their equivalent circuits.
- Apply the pulse triggering mechanism on transistor to design different multivibrator circuits and it's out response.
- Create blocking oscillators, time base generators and analyze them with the timing circuits

TEXT BOOKS:

1. S.Salivahanan and N. Suresh Kumar, "Electronic Devices and Circuits", 4th Edition, Mc Graw Hill Education (India) Private Ltd., 2017.

REFERENCES:

1. Robert L. Boylestad and Louis Nasheresky, "Electronic Devices and Circuit Theory", 9th Edition, Pearson Education/PHI, 2002.
2. David A. Bell, "Solid State Pulse Circuits", Prentice Hall of India, 1992.
3. Millman J. and Taub H, "Pulse Digital and Switching Waveforms", TMH, 2000.
4. Millman and Halkias. C, "Integrated Electronics", TMH, 1991

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20EE303	ELECTROMAGNETIC FIELDS (COMMON TO ECE AND EEE)	L T P C 3 0 0 3

OBJECTIVES:

The students should be made to:

- Interpret the concept of vector algebra and coordinate systems
- Know about the behavior of electrostatic fields
- Analysis the concepts of magneto static fields
- Impart the basic knowledge on Maxwell's equation
- Understand the concept of electromagnetic waves and its characteristics parameters

UNIT I ELEMENTS OF VECTOR CALCULUS **9**

Introduction to vector calculus – Cartesian, cylindrical and spherical coordinate systems – Divergence, gradient and curl – Divergence and Stokes theorems.

UNIT II ELECTROSTATICS **9**

Coulomb's law – Electric field intensity – Continuous charge distribution, electric field due to charge distribution, electric field due to charges distributed uniformly on an infinite, finite line and circular disc. Electric potential – Relationship between potential and electric field – Electric flux density – Gauss law and its applications – Boundary conditions for electric fields between free space, conductors and dielectrics – Poisson's and Laplace's equations.

UNIT III MAGNETOSTATICS **9**

Biot-Savart's law, Magnetic field intensity due to finite and infinite line – Ampere's circuital law and its applications – Magnetic flux density – Force on a moving charge (Lorentz force), force on a differential current element and force between differential current elements (Ampere force law) – Torque on a loop carrying a current – Magnetic boundary conditions.

UNIT IV TIME VARYING ELECTRIC AND MAGNETIC FIELDS **9**

Faraday's law – Conduction and displacement current density – Maxwell's equation in integral form and point form – Retarded potentials.

UNIT V ELECTROMAGNETIC WAVES **9**

Derivation of wave equation in free space and dielectric – Wave equation in phasor form – Reflection of plane waves by a perfect dielectric at normal incidence – Wave polarization: Linear, elliptic and circular polarizations - Poynting vector and Poynting theorem.

TOTAL: 45 PERIODS

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BoS (EEE)

OUTCOMES:

On successful completion of this course, the students will be able to,

- Inspect the various concepts of different coordinate system
- Analyze the behavior of electric fields in conductors
- Evaluate various parameters related to the behavior of materials in magnetic fields
- Understand the Maxwell's equations in integral and differential forms
- Explain electromagnetic wave propagation in free space and dielectrics and concepts of polarization

TEXT BOOK:

1. William H Hayt and John A Buck, "Engineering Electromagnetics", 9th Edition, Tata McGraw Hill, New Delhi, 2020.

REFERENCES:

1. Matthew N O Sadiku, "Elements of Engineering Electromagnetics", 7th Edition, Oxford University Press, 2018.
2. Jordan E C & Balmain K G, "Electromagnetic Waves and Radiating Systems", 2nd Edition, Pearson Education/PHI, 2015.
3. Ashutosh Pramanik, "Electromagnetism-Theory and Applications", 2nd Edition, PHI Learning Private Limited, New Delhi, 2009
4. Gangadhar K A, Ramanthan P M, "Electromagnetic Field Theory (including Antennas) and wave propagation", 8th Edition, Khanna Publications, 2015.
5. Kraus, Fleisch, "Electromagnetics with Applications", McGraw Hill International, 5th Edition, 1999.

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BoS (EEE)

20EC402	LINEAR INTEGRATED CIRCUITS (COMMON TO BME, ECE AND EEE)	L T P C 3 0 0 3

OBJECTIVES:

The student should be made to:

- Learn the basic building blocks of linear integrated circuits
- Understand the linear and non-linear applications of operational amplifiers
- Acquire the concept and applications of analog multipliers and PLL
- Analyze ADC and DAC using op-amp
- Study the concepts of waveform generation using op-amp and some special function ICs

UNIT I BASICS OF OPERATIONAL AMPLIFIERS **9**

Basic information about Op-amps: Symbol, Power Supply Connection – Ideal Operational Amplifier – Inverting Amplifier – Non-Inverting Amplifier – Voltage Follower – Differential Amplifier – Op-amp: Block Diagram, DC characteristics, AC characteristics: Frequency response, Frequency Compensation, Slew rate – open and closed loop configurations.

UNIT II APPLICATIONS OF OPERATIONAL AMPLIFIERS **9**

Basic Op-amp Applications – Scale Changer – Summing Amplifier – Subtractor – Instrumentation amplifier – V-to-I and I-to-V converters – Precision Rectifier – Peak detector – Clipper and Clamper – Sample and Hold circuit – Log amplifier – Antilog amplifier – Differentiator – Integrator – Comparators – Schmitt trigger – Low pass – high pass and band pass butterworth filters.

UNIT III ANALOG MULTIPLIER AND PLL **9**

Analog Multiplier using Emitter Coupled Transistor Pair – Gilbert Multiplier cell – Variable transconductance technique – Analog multiplier ICs and their applications – PLL: basic principles, analysis – Voltage controlled oscillator – Monolithic PLL IC 565 – Application of PLL: Frequency Multiplication, Division, Frequency translation, FM demodulation, FSK demodulator.

UNIT IV ANALOG TO DIGITAL AND DIGITAL TO ANALOG CONVERTERS **9**

Basic DAC techniques – weighted resistor type, R-2R Ladder type, inverted R-2R Ladder DAC, A/D Converter – Flash type, Counter Type A/D converter, Successive Approximation type, Single Slope type, Dual Slope type, DAC/ADC Specifications.

UNIT V WAVEFORM GENERATORS AND SPECIAL FUNCTION ICS **9**

Sine-wave generators, Multivibrators and Triangular wave generator using op-amp, Function generator, Timer IC 555 – Functional Description, Monostable operation, Astable operation – IC Voltage regulators: fixed voltage series regulator – IC 723 general purpose regulator – Switching regulator – Frequency to Voltage and Voltage to Frequency converters – Audio Power amplifier – Video Amplifier – Isolation Amplifier – Opto-couplers and fibre optic IC.

TOTAL: 45 PERIODS

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OUTCOMES:

On successful completion of this course, the students will be able to,

- Understand the basic building blocks and characteristics of linear integrated circuits
- Recognize the linear and non-linear applications of operational amplifiers
- Know the concept of Analog multipliers and PLL and their applications
- Realize A/D Converter and D/A Converter using op-amp
- Acquire the concept of waveform generators using op-amp and special function ICs

TEXT BOOKS:

1. Roy Choudhry D and Shail Jain, "Linear Integrated Circuits", New Age International Pvt. Ltd., 4th Edition, 2018.

REFERENCES:

1. Salivahanan S and Kanchana Bhaskaran V S, "Linear Integrated Circuits", Tata McGraw Hill, 2nd Edition, 6th Reprint, 2010.
2. Sergio Franco, "Design with Operational Amplifiers and Analog Integrated Circuits", Tata McGraw-Hill, 4th Edition, 2016.
3. Ramakant A Gayakwad, "Op-Amp and Linear ICs", Prentice Hall / Pearson Education, 4th Edition, 2015.
4. Gray and Meyer, "Analysis and Design of Analog Integrated Circuits", Wiley International, 5th Edition, 2009.
5. William D Stanley, "Operational Amplifiers with Linear Integrated Circuits", Pearson Education, 4th Edition, 2001.

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BoS (ECE)

20EC403	COMMUNICATION THEORY	L	T	P	C
		3	0	0	3

OBJECTIVES:

The Student should be made to:

- Introduce the concepts of various analog modulations and their spectral characteristics
- Understand the concept of various Angle modulation system
- Know about the noises in communication and its effects
- Understand the principle operation of transmitter and receiver
- Introduce some of the essential pulse analog modulation techniques

UNIT I AMPLITUDE MODULATION SYSTEMS **9**

Amplitude Modulation – Modulation index, Spectra, Power relations and Bandwidth – AM Generation: Square law and Switching modulator – DSBSC Generation: Balanced and Ring Modulator – SSB Generation: Filter, Phase Shift and Third Method – VSB Generation: Filter Method – Hilbert Transform – Pre-envelope & complex envelope – comparison of different AM techniques.

UNIT II ANGLE MODULATION SYSTEMS **9**

Introduction to Angle Modulation – FM and PM – Narrow band FM and Wideband FM, Phasor representation of NBFM – Bandwidth requirements – Carson's Rule – Pre emphasis, De-emphasis – Generation and demodulation of FM waves: Indirect and Direct FM generation – PLL demodulator – FM Stereo Multiplexing.

UNIT III NOISE THEORY **9**

Sources of noise – Types of Noise: Shot noise, Thermal noise and white noise – Noise Equivalent temperature – Narrow band noise – Envelope of Sine wave and Narrow band noise – Noise Figure – SNR – Noise in DSBSC systems using coherent detection – coherent detection with SSB Modulation – Noise in AM system using envelope detection – Noise in FM Reception, FM threshold effect.

UNIT IV TRANSMITTERS &RECEIVERS **9**

Transmitters: Classification of Transmitters, AM Transmitter, Effect of feedback on performance of AM Transmitter, FM Transmitter: Variable reactance type and phase modulated FM Transmitter, Frequency stability in FM Transmitter.

Receivers: Receiver Types: Tuned radio frequency receiver, Superheterodyne receiver, RF section and Characteristics – Frequency changing and tracking, Intermediate frequency, AGC, FM Receiver, Comparison with AM Receiver, Amplitude limiting.

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UNIT V PULSE ANALOG MODULATION 9

Types of Pulse modulation: PAM (Single polarity, double polarity) – PWM: Generation and demodulation of PWM – PPM: Generation and demodulation of PPM – Demodulation of Pulse Analog Modulated Signals – Time Division Multiplexing – FDM – TDM Vs FDM.

TOTAL: 45 PERIODS

OUTCOMES:

On successful completion of this course, the students will be able to,

- Explain the basics of amplitude modulation techniques
- Compare and contrast the strength and weakness of various modulation systems
- Analyze the behavior of analog systems in the presence of noise
- Students will have acquired the knowledge on different transmitters and receivers
- Students will get information about signals broadcasted with different techniques

TEXT BOOKS:

1. George Kennedy, Bernard Davis and Prasanna S R M, "Electronic Communication Systems", McGraw Hill Education India Private Limited, New Delhi, 5th Edition, 2015.
2. Kennedy Davis, "Electronic Communication Systems", Tata McGraw Hill, New Delhi, 4th Edition,2009.

REFERENCES:

1. Taub and Schilling, "Principles of Communication Systems", McGraw Hill Education 4th Edition, New Delhi, 2013.
2. Carlson A B, "Communication Systems: An Introduction to Signals and Noise in Electrical Communication", McGraw Hill, New Delhi, 4th Edition, 2002.
3. Dennis John, Roddy and Coolen, "Electronic Communications", Prentice Hall of India, New Delhi, 4th Edition, 2003.
4. Louis E Frenzel Jr., "Principles of Electronic Communication Systems", McGraw-Hill Education, 4th Edition, 2016.

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BoS (ECE)

20EC404 CONTROL SYSTEM ENGINEERING

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OBJECTIVES:

The Student should be made to:

- Introduce the components and their representation of control systems
- Learn various methods for analyzing the time response of control system
- Acquire methods for analyzing the frequency response of control system
- Train numerous methods for analyzing the stability of control system
- Study the state variable analysis method of control system

UNIT I SYSTEMS COMPONENTS AND THEIR REPRESENTATION **9**

Control System: Terminology and basic structure-Feed forward and feedback control theory-Classifications of control system with examples-Electrical and mechanical transfer function models-Block diagram models-Signal flow graphs models-DC and AC servo systems-Synchronous -Multivariable control system

UNIT II TIME RESPONSE ANALYSIS **9**

Standard test signals-Transient response-Steady state response-Measures of performance of the standard first order and second order system-Effect on an additional zero and an additional pole-Steady error constant and system- PID control-Analytical design for PD, PI,PID control systems

UNIT III FREQUENCY RESPONSE AND SYSTEM ANALYSIS **9**

Closed loop frequency response-Performance specification in frequency domain-Frequency response of standard second order system- Bode Plot - Polar Plot- Design of compensators using Bode plots-Cascade lead compensation-Cascade lag compensation-Cascade lag-lead compensation

UNIT IV CONCEPTS OF STABILITY ANALYSIS **9**

Concept of stability-Bounded - Input Bounded - Output stability-Routh stability criterion-Relative stability-Root locus concept-Guidelines for sketching root locus-Nyquist stability criterion

UNIT V CONTROL SYSTEM ANALYSIS USING STATE VARIABLE METHODS **9**

State variable representation-Conversion of state variable models to transfer functions-Conversion of transfer functions to state variable models-Solution of state equations-Concepts of controllability and observability-Stability of linear systems-Equivalence between transfer function and state variable representations-State variable analysis of digital control system-Digital control design using state feedback.

TOTAL: 45 PERIODS

OUTCOMES:

On successful completion of this course, the students will be able to,

- Identify the various control system components and their representations
- Analyze the various time domain parameters
- Analysis the various frequency response parameters and its system
- Apply different methods to analyze various system stability criterions
- Design transfer functions of digital control system using state variable models

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TEXT BOOKS:

1. A. Anand Kumar, "Control Systems", PHI Learning Private Limited, 2nd Edition, 2014.

REFERENCES:

1. J.Nagrath and M.Gopal, "Control System Engineering", New Age International Publishers, 5th Edition, 2007.
2. M.Gopal, "Control System - Principles and Design", Tata McGraw Hill, 4th Edition, 2012.
3. K. Ogata, "Modern Control Engineering", 5th Edition, PHI, 2012.
4. S.K.Bhattacharya, "Control System Engineering", 3rd Edition, Pearson, 2013.
5. NagoorKani, "Control Systems Engineering", RBA Publications, 1st Edition, 2017

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BoS /ECE

20EC405L **ELECTRONIC CIRCUITS-II LABORATORY** **L T P C**
0 0 3 1

OBJECTIVES:

The Student should be made to:

- Understand the frequency response of various types of feedback amplifiers.
- Learn the design procedure of LC-RC type oscillators.
- Analyze the Performance of wave-shaping circuits and multi-vibrators
- Gain hands on experience in designing feedback amplifiers using SPICE tool
- Evaluate the simulation performance of tuned amplifiers, wave-shaping circuits and multi-vibrators using SPICE tool

LIST OF THE EXPERIMENTS

1. Frequency Response of Voltage Series and Voltage Shunt feedback amplifiers
2. Frequency Response of Current Series and Current Shunt feedback amplifiers
3. Design of RC Phase shift Oscillator
4. Design of Wien Bridge Oscillator
5. Design of Hartley Oscillator
6. Design of Colpitts Oscillator
7. Design of Single Tuned Amplifier
8. Design of RC Integrator and Differentiator circuits
9. Design of Astable and Monostable multivibrators
10. Design of Clippers and Clampers

SIMULATION

1. Design of Voltage and current feedback amplifiers
2. Design of Wein Bridge Oscillator/ Tuned Collector Oscillator
3. Design of Single Tuned Amplifier
4. Design of Bistable Multivibrator
5. Design of Schmitt Trigger circuit with Predictable hysteresis

TOTAL: 45 PERIODS

OUTCOME:

On successful completion of this course, the students will be able to,

- Gain the knowledge on various types of feedback amplifiers.
- Design different type of oscillators and tuned amplifiers circuits.
- Apply the knowledge to design wave-shaping and multi-vibrator circuits.
- Simulate various feedback amplifiers using SPICE tool.
- Analyze tuned amplifiers, multi-vibrators and wave-shaping circuits using SPICE Tool

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS:

1. CRO (Min 30MHz). (15 Nos)
2. Signal Generator /Function Generators (2 MHz). (15 Nos)
3. Dual Regulated Power Supplies (0 - 30V). (15 Nos)
4. Digital Multimeter. (15 Nos)
5. Digital LCR Meter. (2 Nos)
6. Standalone desktops PC. (15 Nos)

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7. Transistor/FET (BJT-NPN-PNP and NMOS/PMOS). (50 Nos)
8. Components and Accessories: Transistors, Resistors, Capacitors, Inductors, diodes, Zener Diodes, Bread Boards, Transformers.
9. Standalone desktop PCs with SPICE software (any public domain or commercial software) – 15 Nos.

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20EC406L	LINEAR INTEGRATED CIRCUITS LABORATORY (COMMON TO ECE AND EEE)	L	T	P	C
		0	0	3	1

OBJECTIVES:

The Student should be made to:

- Understand and design the linear and nonlinear circuits using Op-amp.
- Acquire the knowledge on analyze and deign of amplifiers, filters and oscillators using Op-amp.
- Investigate the working principle of Astable and Monostable multivibrators using Op-amp and NE555.
- Design DC power supply using IC's.
- Design and simulate the analog circuits using SPICE software.

LIST OF THE EXPERIMENTS

1. Design of Inverting and Non-inverting amplifiers
2. Design of Integrator and Differentiator
3. Frequency response of active low-pass filter
4. Frequency response of active high-pass filter
5. Design of Astable and Monostable multivibrators using Op-amp
6. Design of Schmitt Trigger
7. Design of RC phase shift oscillator
8. Design of Wien bridge oscillator
9. Design of Astable and Monostable multivibrators using NE555 Timer
10. Design of Voltage regulator using LM723.

Simulation using SPICE:

1. Simulation of Differential and Instrumentation amplifiers
2. Simulation of D/A Converter and A/D Converter
3. Simulation of Active Band-pass filter
4. Simulation of Analog Multiplier

TOTAL: 45 PERIODS

OUTCOME:

On successful completion of this course, the students will be able to,

- Demonstrate the working of linear and non-linear applications of Op-amp.
- Apply the knowledge to design amplifiers, filters, Oscillators and Multivibrators.
- Learn the working principle of DAC, ADC and multiplier.
- Build the DC power supply for voltage regulation.
- Perform the simulation of analog circuits using SPICE tool.

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS:

1. CRO/DSO (Min 30MHz)-(15 Nos)
2. Signal Generator /Function Generators (2 MHz)- (15 Nos)
3. Dual Regulated Power Supplies (0 - 30V)- (15 Nos)
4. Digital Multimeter- (15 Nos)
5. IC Tester- (5 Nos)

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6. Standalone desktops PC - (15 Nos)
7. Components and Accessories (50 Nos): Transistors, Resistors, Capacitors, diodes, Zener diodes, Bread Boards, Transformers, wires, Power transistors, Potentiometer, A/D and D/A convertors, LEDs
8. SPICE Circuit Simulation Software: (any public domain or commercial software)

Note:
Op-Amps uA741, LM 301, LM311, LM 324, LM317, LM723, 7805, 7812, 2N3524, 2N3525, 2N3391, AD 633, LM 555, LM 565 may be used.

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20EEC401L	LIFE SKILLS AND PERSONALITY DEVELOPMENT (COMMON TO ALL BRANCHES)	L	T	P	C
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OBJECTIVES:

The student should be made to:

- Create self- confident among the students by the training
- Develop good personality for mature outlook in different circumstances
- Encourage effective presentation skills
- Dramatize role play by assigning the best role
- Enhance team building and time management skills

UNIT I CAREER PLANNING **6**

Introduction – Benefits of Career Planning – Expectation and Development – Guidelines for choosing a Career – Future Planning – Evaluation of planning

UNIT II ATTITUDE **6**

Introduction – Rightness of Attitude and behavior – Formation of attitudes – Evolving Behavior of a person – Creating right attitudes – Approaches of Challenges – Lessons from Attitude.

UNIT III ROLE PLAYING **6**

Introduction – settings of role plays – Principles and Purpose – importance of communication in role plays – Arrangement of points and character – Extempore Talk – Debates – Emotional Intelligence.

UNIT IV TEAM BUILDING **6**

Purpose of Creating Team – Exploring Team roles and Processes – Importance of Building and Developing Strong Team – Leadership Qualities – Success of Team Building.

UNIT V TIME MANAGEMENT **6**

Value of time – Concept and applications of time management – Causes for Wasting of Time – Methods of Time Management – Diagnosing Time Management – Planning for presentation – To-do-list – Prioritizing work.

TOTAL: 30 PERIODS

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OUTCOMES:

On successful completion of this course, the students will be able to,

- Improve the leadership skills by identifying the strengths of a team
- Learn to lead a team on a project in an organization
- Helps students to perform on a distinct role and learn to face the challenges
- Build a strong team to achieve their goals with the right choice of people
- Develop the time management skills to achieve success

TEXT BOOKS:

1. "Soft Skills", Career Development Centre, Green Pearl Publications, 2015.

REFERENCES :

1. Thomas A Harris, "I Am Ok, You Are Ok", Harper and Row, New York, 1972.
2. Daniel Coleman, "Emotional Intelligence", Bantam Book, 2006.
3. NiraKonar, "Communication Skills for Professionals", Eastern Economy Edition, 2010.
4. Daniel Coleman, "Emotional Intelligence", Bantam Book, 2006.

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20EC501	DIGITAL COMMUNICATION	L T P C 3 0 2 4

OBJECTIVE:

The Student should be made to:

- Know the principles of Information theory & understand the digital representation of analog signals through sampling and quantization
- Study the various waveform coding schemes with its application
- Understand the ISI and derive Nyquist criteria for zero ISI
- Analyze the various digital modulation schemes
- Understand fundamentals of channel coding

UNIT I INFORMATION THEORY & SAMPLING 9

Discrete Memory less Source - Entropy - Discrete Memoryless channels - Channel Capacity - Source coding theorem - Huffman & Shannon - Fano codes - Low pass sampling - Aliasing - Signal Reconstruction - Quantization - Uniform & non-uniform quantization - quantization noise - PCM.

UNIT II WAVEFORM CODING & REPRESENTATION 9

Prediction filtering and DPCM - Delta Modulation - ADPCM & ADM principles - Linear Predictive Coding - Properties of Line codes - Power Spectral Density of Unipolar/Polar RZ & NRZ - Bipolar NRZ - Manchester.

UNIT III BASEBAND TRANSMISSION & RECEPTION 9

ISI - Nyquist criterion for distortion less transmission - Correlative coding - Eye pattern - Receiving Filters - Matched Filter, Correlation receiver, Adaptive Equalization.

UNIT IV DIGITAL MODULATION SCHEME 9

Geometric Representation of signals - Generation, detection, PSD & BER of Coherent BPSK, BFSK & QPSK - QAM - Carrier Synchronization - Structure of Non-coherent Receivers - Principle of DPSK.

UNIT V ERROR CONTROL CODING 9

Channel coding theorem - Linear Block codes - Hamming codes - Cyclic codes - Convolutional codes - Viterbi Decoder.

LIST OF THE EXPERIMENTS

1. Signal Sampling and reconstruction
2. Time Division Multiplexing
3. AM & FM Modulator and Demodulator
4. PAM, PWM, PPM Modulation and Demodulation
5. Delta Modulation and Demodulation
6. Observation (simulation) of signal constellations of BPSK, QPSK and QAM
7. Line coding schemes
8. FSK, PSK and DPSK schemes (Simulation)

TOTAL: 75 PERIODS

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LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS:

1. Kits for Signal Sampling, TDM, AM, FM, PCM, DM and Line Coding Schemes
2. CROs. (10 Nos)
3. MATLAB / SCILAB or equivalent software package for simulation experiments.(10 Nos)
4. PCs. (10 Nos)

OUTCOMES:

On successful completion of this course, the students will be able to,

- Digitally represent analog signals through sampling & quantization
- Design and implement the various waveform digital coding schemes with its applications
- Apply the knowledge of ISI problems and derive Nyquist Criteria for zero ISI
- Compare error probability of different digital modulation schemes
- Apply various error control coding schemes over information bits

TEXT BOOKS:

1. Simon Haykin, "Communication Systems", 4th Edition, John Wiley, 2006 (Unit I -V).

REFERENCES:

1. B.P.Lathi, "Modern Digital and Analog Communication Systems" 3rd Edition, Oxford University Press 2007.
2. R.N Mutagi "Digital Communication - Theory, Techniques and Applications", 2nd Edition, Oxford University Press, 2013.
3. H P Hsu, Schaum Outline Series: "Analog and Digital Communications", TMH 2006.
4. J.G Proakis, "Digital Communication", 4th Edition, Tata Mc Graw Hill Company, 2001.
5. B. Sklar, "Digital Communication Fundamentals and Applications", 2nd edition, Pearson Education, 2009

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20EC502	MICROPROCESSORS AND MICROCONTROLLERS (COMMON TO BME, CSE, ECE, EEE & IT)	L T P C 3 0 0 3

OBJECTIVES:

The student should be made to:

- Study the architecture of 8085 microprocessor and 8086 microprocessor
- Design a microcontroller based system Illustrate the Architecture of 8086 microprocessor
- Develop skills in interfacing of peripheral devices with 8086 microprocessor
- Study the architecture of 8051 and examine the design aspects of I/O Interfacing circuits
- Develop skills in interfacing 8051 and study about mixed signal microcontroller

UNIT I 8 BIT AND 16 BIT MICROPROCESSORS 9

8085 Microprocessor: Architecture – Instruction Set – Addressing Modes – Assembly Language Programming.

8086 Microprocessor: Architecture – Addressing Modes – Instruction Set – Assembly Language Programming.

UNIT II 8086 SYSTEM BUS STRUCTURE 9

8086 signals – Basic configurations – System bus timing –System design using 8086 – IO programming – Introduction to Multiprogramming – System Bus Structure – Multiprocessor configurations – Coprocessor, Closely Coupled and loosely Coupled configurations – Introduction to advanced processors.

UNIT III PERIPHERAL INTERFACING 9

Memory Interfacing and I/O interfacing – Parallel communication interface – Serial communication interface – D/A and A/D Interface – Timer – Keyboard /display controller – Interrupt controller – DMA controller – Programming and applications Case studies: Traffic Light control, LED display , LCD display, Keyboard display interface and Alarm Controller.

UNIT IV 8051 MICROCONTROLLER ARCHITECTURE AND PROGRAMMING 9

Architecture of 8051 – Special Function Registers (SFRs) – I/O Pins Ports and Circuits – Instruction set – Addressing modes – Assembly Language Programming.

UNIT V INTERFACING MICROCONTROLLER AND MIXED SIGNAL MICROCONTROLLER 9

LCD & Keyboard Interfacing – ADC, DAC & Sensor Interfacing – External Memory Interface Stepper Motor, MSP430 series. Mixed Signal Microcontroller: MSB430 Series Block diagram, Addressing Modes. Instruction set.

TOTAL: 45 PERIODS

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OUTCOMES:

On successful completion of this course, the students will be able to,

- Develop assembly language program to solve mathematical problems using 8 bit and 16 bit microprocessors
- Create a multiprocessor system with 8086 microprocessor
- Interface I/O and memory devices with 8086 microprocessor
- Analyze the architecture and signals of 8051 microcontroller
- Interface microcontroller and analyze the mixed signal microcontroller

TEXT BOOKS:

1. Yu-Cheng Liu and Glenn A Gibson, "Microcomputer Systems: The 8086 / 8088 Family - Architecture, Programming and Design", Prentice Hall of India, 2nd Edition, 2011.
2. Mohamed Ali Mazidi, Janice Gillispie Mazidi and Rolin McKinlay, "The 8051 Microcontroller and Embedded Systems: Using Assembly and C", Pearson Education, 2nd Edition, 2011.

REFERENCES:

1. Doughlas V Hall, "Microprocessors and Interfacing, Programming and Hardware", TMH, 2nd Edition, 2012.
2. Senthil Kumar N, Saravanan M and Jeevananthan S, "Microprocessor and Microcontrollers", Oxford Higher Education, 2nd Edition, 2010.

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20EC503

TRANSMISSION LINES AND WAVE GUIDES

L T P C
3 0 0 3

OBJECTIVE:

The Student should be made to:

- Introduce various types of transmission lines and analyze the lumped circuit model of a transmission line and their characteristics.
- Familiarize the evaluation of various parameters of transmission lines using Smith Chart
- Impart the basic knowledge on designing different types of Filters.
- Investigate the propagation of electromagnetic waves in parallel planes
- Make depth knowledge on Waveguides operating in Various modes and Resonators

UNIT I TRANSMISSION LINE THEORY 9

General theory of Transmission lines - General solutions - Characteristic impedance, propagation constant, attenuation and phase constants - Open circuited and short-circuited lines. The telephone cable, Reflection of line not terminated in Z0 -Reflection coefficient - Distortion in transmission lines - Distortion less line.

UNIT II IMPEDANCE MATCHING AND TUNING 9

Standing waves - nodes - standing wave ratio, impedance matching - Single stub matching. Half wavelength and Quarter wave transformer. Measurement of VSWR, impedance, Single stub and double stub matching problems using Smith chart.

UNIT III PASSIVE FILTERS 9

Characteristic impedance of symmetrical networks - filter fundamentals, Design of filters: Constant K-Low Pass, High Pass, Band Pass, Band Elimination, m-derived sections - low pass, high pass, Composite filters.

UNIT IV GUIDED WAVES BETWEEN PARALLEL PLANES 9

Study of Waves between parallel planes of perfect conductor. Application of the restrictions to Maxwell's equations - Transmission of TM waves between Parallel planes - Transmission of TE waves between Parallel planes. Transmission of TEM waves between Parallel planes - Velocities of the waves.

UNIT V GUIDED WAVES BETWEEN RECTANGULAR PLANES 9

Applications of Maxwell's equations to the rectangular waveguide. TM waves in rectangular waveguide. TE waves in rectangular waveguide - Dominant mode in rectangular waveguide - The TEM wave coaxial lines - Excitation modes - Guide termination and resonant cavities.

TOTAL: 45 PERIODS

OUTCOME:

On successful completion of this course, the students will be able to,

- Acquire knowledge on different types transmission lines and able to explain the concepts of reflection

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- Demonstrate the different types of measurement on basic transmission line parameters like reflection coefficient, standing wave ratio, and impedance using smith chart
- Design different types of prototype filters and m derived filters
- Deduce the field configurations of parallel plane in different modes
- Analyze different modes in the rectangular and resonators

TEXT BOOKS:

1. John D. Ryder, "Network Lines and Fields", PHI, 2013.

REFERENCES:

2. EE.C.Jordan, K.G. Balmain, "E.M.waves & Radiating Systems", Pearson Education, 2006.
3. G.S.N. Raju, "Electromagnetic Field Theory & Transmission Lines", Pearson Education, 2006.
4. R. K. Shevgaonkar, "Electromagnetic Waves", Tata McGraw Hill Publications, 2006.

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20EC504 **DIGITAL SIGNAL PROCESSING** L T P C
(Common to BME & ECE) 3 0 2 4

OBJECTIVES:

The Student should be made to:

- Ascertain the concepts of DFT and FFT
- Gain knowledge of designing FIR and IIR digital filters
- Become skilled at the finite word length effects
- Study the architecture and programming concepts of digital signal processors
- Gain knowledge about various applications of DSP

UNIT I DISCRETE FOURIER TRANSFORM 9

Basic elements of DSP – Direct computation of DFT, Properties of DFT, Circular convolution, Computation of DFT & IDFT using Radix-2 FFT algorithms – Decimation in Time(DIT) FFT algorithm, Decimation in Frequency(DIF) FFT algorithm

UNIT II FIR AND IIR DIGITAL FILTERS 9

FIR Filters: Magnitude response and phase response of digital filters – Design of linear phase FIR filters using Windows (Rectangular, Hamming and Hanning Window) – Gibbs phenomenon – FIR filter structures: Direct form, Cascade form, Linear Phase realization.

IIR Filters: Design of digital IIR filters from analog filters – Bilinear transformation – Impulse Invariance technique – Butterworth and Chebyshev Filters – Warping effect, Prewarping.

UNIT III FINITE WORD LENGTH EFFECTS 9

Fixed point and floating point number representation – Quantization noise – Derivation for quantization Noise power-Truncation and Rounding – Input quantization error – Coefficient Quantization error - Product quantization error – Limit cycle oscillations – Dead band.

UNIT IV DIGITAL SIGNAL PROCESSOR 9

Introduction to DSP processors, MAC Unit, Von Neumann, Harvard architecture – VLIW architecture – Pipelining – Architecture of TMS320C5X Digital Signal Processor – Addressing modes – Instruction set.

UNIT V APPLICATIONS OF DSP 9

Channel Vocoder- Subband coding of speech signals – Compact disc digital audio system – Fetal ECG monitoring – DSP based closed loop controlled anesthesia -Adaptive noise cancellation.

LIST OF THE EXPERIMENTS:

SOFTWARE/SIMULATION:

1. Generation of signals
2. Basic operations on signals
3. Linear and Circular Convolution
4. Computation of DFT
5. Design of FIR filters
6. Design of IIR filters
7. Up sampling and Down sampling

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DSP PROCESSOR BASED IMPLEMENTATION:

1. Study of architecture of Digital Signal Processor
2. Generation of Waveforms
3. Basic operations using addressing modes

EQUIPMENTS FOR A BATCH OF 30 STUDENTS:

1. PCs with Fixed/Floating point DSP Processors (Kit/Add-on Cards) Coding Schemes. (15 Nos)
2. MATLAB with Simulink and Signal Processing Tool Box or Equivalent Software in desktop systems. (15 Nos)
3. CRO (20MHz). (10 Nos)

TOTAL: 75 PERIODS

OUTCOMES:

At the end of the course, learners will be able to:

- Implement the FFT algorithms to get faster realization.
- Design the digital FIR and IIR filters using different transformation techniques
- Analyze the impacts of finite word length effects in filter design
- Write programs for any specific application in DSP Processors
- Apply the applications of DSP in real time

TEXT BOOK:

1. S Salivahanan, A Vallavaraj, C Gnanapriya, "Digital Signal Processing", Second Edition, Tata McGraw Hill, 2016.

REFERENCES:

1. John G Proakis and Dimitris G Manolakis, "Digital Signal Processing, Principles, Algorithms and Applications", Fourth edition, Pearson Education, 2017.
2. Sanjit K Mitra, "Digital Signal Processing-A Computer Based Approach", McGraw Hill Education, 2013.
3. B Venkataramani and M Bhaskar, "Digital Signal Processors, Architecture, Programming" Tata McGraw Hill 2002.
4. Emmanuel C. Ifeachor and Barrie W. Jervis, "Digital Signal Processing: A Practical Approach", 2E, Prentice Hall, 2013

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20MC002	UNIVERSAL HUMAN VALUES 2: UNDERSTANDING HARMONY (COMMON TO ALL BRANCHES)	L T P C 3 0 0 3

Objectives

The students should be made to:

- Understand the need of value education and human aspiration
- Know the difference between self and body
- Recognize the harmony in the family and society
- Understand harmony in nature
- Identify the human values and ethics

UNIT I INTRODUCTION TO VALUE EDUCATION **9**

Value Education – need and process, Self-Exploration – process, Basic Human Aspirations - Continuous Happiness and Prosperity, Basic requirement for fulfillment of Human Aspirants, Understanding Happiness and Prosperity – Continuity of Happiness from Physical Facility.

UNIT II HARMONY IN THE HUMAN BEING **9**

Human being as a co-existence of the self and the Body - The needs of Self and Body, Body as an Instrument - The Self as the Seer- Doer-Enjoyer, Harmony in the self, Harmony of the Self with the Body –Programme for Self – regulation and health.

UNIT III HARMONY IN THE FAMILY AND SOCIETY **9**

Family as the basic unit of human interaction , Understanding Relationship, Trust as the foundational value, Respect as the Right Evaluation, Harmony in the society – Understanding Human Goal, Harmony from Family Order to World Family Order – Universal Human Order - Scope.

UNIT IV HARMONY IN THE NATURE AND EXISTENCE **9**

Nature - as Collections of Units, Classification of Units into Four Orders, Interconnectedness, and mutual fulfillment among the four orders of nature, self-regulation in Nature, Understanding Existence as Units in Space, Existence as Co-existence.

UNIT V IMPLICATIONS OF THE ABOVE HOLISTIC UNDERSTANDING OF HARMONY ON PROFESSIONAL ETHICS **9**

Natural Acceptance of Human Values - Definitiveness of Ethical Human Conduct, Basis for Humanistic Education, Constitution, Universal Human Order, Competence in Professional Ethics, Holistic Technologies, Production System and Management Models – Typical case, Strategies for Transition towards value based life and profession.

TOTAL: 45 PERIODS

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Outcome:

On completion of this course, the students will be able to

- Understand the significance of value education and distinguish between values and skills.
- Distinguish between the Self and the Body, understand the meaning of Harmony in the Self the Co-existence of Self and Body.
- Understand the value of harmonious relationship based on trust, respect and other naturally acceptable feelings.
- Understand the harmony in nature and existence, and work out their mutually fulfilling participation in the nature.
- Distinguish between ethical and unethical practices and understand the human values.

Text Books:

1. R R Gaur, R Sangal, G P Bagaria, 2009, A Foundation Course in Human Values and Professional Ethics, Excel Books, New Delhi, 2nd Revised Edition, 2019.

References:

1. Tripathi A N, "Human Values", New Age Intl. Publishers, New Delhi, 2009.
2. Govindarajan M, Natrajan S and Senthilkumar V S, "Engineering Ethics (Including Human Values)" Eastern Economy, PHI, 12th Edition, 2011.
3. Govindarajan M and Natrajan S, "Professional Ethics and Human Values", PHI, 2011.
4. Banerjee B P, "Foundation of Ethics and Management", Excel Publication, 2005.
5. Bajpai B L, "Indian Ethos and Modern Management", New Royal Book Co, Lucknow, Reprinted 2008.
6. Seebauer and Robert L Berry, "Fundamentals of Ethics for Scientist and Engineers", Oxford University Press, 2000.

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20EC505L	MICROPRCESSORS AND MICROCONTROLLERS LABORATORY (COMMON to BME, CSE, ECE, EEE & IT)	L T P C 0 0 3 1

OBJECTIVE:

The student should be made to:

- Introduce ALP concepts and features
- Write ALP for arithmetic and logical operations in 8086,8051 and MSP 430
- Differentiate Serial and Parallel Interface
- Interface different I/Os with Microprocessors
- Be familiar with MASM

LIST OF THE EXPERIMENTS

8086 PROGRAMS USING KITS AND MASM

1. Basic arithmetic and Logical operations
2. Move a data block without overlap
3. Code conversion, decimal arithmetic and Matrix operations.
4. Floating point operations, string manipulations, sorting and searching
5. Password checking, Print RAM size and system date
6. Counters and Time Delay

PERIPHERALS AND INTERFACING EXPERIMENTS

1. Traffic light control
2. Stepper motor control
3. Key board and Display
4. Serial interface and Parallel interface
5. A/D and D/A interface and Waveform Generation

8051 EXPERIMENTS USING KITS

1. Basic arithmetic and Logical operations
2. Square and Cube program, Find 2's complement of a number
3. Unpacked BCD to ASCII.

MSP430 EXPERIMENTS USING KIT

1. Blinking of LED
2. Seven Segment Display
3. Keyboard
4. LCD

TOTAL: 45 PERIODS

OUTCOME:

On successful completion of this course, the students will be able to,

- Write ALP Programmes for fixed and Floating Point and Arithmetic
- Interface different I/Os with processor
- Establishing Data communication using 8086
- Execute Programs in 8051 & MSP 430
- Design & implement 8051 and MSP 430 controller based system

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LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS:

1. 8086 development kits. (15 Nos)
2. Interfacing Units. (2 Each)
3. 8051 Microcontroller. (15 Nos)
4. MSP 430 (5 Nos)

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20EC506L **MINI PROJECT-I** **L T P C**
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OBJECTIVE:

- Learn different types of sensors from Motes families.
- Design the problem solution as per the requirement analysis done using Motes sensors.
- Study the basic concepts of programming/sensors/ emulator like cooja etc.
- Design and implement the mini project intended solution for project based learning.
- Build and test the mini project successfully.

GUIDELINES

1. The mini project work is to be conducted by a group of three students
2. Each group will be associated with a subject Incharge/ mini project mentor.
3. The group should meet with the concerned faculty during Laboratory hours and theprogress of work discussed must be documented.
4. The students must understand the
    a. Concept
    b. Importance
    c. Interdisciplinary
    d. Challenges
    e. Various applications/smart objects
    f. Major Players/Industry, Standards.
5. The students must understand the IoT Architecture:
    a. Node Structure: Sensing, Processing, Communication, Powering
    b. Networking: Topologies, Layer/Stack architecture
    c. Communication Technologies: Introduction to ZigBee, BLE, WiFi, LTE, IEEE802.11ah.
    d. Discuss data rate, range, power, computations/bandwidth, QoS
    e. Smartness - Signal Processing/Analytics: Impact on Power/Energy savings, dynamic networks, simple case studies.
    f. IoT Fabricator: Introduction to Embedded electronics, fabricating challenges – recreation, IP/security, Challenges.
    g. Hands-on in IoT: Projects based on some Hardware (Raspberry pi, Arduino, Intel, IITH Mote, Smartphone's), Software (Contiki, TinyOS, Android), IoT Fabricator etc. can be used.
6. The students may do will visit different websites to identify their IOT topic for the miniproject.
7. The students may do survey for different application using different types of sensors fortheir mini project.
8. Each group will identify the Hardware (Motes from different Motes families) & sensor configuration and software requirement for their mini project problem statement.
9. Design own circuit board using multiple sensors etc.
10. Installation, configure and manage your sensors in such away so that they can communicate with each other.
11. Work with operating system, emulator like contiki cooja and do coding to for inputdevices on sensors.

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12. Each group will identify the Hardware and software requirement for their mini project problem statement.
13. Create and interface using Mobile/Web to publish or remotely access the data on Internet.
14. Each group along with the concerned faculty shall identify a potential problem statement,on which the study and implementation is to be conducted.
15. Each group may present their work in various project competitions and paper presentations.
16. A detailed report is to be prepared as per guidelines given by the concerned faculty.

TOTAL: 30 PERIODS

OUTCOME:

On successful completion of this course, the students will be able to,

- Identify the requirements for the real world problems.
- Conduct a survey of several available literatures in the preferred field of study.
- Study and enhance software/ hardware skills
- Demonstrate and build the project successfully by hardware/sensor requirements, coding,emulating and testing.
- Demonstrate an ability to work in teams and manage the conduct of the research

TEXT BOOKS:

1. Jean-Philippe Vasseur, Adam Dunkels, Morgan Kuffmann, Interconnecting SmartObjects with IP: The Next Internet".
2. Adrian McEwen, "Designing the Internet of Things", Hakim Cassimally.
3. Dr. Ovidiu Vermesan, Dr. Peter Friess, "Internet of Things: Converging Technologies for Smart Environments and Integrated Ecosystems", River Publishers.
4. Vijay Madisetti , Arshdeep Bahga, "Internet of Things (A Hands-on-Approach)".

REFERENCES:

1. Zach Shelby, Carsten Bormann, "LoWPAN: The Wireless Embedded Internet", Wiley.
2. Daniel Minoli John , "Building the internet of things with ipv6 and mipv6, The EvolvingWorld of M2M Communications", Wiley & Sons.
3. Sitharama Iyengar.S, Nandan Parameshwaran, Phoha. Vir V, Balakrishnan.N, Chuka D. Okoye, "Fundamentals of Sensor Network Programming: Applications and Technology",Wiley publication.

Term Work shall consist of full Mini Project on above guidelines/syllabus.

- Oral Exam: An Oral exam will be held based on the Mini Project and Presentation.

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20EEC501L	PROFESSIONAL SKILLS DEVELOPMENT (COMMON TO ALL BRANCHES)	L	T	P	C
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OBJECTIVES:

The student should be made to:

- Sharpen problem solving skills and to improve thinking ability of the students
- Drive the students to use language with great commitment and cooperation
- Expertise the creative thinking and presentation skills to meet company needs
- Develop and foster the soft skills through individual and group activities
- Expose students to right attitudinal and behavioral thoughts

UNIT I INTRODUCTION TO BASIC ARITHMETIC AND PERSONALITY TRAIT **6**

Aptitude – Numbers, Average, Percentage, Profit and loss, Picture pattern; Soft skills – Personality development, Professional ethics, Perception insights, attitude and behavioral changes.

UNIT II CONCEPT OF PROPORTIONALITY AND INTERPERSONAL SKILLS **6**

Aptitude – Time and work, Pipes and cisterns, Series completion, Critical reasoning; Soft skills – Developing self esteem, Significance of interpersonal behavior and interpersonal relationships.

UNIT III AN APPROACH TO COGNITIVE APTITUDE AND LEADERSHIP SKILLS **6**

Aptitude – Time, speed and distance, Boats and streams, Races and games, Syllogism; Soft skills – Leadership – Characteristics and importance of leadership, Roles and responsibilities of a good Leader.

UNIT IV CONTEMPORARY APTITUDE AND SITUATIONAL RESPONSES **6**

Aptitude – Crypt arithmetic, Ranking, Logarithms, Cubes, Analogy; Soft skills – Decision making – Process and challenges, Creative and Critical thinking.

UNIT V NON-VERBAL REASONONG AND INFLUENCING OTHERS **6**

Aptitude – Clocks, Non – verbal reasoning, Permutation, Classifications; Soft skills – Presentation skills – Make use of visual aids with modern tools, Insights on persistence and perseverance.

TOTAL: 30 PERIODS

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OUTCOMES:

On successful completion of this course, the students will be able to,

- Ability to solve both analytical and logical problems in an effective manner
- Practice to organize and convey the information in such an optimistic way
- Deliver a professional and constructive presentation
- Recognize explicit assumptions and their consequences
- Access the needed information effectively and efficiently

TEXT BOOKS:

1. Aggarwal R S, "Quantitative Aptitude for Competitive Examinations", S Chand Publishing New Delhi, Revised Edition, 2017.
2. Murty G R K, "Soft Skills for Success", DGM Icfai Books, Revised Edition, 2005.

REFERENCES:

1. Abhijit Guha, "Quantitative Aptitude for All Competitive Examinations", McGraw Hill Education; Sixth edition, 2016.
2. Aggarwal R S, "A Modern Approach to Verbal and Non-Verbal Reasoning", S Chand Publishing, New Delhi, 2018.
3. Arun Sharma, "How to Prepare for Quantitative Aptitude for the CAT", McGraw Hill Education; Eighth Edition, 2018.
4. Covey Sean, "Seven Habits of Highly Effective Teens", Fireside Publishers, New York, 1998.
5. Carnegie Dale, "How to Win Friends and Influence People", Simon and Schuster, New York, 1998.

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20EC601	ANTENNA AND WAVE PROPAGATION	L	T	P	C
		3	0	0	3

OBJECTIVE:

The students should be made to

- Give a thorough understanding of the radiation characteristics of different types of antennas
- Analyze the various types antenna arrays and their fields
- Instill knowledge on the special antennas and aperture antennas
- Analyze the various types antenna parameter measurements
- Discuss about the different types of propagation of radio waves at different frequencies

UNIT I ANTENNA FUNDAMENTALS 9

Antenna Parameters - Radiation Pattern, Beam Width, Radiation Power Density, Directivity and Gain, Bandwidth, Polarization, Input Impedance, Efficiency, Antenna Effective Length and Area, Antenna Temperature, Reciprocity Principle- Radiation from Hertzian dipole, Half wave Dipole and Monopole Antenna.

UNIT II DESIGN OF ARRAYS 9

Array of point sources - Two element array, N-element linear array - Broadside array, End fire array - Concept of Phased arrays - Pattern Multiplication, Tapering of arrays - Binomial Array - Dolph - Tchebyscheff arrays.

UNIT III APERTURE AND FREQUENCY INDEPENDENT ANTENNAS 9

Frequency Independent Antenna – Spiral antenna, Helical antenna - Log periodic antenna - Yagi-Uda antenna - Aperture antennas - Horn antenna, Parabolic Reflector antenna, Microstrip antenna.

UNIT IV ANTENNA MEASUREMENTS 9

Measurement of Antenna Gain - Beam width - Radiation resistance - Antenna efficiency - Directivity - Polarization - Measurement of Noise Figure and Noise Temperature.

UNIT V WAVE PROPAGATION 9

Fundamentals of Free Space Propagation, Ground Wave Propagation, Sky Wave propagation - Space Wave Propagation - Duct Propagation -Structure of ionosphere, Critical frequency, Virtual height , MUF, Skip distance, Effects of earth's magnetic fields-Fading, Slow fading, Fast fading-Whistlers.

TOTAL: 45 PERIODS

OUTCOME:

On successful completion of this course, the students will be able to,

- Gain a knowledge on various characteristics of an antenna and dipoleantennas
- Apply knowledge on differentiating the various types antenna arrays andtheir fields patterns

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BoS/ECE

- Analyze the frequency independent antennas and aperture antennas variousantenna measurements techniques
- Understand how to measure different antenna parameters
- Elaborate the different types of propagation mechanism of radio waves

TEXT BOOKS:

1. Prasad K.D, "Antenna & Wave Propagation", 3rd Edition, Sathya PrakashanTech India Publications, New Delhi, 2015.
2. Krauss J.D, "Antenna for all Applications", TMH, 4th Edition, 2010.

REFERENCES:

1. Balanis, "Antenna Theory - Analysis and Design", 3rd Edition, John Wiley & Sons, 2005.
2. Raju G.S.N, "Antennas and Wave Propagation", Pearson Education, 2006.

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BoS/ECE

20EC602 VLSI DESIGN **L T P C**
3 0 0 3

OBJECTIVES:

The students should be made to

- Study the fundamentals of MOS transistor and its characteristics and CMOS logic .
- Design the Combinational logic Circuits using various logic styles.
- Analyze the Sequential logic circuits and Memory architectures.
- Learn the various arithmetic building blocks.
- Develop the digital logic circuits using Verilog HDL and learn the testing methods.

UNIT I MOS TRANSISTOR PRINCIPLES AND CMOS LOGIC 9

MOS Transistor: nMOS and pMOS Transistors, Ideal I-V Characteristics, Non Ideal I-V Characteristics, DC Transfer Characteristics – CMOS Logic: Inverter, NAND Gate, CMOS Logic Gates, NOR Gate, Compound Gates, Pass Transistors and Transmission Gates- Layout Diagrams - Stick Diagrams.

UNIT II DESIGN OF COMBINATIONAL LOGIC CIRCUITS 9

Static CMOS Design: Ratioed Logic-Pseudo nMOS Logic,Cascode Voltage Switch Logic - Dynamic CMOS Design: Basic Principles of Dynamic Logic- Issues in Dynamic Design-Cascading Dynamic Gates - Domino CMOS Logic, Dual Rail Domino Logic, Multiple Output Domino Logic, np CMOS Logic - Static and Dynamic Power Dissipation.

UNIT III DESIGN OF SEQUENTIAL LOGIC CIRCUITS AND MEMORY 9

Static Latches and Registers: Bistability Principle, Multiplexer based Latches, Master-Slave Edge Triggered Registers- Dynamic Latches and Registers: Dynamic Transmission Gate Edge Triggered Registers, C^2MOS Register- True Single Phase Clocked Register (TSPCR)-Memory Architectures and Building Blocks:N-word, Array Structured, Hierarchical and Content Addressable Memory Architecture-Memories: Static RAM and DynamicRAM.

UNIT IV DESIGNING ARITHMETIC BUILDING BLOCKS 9

Data Path Circuits-Adders: Ripple Carry Adder,Carry-Bypass Adder, Linear Carry Select Adder, Square Root Carry Select Adder- Accumulator-Multipliers:Array Multiplier, Carry Save Multiplier, Tree Multiplier- Barrel Shifter.

UNIT V VERILOG HARDWARE DESCRIPTION LANGUAGE AND TESTING 9

Overview of Digital System with Verilog HDL – Modeling Concepts - Modules and Ports definitions- Gate Level Modeling- Dataflow Modeling- Behavioral Modeling- Verilog HDL programs of Combinational and Sequential circuits: Full adder, Full Subtractor, Ripple Carry Adder, Multiplexer, Demultiplexer, Encoder, Decoder, Flip Flops, Up and Down Counters, Shift Registers.

Testing: Need for Testing – Design for Testability: Ad Hoc Testing, Scan Design, BIST - Boundary Scan.

TOTAL: 45 PERIODS

OUTCOMES:

On successful completion of this course, the students will be able to,

- Understand the MOS transistor principles and CMOS logic.

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BoS/ECE

- Analyze the design techniques of combinational circuits and power dissipation.
- Design and construct the Sequential logic Circuits and study memory architectures.
- Apply the various methods to design arithmetic building blocks.
- Develop the combinational and sequential circuits using Verilog HDL and Test the CMOS circuits.

TEXT BOOKS:

1. Jan M. Rabaey, Anantha Chandrakasan, Borivoje. Nikolic, "Digital Integrated Circuits: A Design perspective", 2nd Edition, PHI, 2016.
2. Palnitkar Samir, "Verilog HDL: Guide to Digital Design and synthesis", 2nd Edition, Pearson Education, 2003.

REFERENCES:

1. Neil H.E. Weste, David Money Harris, "CMOS VLSI Design: A Circuits and Systems Perspective", 4th Edition, Pearson Addison-Wesley, 2015.
2. Douglas A.Pucknell and Kamran Eshraghian, "Basic VLSI Design", 3rd Edition, PHI, 2017.

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20CS401	COMPUTER NETWORKS	L T P C
	(Common to AD, CSE, ECE, EEE and IT)	3 0 0 3

OBJECTIVES:

The Student should be made to:

- Understand the protocol layering and physical level communication.
- Be familiar with the Data Link layer.
- Gain the knowledge on network protocols. Architectures and applications.
- Examine the functionalities on TCP and UDP.
- Interpret the knowledge on application layer.

UNIT I INTRODUCTION **9**

Data Communications - Data Flow - Networks - Networks types - The Internet - Standards - Network Models- TCP/IP Protocol Suite - The OSI Model -Physical Layer: Performance - Transmission media - Switching - Circuit-switched Networks - Packet Switching.

UNIT II DATA LINK LAYER & MEDIA ACCESS **9**

Introduction - Link-Layer Addressing - Block Coding - Cyclic Coding - Checksum - DLC Services -Data-Link Layer Protocols - HDLC - Media Access Control - Wired LANs: Ethernet - Wireless LANs: IEEE 802.11, Bluetooth - Connecting Devices.

UNIT III NETWORK LAYER **9**

Network Layer Services - Packet switching - Performance - IPV4 Addresses - Forwarding of IP Packets - Network Layer Protocols: IP, ICMP v4 - Unicast Routing Algorithms - Protocols - Multicasting Basics - IPV6 Addressing - IPV6 Protocol.

UNIT IV TRANSPORT LAYER **9**

Introduction - Transport Layer Protocols - Services - Port Numbers - User Datagram Protocol - Transmission Control Protocol - SCTP.

UNIT V APPLICATION LAYER **9**

WWW and HTTP - FTP - Email -Telnet -SSH - DNS - SNMP.

TOTAL: 45 PERIODS

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OUTCOMES:

On successful completion of this course, the students will be able to,

- Understand the Layered Architecture of Computer Networks.
- Conceptualize the protocols of Data Link Layer and can build Local area networks.
- Apply Subnet and Supernet concepts in the construction of computer network.
- Summarize the protocols used in Transport Layer, QoS and Congestion control mechanisms.
- Analyze different protocols of Application Layer.

TEXTBOOK:

1. Behrouz A. Forouzan, "Data Communications and Networking", Fifth Edition TMH, 2013.

REFERENCES:

1. Larry L. Peterson, Bruce S. Davie, "Computer Networks: A Systems Approach", Fifth Edition, Morgan Kaufmann Publishers Inc., 2012.
2. William Stallings, "Data and Computer Communications", Tenth Edition, Pearson Education, 2013.
3. Nader F. Mir, "Computer and Communication Networks", Second Edition, Prentice Hall, 2014.
4. Ying-Dar Lin, Ren-Hung Hwang and Fred Baker, "Computer Networks: An Open Source Approach", McGraw Hill Publisher, 2011.
5. James F. Kurose, Keith W. Ross, "Computer Networking, A Top-Down Approach Featuring the Internet", Sixth Edition, Pearson Education, 2013.

CHAIRMAN
BoS(CSE)

ECE

20MG501	PRINCIPLES OF MANAGEMENT (COMMON TO CIVIL, CSE, ECE, EEE, IT AND MECH)	L T P C 3 0 0 3

OBJECTIVES:

The Student should be made to:

- Know about the overview of the Management
- Understand various planning tools and techniques
- Learn various structures and designs of organization
- Familiarize with various directing approaches and its impact
- Impart knowledge on the concepts and applications of controlling

UNIT I OVERVIEW OF MANAGEMENT 9

Introduction to Management and Organizations – Management Functions – Types of Managers – Managerial Roles and Skills – Evolution of Management Theory – Managing in a Global Environment – Social Responsibility and Managerial Ethics – Organization's Culture – Source, Types of Organization.

UNIT II PLANNING 9

Foundation of Planning – Purposes of Planning – Types of Plan – Process of Planning – Policies – Planning Tools and Techniques – Importance of Strategic Management – Process – Types of Organizational Strategies – MBO – Decision Making Process – Types of decision.

UNIT III ORGANISING 9

Organization Structure – Organizational Design – Departmentation – Span of Control – Centralization and Decentralization – Human Resource Management – Process – HR Planning – Recruitment – Selection –Training – Performance Management – Career Development– Forces of Managing Change – Types of Change – Innovation.

UNIT IV DIRECTING 9

Foundations of Behavior – Motivation Theories – Leadership – Functions, Style and Theories of Leadership – Team and Team work – Types , Characteristics of Teams – Communication – Process of Communication – Barrier to Effective Communication – Communication and IT.

UNIT V CONTROLLING 9

Foundation of Control – Importance, Process and Tools – Budgetary and Non-Budgetary Control Methods – Types of Budgets – Auditing – MIS – Operation System – Importance of Operations Management – Designing Operations System – Reporting.

TOTAL: 45 PERIODS

OUTCOMES:

On successful completion of this course, the students will be able to,

- Apply various managerial roles and skills
- Use planning tools and techniques for effective decision making
- Implement the applications of organizational structures
- Execute various directing approaches for effective communications
- Evaluate the applications of controlling in an organization

CHAIRMAN
BoS (MECH)

TEXT BOOKS:

1. Stephen P Robbins and Mary Coulter, "Management", Prentice Hall of India, 14th Edition, 2019.
2. James A F Stoner, Edward Freeman R and Daniel R Gilbert Jr., "Management", Pearson Education, 6th Edition, 2015.

REFERENCES:

1. Prasad L M, "Principles and Practice of Management", Sultan Chand and Sons, 10th Edition, 2020.
2. Hellriegel, Slocum and Jackson, "Management-A Competency Based Approach", Thomson South Western, 10th Edition, 2007.
3. Harold Koontz, Heinz Weihrich and Mark V Cannice, "Management-A global & Entrepreneurial Perspective", Tata Mcgraw Hill, 12th Edition, 2007.
4. Andrew J Dubrin, "Essentials of Management", Thomson South-western, 7th Edition, 2007.

CHAIRMAN
BoS (MECH)

20EC603L **VLSI DESIGN LABORATORY** **L T P C**
0 0 3 1

OBJECTIVES:

The students should be made to

- Write HDL code to analyze the various types of combinational logic circuits.
- Design and simulate the sequential logic circuits using Verilog HDL.
- Learn and understand the designing of CMOS logic circuits.
- Understand the design and implementation of digital logic circuits using FPGA.
- Develop the skills to implement and test the digital circuits on FPGA board.

LIST OF THE EXPERIMENTS

1. Design and Simulation of Basic Logic Gates
2. Design and Simulation of Adders and Subtractors
3. Design and Simulation of Multiplexer and Demultiplexer
4. Design and Simulation of Encoder and Decoder
5. Design and Simulation of Comparator
6. Design and Simulation of Flip-Flops
7. Design and Simulation of Counters
8. Design and Simulation of Shift Registers
9. Design of CMOS Inverter
10. Design of CMOS NAND Gate
11. Design of CMOS NOR Gate
12. Study of FPGA board and testing on board LED's and Switches
13. Design and Implementation of 4 bit adder on FPGA Board
14. Design and Implementation of 4 bit multiplier on FPGA Board

TOTAL: 45 PERIODS

OUTCOMES:

On successful completion of this course, the students will be able to,

- Apply the HDL programming for designing the combinational logic circuits.
- Impart the knowledge of design and simulation of sequential circuits using Verilog HDL.
- Design the CMOS logic circuits using EDA/SPICE tools.
- Demonstrate the FPGA implementation of digital logic circuits.
- Import and verify the functionality the logic modules into FPGA boards.

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS:

1. Xilinx ISE/Altera Quartus/ equivalent EDA Tools.
2. Xilinx/Altera/equivalent FPGA Boards. (10 nos).
3. Cadence/Synopsis/ Mentor Graphics/Tanner/SPICE/equivalent EDA Tools.
4. Personal Computer. (30 nos)

Chairman
BoS/ECE

20EC604L **NETWORKS LABORATORY** **L T P C**
0 0 3 1

OBJECTIVES:

The student should be made to:

- Study the various networking hardware devices and IP Commands.
- Write a program to implement error detection/error correction techniques.
- Understand the basic structure of network topologies and implementation of the different protocols.
- Learn and use the simulation tools.
- Know the various Distance Vector and Link State routing algorithms

LIST OF EXPERIMENTS:

1. Study of various Network devices and IP Commands.
2. Implementation of Error Detection / Error Correction Techniques
3. Network Topology – Star, Bus, Ring
4. Token Bus and Token Ring protocols
5. Implementation of Stop and Wait Protocol
6. Implementation of Goback-N Protocol
7. Implementation of Selective Repeat protocol
8. CSMA/CD and CSMA/CA protocols
9. Implementation of Distance Vector routing algorithm
10. Implementation of Link State routing algorithm
11. Study of Network Simulator (NS) and simulation of Congestion Control algorithms

TOTAL: 45 PERIODS

OUTCOMES:

At the end of the course, the student should be able to:

- Understand the working of various networking devices.
- Apply the error detection/error correction techniques.
- Analyze the performance of various types of network topologies and protocols.
- Use the simulation tools to analyze the performance of network.
- Implement and compare the routing algorithms.

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS:

1. C / Python / Java / Equivalent Compiler.
2. Standard LAN Trainer Kits (4 Nos).
3. Network simulator like NS2/ NS3 / Glomosim/OPNET/Packet Tracer/Equivalent.
4. Standalone Desktops (30 Nos).

Chairman
BoS/ECE

20EC605L **MINI PROJECT-II** **L T P C**
0 0 2 1

OBJECTIVE:

- Learn different types of sensors from Motes families.
- Design the problem solution as per the requirement analysis done using Motes sensors.
- Study the basic concepts of programming/sensors/ emulator like cooja etc.
- Design and implement the mini project intended solution for project based learning.
- Build and test the mini project successfully.

GUIDELINES

1. The mini project work is to be conducted by a group of three students
2. Each group will be associated with a subject Incharge/ mini project mentor.
3. The group should meet with the concerned faculty during Laboratory hours and the progress of work discussed must be documented.
4. The students must understand the
    a. Concept
    b. Importance
    c. Interdisciplinary
    d. Challenges
    e. Various applications/smart objects
    f. Major Players/Industry, Standards.
5. The students must understand the IoT Architecture:
    a. Node Structure: Sensing, Processing, Communication, Powering
    b. Networking: Topologies, Layer/Stack architecture
    c. Communication Technologies: Introduction to ZigBee, BLE, WiFi, LTE, IEEE802.11ah.
    d. Discuss data rate, range, power, computations/bandwidth, QoS
    e. Smartness - Signal Processing/Analytics: Impact on Power/Energy savings, dynamic networks, simple case studies.
    f. IoT Fabricator: Introduction to Embedded electronics, fabricating challenges – recreation, IP/security, Challenges.
    g. Hands-on in IoT: Projects based on some Hardware (Raspberry pi, Arduino, Intel, IITH Mote,Smartphones), Software (Contiki, TinyOS, Android), IoT Fabricator etc. can be used.
6. The students may do will visit different websites to identify their IOT topic for the mini project.
7. The students may do survey for different application using different types of sensors for their mini project.
8. Each group will identify the Hardware (Motes from different Motes families) & sensor configuration and software requirement for their mini project problem statement.
9. Design own circuit board using multiple sensors etc.
10. Installation, configure and manage your sensors in such away so that they can communicate with each other.
11. Work with operating system, emulator like contiki cooja and do coding to for input devices on sensors.

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BoS/ECE

12. Each group will identify the Hardware and software requirement for their mini project problem statement.
13. Create and interface using Mobile/Web to publish or remotely access the data on Internet.
14. Each group along with the concerned faculty shall identify a potential problem statement, on which the study and implementation is to be conducted.
15. Each group may present their work in various project competitions and paper presentations.
16. A detailed report is to be prepared as per guidelines given by the concerned faculty.

TOTAL: 30 PERIODS

OUTCOME:

On successful completion of this course, the students will be able to,

- Identify the requirements for the real world problems.
- Conduct a survey of several available literatures in the preferred field of study.
- Study and enhance software/ hardware skills
- Demonstrate and build the project successfully by hardware/sensor requirements, coding, emulating and testing.
- Demonstrate an ability to work in teams and manage the conduct of the research

TEXT BOOKS:

1. Jean-Philippe Vasseur, Adam Dunkels, Morgan Kuffmann, "Interconnecting Smart Objects with IP: The Next Internet".
2. Adrian McEwen, "Designing the Internet of Things", Hakim Cassimally.
3. Dr. Ovidiu Vermesan, Dr. Peter Friess, "Internet of Things: Converging Technologies for Smart Environments and Integrated Ecosystems", River Publishers.
4. Vijay Madisetti , Arshdeep Bahga, "Internet of Things (A Hands-on-Approach)".

REFERENCES:

1. Zach Shelby, Carsten Bormann, "LoWPAN: The Wireless Embedded Internet", Wiley.
2. Daniel Minoli John , "Building the internet of things with ipv6 and mipv6, The Evolving World of M2M Communications", Wiley & Sons.
3. Sitharama Iyengar.S, Nandan Parameshwaran, Phoha. Vir V, Balakrishnan.N, Chuka D. Okoye, "Fundamentals of Sensor Network Programming: Applications and Technology", Wiley publication.

Term Work shall consist of full Mini Project on above guidelines/syllabus.

- Oral Exam: An Oral exam will be held based on the Mini Project and Presentation.

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BoS/ECE

20EEC601L **EMPLOYABILITY SKILLS** **L T P C**
0 0 2 1

OBJECTIVES:

The student should be made to:

- Learn the application of mathematical and project management to different contexts
- Focus on quantitative ability and employability skills through modern practices
- Enhance job skills and analytical ability of students
- Improve reasoning skills and employability skills
- Practice the skills on logical reasoning and interview techniques

UNIT I INTRODUCTION TO NUMERIC ABILITY AND PROJECT MANAGEMENT **6**

Aptitude – Ratio and Proportion – Partnership – Allegation of Mixtures – Coding and Decoding - Number Sequence.

Soft Skills – Managerial Skills – Project Cost, Risk and Task Management, Conflict Management and Resolution.

UNIT II QUANTITATIVE ANALYSIS AND EMPLOYERS EXPECTATIONS **6**

Aptitude – Number System – Data Interpretation – Chain Rule – Surds and Indices – Direction Sense.

Soft Skills – Employers Needs and Expectations – Mind Mapping – Situation Reaction Test (SRT).

UNIT III ANALYTICAL SKILLS AND JOB READINESS **6**

Aptitude – Combination – Probability – Problems on Ages – Seating Arrangements.

Soft Skills – Job Application – Resume Building – Exploring and Identifying Career Options.

UNIT IV REASONING ABILITY AND INSIGHT ON INTERVIEWS **6**

Aptitude – Mensuration – SI and CI – Cause and Effect – Statement, Assumptions and Conclusions.

Soft Skills – Interview Techniques – Job Description – Roles and Responsibilities – Work Etiquettes.

UNIT V LOGICAL REASONING AND READY RECKONERS FOR INTERVIEWS **6**

Aptitude – Input – Output Tracing – Trains – Calendar – Blood Relations.

Soft Skills – Types of Interview – Interview Process – Analyzing the Interviewer – HR Questions – Mock Interviews.

TOTAL: 30 PERIODS

OUTCOMES:

On successful completion of this course, the students will be able to,

- Develop numerical ability and project management skills
- Achieve quantitative skills and employability skills
- Understand both analytical and job readiness in a productive manner
- Acquire reasoning ability and interview techniques
- Obtain logical skills and interviewers expectations

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TEXT BOOKS:

1. Aggarwal R S, "Quantitative Aptitude for Competitive Examinations", S Chand Publishing New Delhi, Revised Edition, 2017.
2. Murty G R K, "Soft Skills for Success", DGM ICFAI books, Revised Edition, 2005.

REFERENCES:

1. Abhijit Guha, "Quantitative Aptitude for All Competitive Examinations", McGraw Hill Education, Sixth Edition, 2016.
2. Carnegie Dale, "How to Win Friends and Influence People", Simon and Schuster New York, 1998.
3. Thomas A Harris, "I'm OK - You're OK", Harper and Row New York, 1972.
4. Rajesh Verma, "Fast Track Objective Arithmetic", Arihant Publications (India) Limited, 2012.
5. Arun Sharma, "How to Prepare for Quantitative Aptitude for CAT", McGraw Hill Education, Eighth Edition, 2018.

Chairman
BoS/S&H

20EC701	EMBEDDED AND REAL TIME SYSTEMS (COMMON TO CSE AND ECE)	L T P C 3 0 0 3

OBJECTIVE:

The students should be made to

- Learn the architecture of ARM7 and Assembly language code for ARM7 processor.
- Understand the embedded computing platform design and software performance.
- Expose the basic concepts of real time Operating system and scheduling algorithm.
- Design techniques and networks for embedded systems.
- Analyze the applications of embedded Control systems

UNIT I INTRODUCTION TO EMBEDDED COMPUTING AND ARM PROCESSORS 9

Complex systems and micro processors - Embedded system design process - Design example: Model train controller - Instruction sets preliminaries - ARM Processor - CPU: programming input and output - supervisor mode, exceptions and traps - Co-processors - Memory system mechanisms - CPU performance - CPU power consumption.

UNIT II EMBEDDED COMPUTING PLATFORM DESIGN 9

The CPU Bus - Memory devices and systems - Designing with computing platforms - consumer electronics architecture - platform - level performance analysis - Components for embedded programs - Models of programs - Assembly, linking and loading - compilation techniques - Program level performance analysis - Software performance optimization - Program level energy and power analysis and optimization - Analysis and optimization of program size - Program validation and testing.

UNIT III PROCESSES AND OPERATING SYSTEMS 9

Introduction - Multiple tasks and multiple processes - Multirate systems - Preemptive real-time operating systems-Priority based scheduling - Interprocess communication mechanisms - Evaluating operating system performance-power optimization strategies for processes.

UNIT IV SYSTEM DESIGN TECHNIQUES AND NETWORKS 9

Design methodologies - Design flows - Requirement Analysis - Specifications - System analysis and architecture design - Quality Assurance techniques - Distributed embedded systems - MPSoCs and shared memory multiprocessors.

UNIT V CASE STUDY 9

Data compressor - Alarm Clock - Software modem - Telephone answering machine - Audio player - Digital still camera - Video accelerator.

TOTAL: 45 PERIODS

OUTCOME:

On successful completion of this course, the students will be able to,

- Summarize Architecture and programming of ARM processor.
- Applying the concepts of embedded systems and its features.

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BoS/ECE

- Analyze various Real time Operating system is used in Embedded System.
- Design the flow & Techniques to develop Software for embedded system networks.
- Analyze Real-time applications using embedded System Products.

TEXT BOOKS:

1. Marilyn Wolf, "Computers as Components - Principles of Embedded Computing System Design", 3rd Edition, Morgan Kaufmann Publisher (An imprint from Elsevier), 2012.

REFERENCES:

1. Jonathan W.Valvano, "Embedded Microcomputer Systems Real Time Interfacing", 3rd Edition Cengage Learning, 2012.
2. David. E. Simon, "An Embedded Software Primer", 1st Edition, 5th Impression, Addison-Wesley Professional, 2007.
3. Raymond J.A. Buhr, Donald L.Bailey, "An Introduction to Real-Time Systems - From Design to Networking with C/C++", Prentice Hall, 1999.
4. C.M. Krishna, Kang G. Shin, "Real-Time Systems", International Editions, Mc Graw Hill 1997.
5. K.V.K.K.Prasad, "Embedded Real-Time Systems: Concepts, Design & Programming", Dream Tech Press, 2005.

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BoS/ECE

20EC702	MICROWAVE ENGINEERING AND OPTICAL COMMUNICATION	L T P C 3 0 0 3

OBJECTIVE:

The students should be made to

- Acquire knowledge on the theory of microwave transmission, microwave generators and associated components.
- Know about the various microwave Measurements.
- Learn about the degradation of light waves in optical fiber
- Facilitate the knowledge about optical fiber sources and transmission techniques
- Give a thorough understanding of Photo detection methods in receiver block.

UNIT I MICROWAVE VACUUM TUBE AND SOLID STATE DEVICES 9

Introduction – Klystrons: Two Cavity Klystron, Reflex Klystron – Travelling Wave Tube Amplifier - The Backward wave Oscillator - Magnetron Oscillator - Transferred Electron Devices (TED) - Gunn Diodes - Avalanche Transit Time Devices (ATTD) - Tunnel Diodes - Varactor Diodes.

UNIT II MICROWAVE MEASUREMENTS 9

Introduction - Tunable Detector - Slotted Line Carriage - VSWR Meter - Spectrum Analyser - Network Analyser-Power Measurements -Insertion Loss and Attenuation Measurements -VSWR Measurements - Return Loss Measurement by a Reflectometer - Impedance Measurement - Frequency Measurement - Microwave Antenna Measurements.

UNIT III INTRODUCTION TO OPTICAL FIBERS 9

Introduction to Telecommunications and Fiber Optics: The Evolution of Fiber Optic Systems, Basic Optical Laws and Definitions: Propagation of light inside fiber - Critical-Angle - Numerical Aperture - Acceptance-Angle -Cut-off wavelength, Mode Field Diameter, Mode Theory: V-Number, Fiber Types, Splicing Techniques and Connectors.

UNIT IV LOSSES AND DISPERSION IN OPTICAL FIBERS 9

Merits and Demerits of Fiber Optics over conventional copper wire systems, Losses: Attenuation Losses - Absorption Losses - Scattering Losses - Bending Losses - Core and Cladding Losses - Total Combined Losses, Dispersion: Group-Delay - Material Dispersion - Waveguide Dispersion - Intermodal Distortion.

UNIT V OPTICAL SOURCES AND PHOTO DETECTORS 9

Topics from Semiconductor Physics - Light Emitting Diodes(LEDs) - Laser Diodes - Light Source Linearity - Reliability Consideration - Physical Principles of Photo Diodes - Physical Principles of Photo Diodes - Photo detector Noise - Detector Response Time - Avalanche Multiplication Noise - Structures for InGaAs APDs - Temperature Effect on Avalanche Gain - Comparison of Photo detectors - Fundamental Receiver Operation.

TOTAL: 45 PERIODS

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BoS/ECE

OUTCOME:

On successful completion of this course, the students will be able to,

- Anyalze the Microwave devices and its types
- An ability to analyze and measure the various methods of microwave measurements
- Facilitate the knowledge about the degradation of light waves in optical fiber.
- Discuss the various optical fiber modes, configurations and various signal degradation factors associated with optical fiber.
- Explain the various optical sources and optical detectors and their use in the optical communication system.

TEXT BOOKS:

1. Annapurna Das, Sisir K Das, "Microwave Engineering", Tata McGraw Hill, 2nd Edition, 2012.
2. Gerd Keiser, "Optical Fiber Communication", Tata McGraw Hill, 4th Edition, 2011.

REFERENCES:

1. John M.Senior, "Optical fiber communication", Pearson Education, 2nd Edition, 2007.
2. Govind P. Agrawal, "Fiber-optic communication systems", 3rd, John Wiley & sons, 2004.
3. David M. Pozar, "Microwave Engineering", 4th Edition, Wiley India, 2012.

Chairman
BoS/ECE

20EC703L **EMBEDDED LABORATORY** **L T P C**
0 0 3 1

OBJECTIVE:

The students should be made to

- Understand the Building Blocks of Embedded Systems with ARM processor
- Learn the interfacing procedure of various devices such as ADC-DAC, PWM-LED
- Analyze performance of processor by interfacing keyboard, display, motor and sensor.
- Evaluate the interrupt performance of ARM and FPGA processor.
- Apply the knowledge of interfacing between zigbee protocol with ARM processor

LIST OF THE EXPERIMENTS

1. Study of ARM evaluation system
2. Interfacing ADC and DAC.
3. Interfacing LED and PWM.
4. Interfacing real time clock and serial port.
5. Interfacing keyboard and LCD.
6. Interfacing EPROM and interrupt.
7. Mailbox.
8. Interrupt performance characteristics of ARM and FPGA.
9. Flashing of LEDS.
10. Interfacing stepper motor and temperature sensor.
11. Implementing zigbee protocol with ARM.

IOT EXPERIMENTS

1. Interface LED / Buzzer with Arduino / raspberry pi
2. Interface sensor with Arduino / raspberry pi

TOTAL: 45 PERIODS

OUTCOME:

On successful completion of this course, the students will be able to,

- Design a ARM for the specific application by the way of basic building blocks of embedded system.
- Implement various interfacing mechanism and observe the performance by using in KEIL software.
- Analyze performance of ARM processor by interfacing keyboard, display, motor and sensor.
- Evaluate the interrupt performance of ARM processor by using in KEIL software.
- Apply the interfacing knowledge between zigbee communication protocols and IoT modules

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS:

1. Embedded trainer kits with ARM board.
2. Embedded trainer kits suitable for wireless communication.
3. Adequate quantities of Hardware, software and consumables.

Chairman
BoS/ECE

20EC704L	MICROWAVE AND OPTICAL COMMUNICATION LABORATORY	L T P C 0 0 3 1

OBJECTIVE:

The students should be made to

- Be familiar with basic microwave and optical measurements.
- Understand the working principle of optical sources, detector, fibers and microwave components
- Learn about the characteristics and measurements in optical fiber
- Understand the characteristics of Gunn diode or reflex klystron tube
- Know about the behavior of microwave components.

LIST OF THE EXPERIMENTS

I. MICROWAVE EXPERIMENTS

1. Reflex klystron or Gunn diode characteristics and basic microwave parameter measurement such as VSWR, frequency, wavelength.
2. Directional Coupler Characteristics.
3. Radiation Pattern of Horn Antenna.
4. S-parameter Measurement of the following microwave components (Isolator, Circulator, E plane Tee, H Plane Tee, Magic Tee)
5. Attenuation and Power Measurement

II. OPTICAL EXPERIMENTS

1. DC Characteristics of LED and PIN Photo diode
2. Mode Characteristics of Fibers
3. Measurement of connector and bending losses
4. Fiber optic Analog and Digital Link- frequency response(Analog) and eye diagram(Digital)
5. Numerical Aperture determination for Fibers
6. Attenuation Measurement in Fibers

TOTAL: 45 PERIODS

OUTCOMES:

On successful completion of this course, the students will be able to,

- Analyze the performance of simple optical link.
- Test microwave and optical components.
- Analyse the mode characteristics of fiber and Calculate the wave parameter (Frequency, VSWR, Reflection coefficients)
- Implement multihole directional coupler and magic tee in different microwave platforms..
- Understanding the concept and characteristics of reflex klystron or Gunn diode

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS:

1. Trainer kit for carrying out LED and PIN diode characteristics, Digital multimeter, optical power meter.
2. Trainer kit for determining the mode characteristics, losses in optical fiber.

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3. Trainer kit for analyzing Analog and Digital link performance, 2 Mbps PRBS Data source, 10 MHz signal generator, 20 MHz Digital storage Oscilloscope.
4. Kit for measuring Numerical aperture and Attenuation of fiber.
5. MM/SM Glass and plastic fiber patch chords with ST/SC/E2000 connectors.
6. LEDs with ST / SC / E2000 receptacles - 650 / 850 nm.
7. PiN PDs with ST / SC / E2000 receptacles - 650 / 850 nm.
8. Microwave test Bench at X band to determine Directional coupler characteristics.
9. Microwave test Bench at X band and Antenna turn table to measure Radiation pattern of Horn antenna, 2 Horn antennas.
10. Microwave test Bench at X band to determine VSWR for Isolator and Circulator, VSWR meter, Isolator, Circulator, E Plane Tee, H plane Tee.
11. Microwave test Bench at X band, Variable attenuator, Detector and 20 MHz Digital / Analog Oscilloscope.

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20EC501PE	INDUSTRIAL ELECTRONICS	L	T	P	C
		3	0	0	3

OBJECTIVE:

The Student should be made to:

- Present the power semiconductor devices fundamentals and its applications
- Familiarize with the design of various phase controlled converters using power devices
- Understand the principle of operation of DC choppers
- Explain the performance of various inverters
- Introduce the application of power devices in industry.

UNIT I POWER SEMICONDUCTOR DEVICES **9**

Thyristor, Thyristor characteristics, Thyristor turn-on methods, Thyristor protection, Series and parallel operation of thyristors, Thyristor commutation, Characteristics of Diac and Triac, Power diode,Power transistor, Power MOSFET,IGBT

UNIT II PHASE CONTROLLED CONVERTERS **9**

Principle of phase control, Single-phase half-wave circuit with different types of load, Single phase full-wave mid-point converter, Single-phase full-wave bridge converters, Single-phase miconverter, Three-phase thyristor converters, Single-phase and three-phase dual converters.

UNIT III DC CHOPPERS **9**

Principle of chopper operation and control strategies, Step-up and step-down choppers, Types of chopper circuits, Voltage-commutated chopper, Current commutated chopper, Load-commutated chopper.

UNIT IV INVERTERS **9**

Single-phase voltage source inverters, Modified McMurray half-bridge and full-bridge inverter, McMurray-Bedford half-bridge and full-bridge inverter, Pulse-width modulated inverters, current source inverters, Series inverters, Parallel inverter.

UNIT V APPLICATIONS OF INDUSTRIAL ELECTRONICS **9**

Switched mode power supply (SMPS), Uninterruptible power supplies, solid state relays (light operated relays), LASCRs/photo SCRs, Wind Power Control :Fixed speed with capacitor bank, Rotor resistance control,

TOTAL: 45 PERIODS

OUTCOMES:

On successful completion of this course, the students will be able to,

- Understand the thyristor family such as SCR, DIAC, TRIAC etc
- Describe the application of thyristor such as AC Phase control using SCR
- Design various chopper circuits using power devices
- Analysis and design procedures of various inverters circuits
- Equip the skill to design and develop a realtime applications.

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TEXT BOOKS:

1. Muhammad H. Rashid, "Power Electronics: Circuits, Devices and Applications", 4th Edition, Pearson / PHI Publication, 2014.

REFERENCES:

1. Dr. P. S. Bimbhra, "Power Electronics", 5th Edition, Khanna Publishers, 2014
2. P.C.Sen, "Power Electronics", Tata McGraw-Hill, 1st Edition, 2001.
3. C. W. Lander, "Power Electronics", 3rd Edition, McGraw Hill Publication,1993

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20EC502PE	INTRODUCTION TO VLSI DESIGN	L T P C 3 0 0 3

OBJECTIVES:

The Student should be made to:

- Understand MOS device characteristics and to implement simple gates using CMOS logic style with delay and power constraints.
- Study the fundamentals of analog circuits and MOS device models.
- Understand the CMOS fabrication process styles including layout design rules.
- Design combinational and sequential circuits using different logic styles.
- Use modern EDA tools to simulate and synthesize VLSI circuits

UNIT I MOS TRANSISTOR THEORY **9**

I-V Characteristics, C-V Characteristics, Non ideal I-V effects of MOS Transistors, Basic gates, Compound Gates, Transmission Gates based combinational and sequential logic design

UNIT II CMOS CIRCUIT CHARACTERIZATION AND PERFORMANCE ESTIMATION **9**

DC transfer Characteristics of CMOS inverter, Circuit characterization and performance estimation: Delay estimation, Logical effort and Transistor Sizing. Power Dissipation: Static &Dynamic Power Dissipation.

UNIT III CMOS COMBINATIONAL AND SEQUENTIAL CIRCUIT DESIGN **9**

Static CMOS, Ratioed Logic, Dynamic circuits, Pass Transistor Circuits, Conventional CMOS Latches and Flip Flops, Static latches and Registers, Dynamic latches and Registers.

UNIT IV SUB SYSTEM DESIGN **9**

Single bit Adder, Carry look ahead adder, Carry propagate Adder, Magnitude Comparator, Barrel Shifter, Signed and unsigned multiplier.

UNIT V CMOS FABRICATION AND LAYOUT **9**

CMOS Process Technology N-well, P-well process, Stick diagram for Boolean functions using Euler Theorem, Layout Design Rule

TOTAL: 45 PERIODS

OUTCOMES:

On successful completion of this course, the students will be able to,

- Clear understanding of fundamental concepts of MOS transistors
- Able to design simple logic gates using CMOS logic style & calculate power and delay of simple CMOS circuits
- Able to design and validate combinational and sequential circuits using different logic
- styles.
- Able to design VLSI circuits at subsystem abstraction level
- Understand fabrication processes and their impact on the circuit performance

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TEXT BOOKS:

1. Neil H.E. Weste, David Money Harris, "CMOS VLSI Design,A Circuits and Systems Perspective", 4th Edition, Pearson , 2017
2. Jan M. Rabaey ,Anantha Chandrakasan, Borivoje. Nikolic, "Digital Integrated Circuits: A Design perspective", 2nd Edition , Pearson , 2016.

REFERENCES

1. M.J. Smith, "Application Specific Integrated Circuits", Addisson Wesley, 1997
2. Sung-Mo kang, Yusuf leblebici, Chulwoo Kim, "CMOS Digital Integrate Circuits: Analysis & Design", 4th edition McGraw Hill Education,2013
3. Wayne Wolf, "Modern VLSI Design: System On Chip", Pearson Education, 2007
4. R.Jacob Baker, Harry W.LI., David E. Boyee, "CMOS Circuit Design, Layout and
5. Simulation‖", Prentice Hall of India, 2005.

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20EC503PE	INTERNET OF THINGS	L	T	P	C
		3	0	0	3

OBJECTIVES:

The Student should be made to:

- Understand the fundamentals of Internet of Things
- Study about domain specific IoTs & M2M
- Design the IoT using Python
- Build a small low cost embedded system using Raspberry Pi
- Apply the concept of internet of things in the real world scenario

UNIT I INTRODUCTION TO IoT **9**

Internet of Things – characteristics- Physical Design- Logical Design- IoT Enabling Technologies - IoT Levels & Deployment Templates - IoT Platforms Design Methodology.

UNIT II DOMAIN SPECIFIC IoTs & M2M **9**

Domain Specific IoTs- M2M- Difference between IoT & M2M- Software Defined Networking- Network Function Virtualization.

UNIT III IoT LOGICAL DESIGN USING PYTHON **9**

Introduction –Python Data types & Data structures-Control Flow-Functions-Modules-Packages-File Handling-Classes-Python Packages of Interest for IoT.

UNIT IV IoT PHYSICAL DEVICES & ENDPOINTS **9**

IoT Device -Building blocks -Raspberry Pi -Board - Linux on Raspberry Pi - Raspberry Pi Interfaces -Programming Raspberry Pi with Python - Other IoT Devices – Arduino.

UNIT V CASE STUDIES **9**

Home Automation – Cities – Environment – Agriculture - Structural Health monitoring - Weather monitoring.

TOTAL: 45 PERIODS

OUTCOMES:

On successful completion of this course, the students will be able to,

- Understand the concepts of Internet of Things
- Analyze the domain specific applications of IoT
- Apply the knowledge of Python for IoT
- Design a portable IoT using Rasperry Pi
- Implement basic IoT applications on embedded platform

TEXT BOOKS:

1. Arshdeep Bahga, Vijay Madisetti, "Internet of Things – A hands-on approach", Universities Press, 2015.

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REFERENCES:

1. Dieter Uckelmann, Mark Harrison, Michahelles, Florian (Eds), "Architecting the Internet of Things", Springer, 2011
2. Honbo Zhou, "The Internet of Things in the Cloud: A Middleware Perspective", CRC Press, 2012.
3. Jan Holler, Vlasios Tsiatsis , Catherine Mulligan, Stamatis , Karnouskos, Stefan Avesand. David Boyle, "From Machine-to-Machine to the Internet of Things - Introduction to a New Age of Intelligence", Elsevier, 2014
4. Olivier Hersent, David Boswarthick, Omar Elloumi, "The Internet of Things – Key applications and Protocols", Wiley, 2012.

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20EC504PE	ELECTRONICS MEASUREMENT AND INSTRUMENTATION	L T P C 3 0 0 3

OBJECTIVE:

The Student should be made to:

- Understand the fundamental concepts of electronic measurements
- Understand the operation of oscilloscopes and meters
- Elucidate signal generators and signal analyzers in measurements.
- Explore the significance of digital instruments in measurements
- Identify the need of data acquisition systems and measurement techniques in optical domains

UNIT I BASIC MEASUREMENT CONCEPTS **9**

Measurement Systems-Static and Dynamic characteristics – Units and Standards of Measurements – Error, Accuracy and Precision – Statistical Analysis – Moving Coil, Moving Iron Meters – Multimeters – Bridge Measurements – Wheatstone , Kelvin ,Maxwell, Hay, Schering, Anderson and Wien bridge.

UNIT II ELECTRONIC MEASUREMENTS **9**

Electronic Multimeters – Cathode Ray Oscilloscopes – Block Schematic – Applications – Special Oscilloscopes, Delayed Time Base Oscilloscopes, Analog and Digital Storage Oscilloscope, Sampling Oscilloscope – Q meters – Vector meters – RF voltage and power measurements – True RMS meters.

UNIT III SIGNAL GENERATORS AND ANALYZERS **9**

Function Generators – RF signal generators – Sweep generators – Frequency Synthesizer – Wave Analyzer – Harmonic Distortion Analyzer – Spectrum Analyzer, Digital Spectrum Analyzer, Vector Network Analyzer.

UNIT IV DIGITAL INSTRUMENTS **9**

Comparison of Analog and Digital Techniques – Digital Voltmeter – Frequency Counters – Digital RLC meters– Measurement of frequency and time interval – Extension of frequency range – Automation in Digital Instruments – Automatic Polarity Indication, Ranging and Zeroing, Fully Automatic Digital Instruments, Computer Controlled Test Systems, Virtual Instrumentation. Digital display devices (Flat panels)-LED (including OLED) displays, LCD (liquid crystal) displays, Thin Film Transistor, LCD (TFT-LCD)-PDPs (Plasma display panels)

UNIT V DATA ACQUISITION SYSTEMS AND FIBER OPTIC MEASUREMENTS **9**

Elements of a Digital Data Acquisition System – Interfacing of Transducers – Multiplexing – Data Loggers – Computer Controlled Instrumentation – IEEE 488 bus – Fiber Optic Measurements for Power and System Loss – Optical Time Domain Reflectometer.

TOTAL: 45 PERIODS

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OUTCOMES:

On successful completion of this course, the students will be able to,

- Apply measurements concepts to instruments design
- Analyze the analog instruments to select appropriate instrument for the measurement requirements
- Select the required signal generators and analyzers for the design of the Measurement Process and Maintenance of equipment.
- Analyze the digital instruments to select appropriate instrument for the measurement requirements
- Construct an automated data acquisition system for computer controlled measurement in modern wired and

TEXT BOOK:

1. Albert D.Helfrick and William D.Cooper, "Modern Electronic Instrumentation and Measurement Techniques", 2nd Edition, Pearson, 2009.
2. A.K. Sawhney and Puneet Sawhney, "A Course In Electrical And Electronic Measurements And Instrumentation", 19th Edition, Dhanpat Rai Publications, 2012.

REFERENCES:

1. Joseph J.Carr, "Elements of Electronics Instrumentation and Measurement", 2nd Edition Pearson Education, 2003.
2. David A. Bell, "Electronic Instrumentation and measurements", 3rd Edition, Oxford university press, 2013.
3. B.C. Nakra and K.K. Choudhry, "Instrumentation, Measurement and Analysis", TMH, 3rd Edition,2017.
4. Jiun-Haw Lee, David N.Liu , Shin-Tson Wu"Introduction to Flat Panel Displays, 1st Edition, 2009

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20EC505PE **NANO ELECTRONICS** **L T P C**
3 0 0 3

OBJECTIVES:

The student should be made to:

- Know about physical fundamentals of Nano technology
- Learn the fundamentals of super conducting devices
- Study the fundamentals of MOSFET devices
- Learn the Memory Devices and Sensors
- Learn about Innovative Electronic Devices

UNIT I FUNDAMENTAL Of NANO ELECTRONICS **9**

Basics of nanoelectronics – physical fundamentals of nano electronics – basics of information theory – the tools for micro and nanofabrication – basics of lithographic techniques for nanoelectronics –microlithography– nanolithography– tools for nanolithography.

UNIT II TUNNELING AND SUPER CONDUCTING DEVICES **9**

Nano electronics with tunneling devices and superconducting devices – tunneling element technology – Resonant tunneling Devices single electron devices – single electron devices for logic and gate applications – Carbon Nanotube based logic gates, optical devices – Quantum dots, quantum wires.

UNIT III MOSFETS **9**

Silicon MOSFETS– fundamentals of MOSFET devices–Nano FETS-single electron MOS transistor –split gate transistor – Electron wave transistor – Electron spin transistor – advanced MOSFET concepts – Principles of Single Electron Transistor (SET) – SET circuit design – comparison between FET and SET circuit design.

UNIT IV MEMORY DEVICES AND SENSORS **9**

Nano ferroelectrics – Ferroelectric random access memory – FeRAM circuit design – ferroelectric thin film properties and integration – calorimetric – sensors – electrochemical cells– resistive semiconductor gas sensors –electronic noses – identification of hazardous solvents and gases – semiconductor sensor array.

UNIT V INNOVATIVE ELECTRONIC DEVICES **9**

General Properties, Resonant Tunneling Diode, Quantum Cascade Laser, Single Electron,Transistor, Carbon Nanotube Devices.

TOTAL: 45 PERIODS

OUTCOMES:

On successful completion of this course, the students will be able to,

- Know basics of nano electronics and its fabrication
- Understand the concept of tunnelling and super conducting devices
- Understand fundamentals of MOSFETS and design of circuits

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- Learn memory devices and sensor techniques
- Gain basic knowledge about Innovative Electronic Devices

TEXT BOOKS:

1. Vladimir V mitin,Viatcheslav A kochelap,Michael A Stroscio,"Introduction to Nanoelectronics Science, Nanotechnology, Engineering, and Applications", Cambridge University Press,2008.
2. Fahrner W R, "Nanotechnology and Nanoelectronics: Materials, Devices, Measurement Techniques", Springer, 2010.

REFERENCES:

1. Goser K, Glosekotter P, Dienstuhl J, "Nanoelectronic and Nanosystems – From Transistors to Molecular Quantum Devices", Springer, 2004.
2. Rainer Waser, "Nanoelectronics and Information Technology: Advanced Electronic Materials Novel and Devices", Wiley VCH, 2005.
3. Mick Wilson, Kamali Kannangara, Geoff smith, "Nanotechnology: Basic Science and Emerging Technologies", Overseas press, 2005.

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BOS (ECE)

20CE502PE	AIR POLLUTION AND CONTROL ENGINEERING	L	T	P	C
	(Common to AGE, BME, ECE, EEE, CSE, IT, Mech)	3	0	0	3

OBJECTIVES:

The student should be made to:

- Impart knowledge on ambient air quality and emission standards.
- Learn effects of meteorology on air pollution.
- Understand various types of particulate contaminants with its sources and control measures.
- Gain awareness on different types of gaseous contaminants and its preventive measures.
- Study various sources, types and control of indoor air pollutants.

UNIT I INTRODUCTION 9

Structure and composition of Atmosphere – Definition, Scope and Scales of Air Pollution – Sources and classification of air pollutants and their effect on human health, vegetation, animals, property, aesthetic value and visibility- Ambient Air Quality and Emission standards –Ambient and stack sampling and Analysis of Particulate and Gaseous Pollutants.

UNIT II METEOROLOGY 9

Effects of meteorology on Air Pollution - Fundamentals, Atmospheric stability, Inversion, Wind profiles and stack plume patterns- Atmospheric Diffusion Theories – Dispersion models, Plume rise.

UNIT III CONTROL OF PARTICULATE CONTAMINANTS 9

Factors affecting Selection of Control Equipment – Gas Particle Interaction – Working principle, Design and performance equations of Gravity Separators, Centrifugal separators Fabric filters, Particulate Scrubbers, Electrostatic Precipitators – Operational Considerations.

UNIT IV CONTROL OF GASEOUS CONTAMINANTS 9

Factors affecting Selection of Control Equipment – Working principle, Design and performance equations of absorption, Adsorption, condensation, Incineration, Bio scrubbers, Bio filters – Process control and Monitoring - Operational Considerations.

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UNIT V INDOOR AIR QUALITY MANAGEMENT 9

Sources types and control of indoor air pollutants, sick building syndrome types – Radon Pollution and its control- Sources and Effects of Noise Pollution – Measurement – Standards – Control and Preventive measures.

TOTAL: 45 PERIODS

OUTCOMES:

On successful completion of this course, the students will be able to,

- Understand the nature and characteristics of air pollutants.
- Analyze the fundamentals on effects of meteorology in air pollution.
- Design stacks and particulate air pollution control devices to meet applicable standards.
- Learn control devices of gaseous contaminants with design standards.
- Maintain indoor quality management.

TEXT BOOKS:

1. Lawrence K. Wang, Norman C. Parelra, Yung Tse Hung, Air Pollution Control Engineering, Tokyo, 2004.
2. Noel de Nevers, Air Pollution Control Engineering, Mc Graw Hill, New York, 1995.

REFERENCE BOOKS:

1. David H.F. Liu, Bela G. Liptak, "Air Pollution", Lweis Publishers, 2000.
2. Arthur C Stern, "Air Pollution (Vol. I – Vol. VIII)", Academic Press, 2006.
3. Wayne T Davis, "Air Pollution Engineering Manual", John Wiley & Sons, Inc., 2000.
4. Anjaneyulu. Y, "Air Pollution and Control Technologies", Allied Publishers Pvt. Ltd., India 2002.

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20CS201	PYTHON PROGRAMMING	L T P C
	(Common to AD, BME, CSE, ECE, EEE and IT)	3 0 0 3

OBJECTIVES:

The Student should be made to:

- Acquire knowledge about the fundamentals of Python language.
- Learn about Control flow and functions in Python language.
- Develop programs using object oriented programming concepts.
- Use Python data structures like lists, tuples and dictionaries.
- Build application that handles files and exceptions.

UNIT I INTRODUCTION TO PYTHON 9

Programming Languages - Python History - Getting Started with Python - Writing a Simple program - Reading input from console - Identifiers - Variables, Assignment Statements and Expressions - Simultaneous Assignments - Named Constants - Data Types and Operators - Evaluating expressions - Augmented Assignment operators - Type conversion - Common Python Functions - Strings and Characters - Objects and Methods - Formatting Numbers and Strings.

UNIT II CONTROL STATEMENTS AND FUNCTIONS 9

Selections: if - Two way if-else - Nested if and Multi-way if-elif-else Statements - Logical Operators - Conditional Expressions - Operator Precedence and Associativity - Loops: while - for - Nested Loops - break and continue - Function: Definition - Calling and Returning values - Positional and keyword arguments - Passing arguments by reference values - Modularizing Code - Scope of variables - Default Arguments - Function Abstraction and Stepwise Refinement - Recursion.

UNIT III OOP CONCEPTS IN PYTHON 9

Object and classes - Defining classes for objects - UML Class diagram - Immutable Objects vs. Mutable Objects - Hiding data fields - Class abstraction and encapsulation - Object-Oriented Thinking - The str Class - Inheritance and Polymorphism: Super classes and Sub classes - overriding methods - Object class - Polymorphism and Dynamic Binding - The insistence Function - Class Relationships.

UNIT IV DATA STRUCTURES IN PYTHON 9

List Basics - Copying Lists - Passing List to Functions - Returning a List from function - Searching Lists - Multidimensional Lists - Tuples - Sets - Comparing Sets and Lists - Dictionaries.

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UNIT V FILES AND EXCEPTION HANDLING 9

Introduction - Text Input and Output - File Dialogs - Retrieving Data from the Web - Exception Handling - Raising Exceptions - Processing Exception using Exception Objects - Defining Custom Exception Classes.

TOTAL: 45 PERIODS

OUTCOMES:

On successful completion of this course, the students will be able to,

- Understand the basics of python programming languages.
- Apply the concepts of Control flow and functions to build applications.
- Build solutions using the concepts of object oriented programming.
- Design applications using data structures for real-time problems.
- Develop programs by using files and exception handling for the given scenario.

TEXT BOOKS:

1. Y. Daniel Liang , "Introduction to Programming Using Python", Pearson Education, 2013.

REFERENCES:

1. Timothy A. Budd, "Exploring Pyhton", McGraw Hill Education (India) Private Ltd, 2017.
2. Allen B. Downey, "Think Python: How to Think Like a Computer Scientist", 2nd edition, Updated for Python 3, Shroff / O'Reilly Publishers, 2016 (http://greenteapress.com/wp/think-python/)
3. Robert Sedgewick, Kevin Wayne, Robert Dondero, "Introduction to Programming in Python: An Inter-disciplinary Approach", Pearson India Education Services Pvt. Ltd., 2016.
4. Mark Lutz, "Learning python", O'Reilly Publication, 5th edition, 2013.
5. Guido Van Rossum and Fred L. Drake Jr, "An Introduction to Python", Revised and updated for Python 3.2, Network Theory Ltd., 2011.

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20EC506PE	PRINCIPLES OF DIGITAL SIGNAL PROCESSING (COMMON TO CSE & IT)	L	T	P	C
		3	0	0	3

OBJECTIVES:

The Student should be made to:

- Understand the basics of discrete time signals, systems and their classifications
- Analyze the discrete time signals in both time and frequency domain.
- Design digital IIR filters using analog-to-digital filter transformation.
- Design Linear phase digital FIR filters
- Realize the concept and usage of DSP in various engineering fields.

UNIT I CLASSIFICATION OF DT SIGNALS AND SYSTEMS **9**

Discrete Time(DT) Signals - Classification of DT signals: Deterministic and Random, Periodic & Aperiodic, Even and Odd, Energy & Power, Causal and Non causal. Classification of DT systems: Static and Dynamic , Time Invariant and Time Variant, Linear and Nonlinear , Causal and Non Causal, Stable and Unstable- Sampling Theorem-Linear convolution.

UNIT II ANALYSIS OF LTI DISCRETE TIME SYSTEMS **9**

Z-Transform - Inverse Z Transform-Analysis of LTI Discrete Time systems using Z-Transform-Computation of DFT–Properties of DFT–Radix-2 FFT Algorithms:DIT FFT and DIF FFT.

UNIT III FINITE IMPULSE RESPONSE FILTERS **9**

Linear Phase FIR filters–Design of Linear phase FIR filters using Window method (Rectangular, Hamming and Hanning window) –Frequency Sampling Technique- FIR filter Structures: Direct form, Cascade form, Linear phase realizations.

UNIT IV INFINITE IMPULSE RESPONSE FILTERS **9**

Design of digital IIR filters from analog filters-Approximation of derivatives- Bilinear transformation-Impulse Invariance technique–Butterworth and Chebyshev Filters - IIR filter Structures: Direct form-I, Direct form-II, Cascade and Parallel forms.

UNIT V MULTIRATE SIGNAL PROCESSING AND ADAPTIVE FILTERS **9**

Multirate Signal Processing: Decimation- Interpolation-Sampling rate conversion –Subband coding

Adaptive filters: Adaptive Noise Cancellation- Adaptive Channel Equalization- Adaptive Echo Cancellation-Adaptive Line Enhancing.

TOTAL: 45 PERIODS

OUTCOMES:

On successful completion of this course, the students will be able to,

- Perform mathematical operations on DT signals.
- Transform the time domain signal into frequency domain signal and vice-versa.
- Design the digital FIR filters using various techniques
- Apply the knowledge to design digital FIR filters for the given analog specifications.
- Analyze the multirate signal proceeding and adaptive filtering in Engineering problems.

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TEXT BOOKS:

1. Salivahanan.S,Vallavaraj.A,Gnanapriya.C, "Digital Signal Processing", 2nd Edition, Tata McGraw Hill, 2011.

REFERENCE:

1. John G. Proakis and Dimitris G.Manolakis, Digital Signal Processing – Principles, Algorithms and Applications, 4th Edition, Pearson Education / Prentice Hall, 2007.
2. Oppenheim.V,Schafer.R.W and Buck.J.R, Discrete-Time Signal Processing, 8th Indian Reprint, Pearson, 2004.
3. Emmanuel C.Ifeachor, and Barrie.W.Jervis, Digital Signal Processing, 2nd Edition, Pearson Education / Prentice Hall, 2002.
4. Sanjit K. Mitra, "Digital Signal Processing – A Computer Based Approach", 3rd Edition, Tata Mc Graw Hill, 2007

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ECE

20MA601PE **QUANTITATIVE AND REASONING APTITUDE**

(Common to all branches)

L	T	P	C
3	0	0	3

OBJECTIVES:

The Student should be made to:

- Sense the problems and develop strategies to find the solutions.
- Derive conclusions and make decision by analyzing mathematical functions.
- Build the right decision quantitatively based on the situations that depends upon the factors.
- Evaluate the validity and possible biases in the arguments presented in authentic contexts based on multiple sources of quantitative information.
- Do aptitude actively such as analyzing data, constructing hypotheses, solving problems, reflecting on their work and making connections.

UNIT I QUANTITATIVE ANALYSIS ON NUMBERS AND PERCENTAGE **9**

Numbers - Simplification – H.C.F and L.C.M of Numbers – Square Root and Cube Root – Surds and Indices – finding Unit and Last two digits of given expression – Remainder Theorem - Average -Logarithm - Percentage – Profit, Loss and Discount.

UNIT II ANALYSIS ON EFFICIENCY, TIME AND SPEED **9**

Simple Interest – Compound Interest - Time and Work – Pipes and Cistern – Chain rule - Time, Speed, Distance – Trains - Boats and streams- Races and games – Calendar -Clocks - Crypt arithmetic Problems.

UNIT III ANALYTICAL THINKING ABILITY OF RATIO & PROPORTION AND PROBABILITY **9**

Ratio and Proportion -Problems on Ages – Partnership – Alligation or Mixture - Permutation and Combination – Probability - Height and Distance – Trigonometry–Mensuration (Two dimensional and Three dimensional figures) - Data Interpretation.

UNIT IV REASONING ABILITY – I **9**

Series Completion – Coding and Decoding - Odd man out - Blood Relations - Sequential output Tracing – Analogy – Direction Sense Test - Classification - Ranking - Seating Arrangements - Dice – Cubes and Cuboids.

UNIT V REASONING ABILITY – II **9**

Syllogism – Statement and Conclusion -Statement and Assumption – Cause and effect - Transformation of Matrices - Matrix Reasoning - Mirror and Water Image – Paper folding – Completion of incomplete pattern- Embedded Images.

TOTAL: 45 PERIODS

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OUTCOMES:

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

- Solve a real-time problem which requires interpretation and comparison of complex numeric summaries.
- Get reason, models, and draw the conclusions or make decisions with mathematical, statistical and quantitative information.
- Justify and communicate effectively with conclusions in the appropriate ways to the audience.
- Apply probabilistic reason to draw conclusions, to make decisions, and to evaluate outcomes of decisions.
- Perceive success in future courses, gain skills for the workplace, and participate as a productive citizens in society.

TEXT BOOKS:

1. Aggarwal R S, "Quantitative Aptitude for Competitive Examinations", S Chand Publishing; New Delhi, Revised edition, 2017.
2. Aggarwal R S, "A Modern Approach to Verbal and Non – Verbal Reasoning", S Chand Publishing; New Delhi, Revised edition, 2018.

REFERENCES:

1. Abhijit Guha, "Quantitative Aptitude for All Competitive Examinations", McGraw Hill Education; 6th edition, 2016.
2. Arun Sharma, "How to Prepare for Quantitative Aptitude for the CAT", McGraw Hill Education; 8th edition, 2018.
3. Kailash Chandra and Sunil Kumar, "General Intelligence and Reasoning (Verbal and Non – Verbal)", Arihant Publications, 13th edition, 2019.
4. Anand P A and Lalith Singh, "Wiley's Verbal Ability and Reasoning for Competitive Examinations", 2016.

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20EC601PE **DIGITAL IMAGE PROCESSING TECHNIQUES (COMMON TO CSE AND ECE)** **L T P C 3 0 0 3**

OBJECTIVES:

The Student should be made to:

- Understand the fundamentals of image processing and mathematical transforms necessary for image processing
- Apply various processes on images for image understanding
- Get exposed to simple image enhancement techniques in Spatial and Frequency domain
- Learn the various image restoration and segmentation techniques
- Become familiar with image compression methods

UNIT I DIGITAL IMAGE FUNDAMENTALS AND TRANSFORMS **9**

Digital Image -Steps in Digital Image Processing – Components – Elements of Visual Perception – Image Sampling and Quantization – Basic relationship between pixels - Color image fundamentals-RGB and HSI models

UNIT II IMAGE TRANSFORMS **9**

Need for Transform- DFT- Properties of DFT- Separability, Translation, Periodicity, Rotation, Average Value – DCT- DST – Walsh Transform – Hadamard Transform – Haar Transform- Slant Transform- Wavelet transform

UNIT III IMAGE ENHANCEMENT **9**

Spatial Domain: Gray level transformations – Histogram equalization – 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- Homomorphic Filtering

UNIT IV IMAGE RESTORATION AND SEGMENTATION **9**

Restoration: Degradation Model -Noise models – Mean Filters – Order Statistics filters – Inverse Filtering – Wiener Filtering, Segmentation: Point, Line and Edge Detection– Region based segmentation: Region growing - Region splitting and merging- Thresholding- Morphological processing: Erosion and dilation.

UNIT V IMAGE COMPRESSION **9**

Need for data compression- Image Compression model – Lossless Compression: Huffman Coding - Arithmetic Coding – Bit-Plane Coding – Run Length Encoding- Lossy Compression: Lossy Predictive Coding – Compression Standards: JPEG and MPEG

TOTAL: 45 PERIODS

OUTCOMES:

At the end of the course, learners will be able to:

- Apply knowledge of mathematics for image understanding and analysis the techniques/ processes for image understanding.
- Use various Transform Techniques for Image Enhancement
- Perform image enhancement techniques in spatial and frequency domain.
- Analyze the image restoration filtering techniques and segmentation techniques.
- Appraise the need for image compression using lossy and lossless techniques

Chairman
BoS/ECE

TEXT BOOKS:

1. Rafael C Gonzalez, Richard E Woods, "Digital Image Processing", Pearson, 4th Edition, 2018.
2. Anil K Jain, "Fundamentals of Digital Image Processing", Pearson, 2006.

REFERENCES:

1. Jayaraman S, Esakkirajan S & Veerakumar T, "Digital Image Processing", 1st Edition, Tata McGraw Hill, New Delhi, 2016.
2. Kenneth R Castleman, "Digital Image Processing", Pearson, 2006.
3. William K Pratt, " Digital Image Processing", John Wiley, New York, 2002
4. Sridhar.S, "Digital Image Processing", Oxford University Press, 1st Edition – 2013

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20EC602PE **WIRELESS COMMUNICATION** **L T P C**
3 0 0 3

OBJECTIVES:

The Student should be made to:

- Familiarize the concepts related to cellular concepts and its generations
- Understand the concepts of traffic engineering and propagation mechanism
- Describe the different modulation schemes which are used in wireless communication systems.
- Describe the different diversity schemes as applied in wireless communication systems
- Gain the knowledge in variety of multiple access techniques

UNITI CELLULAR CONCEPT **9**

Cellular Concept- Frequency reuse- channel assignment strategies – Handoff strategies- Interference and system capacity- Improving coverage and capacity in cellular system- GSM architecture- GPRS architecture- UMTS architecture.

UNIT II TRAFFIC ENGINEERING AND MOBILE RADIO PROPAGATION **9**

Trunking and Grade of Service – Propagation Mechanisms – Fading –Large Scale Fading Small Scale Fading-Types of Small Scale Fading - Link budget calculations

UNIT III MODULATION TECHNIQUES FOR MOBILE RADIO CHANNEL **9**

Overview of linear modulation techniques: QPSK, MSK, QAM – GMSK- OFDM and its principle, transceiver implementation, cyclic prefix, inter carrier interference, windowing, PAPR and its reduction techniques.

UNIT IV DIVERSITY TECHNIQUES **9**

Diversity – Types of diversity – Diversity combining techniques: Selection, Feedback, Maximal -Ratio Combining and Equal Gain Combining – Rake receiver

UNIT V MULTIPLE ACCESS TECHNIQUES **9**

Introduction, Comparisons of multiple Access Strategies, TDMA, CDMA, FDMA, OFDMA, CSMA Protocols.

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TOTAL: 45 PERIODS

OUTCOMES:

Upon completion of the course, the student would be able to:

- Apply the various cellular concepts like frequency reuse, channel assignments, handoff strategies etc., in mobile communication.
- Elaborate the traffic engineering and characteristics of a wireless channel
- Understand and solve wireless communication design issues using different mechanism schemes and perform practical link budget design
- Differentiate the modulation schemes available and select appropriate method to improve the performance of wireless communication .
- Appraise a suitable diversity technique to combat the multipath fading effects.

Chairman
BoS/ECE

TEXT BOOKS:

1. Rapport T.S., Wireless Communications, 2012 (Reprint) 2nd edition, Pearson R education, Noida, India.
2. A.F,Molish, Wireless communications, Wiley, 2005
3. A.Goldsmith, Wireless communications, Cambridge university Press, 2005

REFERENCES:

1. T.L Signal, Wireless Communications, 2014 (Reprint) Tata McGraw Hill Education 1st edition ,Newdelhi,India
2. Keith Q T Zhang,Wireless communications: Principles, Theory and Mehodology, 2016, 1st edition John Wiley & Sons, west Sussex,UK
3. S.G Glisic," Advanced Wireless communications," 4G Technologies, Wiley 2004.
4. Ke-Lin Du,M.N.Swamy," Wireless communication systems," Wiley, 2004

Chairman
BoS/ECE

20EC603PE **ADVANCED MICROCONTROLLER** L T P C
3 0 0 3

OBJECTIVES:

The Student should be made to:

- Familiarize the features, specification of modern microprocessors
- Gain knowledge on the architecture of Intel 32 and 64 bit microprocessors and salient features associated with them
- Familiarize the features, specification of modern microcontrollers
- Gain knowledge on the 32 bit microcontrollers based ARM architectures
- Familiarize with the features of MSP 430 microcontroller

UNIT I ADVANCED FEATURES OF MICROPROCESSORS 9

Evolution of microprocessors - Data and Address buses – clock speed – memory interface - multi-core architectures – cache memory hierarchy – operating modes – super scaler execution – dynamic execution – over-clocking – integrated graphics processing - performance benchmarks.

UNIT II HIGH PERFORMANCE CISC ARCHITECTURES 9

Introduction to IA-32 architecture – Intel Pentium Processors family tree – Memory Management – Branch prediction logic - Superscalar architecture – Hyper threading technology – 64 bit extension technology – Intel 64 bit architecture - Intel Core processor family tree – Turbo boost technology – Smart cache - features of Nehalem microarchitecture.

UNIT III HIGH PERFORMANCE RISC ARCHITECTURE – ARM 9

RISC architecture merits and demerits – The programmer's model of ARM Architecture – 3-stage pipeline ARM organization - 3-stage pipeline ARM organization – ARM instruction execution – Salient features of ARM instruction set - ARM architecture profiles (A, R and M profiles).

UNIT IV ARM CORTEX PROCESSORS 9

Introduction to the Cortex-M Processor Family - ARM 'Cortex-M3' architecture for microcontrollers – Thumb 2 instruction technology – Internal Registers - Nested Vectored Interrupt controller - Memory map - Interrupts and exception handling – Applications of Cortex- M3 architecture

UNIT V MSP430 MICROCONTROLLERS 9

Functional Block diagram of MSP430F2003 - Memory Mapped CPU, Exceptions, Architecture of MSP430 - Processor Addressing Modes - Instruction Set, Interrupts, Digital in-outs, Timer, Communication interfaces.

TOTAL: 45 PERIODS

OUTCOMES:

On successful completion of this course, the students will be able to,

- Explain the features and important specifications of modern microprocessors
- Clarify the salient features of CISC microprocessors based on IA-32 bit and IA-64 bit architectures
- Explicate the salient features of RISC processors based on ARM architecture and different application profiles of ARM core

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- Explain the features and important specifications of modern microcontrollers
- Implement designs using MSP430 micro controller.

TEXT BOOKS:

1. Barry B Breg, The Intel Microprocessors, 8th edition, PHI, 2009.
2. Steve Furber, "ARM System – On – Chip architecture, "Addision Wesley, 2000

REFERENCES:

1. Intel Inc, Intel 64 and IA-32 Architectures Developers Manual, Volume-I, 2016
2. Joseph Yiu, The Definitive Guide to the ARM ® Cortex-M3, Newnes, 2010
3. John H Davies, MSP430 Microcontroller Basics, Elsevier, 2008
4. Trevor Martin, The Designers Guide to the Cortex-M Processor Family, Newnes,2013
5. Manuel Jimenez, Rogelio Palomera and Isidoro Convertier," Introduction to Embedded systems using Microcontrollers and the MSP430," Springer 2014.

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BoS/ECE

20EC604PE **DISPLAY DEVICES** L T P C
3 0 0 3

OBJECTIVE:

The Student should be made to:

- Understand the characteristics of visual and display systems.
- Know about different display technologies
- Gain knowledge about TFT and PLASMA display devices
- Familiar with the advanced display devices
- Gain knowledge about 2D and 3D display devices

UNIT I CHARACTERISTICS OF DISPLAY SYSTEMS 9

Human visual characteristics related to display systems-Brightness and contrast - Visual acuity, information content and resolution- Field of view and angle of viewing- Perception of colour- Colour gamut - Perception of motion, refresh rate and Critical Fusion Frequency. Non-Human visual characteristics related to display systems-Size, Aspect ratio, Electromagnetic emission, Degradation and screen burn, power consumption.

UNIT II LIQUID CRYSTAL DISPLAYS, LIGHT-EMITTING DIODE DISPLAY 9

LCD -construction-principle–technology for display, Construction and principle in LED OLED:Definition, basic device structure, basic light emission mechanism, lifetime and image burning, comparison between OLED and LCD modules, basic passive and active matrix OLED display

UNIT III TFT AND PLASMA DISPLAY 9

TFT –structure, process, MOSFET basics, LTPS-TFT –driven OLED display design, TFT technologies for OLED displays- new OLED applications-TFT Active matrix LCD, Construction and principle in PDP.

UNIT IV ADVANCED DISPLAY DEVICES 9

Construction and principle in Quantum dot display (QLED) display, Electroluminescent (ELD) Surface-conduction electron-emitter displays (SEDs), Field emission displays(FEDs), Nano-emissive display(NEDs), Liquid crystal on Silicon, Laser video display, Inter ferometric modulator display, Digital light processing(DLP), e-paper.

UNIT V 2 AND 3-DIMENSIONAL DISPLAYS 9

2-dimensional displays: Basic principle of operation and applications of Television set-Computer monitors- Head mounted display-Broadcast reference monitor-Medical monitors.3-dimensional displays: Basic principle of operation and applications of Volumetric display-Laser display-Holographic display-Light field displays.

TOTAL: 45 PERIODS

OUTCOMES:

On successful completion of this course, the students will be able to,

- Learn about the characteristics of visual systems and display devices
- Discuss the concept of LCD and LED displays
- Gain a sound understanding of the operation, analysis and design of TFT and plasma displays

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- Understand the working principle of advanced display devices
- Understand design techniques used in 2Dand 3D display devices

TEXT BOOK:

1. Janglin Chen, Wayne Cranton, Mark Fihn , "Handbook of Visual Display Technology", Springer Publication.

REFERENCES:

1. Joseph A Castellano, "Hand book of Display Technology", Elsevier, 1992.
2. Achintya K. Bhowmik, "Interactive Displays: Natural Human-Interface Technologies", Wiley SID Series, 2014.
3. Takatoshi Tsujimura, "OLED Display Fundamentals and Applications", 2nd Edition,John Wiley and Sons, New Delhi, 2017.

ONLINE RESOURCES:

1. https://www.elprocus.com/tft-oeld-advancement-display-technology/
2. https://www.coursera.org/learn/displays

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E&E

20IT601	ARTIFICIAL INTELLIGENCE (COMMON TO ECE, EEE AND IT)	L T P C 3 0 0 3

OBJECTIVES:

The Student should be made to:

- Impart basic knowledge about the artificial intelligence and generic problem-solving methods
- Understand the basic techniques of knowledge representation and reasoning
- Learn to construct plans of actions
- Study network models used for reasoning in uncertainty
- Know how to learn from sample of data

UNIT I INTRODUCTION **9**

Introduction -Intelligent agents -Problem Solving : Solving problems by searching –Problem solving agents - Searching for solutions -Uninformed search strategies -Informed search strategies -Heuristic functions

UNIT II KNOWLEDGE AND REASONING **9**

Logical Agents : Knowledge based agent –The Wumpus world - Logic - Propositional logic - Syntax and Semantic of First Order Logic -Using First Order Logic –Knowledge engineering in First Order Logic -Propositional vs First Order Inference -Unification and Lifting -Forward chaining -Backward chaining – Resolution

UNIT III PLANNING **9**

Classical Planning : Definitions -Examples - Algorithms for Planning as state space search - Planning graphs -Planning and acting in the real world : Time, Schedule and Resources - Hierarchical planning -Planning and acting in Non deterministic domain

UNIT IV UNCERTAIN KNOWLEDGE AND REASONING **9**

Quantifying uncertainty -Acting under uncertainty -Basic probability notation -Inference using full joint distribution –Baye's Rule and its Use – Probabilistic Reasoning -Semantics of Bayesian networks -Bayesian nets with continuous variable -Exact inference in Bayesian networks

UNIT V LEARNING **9**

Forms of learning -Supervised learning -Learning decision trees – Artificial neural networks - Support vector machine – Reinforcement Learning – Passive Reinforcement Learning – Active Reinforcement Learning – Generalization – Policy Search – Applications.

TOTAL: 45 PERIODS

OUTCOMES:

On successful completion of this course, the students will be able to,

- Formulate a problem and find the solution using searching techniques
- Use the knowledge and the process of inference to derive new representations
- Represent planning problems and find the sequence actions to achieve goals
- Build network models to reason under uncertainty
- Design and apply learning models

CHAIRMAN
BoS (IT)

TEXT BOOKS:

1. Stuart Russell and P. Norvig, "Artificial Intelligence – A Modern Approach", 4th Edition, Pearson Education, 2020

REFERENCES:

1. Nils J. Nilsson, "Artificial Intelligence: A new Synthesis", Morgon Kaufmann Publishers (Elsevier), 2000.
2. Elaine Rich and Kevin Knight, "Artificial Intelligence", Tata McGraw Hill, Second Edition, 2003.
3. George F. Luger, "Artificial Intelligence-Structures and Strategies for Complex Problem Solving", Pearson Education, Fourth Edition, 2002.
4. Bratko.I, "Prolog Programming for Artificial Intelligence (International Computer Science Series)", Addison-Wesley Educational Publishers Inc, Fourth edition, 2011.
5. David L. Poole, Alan K. Mackworth, "Artificial Intelligence: Foundations of Computational Agents", CambridgeUniversity Press, 2010.

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BoS (IT)

20EC605PE COMPUTER ARCHITECTURE AND ORGANIZATION

L	T	P	C
3	0	0	3

OBJECTIVES:

The Student should be made to:

- Study the basic concepts of computer architecture and organization
- Understand the Memory, input and output operation of a digital computer.
- Learn algorithms for the Arithmetic Functions with Fixed and Floating Point Numbers
- Design the input and output for the digital computer system.
- Understand the advanced computer architecture

UNIT I COMPUTER ORGANIZATION & INSTRUCTIONS **9**

Evolution of Computer Systems-Basic Operation of a Computer- Memory Addressing and Languages-Software and Architecture Types- Instruction Set Architecture-Number Representation- Instruction Format and Addressing Modes-CISC and RISC Architecture-MIPS32 Instruction Set-MIPS Programming Examples- SPIM-A MIPS32 Simulator-Measuring CPU Performance-Choice of Benchmarks-Summarizing Performance Results-Amdahl's Law -Design of Control unit-MIPS Implementation

UNIT II MEMORY AND I/O ORGANIZATION **9**

Processor Memory Interaction- Static and Dynamic RAM-Asynchronous DRAM-Synchronous DRAM-Memory Interfacing and Addressing-Memory Hierarchy Design -Cache Memory-Improving Cache Performance- Design of Adders, Multipliers and Dividers

UNIT III ARITHMETIC **9**

Floating-Point Numbers- Floating-Point Arithmetic-Basic Pipelining Concepts-Pipeline Scheduling-Arithmetic Pipeline-Secondary Storage Devices

UNIT IV INPUT-OUTPUT SYSTEM DESIGN **9**

Input-Output Organization-Data Transfer Techniques-Interrupt Handling - Direct Memory Access-Some Example Device Interfacing-Exercises on I/O Transfer-Bus Standards

UNIT V ADVANCED COMPUTER ARCHITECTURE **9**

Pipelining the MIPS32 Data Path- MIPS Pipeline - Pipeline Hazards-Multicycle Operations in MIPS32- Exploiting Instruction Level Parallelism- Vector Processors- Multi-Core Processors- Case Studies: GPU and Intel processor.

TOTAL: 45 PERIODS

OUTCOMES:

On successful completion of this course, the students will be able to,

- Articulate differences between computer organization and computer architecture
- Understand the use of different types of memory.
- Knowledge on various type of ALU operation.
- Implement various input and output for digital computer.
- Understand parallelism both in terms of a single processor and multiple processors.

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TEXT BOOKS:

1. Patterson.D.A and Hennessy.J.L, "Computer Architecture: A Quantitative Approach, 5th Edition", Morgan Koffman, 2011.
2. Patterson.D.A and Hennessy.J.L, "Computer Organization and Design: The Hardware/Software Interface, 5th Edition", Elsevier India, 2016.

REFERENCES:

1. Stallings. W, "Computer Organization and Architecture: Designing for Performance", Pearson, 2015.
2. Hamacher.C, Vranesic.Z and Zaky.S, "Computer Organization, 5th Edition", McGraw Hill, 2011.
3. Hayes.J.P, "Computer Architecture and Organization", 3rd Edition, McGraw Hill, 1998.

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BoS/ECE

20EC701PE	IOT FOR SYSTEM DESIGN	L	T	P	C
		3	0	0	3

OBJECTIVES:

The Student should be made to:

- Acquire knowledge about building blocks of Internet of Things(IoT)
- Apply knowledge on communication protocol for IoT
- Gain Knowledge on Raspberry PI for IoT applications
- Illustrate on various wireless communication for IoT
- Gain meaningful insights on data from IoT devices using data analytics

UNIT I CONCEPTS AND BUILDING BLOCKS OF INTERNET OF THINGS 9

Definition and Characteristics of IoT – Things in IoT – IoT Protocols – Functional Blocks – Communication Models & APIs – IoT Enabling Technologies – IoT Levels – Domain Specific IoTs- Home Automation, Cities, Environment, Energy, Retail, Logistics, Agriculture, Industry, Health & Lifestyle

UNIT II SYSTEM MANAGEMENT & PROTOTYPING FOR IOT 9

IoT and M2M – Difference between IoT and M2M – Software Defined Networking – Network Function Virtualization for IoT – Need for IoT Systems Management – SNMP – Limitations of SNMP – CC3200 SimpleLink Wi-Fi Module – Block Diagram, Features, applications– ESP8266 WiFi Module – Block Diagram, Features, applications

UNIT III EMBEDDED IOT WITH RASPBERRY PI 9

Overview of Raspberry Pi – General-Purpose Input/Outputs – Programming Raspberry Pi with Python - Sensors with Raspberry Pi – Actuators with Raspberry Pi – Controlling – Camera interface – Web Server with Raspberry Pi – Raspberry Pi as a Database Server

UNIT IV WIRELESS TECHNOLOGIES FOR IOT 9

Comparison of Wireless Technologies – ZigBee – ZigBee protocol stack – IEEE 802.15.4 PHY layer – Network topologies in ZigBee – ZigBee Applications – Bluetooth Low-Energy Profile - Versions of Bluetooth – BLE packet – Bluetooth HDP – IEEE 802.15.6 – NFC – IPv6 over Low-Power WPAN – 6LoWPAN Goals, Transmission

UNIT V DATA ANALYTICS & IOT CASE STUDIES 9

Introduction to Data Analytics for IoT – Apache Hadoop – Programming Model, Job Execution, Execution Workflow. Case Studies – Smart Parking, Smart Irrigation, Air Pollution Monitoring, Forest Fire Detection, Weather Reporting Bot.

TOTAL: 45 PERIODS

OUTCOMES:

On successful completion of this course, the students will be able to,

- Understand challenges in Internet of Things (IoT) system design
- Knowledge on Communication protocol
- Design a portable IoT using Rasperry Pi
- Understand specifications and modeling approaches in wireless communication for real-time and IoT systems.
- Design and implement hardware and software for a IoT application

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TEXT BOOKS:

1. Arshdeep Bahga, Vijay Madisetti, "Internet of Things, A Hands-on-Approach", 1st Edition, Universities press Pvt. Ltd., India, 2015.
2. Daniel Minoli, "Building the Internet of Things with IPv6 and MIPv6, 1st Edition, John Wiley & Sons", Inc, USA, 2013.

REFERENCES:

1. Adrian McEwen and Hakim Cassimally, "Designing the Internet of Things", 1st Edition, John Wiley & Sons Ltd, UK, 2014.
2. Peter Waher, "Learning Internet of Things", 1st Edition, Packt Publishing Ltd, UK, 2015.
3. Charles Bell, "Beginning Sensor Networks with Arduino and Raspberry Pi" , 1st Edition, Apress Publishers, USA, 2013

ONLINE RESOURCES:

- http://www.ti.com/lit/ug/swru372b/swru372b.pdf
- https://nurdspace.nl/images/e/e0/ESP8266_Specifications_English.pdf
- https://nptel.ac.in/courses/106/105/106105166/
- https://nptel.ac.in/courses/108/108/108108098/

Chairman
BoS/ECE

20EC702PE ADVANCED ELECTRONIC SYSTEM DESIGN **L T P C**
3 0 0 3

OBJECTIVES:

The Student should be made to:

- Learn the design procedures of modern Power Supplies using SCR and SMPS technology
- Know the layout rules and computer aided design for fabrication of PCBs
- Study the various A/D converters for data acquisition systems
- Learn about modeling of FPGA based architecture design
- Concentrate on hardware and software design procedures for System-on Chip Design

UNIT I DESIGN OF POWER SUPPLIES **9**

DC power supply design using transistors and SCRs – Design of crowbar and foldback protection circuits – Switched mode power supplies – Forward, flyback, buck and boost converters – Design of transformers and control circuits for SMPS – UPS

UNIT II DESIGN OF PRINTED CIRCUIT BOARDS **9**

Introduction to technology of Printed Circuit Boards (PCB) – General layout rules and parameters – PCB design rules for Digital, High Frequency, Analog, Power Electronics and Microwave circuits – Computer Aided design of PCBs.

UNIT III DESIGN OF DATA ACQUISITION SYSTEMS **9**

Amplification of Low level signals – Grounding, Shielding and Guarding techniques – Dual slope, quad slope and high speed A/D converters – Microprocessors Compatible A/D converters – Multiplying A/D converters and Logarithmic A/D converters – Sample and Hold – Design of two and four wire transmitters.

UNIT IV FPGA BASED ARCHITECTURE DESIGN **9**

FPGA Architectures: SRAM-Based FPGAs. Permanently Programmed FPGAs. DCT, FFT and DWT architectures – Digital Design of Artificial cochlea.

UNIT V SYSTEM-ON CHIP DESIGN **9**

SoC Design Flow, High Level Algorithm Model with MATLAB/C++, Hardware/Software Partition, Communication Refinement, Hardware /Software Coverification, System-level verification, Embedded Software Architecture for SoC Design

TOTAL: 45 PERIODS

OUTCOMES:

On successful completion of this course, the students will be able to,

- Design modern Power Supplies using SCR and SMPS technology
- Design computer aided PCB layout for any circuit
- Design and model various analog to digital Converters for data acquisition
- Experimentation on Hardware / software co-design in FPGA based Architectures
- Experimentation on Hardware / software co-design in system on-chip design trends

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TEXT BOOKS:

1. Razavi. B, "Principles of Data Conversion System Design", Wiley–IEEE Press, 1994.
2. Walter C. Bosshart, "Printed Circuit Boards – Design and Technology", TMH, 2008

REFERENCES :

1. Keshab K. Parhi, "VLSI Digital Signal Processing Systems, Design and implementation ", John Wiley &Sons, 2012.
2. Bert Haskell, "Portable Electronics Product Design and Development: For Cellular Phones, PDAs, Digital Cameras, Personal Electronics, and More", McGraw Hill Professional, 2004
3. Otmar Kigenstein, "Switched Mode Power Supplies in Practice", John Wiley and Sons, 1989.
4. Muhammad H.Rashid, "Power Electronics – Circuits, Devices and Applications", Prentice Hall of India, 2009.
5. Smith.M.J.S, "Application -Specific Integrated Circuits", Pearson Education, 2013.

Chairman
BoS/ECE

20EC703PE	TRANSDUCER ENGINEERING	L T P C 3 0 0 3

OBJECTIVES:

The Student should be made to:

- Understand how physical quantities are measured and how they are converted to electrical or other forms.
- Study the characteristics of Transducers
- Make students familiar with the working principle of in resistance transducers.
- Develop the knowledge of inductance and capacitance transducers.
- Make students aware about the use of different transducers.

UNIT I SCIENCE OF MEASUREMENTS AND CLASSIFICATION OF TRANSDUCERS 9

Units and standards – Calibration methods – Static calibration – Classification of errors :- Limiting error and probable error – Error analysis :– Statistical methods – Odds and uncertainty – Classification of transducers – Selection of transducers.

UNIT II CHARACTERISTICS OF TRANSDUCERS 9

Static characteristics: – Accuracy, precision, resolution, sensitivity, linearity, span and range - Dynamic characteristics: – Mathematical model of transducer – Zero, I and II order transducers - Response to impulse, step, ramp and sinusoidal inputs.

UNIT III VARIABLE RESISTANCE TRANSDUCERS 9

Principle of operation, construction details, characteristics and applications of potentiometer, strain gauge, resistance thermometer, Thermistor, hot-wire anemometer, piezoresistive sensor and humidity sensor.

UNIT IV VARIABLE INDUCTANCE AND VARIABLE CAPACITANCE TRANSDUCERS 9

Induction potentiometer – Variable reluctance transducers – EI pick up – Principle of operation, construction details, characteristics and applications of LVDT –Capacitive transducer and types – Capacitor microphone – Frequency response.

UNIT V OTHER TRANSDUCERS 9

Piezoelectric transducer - Hall Effect transducer – Magneto elastic sensor- Digital transducers – Smart sensors - Fibre optic sensors- Film sensors-Introduction to MEMS and Nano sensors.

TOTAL : 45 PERIODS

OUTCOMES:

- Use concepts in common methods for converting a physical parameter into an electrical quantity
- Predict correctly the expected performance of various sensors
- Predict correctly the expected performance of various variable resistance transducers
- Predict correctly the expected performance of variable inductance and variable capacitance transducers
- Set up testing strategies to evaluate performance characteristics of different types of transducers

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BoS/ECE

TEXT BOOKS:

1. Neubert H.K.P., Instrument Transducers – An Introduction to their Performance and Design, Oxford University Press, Cambridge, 2003.
2. Doebelin E.O. and Manik D.N., Measurement Systems – Applications and Design, Special Indian Edition, Tata McGraw Hill Education Pvt. Ltd., 2007.
3. Patranabis. D, Sensors and Transducers, 2nd edition, Prentice Hall of India, 2010. E.A.

REFERENCES:

1. John P. Bentley, Principles of Measurement Systems, 3rd Edition, Pearson Education, 2000.
2. Murthy, D.V.S., Transducers and Instrumentation, 2nd Edition, Prentice Hall of India
3. Pvt. Ltd., New Delhi, 2010.
4. Bolton.W, Engineering Science, Elsevier Newnes, 5th edition, 2006.
5. Ramón Pallás-Areny, John G. Webster, Sensors and Signal Conditioning, Wiley-Interscience 2nd Edition, 1991.

Chairman
BoS/ECE

20EC704PE **VIRTUAL INSTRUMENTATION** **L T P C**
3 0 0 3

OBJECTIVES:

The Student should be made to:

- Introduce the concept of virtual instrumentation
- Acquire knowledge on Data Acquisition Systems and network interface concepts
- Aware of communication networked modules in VI
- Understand the control strategies in VI
- Gain knowledge in operating system requirements in VI

UNIT I INTRODUCTION **9**

Virtual Instrumentation - Definition and Flexibility - Block diagram and Architecture for Virtual Instruments versus Traditional Instruments Instrumentation -VI Programming techniques - VI, sub VI, Loop and Charts, Arrays, Clusters and Graphs, Case and Sequence Structures, Formula nodes, String and File Input / Output.

UNIT II DATA ACQUISTITION IN VI **9**

A/D and D/A converters, Plug-in Analog Input / Output cards – Digital Input and Output Cards, Organization of the DAQ VI system – Opto-isolation – Performing analog input and analog output – Scanning multiple analog channels – Issues involved in selection of Data acquisition cards – Data acquisition modules with serial communication – Design of digital voltmeter with transducer input –Timers and Counters.

UNIT III COMMUNICATION NETWORKED MODULES **9**

Introduction to PC Buses – Local busses:- ISA, PCI, RS232, RS422 and RS485 – Interface Buses:- USB, PCMCIA, VXI, SCXI and PXI –Instrumentation Buses :- Modbus and GPIB – Networked busses – ISO/OSI Reference model, Ethernet and TCP/ IP Protocols.

UNIT IV REAL TIME CONTROL IN VI **9**

Designs using VI Software - ON/OFF controller – Proportional controller – Modeling and basic control of level and reactor processes – Case studies on development of HMI, SCADA in VI

UNIT V OPERATING SYSTEM AND HARDWARE OVERVIEW **9**

PC architecture, current trends, operating system requirements, PC based instrumentation, analog and digital interfaces, PXI and SCXI main frame - modular instruments – Transducers – power, speed and timing considerations.

TOTAL: 45 PERIODS

OUTCOMES:

On successful completion of this course, the students will be able to,

- Define virtual instrumentation concepts
- Analyze and design different type of programs based on data acquisition
- Know the communication networked modules in VI
- Illustrate implementation methods for instrumentation
- Explain the various types of structures used in operating system in VI

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BoS/ECE

TEXT BOOKS:

1. LabVIEW Graphical Programming, Gary W. Johnson, Richard Jennings 3rd edition, McGraw-Hill Professional Publishing.
2. Lisa K Wells, Lab view for Everyonell, Prentice Hall of India.

REFERENCES :

1. Barry Paton, —Sensor, transducers and Lab viewll, Prentice Hall of India 2000.
2. Buchanan, W. —Computer busesll, CRC Press 2000

ONLINE RESOURCES :

- https://www.ni.com

Chairman
BoS/ECE

20EC705PE **PCB DESIGN** **L T P C**
3 0 0 3

OBJECTIVES:

The Student should be made to:

- Understand the need for PCB Design and steps involved in PCB Design
- Familiarize the design rules for different applications
- Develop the basic skills to the design of various tools used in PCB designing
- Understand the production techniques involved in PCB designing.
- Develop the ability to analyze the performance of different types of PCB Technology Trends

UNIT I INTRODUCTION TO PRINTED CIRCUIT BOARD 7

Fundamental of electronic components, basic electronic circuits, Basics of printed circuit board designing: Layout planning, general rules and parameters, ground conductor considerations, thermal issues, check and inspection of artwork.

UNIT II DESIGN RULES FOR PCB 7

Design rules for Digital circuit PCBs, Analog circuit PCBs, high frequency and fast pulse applications, Power electronic applications, Microwave applications

UNIT III DESIGN TOOLS **10**

Introduction to Electronic design automation(EDA) tools for PCB designing: Brief Introduction of various simulators, SPICE and PSPICE Environment, Selecting the Components Footprints as per design, Making New Footprints, Assigning Footprint to components, Net listing, PCB Layout Designing, Auto routing and manual routing. Assigning specific text (silkscreen) to design, Creating report of design, creating manufacturing data (GERBER) for design.

UNIT IV PRINTING PROCESS **12**

Introduction printed circuit board production techniques Photo printing, film-master production, reprographic camera, basic process for double sided PCBs photo resists, Screen printing process, plating, relative performance and quality control, Etching machines, Solders alloys, fluxes, soldering techniques, Mechanical operations.

UNIT V PCB TECHNOLOGY **9**

PCB Technology Trends: Multilayer PCBs. Multiwire PCB, Flexible PCBs, Surface mount PCBs, Reflow soldering, Introduction to High-Density Interconnection (HDI) Technology.

TOTAL: 45 PERIODS

OUTCOMES:

On successful completion of this course, the students will be able to,

- Understand important and fundamental of PCB designing.
- Apply design rules involved in PCB designing
- Apply advance techniques, skills and modern tools for designing and fabrication of PCBs.
- Have the ability to apply the concepts of printing process in designing
- Apply the knowledge and techniques to fabricate Multilayer, SMT and HDI PCB.

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TEXT BOOKS:

1. Khandpur.R.S, "Printed circuit board design, fabrication assembly and testing", Tata McGraw Hill 2006.

REFERENCES:

1. Walter C. Bosshart, "Printed circuit Board Design and technology",
2. Clyde F. Coombs, Jr, Happy T. Holden, "Printed Circuits Handbook", 6th Edition, McGraw-Hill Education Year: 2016
3. Kraig Mitzner Bob Doe Alexander Akulin Anton Suponin Dirk Müller, "Complete PCB Design Using OrCAD Capture and PCB Editor", 2nd Edition 2009.
4. Rao R Tummala & Madhavan Swaminathan, "Introduction to System-on-Package", McGraw Hill,2008.
5. Mark I Montrose, "EMC and Printed circuit board, Design theory and layout", IEEE compatibility society

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BoS/ECE

20EC706PE	INTRODUCTION TO WIRELESS AND CELLULAR COMMUNICATION (COMMON TO BME AND ECE)	L T P C 3 0 0 3

OBJECTIVES:

The Student should be made to:

- Depth understanding of the wireless channel and the related impairments
- An ability to evaluate the Classification of Signal Variation
- An understanding on signal propagation in cellular environment
- An ability to explain Antenna diversity, wireless Channel Capacity for Wireless Communication
- An ability to explain multiple access techniques for Wireless Communication

UNIT I INTRODUCTION 9

Overview of Cellular Systems- 5G and other Wireless Technologies- Basic Cellular Terminology- Introduction to Antennas and Propagation Models- Link budget, Fading margin, Outage- Cellular Concept- Cellular system design and analysis- Cellular Geometry & System Design- Cellular System Capacity, Trunking Handoff & Mobility.

UNIT II CLASSIFICATION OF SIGNAL 9

Classification of Signal Variation-- Shadowing, Outage, Multipath-- Rayleigh Fading and Statistical Characterization- Properties of Rayleigh Distribution- BER in Fading, Narrowband vs Wideband Channels- Characterization of Multipath Fading Channels- Choice of Modulation- Coherent versus Differential Detection- BER in Fading - Part II, Ricean Fading- Ricean and Nakagami Fading, Moment Generating Function (MGF)- MGF Part II, WSSUS

UNIT III CHARACTERISTICS OF CHANNELS 9

WSSUS Part II, Coherence Time, Doppler Spectrum- Doppler, Temporal Characteristics of Fading Channels- Characterization of Time Dispersive Fading Channels- Classification of Fading Channels- Practical Channel Models (ITU, COST), Computer generation of Rayleigh fading- Rayleigh Fading simulation - Clark and Gans Method- Jakes Method.

UNIT IV DIVERSITY 9

Introduction to Diversity, Antenna selection diversity-- Statistical Characterization of Antenna Diversity, Optimal Diversity Combining- BER in fading, Equal Gain Combining- Array Gain, Diversity Gain, Alamouti Scheme- Alamouti Scheme Part II, Channel Capacity- Capacity of fading Channels, Capacity with Outage- Channel State Information, Optimum Power Allocation- Optimum Power Allocation - Water filling.

UNIT V SPREAD SPECTRUM COMMUNICATIONS 9

Intro to Direct Sequence Spread Spectrum Communications- Properties of Spreading Sequences- Introduction to CDMA- Features of cdma2000 and WCDMA- Rake Receiver for multipath channels- Multiuser environment- CDMA system Capacity- CDMA Multiuser

TOTAL: 45 PERIODS

OUTCOMES:

On successful completion of this course, the students will be able to,

- Demonstrate an understanding on functioning of various example wireless communication systems, their evolution and standards.
- Understanding on signal propagation in cellular environment.
- Know about Classification of Signal Variation and fading.

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- Understand concepts of diversity and bit error rate in cellular communication
- Understanding on functioning of a spread-spectrum system and minimize the design challenges.

TEXT BOOKS:

1. Rappaport.T.S, "Wireless Communications – Principles and Practice", 2nd edition Pearson, 2010..

REFERENCES:

1. Molisch.A, "Wireless Communications," Wiley, 2005
2. Haykin & Moher, "Modern Wireless Communications" Pearson 2011 Indian Edition.
3. Proakis.J.G, "Digital Communications," McGraw Hill.
4. Goldsmith.A, "Wireless Communications," Cambridge Univ Press, 2005.
5. Tse.D and Viswanath.P, "Fundamentals of Wireless Communications," Cambridge Univ Press, 2005

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BoS/ECE

20BM705PE TELEHEALTH TECHNOLOGY **L T P C**
(Common to BME and ECE) **3 0 0 3**

OBJECTIVES:

The student should be made to:

- Learn the key principles for telemedicine and health
- Gain knowledge about information and communication infrastructure for telemedicine
- Have the required knowledge on ethical and legal aspects of telemedicine
- Understand telemedical technology
- Know telemedical standards, mobile telemedicine and its applications.

UNIT I FUNDAMENTALS OF TELEMEDICINE **9**

History of telemedicine, Definition of telemedicine, Tele-Health, Tele-care, scope, Telemedicine systems, Benefits and Limitations of telemedicine.

UNIT II TYPE OF INFORMATION AND COMMUNICATION INFRASTRUCTURE FOR TELEMEDICINE **9**

Audio, Video, Still images, Text and Data, FAX type of communications and network: PSTN, POTS, ANT, ISDN, Internet, Air/Wireless Communications, GSM satellite, Microwave, Mobile health and ubiquitous healthcare.

UNIT III ETHICAL AND LEGAL ASPECTS OF TELEMEDICINE **9**

Confidentiality, Patient rights and consent: Confidentiality and the law, the Patient-Doctor relationship, Access to Medical records, Consent treatment – Data protection and Security, Jurisdictional issues, Intellectual Property Rights.

UNIT IV PICTURE ARCHIVING AND COMMUNICATION SYSTEM **9**

Introduction to Radiology information system and ACS, DICOM, PACS strategic plan and needs assessment, Technical Issues, PACS architecture

UNIT V APPLICATION OF TELEMEDICINE **9**

Teleradiology, Telepathology, Telecardiology, Teleoncology, Teledermatology, Telesurgery, E-Health and Cyber Medicine

TOTAL: 45 PERIODS

OUTCOMES:

On successful completion of this course, the students will be able to,

- Apply multimedia technologies in telemedicine
- Explain protocols behind encryption techniques for secure transmission of data
- Apply telehealth in healthcare
- Plan strategies for Radiology department
- Validate the significance of various application in telemedicine

TEXTBOOKS:

1. Norris A C, " Essentials of Telemedicine and Telecare", John Wiley, New York, 2002
2. Huang H K, "PACS and Imaging Informatics: Basic Principles and Applications", Wiley New Jersey, 2010.

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REFERENCES:

1. Olga Ferrer Roca, Marcelo Sosa Iudicissa, "Handbook of Telemedicine", IOS Press, Netherland, 2002.
2. Khandpur R S, "Handbook of Biomedical Instrumentation", Tata McGraw Hill, New Delhi, 2003.
3. Keith J Dreyer, Amit Mehta, James H Thrall, "PACS: A Guide to the Digital Revolution", Springer, New York, 2002.
4. Khandpur R S, "Telemedicine – Technology and Applications", PHI Learning Pvt Limited, New Delhi

Ashok.T

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BoS/BME

20EC707PE	WIRELESS NETWORKS	L T P C 3 0 0 3

OBJECTIVE:

The student should be made to:

- Understand the concept about Wireless networks, protocol stack and standards
- Understand and analyse the network layer solutions for Wireless networks
- Study about fundamentals of 3G Services, its protocols and applications
- Have in depth knowledge on internetworking of WLAN and WWAN
- Learn about evolution of 4G Networks, its architecture and applications

UNIT I WIRELESS LAN 9

Introduction-WLAN technologies: – IEEE802.11: System architecture, protocol architecture, 802.11b, 802.11a – Hiper LAN: WATM, BRAN, HiperLAN2 – Bluetooth: Architecture, WPAN – IEEE 802.15.4, Wireless USB, Zigbee, 6LoWPAN, Wireless HART-2G overview.

UNIT II MOBILE NETWORK LAYER 9

Introduction – Mobile IP: IP packet delivery, Agent discovery, tunneling and encapsulation, IPV6-Network layer in the internet- Mobile IP session initiation protocol – mobile ad-hoc network: Routing: Destination Sequence distance vector, IoT: CoAP

UNIT III 3G OVERVIEW 9

Overview of UTMS Terrestrial Radio access network-UMTS Core network Architecture: 3GPP Architecture, User equipment, CDMA2000 overview- Radio and Network components, Network structure, Radio Network, TD - CDMA, TD – SCDMA.

UNIT IV INTERNETWORKING BETWEEN WLANS AND WWANS 9

Internetworking objectives and requirements, Schemes to connect WLANS and 3G Networks, Session Mobility, Internetworking Architecture for WLAN and GPRS, System Description, Local Multipoint Distribution Service, Multichannel Multipoint Distribution System.

UNIT V 4G & BEYOND 9

Introduction – 4G vision – 4G features and challenges – Applications of 4G – 4G Technologies: Multicarrier Modulation, Smart antenna techniques, IMS Architecture, LTE, Advanced Broadband Wireless Access and Services, MVNO.

TOTAL: 45 PERIODS

OUTCOMES:

Upon completion of the course, the student would be able to:

- Implement wireless network environment for any application using latest wireless protocols and standards
- Select the suitable network depending on the availability and requirement
- Familiar with the latest 3G networks and its architecture
- Conversant with the latest 4G networks and its architecture
- Implement different type of applications for smart phones and mobile devices with latest network strategies.

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TEXT BOOKS:

1. Jochen Schiller, "Mobile Communications", 2nd Edition, Pearson Education 2012.
2. Vijay Garg, "Wireless Communications and networking", 1st Edition, Elsevier 2007.

REFERENCES:

1. Erik Dahlman, Stefan Parkvall, Johan Skold and Per Beming, "3G Evolution HSPA and LTE for Mobile Broadbandll", 2nd Edition, Academic Press, 2008.
2. Anurag Kumar, Manjunath.D, Joy kuri, "Wireless Networking", 1st Edition, Elsevier 2011.
3. Simon Haykin, Michael Moher, David Koilpillai, "Modern Wireless Communications", 1st Edition, Pearson Education 2013.

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BoS/ECE

20EC708PE INTRODUCTION TO MEMS AND NEMS

L	T	P	C
3	0	0	3

OBJECTIVES:

The Student should be made to:

- Understand the concepts of micro electromechanical devices and quantum mechanics
- Learn the fabrication process of Microsystems
- Gain knowledge in micro and nano sensors
- Understand the design concepts of micro sensors and micro actuators
- Understand the packaging and characterization of MEMS/NEMS

UNIT I INTRODUCTION TO MEMS AND NEMS 9

Introduction to micro systems, Advantages of MEMS, Materials for MEMS. Potential applications of MEMS and NEMS. Introduction to NEMS, Issues of nano scaling, Giant magneto resistance and multilayer structures, Nano structured materials, Atomic structures and Quantum mechanics, Schrodinger Equation and Wave function Theory

UNIT II FABRICATION OF MEMS AND NEMS 9

Photolithography, Ion Implantation, Diffusion, Oxidation. Thin film depositions: LPCVD, Sputtering, Evaporation, Electroplating; Etching techniques: Dry and wet etching, electrochemical etching; Micromachining: Bulk Micromachining, Surface Micromachining, LIGA, SOI MUMPS.

UNIT III MICRO AND NANO SENSORS 9

Acoustic sensor – Quartz crystal microbalance, surface acoustic wave, Flextural plate wave, shear horizontal; Vibratory gyroscope, Capacitive and Piezo Resistive Pressure sensors, Nano gas sensor.

UNIT IV MICRO AND NANO ACTUATORS 9

Electrostatic actuators – parallel plate capacitor, Interdigitated finger capacitor, piezoelectric actuators, Thermal actuators, Actuators using shape memory alloys; Microgrippers, Micromotors, Microvalves, Micropumps, Nano energy harvester.

UNIT V PACKAGING AND CHARACTERIZATION OF MEMS AND NEMS 9

Micro / nano systems packaging, Essential packaging technologies, Selection of packaging materials; SEM, TEM, AFM, STM, Spectroscopic techniques for Nano characterization.

TOTAL: 45 PERIODS

OUTCOMES:

On successful completion of this course, the students will be able to,

- Understand the basics of micro/nano electromechanical structures, devices and systems including their theoretical foundations, applications and advantages
- Recognize the use of materials in micro/nano fabrication and describe the fabrication processes including surface micromachining, bulk micromachining and LIGA
- Analyze the key performance aspects of micro/nano electromechanical sensors.
- Analyze the key performance aspects of micro/nano electromechanical actuators
- Understand the techniques for characterization and packaging requirements of MEMS/NEMS Acquire knowledge on satellite orbits and launching

Chairman
BoS/ECE

TEXT BOOKS:

1. Sergey Edward Lyshevski, "MEMS and NEMS: Systems, Devices, and Structures", CRC Press, 2002.
2. Chang Liu, "Foundations of MEMS", Pearson education India limited, 2006

REFERENCES :

1. Vinod Kumar Khanna "Nanosensors: Physical, Chemical, and Biological", CRC press, 2012.
2. Tai Ran Hsu, "MEMS and Microsystems Design and Manufacture", Tata Mcgraw Hill, 2002.
3. Mahalik N P, "MEMS", Tata McGraw Hill, 2007.
4. Manouchehr E Motamedi, "MOEMS: Micro-Opto-Electro-Mechanical Systems", SPIE press, 1st edition, 2005

Chairman
BoS/ECE

20EC709PE	NETWORK SECURITY	L T P C 3 0 0 3

OBJECTIVES:

The Student should be made to:

- Understand the different types of conventional encryption and its algorithms
- Familiar with the Hash functions and digital signatures in network security.
- Understand the various security services for email in network security
- Gain knowledge in various system security authentication and application in IDS and Firewall.
- Provide in-depth understanding of the underlying concepts of network security applications

UNIT I CONVENTIONAL ENCRYPTION 9

Introduction – Conventional Encryption model – Data Encryption Standard – block cipher – Encryption algorithms – confidentiality – Key distribution.

UNIT II PUBLIC KEY ENCRYPTION AND HASHING 9

Principles of Public key cryptosystems – RSA algorithm – Diffie-Hellman Key Exchange – Message authentication and Hash function – Hash MAC algorithms – Digital signatures.

UNIT III AUTHENTICATION APPLICATIONS 9

Kerberos, x.509 Authentication service, Public key infrastructure. Electronic Mail Security:- Pretty Good Privacy, S/MIME.

UNIT IV IP AND WEB SECURITY 9

IP security overview – IP security Architecture, authentication Header – Security payload – security association – key management. Web security requirement – secure sockets layer – transport layer security –secure electronic transaction – dual signature.

UNIT V SYSTEM SECURITY 9

Intruders – Intrusion detection-password management -Viruses – Viruses and related threats- Worms – Firewall design – Trusted systems – Antivirus techniques – digital immune systems.

TOTAL: 45 PERIODS

OUTCOMES:

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

- Remember the conventional encryption technique, classical encryption technique and modern encryption technique.
- Understand Asymmetric encryption algorithm and Diffie-Hellman algorithm
- Understand network security applications like IP security, WEB security and System security along with different key management and distribution technique in symmetric and Asymmetric algorithm
- Identify the threats and security attacks in the networks and corresponding services and mechanisms
- Provide a practical survey of both principles and practice of cryptography and network security technology

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BoS/ECE

TEXT BOOKS

1. William Stallings. "Cryptography and Network Security", 4th Edition, Prentice Hall of India, New Delhi; 2004.

REFERENCE:

1. Kaufmann.C, Perlman.R and Speciner.M, "Network Security: Private Communication in a Public World", Prentice Hall PTR, 2002.
2. Cheswick.W.R, Bellovin.S.M and Rubin.A.D, "Firewalls and Internet Security", Addison- Wesley, 2003.

Chairman
BoS/ECE

20CS707PE **INTRODUCTION TO MACHINE LEARNING** **L T P C**

(Common to CSE, ECE, EEE and IT) **3 0 0 3**

OBJECTIVES:

The Student should be made to:

- Provide a strong foundation on fundamental concepts in Machine Learning.
- Enable Problem-solving through various linear methods for classification techniques.
- Apply these techniques in which involve models, trees and related applications methods.
- Apply Machine Learning techniques for ensemble methods and graphical models
- Apply Machine Learning techniques primarily for mixture models.

UNIT I INTRODUCTION **9**

Introduction to Machine Learning - Supervised Learning -Unsupervised Learning - Reinforcement Learning - Probability Theory - Probability Basics- Linear Algebra - Statistical Decision Theory – Regression – Classification - Bias-Variance - Linear Regression - Multivariate Regression - Dimensionality Reduction - Subset Selection - Shrinkage Methods - Principal Components Regression - Partial Least Squares.

UNIT II LINEAR METHODS FOR CLASSIFICATION **9**

Classification - Linear Models - Linear Classification - Logistic Regression - Linear Discriminant Analysis – Optimization - Classification - Separating Hyperplane Approaches - Perceptron Learning - SVM – Formulation - Interpretation & Analysis - SVMs for Linearly Non Separable Data - SVM Kernels - Hinge Loss Formulation - Artificial Neural Networks - Early Models - Backpropogation - Initialization, Training & Validation - Parameter Estimation - Maximum Likelihood Estimate - Priors & MAP Estimate - Bayesian Parameter Estimation

UNIT III ADDITIVE MODELS, TREES, AND RELATED METHODS **9**

Decision Trees – Regression Trees - Stopping Criteria & Pruning - Loss Functions for Classification - Categorical Attributes - Multiway Splits - Missing Values, Imputation & Surrogate Splits Instability, Smoothness & Repeated Subtrees- Evaluation Measures I - Bootstrapping & Cross Validation - 2 Class Evaluation Measures - The ROC Curve - Minimum Description Length & Exploratory Analysis- Hypothesis Testing - Basic Concepts - Sampling Distributions & the Z Test - Student\'s t-test - The Two Sample & Paired Sample t-tests - Confidence Intervals.

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BoS (CSE)

UNIT IV ENSEMBLE METHODSAND GRAPHICAL MODELS 9

Ensemble Methods: Bagging, Committee Machines & Stacking – Boosting - Gradient Boosting - Random Forest – Graphical Models: Naive Bayes - Bayesian Networks - Undirected Graphical Models – Introduction Undirected Graphical Models - Potential Functions - Hidden Markov Models - Variable Elimination - Belief Propagation - Clustering: Partitional Clustering - Hierarchical Clustering - Threshold Graphs - The BIRCH Algorithm - The CURE Algorithm - Density Based Clustering.

UNIT V MIXTURE MODELS AND EM 9

Gaussian Mixture Models - Expectation Maximization - Expectation Maximization Continued – Spectral Clustering –Learning Theory - Frequent Itemset Mining - The Apriori Property - Reinforcement Learning: Introduction to Reinforcement Learning -RL Framework and TD Learning Miscellaneous - Multi-class Classification.

TOTAL: 45 PERIODS

OUTCOMES:

On successful completion of this course, the students will be able to,

- Provide a basic exposition to the goals and methods of Machine Learning.
- Study of the design of linear methods for classification techniques.
- Apply the Intelligent techniques for problem solving in models, trees and related applications methods.
- Improve problem solving skills using the clustering techniques
- Acquired knowledge in the areas of mixture models.

TEXT BOOK:

1. The Elements of Statistical Learning, by Trevor Hastie, Robert Tibshirani, Jerome H. Friedman (freely available online)
2. Pattern Recognition and Machine Learning, by Christopher Bishop (optional)

REFERENCES:

1. David Barber, "Bayesian Reasoning and Machine Learning", Cambridge University Press, 2016.
2. Richard S. Sutton and Andrew G.Barto, "Reinforcement Learning: An Introduction", The MIT Press, Second Edition, 2018.
3. Himanshu Singh, "Statistics for Machine Learning", BPB Publications, 1st Edition, 2021.
4. Jason Brownlee, "Statistical Methods for Machine Learning".
5. Cha Zhang, Yunqian Ma, "Ensemble Machine Learning", Springer, 2012.
6. Gareth James, Daniela Witten, Trevor Hastie, Robert Tibshirani, "An Introduction to Statistical Learning", Springer, 2nd Edition.
7. https://onlinecourses.nptel.ac.in/noc21_cs24/preview

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BoS (CSE)

20EC710PE	SENSORS AND ACTUATORS	L	T	P	C
		3	0	0	3

OBJECTIVES:

The Student should be made to:

- Understand basics of sensors, actuators and their operating principle
- Learn different types of microfabrication techniques for designing and developing sensors
- Understand various types of electrochemical sensors and actuators working principles
- Understand the interfacing of sensors and signal conditioning circuits to establish by control system or monitoring system
- Understanding on characteristic parameters to evaluate sensor performance.

UNIT I BASICS OF ENERGY TRANSFORMATION AND THIN FLIM PHYSICS 9

Transducers, Sensors and Actuators, Understanding of thin film physics: Application in MOSFET and its variants, Thin Film Deposition Techniques: Chemical Vapor Deposition (APCVD, LPCVD, UHVCVD, PECVD, ALCVD, HPCVD, MOCVD),

UNIT II THIN FILM DEPOSITION TECHNIQUES AND PHOTOLITHOGRAPHY 9

Physical Vapor Deposition (Thermal Deposition, E-beam Evaporation, Sputtering, Pulsed Laser Deposition). Basic understanding of Photolithography for pattering layer, Detailed overview of Etching methods,

UNIT III SENSORS AND ACTUATORS 9

Various gas sensors: Optical gas sensor, Metal oxide semiconductor gas sensor, Field effect transistor gas sensor, Piezoelectric gas sensor, Polymer gas sensor, Nano-structured based gas sensors Design and fabrication process of Micro sensors: Force Sensors, Pressure Sensors, Strain gauges and practical applications

UNIT IV MICROFLUIDICS AND COMSOL MULTIPHYSICS 9

Explain working principles of Actuators. Piezoelectric and Piezoresistive actuators, micropumps and micro actuators with practical applications Understanding basics of microfluidics to assist Photomask design using Clewin Software, pattern transfer techniques, PDMS moulding and degassing, device bonding techniques,

UNIT V CHARACTERISTICS OF SENSOR & INTERFACING 9

Simulation, Optimization and characterization of various sensors using COMSOL Multiphysics Understanding of Sensor Interfacing with Microprocessor to build electronic system Static and Dynamic Characteristic Parameters for Sensors and Actuators, Calibration of Sensor based electronics systems

TOTAL: 45 PERIODS

OUTCOMES:

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

- Designed micro technology and its use to fabricate sensors and systems.
- Exposure to sensors and its importance in the real world.
- Understand how to fabricate some of those sensors.

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- Exposure towards how to fabricate the sensors and understand and also learn modern day microsensors and micro actuators,
- To simulate some of those sensors and characterize before fabricating it.

TEXT BOOKS:

1. Pallás-Areny Ramón, and John G. Webster, "Sensors and Signal Conditioning", Wiley-Blackwell, 2008
2. Jacob Fraden, "Handbook of modern sensors", Springer.
3. Stefan Johann Rupitsch,"Piezoelectric Sensors and Actuators: Fundamentals and Applications", Springer, 2018

REFERENCES :

1. Stephen D. Senturia, "Micro system Design", Kluwer Academic Publisher, 2001
2. S.M. Sze (Ed), "Silicon VLSI Technology", Pearson Education, 2001
3. Madou, "VLSI Technology", 2nd Edition, McGraw Hill, 1988
4. M Fundamentals of Micro fabrication, CRC Press, 1997.

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20EC801PE SATELLITE COMMUNICATIONS **L T P C**
3 0 0 3

OBJECTIVES:

The Student should be made to:

- Understand the orbital aspects and components of a satellite communication system.
- Get knowledge of every aspects of link budget of a satellite communication system
- Gain knowledge about the Satellite Access schemes
- Get a complete knowledge about the earth and space subsystems
- Know about the applications of satellite services

UNIT I SATELLITE ORBITS **9**

Kepler's Laws, Newton's law – orbital parameters, orbital perturbations, station keeping, geo stationary and nonGeo stationary orbits – Look Angle Determination – Limits of visibility – Eclipse–Sub satellite point – Sun transit outage – Launching Procedures – Launch vehicles and propulsion

UNIT II SPACE SEGMENT AND SATELLITE LINK DESIGN **9**

Spacecraft Technology – Structure, Primary power, Attitude and Orbit control, Thermal control and Propulsion, communication Payload and supporting subsystems, Telemetry, Tracking and command – Satellite uplink and downlink Analysis and Design, link budget, E/N calculation – Performance impairments – System noise, inter modulation and interference, Propagation Characteristics and Frequency considerations – System reliability and design lifetime.

UNIT III SATELLITE ACCESS **9**

Modulation and Multiplexing for different services – Multiple accesses: FDMA, TDMA, Assignment Methods – Spread Spectrum technique for satellite communication.

UNIT IV EARTH SEGMENT **9**

Earth Station Technology – Terrestrial Interface, Transmitter and Receiver, Antenna Systems TVRO, MATV, CATV – Test Equipment Measurements on G/T, C/No, EIRP, Antenna Gain.

UNIT V SATELLITE APPLICATIONS **9**

Mobile satellite services: GSM, GPS,IRNSS, LEO, MEO, Satellite Navigational System – Direct Broadcast satellites (DBS)– Direct to home Broadcast (DTH), Digital audio broadcast (DAB), Digital video Broadcast – Specialized services: Remote sensing.

TOTAL: 45 PERIODS

OUTCOMES:

On successful completion of this course, the students will be able to,

- Explain the satellite orbits and launching procedures of satellite systems.
- Analyze the satellite space segment and link budget design.
- Apply the different accessing schemes for satellite communication systems.
- Describe complete knowledge about the earth and space subsystems
- Get knowledge and relate different components in satellite communication and use them in projects.

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TEXT BOOKS:

1. Dennis Roddy, 'Satellite Communication', McGraw Hill International, 4th Edition, 2008
2. Timothy Pratt, Charles W. Bostian, Jeremy E. Allnutt, "Satellite Communications", Wiley Student Edition, 2nd edition, 2014

REFERENCES :

1. Wilbur L. Pritchard, Hendri G. Suyderhoud, Robert A. Nelson, 'Satellite Communication Systems Engineering', Pearson, 2nd Edition 2007
2. Agarwal N, 'Design of Geosynchronous Space Craft, Prentice Hall, 1986
3. Bruce R. Elbert, 'The Satellite Communication Applications' Hand Book, Artech House Bostan London, 2nd Edition, 2004.
4. Tri T. Ha, 'Digital Satellite Communication', Howard W.Sams& Co, 2nd Edition, 2009
5. Emanuel Fthenakis, 'Manual of Satellite Communications', McGraw Hill Book Co., 1984

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20EC802PE HIGH SPEED NETWORKS

L	T	P	C
3	0	0	3

OBJECTIVES:

The Student should be made to:

- provide the basic concepts of frame relay and ATM networks.
- know techniques involved in traffic and congestion control.
- know about the end to end performance parameters and techniques used by TCP.
- update knowledge about the development in high speed networks.
- Understand the different QOS.

UNIT I HIGH SPEED NETWORKS **9**

Frame Relay Networks – Asynchronous transfer mode: ATM Protocol Architecture, ATM logical Connection, ATM Cell – ATM Service Categories, AAL, High Speed LANs: Fast Ethernet, Gigabit Ethernet, Fiber Channel – Wireless LANs: applications, requirements, Architecture of 802.11.

UNIT II CONGESTION AND TRAFFIC MANAGEMENT **9**

Queuing Analysis: Queuing Models, Single Server Queues – Effects of Congestion – Congestion Control – Traffic Management – Congestion Control in Packet Switching Networks – Frame Relay Congestion Control.

UNIT III TCP AND ATM CONGESTION CONTROL **9**

TCP Flow control – TCP Congestion Control: Retransmission Timer Management, Exponential RTO back off, KARN"s Algorithm, Window management – Performance of TCP over ATM -Traffic and Congestion control in ATM – Requirements, Attributes, Traffic Management Frame work, Traffic Control.

UNIT IV INTEGRATED AND DIFFERENTIATED SERVICES **9**

Integrated Services Architecture: Approach, Components, Services- Queuing Discipline: FQ, PS, BRFQ, GPS, WFQ – Random Early Detection - Differentiated Services.

UNIT V PROTOCOLS FOR QOS SUPPORT **9**

RSVP: Goals & Characteristics, Data Flow, RSVP operations, Protocol Mechanisms – Multiprotocol Label Switching: Operations, Label Stacking – RTP – Protocol Architecture, Data Transfer Protocol, RTCP.

TOTAL: 45 PERIODS

OUTCOMES:

On successful completion of this course, the students will be able to,

- Understand the knowledge about Asynchronous transfer protocol and TCP/IP.
- Identify different extents of quality of service to different applications.
- Understand the advancement in protocols.
- Analyze the different queuing techniques.
- Acquire the knowledge about the progress of high speed networks.

TEXT BOOKS:

1. William Stallings, "High Speed Networks and Internet", Pearson Education, 2nd Edition, 2010

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REFERENCES :

1. Warland, Pravin Varaiya, "High performance communication networks", 2nd edition, Jean Harcourt Asia Pvt. Ltd., 2001.
2. Irvan Pepelnjk, Jim Guichard, Jeff Apcar, "MPLS and VPN architecture", Cisco Press, Volume 1 and 2, 2003.
3. Abhijit S. Pandya, Ercan Sea, "ATM Technology for Broad Band Telecommunication Networks", CRC Press, New York, 2004

Chairman
BoS/ECE

20EC803PE AVIONICS

L	T	P	C
3	0	0	3

OBJECTIVES:

The Student should be made to:

- Develop understanding of Avionic systems
- Acquire knowledge on navigation at Radio frequencies.
- Gain knowledge in inertial sensors and satellite navigation
- Discuss about air data systems and autopilot
- Understand principle of aircraft displays.

UNIT I ROLE OF AVIONIC SYSTEMS IN AIRCRAFTS **9**

Introduction to aircraft – Axes system – Parts, Aircraft dynamics – Lift & drag, angle of incidence/angle of attack, pitching moment and aerodynamic centre, aircraft stability – importance and role of Avionics – systems which interface directly with pilot – Aircraft state sensor systems – Navigation systems – External world sensor systems – Task automation systems – Avionics architecture evolution – Avionics Data buses – MIL STD 1553, ARINC 429, ARINC 629.

UNIT II RADIO NAVIGATION **9**

Short Range Navigation Aids–Automatic Direction Finder (ADF), Distance Measuring Equipment(DME), VHF Omni– Directional Range (VOR) Long Range Navigation Aids – Long Range Navigation (LORAN), DECCA, Optimized Method for Estimated Guidance Accuracy (OMEGA). Approach–Landing Navigation Aids – Instrument Landing System (ILS), Microwave landing System (MLS)

UNIT III INERTIAL AND SATELLITE NAVIGATION SYSTEMS **9**

Inertial sensors – Gyroscopes, Accelerometers, Inertial navigation systems – Basic principles & Schuler Tuning – platform axes – initial alignment and gyro compassing– Vertical navigation channel – Strap down IN system computing – Satellite Navigation – GPS.

UNIT IV AIR DATA SYSTEMS AND AUTOPILOT **9**

Air data quantities – Altitude, Airspeed, Mach no., Vertical speed, Total Air temperature, Air data sensors, Stall warning, Altitude warning – Autopilot – Basic principles – Longitudinal and lateral autopilot – Safety Measures.

UNIT V AIRCRAFT DISPLAYS **9**

Display technologies – LED, LCD, CRT, Flat Panel Display – Primary Flight parameter displays – Head Up Display, Helmet Mounted Display, Night vision goggles, Head Down Display, MFD, MFK, Virtual cockpit

TOTAL: 45 PERIODS

OUTCOMES:

On successful completion of this course, the students will be able to,

- Specify the role of electronics in aviation
- Narrate various navigation systems
- Narrate inertial and satellite navigation system
- Analyze air data systems and apply knowledge on control system engineering to understand Autopilot mode
- Discuss about the auto pilot and display technologies related concepts.

Chairman
BoS/ECE

TEXT BOOK:

1. Albert Helfrick. D, "Principles of Avionics", Avionics communications Inc., 4th edition,2007
2. Collinson, R.P.G, "Introduction to Avionics", Chapman and Hall, 1996.

REFERENCE:

1. Middleton, D.H, "Avionics Systems", Longman Group UK Ltd, 1989.
2. Spitzer, C.R. "Digital Avionics Systems", Prentice Hall, 1993.
3. Spitzer, C.R, "The Avionics Handbook", CRC Press, 2000.
4. Pallet, E.H.J, "Aircraft Instruments and Integrated Systems", Longman Group UK Ltd, 1992. Extensive Reading:

ONLINE RESOURCES:

- www.milstd1553.com/
- https://www.nasa.gov/

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BoS/ECE

20EC804PE **MIXED SIGNAL DESIGN** **L T P C**
3 0 0 3

OBJECTIVES:

The Student should be made to:

- Learn the performance of Sample/hold circuits
- Know the performance of switched capacitor and analog comparator
- Understand and design Digital to Analog converters
- Understand and design Analog to Digital Converters
- Understand and design Power Amplifiers and data converter interfaces

UNIT I SAMPLE AND HOLD CIRCUITS **9**

Analog versus Discrete time signals, analog to digital signal conversion, Sampling switches: Impulse sampling, decimation, sample and hold, track and hold, interpolation, sample and hold gain, aperture error, Analog integrator, Issues in data converters: sampling, quantization and reconstruction, oversampling and aliasing

UNIT II SWITCHED CAPACITOR CIRCUITS AND COMPARATORS **9**

Switched capacitor architecture: Switched capacitor integrator, Current mode architecture, Basic comparator, characteristics of comparator, clock comparator, Comparator: Single stage amplifier, cascaded amplifier, Latched comparator.

UNIT III DIGITAL TO ANALOG CONVERTERS **9**

Differential non-linearity (DNL), Integral non-linearity (INL), Offset, Gain Error, Signal to noise ratio, dynamic range, Reference multiplication and division: voltage, current and charge division, Resistor ladder DAC: switching functions, architecture with switched sub divider, Current steering DAC: R-2R network switching functions, R-2R network architecture, Binary to thermometer code conversion, Design challenges: Current element matching, clock feed through, zero order hold.

UNIT IV ANALOG TO DIGITAL CONVERTERS **9**

Quantization error, Differential non-linearity (DNL), Integral non-linearity (INL), Offset, Gain Error, Signal to noise ratio, aliasing, ADC architecture: Successive approximation register(SAR) ADC, Pipelined ADC, Flash ADC, Performance metrics: Slew in sampling point, input capacitance non-linearity, charge redistribution in DAC, comparator offset cancellation.

UNIT V POWER AMPLIFIERS AND INTERFACING FOR DATA CONVERTERS **9**

MOSFET power amplifier, MOSFET based: Class A, Class B, Class AB, Class D power amplifiers, Parallel and serial protocols

TOTAL: 45 PERIODS

OUTCOMES:

On successful completion of this course, the students will be able to,

- Design sample/hold circuits for different applications
- Explore the usage of switched capacitor and comparators
- Analyze Digital to Analog converters
- Examine Analog to Digital converters
- Analyze Power Amplifiers design and data converter interfaces

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TEXT BOOKS:

1. Franco Maloberti, Data converters, Springer, 2007.
2. David A John and Kenmarti, Analog integrated circuit design, Wiley India, 1997.
3. Behzad Razavi, Principles of data conversion system design, Wiley-Blackwell, 1st Edition, 1994

REFERENCES :

1. Walt Kester Analog divisors inc. edited by, The data conversion handbook, Newness, Elsevier, 2005.
2. Jacob Baker R, CMOS: Circuit design, layout and simulation, Wiley Interscience, 2nd Edition, 2008.
3. Rudy Van De Plassche, CMOS integrated Analog-to-Digital and Digital-to-Analog Converters, Springer, 2nd Edition, 2005.

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BoS/ECE

20EC805PE	SPEECH SIGNAL PROCESSING	L T P C 3 0 0 3

OBJECTIVES:

The Student should be made to:

- Describe the fundamentals of speech and production system
- Determine the time domain parameters of speech.
- Determine the frequency domain parameters of speech
- Use different speech analysis techniques using prediction.
- Know about various speech recognition systems

UNIT I MECHANICS OF SPEECH 9

Speech production mechanism – Nature of Speech signal – Discrete time modelling of Speech production – Representation of Speech signals – Classification of Speech sounds – Articulatory features, Auditory perception – Anatomical pathways from the ear to the perception of sound – Peripheral auditory system.

UNIT II TIME DOMAIN METHODS FOR SPEECH PROCESSING 9

Time domain parameters of Speech signal – Time dependent processing of speech – Methods for extracting the parameters Energy, Average Magnitude – Zero crossing Rate – Short Time Auto Correlation Function – Pitch period estimation using Auto Correlation Function.

UNIT III FREQUENCY DOMAIN METHOD FOR SPEECH PROCESSING 9

Short Time Fourier analysis – Fourier transform and Linear filtering interpretations – Sampling rates - Short time synthesis: overlap add and filter bank summation – spectrograms - Pitch Detection – Analysis by Synthesis– Pitch synchronous spectrum Analysis – Pitch synchronous estimation of the glottal wave – Analysis synthesis systems: Phase vocoder – Channel Vocoder.

UNIT IV LINEAR PREDICTIVE ANALYSIS OF SPEECH 9

Basic Principles of Linear Predictive Analysis – The Auto correlation method – The Covariance method – Solution of LPC equations – Cholesky Decomposition solution – Durbin's Recursive solution - Comparison of solutions – Pitch detection and Formant analysis using LPC parameters – Voice Excited LPC Vocoders.

UNIT V SPEECH PROCESSING FOR MAN–MACHINE COMMUNICATION 9

Voice Response Systems: Design Considerations – Multiple outputs Digital Voice Response System, speaker identification and verification systems - Speech Recognition Systems: Isolated Digit Recognition System – Large Vocabulary word Recognition System. Natural Language Processing

TOTAL: 45 PERIODS

OUTCOMES:

On successful completion of this course, the students will be able to,

- Analyze speech production and perception mechanisms.
- Analyze various techniques of short time speech processing.
- Extract frequency domain properties of the speech.
- Apply prediction in speech analysis
- Apply speech processing for Man–Machine communication.

Chairman
BoS/ECE

TEXT BOOK:

1. Rabiner.L.R and Schaffer.R.W," Digital Processing of Speech signals", 4th Edition, Pearson Education, 2009.

REFERENCE BOOK:

1. Ben Gold and Nelson Morgan, Speech and Audio Signal Processing, 2nd edition, John Wiley and Sons Inc., 2011.
2. Quatieri, "Discrete–time Speech Signal Processing", Prentice Hall, 2002.
3. Flanagan.J.L, "Speech analysis: Synthesis and Perception", Springer, 2nd edition, 1972.
4. Witten.I.H, "Principles of Computer Speech", Academic Press, 1982.

ONLINE RESOURCES:

- http://www.isle.illinois.edu/~hasegawa/notes/
- http://www.speech.cs.cmu.edu/

Chairman
BoS/ECE

20CS701PE	SOFTWARE TESTING (Common to CSE, ECE and IT)	L T P C 3 0 0 3

OBJECTIVES:

The Student should be made to:

- Learn the basics of testing graphs.
- Design Data flow graphs for testing software.
- Understand Graph Coverageto test code
- Know the basics ofMutation testing and operators.
- Test web applications and Object oriented Applications

UNIT I INTRODUCTION **9**

Terminologies – Testing based on Models and Criteria – Automation – Basics of Graphs – Structural Graph Coverage Criteria – Elementary Graph Algorithms

UNIT II DATA FLOW GRAPHS **9**

Data flow graphs – Algorithms:Data flow graphscoverage Criteria – Graph coverage - Criteria:Applied to test code-Testing Source code: Classical Coverage criteria

UNIT III BASICS OF TESTING **9**

Software design and Integration Testing – Design Integration Testing and Graph Coverage – Specification Testing and Graph Coverage - Graph Coverage and Finite state machines - Basics needed for testing – Logic: Coverage Criteria –Applying to test code –Issues in applying to test code – Applied to test specifications-Applied to finite state machines

UNIT IV TESTING METHODOLOGIES **9**

Functional testing – Input space partitioning - Input space partitioning: Coverage criteria, Example – Syntax based testing-Mutation testing – Mutation testing for programs-Mutation operators for source code – Mutation testing vs Graphs and logic based testing-Mutation for Integration- Grammars and Inputs

UNIT V TESTING WEB AND OBJECT ORIENTED APPLICATIONS **9**

Testing of web applications and Web services – Testing of Object oriented Applications – Symbolic testing – Directed automated Random Testing – Testing of object oriented applications – Testing of mobile applications – Non-functional system testing – Regression testing

TOTAL: 45 PERIODS

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BoS (CSE)

OUTCOMES:

On successful completion of this course, the students will be able to,

- Learn the basics of testing graphs.
- Design Data flow graphs for testing software.
- Understand Graph Coverage to test code
- Know the basics of Mutation testing and operators.
- Test web applications and Object oriented Applications

TEXT BOOK:

1. Srinivasan Desikan and Gopalaswamy Ramesh, Software Testing – Principles and Practices, Pearson Education, 2006.
2. Ron Patton, Software Testing, Second Edition, Sams Publishing, Pearson Education, 2007.

REFERENCES:

1. Kshirasagar Naik, Priyadarshi Tripathy, Software Testing and Quality Assurance: Theory and Practice,wiley publication,2011.
2. Ilene Burnstein, Practical Software Testingǁ, Springer International Edition, 2003.
3. Edward Kit Software Testing in the Real World – Improving the Process, Pearson Education, 1995.
4. Aditya P. Mathur, Foundations of Software Testing _ Fundamental Algorithms and Techniques, Dorling Kindersley (India) Pvt. Ltd., Pearson Education, 2008.
5. https://nptel.ac.in/courses/106/101/106101163/#
6. Prof. Meenakshi D'Souza, Software Testing, NPTEL book,2020

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BoS (CSE)

20EC806PE	MOBILE ADHOC NETWORKS (COMMON TO CSE,ECE AND IT)	L T P C 3 0 0 3

OBJECTIVE:

The Student should be made to:

- Exposed to the architectures and protocols of Ad Hoc Wireless Networks
- Familiarize with different MAC, routing and transport layer protocols of adhoc networks
- Understand the network protocols to design a network
- Gain knowledge in Security issues in adhoc networks
- Aware of fundamental concepts and design issues of Ad Hoc Wireless Networks

UNIT I MOBILE ADHOC NETWORKS AND IEEE STANDARDS 802.11 **9**

Adhoc networks – Definition – General and design Issues – Applications – Characteristics of Wireless channel – Comparison of OSI Reference Model – TCP/IP Reference Model and ATM Reference Model – IEEE 802.11 standards: 802.11a, 802.11b, 802.11g, 802.15 & HIPERLAN.

UNIT II MEDIUM ACCESS PROTOCOLS **9**

Design issues, goals and classification – Contention based protocols with reservation – Scheduling algorithms – Protocols using directional antennas.

UNIT III NETWORK PROTOCOLS **9**

Routing Protocols: Design issues, goals and classification – Proactive vs reactive routing – (DSDV, CGSR, DSR, AODV, TORA, LAR, ABR, SSA) Unicast routing algorithms, hybrid routing algorithm, Power aware routing Protocols, Hierarchical Routing, Multicast routing algorithms, Tree – based Multicast Routing Protocols (BEMRP, MZRP, MCEDAR, ABAM, MAODV, AM Route) and Mesh based Multicast Routing Protocols (ODMRP, FGMP, CAMP).

UNIT IV END TO END DELIVERY AND SECURITY **9**

Transport layer: Issues in designing – Transport layer classification, adhoc transport protocols – Security issues in adhoc networks: issues and challenges, network security attacks, secure routing protocols.

UNIT V QUALITY OF SERVICE AND ENERGY MANAGEMENT **9**

Issues and Challenges in Providing QoS in Ad Hoc Wireless Networks – Classifications of QoS Solutions. MAC Layer Solutions – Network Layer Solutions – QoS Frameworks - Energy Management –Needs and its Classification.

TOTAL: 45 PERIODS

OUTCOMES:

On successful completion of this course, the students will be able to,

- Compare the differences between cellular and ad hoc networks and the analyze the challenges at various layers and applications.
- Summarize the protocols used at the MAC layer and scheduling mechanisms.
- Compare and analyze types of routing protocols used for unicast and multicast routing.
- Examine the network security solution and routing mechanism.
- Evaluate the energy management schemes and Quality of service solution in ad - hoc networks.

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BoS/ECE

TEXT BOOKS:

1. Siva Ram Murthy. C and Manoj.B.S, "Ad hoc Wireless Networks Architectures and protocols", 2nd Edition, Pearson Education, 2011.
2. Charles E. Perkins, "Ad hoc Networking", Addison Wesley, 2008

REFERENCES:

1. Stefano Basagni, Marco Conti, Silvia Giordano and Ivan Stojmenovic, "Mobile Adhoc Networking", Wiley– IEEE press, 2004.
2. Mohammad Ilyas, "The Handbook of AdHoc Wireless Networks", CRC press, 2017.

Chairman
BoS/ECE

20MG701	TOTAL QUALITY MANAGEMENT (COMMON TO CIVIL, CSE, ECE, EEE, IT AND MECH)	L T P C 3 0 0 3

OBJECTIVES:

The Students should be made to:

- Provide an overview of basic approaches of TQM
- Familiarize with the concepts and principles of TQM
- Impart knowledge on basic and new quality tools
- Learn the applications of TQM techniques in various industries
- Understand the various quality systems, standards and procedures

UNIT I INTRODUCTION 9

Definition of quality and TQM – basic needs of quality – contributions of Deming, Juran and Crosby – TQM framework – historical review of quality management – dimensions of quality – barriers to TQM – benefits of TQM – quality council – quality statements.

UNIT II TQM PRINCIPLES 9

Customer satisfaction – customer perception of quality, customer complaints, service quality and customer retention – employee involvement – motivation, empowerment, team and teamwork, recognition and reward, performance appraisal – continuous process improvement – PDSA cycle, 5s and Kaizen – supplier partnership – supplier selection and supplier rating.

UNIT III TQM TOOLS 9

Basic seven tools of quality – new seven management tools – six sigma – concepts and process – quality costs – reengineering process – improvement strategies – Taguchi principles – quality loss function – role of IT in TQM.

UNIT IV TQM TECHNIQUES 9

Benchmarking - reasons, types and process – Failure Mode of Effect Analysis (FMEA) - procedures and types – Quality Function Deployment (QFD) - benefits and process – Total Productive Maintenance (TPM) - process.

UNIT V QUALITY SYSTEMS 9

Benefits of ISO registration – ISO 9000 series of standards – ISO 9000 requirements and implementation – other sectors specific standards – documentation – audit – ISO 14000 series of standards - concepts, requirements and benefits – quality awards.

TOTAL: 45 PERIODS

OUTCOMES:

On successful completion of this course, the students will be able to,

- Implement the concept of quality, TQM to bring quality management
- Improve the customer supplier relationship management and enrich the employee involvement
- Apply the basic and new quality tools for enhancing quality
- Explore the usage of TQM techniques for measuring, controlling and improving the quality
- Execute the various quality systems, its standards and procedures to increase the quality assurance

CHAIRMAN
BoS (MECH)

TEXT BOOKS:

1. Dale H Besterfiled, "Total Quality Management", Pearson Education Asia, 3rd Edition, 2013.
2. Poonia M P and Sharma S C, "Total Quality Management", Khanna Publication, 1st Edition, 2018.

REFERENCES:

1. James R Evans and William M Lindsay, "The Management and Control of Quality", South-Western Cengage Learning, 6th Edition, 2010.
2. Vijayan V and Ramakrishnan H "Total Quality Management", S Chand Publication, Pune, 1st Edition, 2014.
3. Suganthi L and Anand Samuel, "Total Quality Management", Prentice Hall (India) Pvt. Ltd, 7th Edition, 2011.
4. Poornima M Charantimath, "Total Quality Management", Pearson Education, 3rd Edition, 2017.

CHAIRMAN
BoS (MECH)

20EC807PE **RADAR AND NAVIGATIONAL AIDS** **L T P C**
3 0 0 3

OBJECTIVES:

The Student should be made to:

- Discuss the radar fundamentals and various types of RADARS
- Know the performance of different antenna for radars
- Understand the concept of moving target indication
- Be aware of various navigational aids
- Acquire knowledge in modern navigation tools

UNIT I PRINCIPLES OF RADAR **9**

Radar Equation – Radar Block diagram and Operation – Radar Frequencies – Millimeter and sub millimeter waves – Applications of Radar – Prediction of Range Performance – Minimum Detectable Signal – Receiver Noise – Signal to Noise Ratio – Matched filter impulse response – Integration of radar Pulses – Radar Cross Section of Targets – Cross section Fluctuations – Radar Clutter.

UNIT II ANTENNAS FOR RADAR & NAVIGATION AND CW & FM RADAR **9**

Antenna Concept – Reflector Antennas – Phased Array antennas – Loop Antenna – Doppler effect – CW radar – FMCW radar – Airborne Doppler Navigation – Multiple Frequency CW radar.

UNIT III MTI & PULSE DOPPLER RADAR AND TRACKING & IMAGING RADAR **9**

Delay line Cancellers – Multiple or staggered Pulse Repetition Frequencies – Range gated Doppler Filters – Block Diagram of Digital Signal Processor – Example of MTI radar Processor – Pulse Doppler Radar – Non coherent MTI – MTI from moving platform – Other types of MTI – Airborne radar –Tracking with radar – Mono pulse tracking – Conical scan and sequential lobing – Low angle tracking – Air Surveillance Radar – Synthetic aperture radar (SAR)- Introduction to LiDAR

UNIT IV NAVIGATIONAL SYSTEMS **9**

Four Methods of Navigation – Radio Direction Findings – Loop input circuits – Aural null direction finder – Goniometer – Errors in Direction Finding – Adcock Direction Finder – Direction Finding at very high frequency – Automatic Direction Finder – Range and Accuracy of Direction Finders – LF/MF Four course Radio Range – VHF Omni Directional Range – VOR receiving Equipment – Range and Accuracy of VOR – LORAN – DECCA navigation system

UNIT V MODERN NAVIGATION **9**

Aids to approach and Landing – Instrument Landing System – Ground controlled Approach System – Microwave landing system – Distance Measuring Equipment – TACAN – Doppler frequency equations – Track stabilization – Doppler navigation system – GPS: principle of operation – Position location determination – GPS receiver.

TOTAL: 45 PERIODS

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BoS/ECE

OUTCOMES:

On successful completion of this course, the students will be able to,

- Understand the principle behind radar range equation and different types of targets available.
- Design antenna for radars
- Understand the Doppler and tracking methods in radar systems.
- Design Navigational Aids
- Analyse modern navigation tools

TEXT BOOKS:

1. Skolnik M, "Introduction to Radar Systems", Tata McGraw–Hill, 2007.
2. Nagaraja.N.S, "Elements of Electronic Navigation Systems", 2nd Edition, Tata McGraw–Hill, 2004

REFERENCES :

1. Peyton Z. Peebles, "Radar Principles", John Wiley, 2007.
2. Toomay.J.C, Hannen, Paul J, "Principles of Radar", 3rd Edition, PHI, 2010.

ONLINE RESOURSCES:

- www.turma–aguia.com/davi/skolnik/Skolnik_chapter_1.pdf
- www.key2study.com/66web/acnsprelims.pdf

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BoS/ECE

20CS704PE	SOFT COMPUTING	L T P C
	(Common to CSE, ECE, EEE and IT)	3 0 0 3

OBJECTIVES:

The Student should be made to:

- Learn the various soft computing frames works.
- Be familiar with design of various neural networks.
- Be exposed to fuzzy logic.
- Learn genetic programming.
- Be exposed to hybrid systems.

UNIT I BASICS OF SOFT COMPUTING 9

Soft computing: Introduction - Soft Computing Vs. Hard Computing - Types of soft computing techniques - Applications of Soft Computing. Artificial Neural Network: Introduction - Characteristics - Learning Methods - Taxonomy - Evolution of Neural Networks - Basic Models - Important Technologies - Applications of Neural Network.

UNIT II NEURAL NETWORKS 9

Supervised Learning Network: Perceptron Networks - Adaptive linear Neuron - Multiple Adaptive linear Neuron - BPN - RBF - Associative Memory Network: Auto Associative Memory Network - Hetero Associative Memory Network - Bidirectional Associative Memory - Hopfield Networks - Iterative Auto Associative Memory Network- Unsupervised Learning Networks: Kohonen self-Organizing Feature Maps, LVQ - CP Networks, ART Network.

UNIT III FUZZY LOGIC 9

Fuzzy Logic: Fuzzy set theory - Fuzzy set versus crisp set - Crisp Relation and Fuzzy Relations - Fuzzy systems: crisp logic - Fuzzy Logic - Introduction and Features of Membership Functions. Fuzzy rule base system: Fuzzy propositions - formation - Decomposition and Aggregation of Fuzzy Rules - Fuzzy Reasoning - Fuzzy Inference Systems - Fuzzy Decision Making and Applications of Fuzzy Logic - Defuzzification.

UNIT IV GENETIC ALGORITHM 9

Introduction to Genetic Algorithms (GA) - Representation - Operators in GA - Fitness function - Population - Building block hypothesis and schema theorem - Genetic Algorithms Operators - Methods of Selection - Crossover and Mutation - Simple GA(SGA) - Other types of GA - Generation gap - Steady state GA - Applications of GA.

C. Gunavanath

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BoS (CSE)

UNIT V HYBRID SOFT COMPUTING TECHNIQUES 9

Neuro fuzzy Hybrid Systems - Genetic Neuro Hybrid Systems - Genetic fuzzy Hybrid and fuzzy Genetic Hybrid Systems - Simplified fuzzy ARTMAP - Applications: Optimization of Traveling Salesman Problem using Genetic Algorithm Approach - Soft Computing Based Hybrid fuzzy Controllers.

TOTAL: 45 PERIODS

OUTCOMES:

On successful completion of this course, the students will be able to,

- Identify soft computing techniques and their roles in building intelligent machines.
- Recognize the feasibility of applying a soft computing methodology for a particular problem.
- Apply fuzzy logic and reasoning to handle uncertainty and solve engineering problems.
- Apply genetic algorithms to combinatorial optimization problems.
- Evaluate and compare solutions by various soft computing approaches for a given problem.

TEXT BOOK:

1. S.N.Sivanandam and S.N.Deepa, "Principles of Soft Computing", Wiley India Pvt Ltd, 2011.

REFERENCES:

1. Jang J S R, Sun C T and Mizutani E, "Neuro-Fuzzy and Soft Computing", PHI / Pearson Education 2004.
2. David E. Goldberg, "Genetic Algorithm in Search Optimization and Machine Learning" Pearson Education India, 2013.
3. RajasekaranS and VijayalakshmiPai G A, "Neural Networks, Fuzzy Logic and Genetic Algorithm: Synthesis & Applications", Prentice-Hall of India Pvt. Ltd., 2006.
4. Simon Haykin, "Neural Networks Comprehensive Foundation" Pearson Education, Second Edition, 2005.
5. George J. Klir, Ute St. Clair, Bo Yuan, "Fuzzy Set Theory: Foundations and Applications" Prentice Hall, 1997.
6. http://nptel.ac.in/courses/106106046/41

CHAIRMAN
BoS (CSE)

20EC808PE	ELECTROMAGNETIC INTERFERENCE AND COMPATIBILITY	L	T	P	C
		3	0	0	3

OBJECTIVES:

The Student should be made to:

- Gain broad conceptual understanding of the various aspects of electromagnetic interference and compatibility
- Develop a theoretical understanding of electromagnetic shielding effectiveness
- Understand ways of mitigating EMI by using shielding, grounding and filtering
- Understand the need for standards and to appreciate measurement methods
- Aware of EMI impacts wireless and broadband technologies

UNIT I INTRODUCTION, AND SOURCES OF ELECTROMAGNETIC INTERFERENCE 9

Introduction - Classification of sources - Natural sources - Man-made sources - Surveys of the electromagnetic environment.

UNIT II SHIELDING 9

Introduction - Shielding effectiveness - Far-field sources - Near-field sources - Low-frequency, magnetic field shielding - Effects of apertures.

UNIT III INTERFERENCE CONTROL TECHNIQUES 9

Equipment screening - Cable screening - grounding - Power-line filters - Isolation - Balancing - Signal-line filters - Nonlinear protective devices.

UNIT IV EMC STANDARDS, MEASUREMENTS AND TESTING 9

Need for standards - The international framework - Human exposure limits to EM fields - EMC measurement techniques - Measurement tools - Test environments

UNIT V EMC CONSIDERATIONS IN WIRELESS AND BROADBAND TECHNOLOGIES 9

Efficient use of frequency spectrum - EMC, interoperability and coexistence - Specifications and alliances - Transmission of high-frequency signals over telephone and power networks - EMC and digital subscriber lines - EMC and power line telecommunications.

TOTAL: 45 PERIODS

OUTCOMES:

On successful completion of this course, the students will be able to,

- Knowledge of the various sources of electromagnetic interference
- Display an understanding of the effect of how electromagnetic fields couple through apertures, and solve simple problems based on that understanding
- Explain the EMI mitigation techniques of shielding and grounding
- Explain the need for standards and EMC measurement methods
- Discuss the impact of EMC on wireless and broadband technologies

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BoS/ECE

TEXT BOOKS:

1. Christopoulos C, "Principles and Techniques of Electromagnetic Compatibility", CRCPress, 2nd Edition, Indian Edition, 2013.
2. Paul C R, "Introduction to Electromagnetic Compatibility", Wiley India, 2nd Edition,2008

REFERENCES:

1. Kodali V P, "Engineering Electromagnetic Compatibility", Wiley India, 2nd Edition, 2010.
2. Bemhard Keiser, "Principles of Electromagnetic Compatibility", Artech house, Norwood, 3rd Edition, 1986.
3. Henry W Ott, "Electromagnetic Compatibility Engineering", John Wiley & Sons Inc, Newyork, 2009.
4. Scott Bennett W, "Control and Measurement of Unintentional Electromagnetic Radiation", John Wiley & Sons Inc., Wiley Interscience Series, 1997

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BoS/ECE

20EC809PE	ENCLOSURE DESIGN OF ELECTRONICS (COMMON TO BME AND ECE)	L T P C 3 0 0 3

OBJECTIVES:

The Student should be made to:

- Sensitise a registrant to various aspects of an electronics product.
- Specifically on non electrical aspects like mechanical design and detailing.
- Starting from a need translated into specifications.
- Leading to design and prototyping
- Ending up in a manufacturable physical prototype

UNIT I INTRODUCTION **9**

Introduction to Products, Industrial Design and Product design, Types of products ID as per ICSID and WIPO -Creativity in Product Design, Needs vs features, Product conceptualization -Sketching basics, sketching as a design tool, Using illustration software.

UNIT II PACKAGING AND ENCLOSURES **9**

Role of packaging and enclosures, Use of IP approved sets, Design of Purpose built enclosures-Physical simulation of a small system, Basics of building a prototype mock up, Skills and specification in alternate materials -Use of off the shelf electronics system, Gumstix, Beagle, RasberryPi, Arduino, Kit application. Adaption for I / O.

UNIT III DEVELOPMENT TOOLS **9**

Development of Enclosures with Laser tools, Use of Flat plastics, Product specific Enclosure design, Application of CAD tools (dessault, siemens, Autodesk, McNeil), Design for FDM (3d printing), Specifics of Design for Production Scale-up.

UNIT IV I/O INTERFACES **9**

Design of I/O interfaces Front panel layout and graphics Heat sink enclosures, Detailing of Built in Heat sink boxes, Connector basics, Common connectors, MIL C connectors- Basics of ergonomis - Connection and wiring, Integration and Validation

UNIT V MANUFACTURING DOCUMENTATION **9**

Detailing and manufacturing enclosures using CAD: Detailing with CAD, Integrating Products with CAD, Product Detailing, Components CAD Physical Models, Applicability for industrial specific dealing-Sheet Metal and Plastic common details, Sourcing and logistics of hardware, Area for specification-Sample of Simple Organic Shapes.

TOTAL: 45 PERIODS

OUTCOMES:

On successful completion of this course, the students will be able to,

- Understand need of electronics product design
- Design of Package and enclosures
- Understand the development tools
- Study the details of I/O interfaces.
- Knowledge about preparation of manufacturing documentation

TEXT BOOK:

1. Prof. N. V. Chalapathi Rao, "Enclosure design of Electronics Equipment", IISC, Bangalore.

Chairman
BoS/ECE

20BM501OE BASICS OF BIOMEDICAL INSTRUMENTATION

L	T	P	C
3	0	0	3

OBJECTIVES:

The student should be made to:

- Gain knowledge about various physiological parameters of both electrical and non-electrical
- Know the importance of pH, pO_2, pCO_2 levels in human
- Add insights on the various methods of recording and also the methods for transmitting these parameters
- Study about the various assist devices used in hospitals
- Gain knowledge about equipment used for physical medicine and the various recently developed diagnostic and therapeutic techniques

UNIT I ELECTRO-PHYSIOLOGY AND BIO-POTENTIAL RECORDING 9

Sources of biomedical signals, Bio-potentials, Bio-potential electrodes, Biological amplifiers, ECG, EEG, EMG, PCG, Typical waveforms and signal characteristics.

UNIT II BIO-CHEMICAL AND NON ELECTRICAL PARAMENTER MEASUREMENT 9

pH, pO_2, pCO_2, Colorimeter, Blood flow meter, Cardiac output, Respiratory, Blood pressure, Temperature and Pulse measurement, Blood Cell Counters.

UNIT III ASSIST DEVICES AND IMAGING SYSTEMS 9

Cardiac Pacemakers, DC Defibrillator, Dialyzer, Ventilators, Computed Tomography, Magnetic Resonance Imaging systems, Ultrasonic Imaging systems (Block diagrammatic approach would suffice).

UNIT IV PHYSICAL MEDICINE AND BIOTELEMETRY 9

Diathermies – Shortwave, Ultrasonic and Microwave type and their applications, Surgical Diathermy, Biotelemetry.

UNIT V RECENT TRENDS IN MEDICAL INSTRUMENTATION 9

Telemedicine, Insulin Pumps, Radio Pill, Endoscopy, Brain Machine Interface, Lab on a Chip.

TOTAL: 45 PERIODS

OUTCOMES:

On successful completion of this course, the students will be able to,

- Know the human body electro-physiological parameters and recording of bio-potentials
- Comprehend the non-electrical physiological parameters and their measurement-body temperature, blood pressure, pulse, blood cell count, blood flow meter…
- Interpret the various assist devices used in the hospitals viz pacemakers, defibrillators, dialyzers and ventilators
- Comprehend physical medicine methods. E.g) Ultrasonic, Shortwave, Microwave surgical diathermies and bio-telemetry principles and methods
- Know about recent trends in medical instrumentation

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TEXT BOOK:

1. Leslie Cromwell, "Biomedical Instrumentation and Measurement", Prentice Hall of India, New Delhi, 2007.

REFERENCES:

1. Khandpur R S, "Handbook of Biomedical Instrumentation", Tata McGraw Hill, New Delhi, 2003.
2. John G Webster, "Medical Instrumentation Application and Design", 3rd Edition, Wiley India Edition, 2007.
3. Joseph J Carr and John M Brown, "Introduction to Biomedical Equipment Technology", John Wiley and Sons, New York, 2004.

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20BM502OE **INTRODUCTION TO CELL BIOLOGY** **L T P C**
3 0 0 3

OBJECTIVES:

The student should be made to:

- Provide knowledge on cell structure and junctions
- Know the membranes and cell wall
- Be acquainted with cell division and its cycles
- Become aware of the significance of DNA and RNA, Proteins
- Identify various enzymes and its use in industries

UNIT I CELL STRUCTURE **9**

Cell organization, structure of organelles, extra cellular matrix and cell junctions.

UNIT II CELL ORGANELLE AND FUNCTION **9**

Nucleus, Mitochondria, Lysosomes, Endoplasmic reticulum, Golgi apparatus, vesicles, centrosomes, cell membranes, ribosomes, cytosol, chloroplasts, flagella, cell wall.

UNIT III DIVISION **9**

Cell cycle – mitosis, meiosis, cell cycle regulation and apoptosis.

UNIT IV MACROMOLECULES **9**

DNA, RNA and Proteins – basic units, architectural hierarchy and organization, functions.

UNIT V ENZYMES **9**

Enzymes – Structure, Mechanism of action, Factors that affect enzyme activity, Common enzymes used in industrial setup of plant and animal origin.

TOTAL: 45 PERIODS

OUTCOMES:

On successful completion of this course, the students will be able to,

- Identify the structure of the cell and its functions
- Recognize the functions of cell wall and membrane
- Familiar with the cell cycle and its characteristics
- Apply the knowledge of DNA and RNA to study different characteristics
- Comment of various enzymes and its role by doing thorough analysis

TEXT BOOKS:

1. Lodish, Harvey etal., "Molecular Cell Biology", 5th Edition, W H Freeman, 2005.
2. Cooper G M and Hansman R E, "The Cell: A Molecular Approach", 4th Edition, ASM Press, 2007.
3. Alberts, Bruce etal., "Molecular Biology of The Cell", 4th Edition, Garland Science (Taylors Francis), 2002.

REFERENCES:

1. McDonald, F etal., "Molecular Biology of Cancer", 2nd Edition, Taylor & Francis, 2004.
2. King and Roger J B, "Cancer Biology" Addison Wesley Longman, 1996.

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20EC503OE	INTRODUCTION TO INTERNET OF THINGS	L	T	P	C
		3	0	0	3

Course Objectives:

This course will enable students to

- Assess the impact of IoT applications, architectures in real world
- Illustrate the infrastructure, protocols and integration requirements of deploying smart objects and connect them to network
- Study the prerequisites for implementing IoT based applications
- Absorb various IoT supporting technologies
- Infer the importance of setting-up smart environment , data Analytics and Security in IoT

UNIT-1 INTRODUCTION TO IOT **9**

Predecessors of IoT - Overview of Internet of Things: Emergence of IoT - IoT Networking Components - Addressing Strategies in IoT - IoT Sensing and Actuation: Sensors- Actuators - IoT Processing Topologies and Types - IoT Connectivity Technologies.

UNIT-II M2M TO IOT **9**

Infrastructure and Service Discovery Protocols for IoT – Architecture – Protocols – Service Discovery – Sensor and Actuator Networks – IoT device Integration: concepts, standards, Implementations – Protocols and Middleware.

UNIT-III DEVELOPING IOT SOLUTIONS **9**

Interoperability in IoT - Introduction to Arduino Programming - Integration of Sensors and Actuators with Arduino - Introduction to Python programming and Raspberry Pi - Implementation of IoT with Raspberry Pi.

UNIT-IV ASSOCIATE IOT TECHNOLOGIES **9**

Software Defined Networking (SDN) - SDN for IoT - Data Handling and Analytics - Cloud Computing: Fundamentals, service models, service management and security - Sensor-Cloud - Fog Computing.

UNIT-V IOT SMARTER ENVIRONMENTS AND DATA ANALYTICS **9**

Smart cities and smart homes - Connected Vehicles – Smart Grid – IoT Data Analytics platform - Introduction to Industrial IoT, IIC and Industry 4.0 – IIoT Analytics - Case studies: Agricultural IoT, Healthcare IoT and Activity IoT - Security Management in IoT – AAA Framework.

TOTAL: 45 PERIODS

OUTCOMES:

On successful completion of this course, the students will be able to,

- Interpret the impact and challenges posed by IoT networks leading to new architectural models.
- Compare and contrast the deployment of smart objects and the technologies to connect them to network.
- Appraise the basic requirements needed for designing real-time IoT based applications.
- Develop novel IoT supporting technologies for real world entities
- Illustrate different sensor technologies for sensing different entities, data Analytics and Security in IoT.

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TEXT BOOKS:

1. The Internet of Things: Enabling Technologies, Platforms, and Use Cases, by Pethuru Raj and Anupama C. Raman (CRC Press, 2020)
2. Internet of Things: A Hands-on Approach, by Arshdeep Bahga and Vijay Madisetti (Universities Press, 2020)

REFERENCES:

1. Introduction to IoT by Sudip Misra, Anandarup Mukherjee, Arijit Roy, Cambridge University Press, 2021
2. Raj Kamal, "Internet of Things: Architecture and Design Principles", 1st Edition, McGraw Hill Education, 2017
3. Srinivasa K G, "Internet of Things", CENGAGE Leaning India, 2017

ONLINE RESOURCES:

1. https://onlinecourses.nptel.ac.in/noc21_cs63/

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BoS/ECE

20CE501PE	INDUSTRIAL WASTE MANAGEMENT (Common to AGE, BME, ECE, EEE, CSE, IT, Mech)	L T P C 3 0 0 3

OBJECTIVES:

The student should be made to:

- Understand the various characteristics of industrial waste water.
- Learn the process and mechanism of different waste water treatment process.
- Impart awareness on waste that emits from industries.
- Gain knowledge on biological waste water treatment process.
- Familiarize with treatment of sludge and its disposal methods.

UNIT I INTRODUCTION 9

Undesirable waste water characteristics – Characteristics of industrial waste waters – Waste water characteristics – Estimating the organic content – Measuring the efficiency toxicity – In plant waste control and waste reuse – Storm water control.

UNIT II WASTE WATER TREATMENT PROCESSES 9

Pre and primary treatment of waste water – Equalization – Neutralization – Sedimentation – Oil separation-sour water strippers – Floatation – Coagulation, precipitation and metals removal– coagulation – Heavy metals removal – Aeration and mass transfer; mechanism of oxygen transfer – Aeration equipment – Air stripping of volatile organic compounds.

UNIT III POLLUTION FROM MAJOR INDUSTRIES 9

Sources, Characteristics, waste treatment flow from industries such as Textiles, pulp and paper mill wastes breweries and distilleries waste, Tanneries, Pharmaceuticals, Dairy, Sugar mill wastes, Steel plants, oil Refineries, fertilizer plant waste, petrochemical complex waste, corn starch industry waste – Odour and its removal-removal color from waste waters – Waste minimization and clean technologies.

UNIT IV BIOLOGICAL WASTE WATER TREATMENT PROCESS 9

Lagoons and stabilization basins – Aerated lagoons-activated sludge processes – Trickling filtration – Rotating biological contactors – Anaerobic decomposition-laboratory evaluation of

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anaerobic treatment – Adsorption – Theory of activated carbon – Sludge quality considerations – Stripping of volatile organics – Nitrification and denitrification.

UNIT V SLUDGE TREATMENT AND DISPOSAL 9

Characteristics of sludge for disposal – Aerobic digestion – Gravity thickening – Flotation thickening – Rotatary drum screen – Gravity belt thickener – Centrifugation – Vacuum filtration – Pressure filtration – Belt filter press – Sand bed drying-factors affecting dewatering performance – Land disposal of sludges – Incineration.

TOTAL: 45 PERIODS

OUTCOMES:

On successful completion of this course, the students will be able to,

- Gain knowledge on undesirable waste water characteristics.
- Understand various methods dealt with treatment of waste water.
- Learn various sources, types, characteristics and disposal methods of industrial waste water.
- Acquire knowledge on different types of aerobic and anaerobic waste water treatment process.
- Aware with various sludge treatment methods and its disposal.

TEXT BOOKS:

1. Wesley Eckenfelder W, Jr Industrial Water Pollution Control 3rd Edition, Mc–GrawHill Book Company, New Delhi, 2000.
2. Stephenson R L and Blackburn J B, Industrial Wastewater Systems Hand book, Lewis Publisher, New York, 1998.

REFERENCE BOOKS:

1. M.N.Rao & A.K.Dutta, Wastewater Treatment, Oxford - IBH Publication, 1995.
2. H.M. Freeman, Industrial Pollution Prevention Hand Book, McGraw-Hill Inc., New Delhi, 1995.

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20CS506OE FUNDAMENTALS OF SOFTWARE ENGINEERING **L T P C**

(Common to BME, CIVIL, ECE, EEE and MECH) **3 0 0 3**

OBJECTIVES:

The Student should be made to:

- Explore the fundamental concepts of software engineering
- Learn the requirements engineering process and planning for software development
- Understand the software design principles
- Know coding standards and different testing strategies
- Learn the project management principles and quality assurance standards

UNIT I SOFTWARE AND SOFTWARE ENGINEERING **8**

The Nature of Software - Software Engineering - Software Myths – Process Models: Prescriptive Process Models, Specialized Process Models, Personal and Team Process Models – Overview of Agile Process -Overview of CMMi

UNIT II REQUIREMENTS ENGINEERING AND PLANNING **10**

Requirements Engineering: Establishing the Groundwork - Eliciting Requirements - Negotiating Requirements - Validating Requirements - Requirements Analysis using scenario based modeling. Process and Project Metrics: Software Measurement - Metrics for Software Quality. Estimation: The Project Planning Process – Resources - Software Project Estimation - Decomposition Techniques - Empirical Estimation Models - Project Scheduling

UNIT III MODELLING AND DESIGN **9**

Modelling: Data Modeling Concepts - Class-Based Modeling - Flow-Oriented Modeling - Creating a Behavioral Model Design Concepts - Architectural Design: Software Architecture, Architectural Styles, Architectural Design, Architectural Mapping Using Data Flow - User Interface Design: The Golden Rules, User Interface Analysis and Design, Interface Analysis

UNIT IV CODING AND SOFTWARE TESTING **9**

Coding standards and guidelines - Testing: Strategic approach to Software Testing - Test Strategies for Conventional Software - Validation Testing - System Testing – Debugging – White-box Testing - Basis Path Testing - Control Structure Testing - Black-box Testing

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UNIT V PROJECT MANAGEMENT AND SOFTWARE QUALITY 9

Project Management Concepts: The Management Spectrum, People, Product and Process – Software Configuration Management – Risk Management - Quality Management: Software Quality, Achieving Software Quality - Elements of Software Quality Assurance - The ISO 9000 Quality Standard

TOTAL: 45 PERIODS

OUTCOMES:

On successful completion of this course, the students will be able to,

- Apply software engineering principles for software development.
- Formulate software requirement specification and plan for software development
- Design software according to the specification
- Code the software using guidelines / standards and conduct testing
- Manage and maintain the software process by assuring the quality

TEXT BOOKS:

1. Roger S. Pressman and Bruce R. Maxim, "Software Engineering – A practitioner's approach", McGraw Hill Publications, Eighth Edition, 2014

REFERENCES:

1. Pankaj Jalote, "An Integrated Approach to Software Engineering", Springer, Third Edition, 2005
2. Ian Sommerville, "Software engineering", Pearson Education Asia, Seventh Edition, 2007.
3. Watts S.Humphrey, "A Discipline for Software Engineering", Pearson Education, 2007.
4. James F.Peters and WitoldPedrycz, "Software Engineering, Engineering Approach", Wiley-India, 2007.
5. Stephen R.Schach, "Software Engineering", Tata McGraw-Hill, 2007.
6. S.A.Kelkar, "Software Engineering", Prentice Hall of India Pvt, 2007

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BoS (CSE)

20CS508OE	PRINCIPLES OF MULTIMEDIA (ECE Only)	L T P C 3 0 0 3

ECE

OBJECTIVES:

The Student should be made to:

- Study the basic concepts related to Multimedia
- Explain the basic multimedia building blocks and application development tools.
- Demonstrate online multimedia application creation tools
- Understand computer animation basics and needs
- Demonstrate various computer animation techniques.

UNIT I INTRODUCTION TO MULTIMEDIA 9

Multimedia overview: Components , Hypermedia ,File formats – Color models – Digital Audio representation – Digital music making – MIDI - Digital Video: Video compression techniques – Multimedia for portable devices

UNIT II MULTIMEDIA BUILDING BLOCKS 9

Multimedia building blocks: Text, Graphics, Video Capturing, Sound capturing and editing - Introduction to 2D & 3D graphics – Surface characteristics and texture – Lights – Animation: key frames &tweening – Techniques – Principles of animation – 3D animation – File formats

UNIT III MULTIMEDIA APPLICATIONS 9

Databases: Properties of MMDBMS, Multimedia queries, Management of continuous data, document modeling, Media Servers- Security: Digital Signatures, steganographic methods: single images, motion pictures, audio data, 3D scenes, copyright protection.

UNIT IV COMPUTER ANIMATION BASICS 9

History of Computer Animation - Modeling digital objects : Modeling Concepts - Modeling Techniques – Rendering Concepts : Lights, Camera and Materials - color- Rendering Process - Hidden surface removal - Z-Buffer - Ray tracing

UNIT V COMPUTER ANIMATION TECHNIQUES 9

Principles of animation - Computer Animation techniques: keyframe Techniques, camera animation, light animation, animation file formats - Advanced Computer Animation techniques: Motion Capture, Facial animation, crowd animation - Visual effects techniques: Crowd replications, 3-d morphing, motion control.

TOTAL: 45 PERIODS

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OUTCOMES:

On successful completion of this course, the students will be able to,

- Identify the architectural components for multimedia applications.
- Work with various elements of multimedia.
- Develop audio, video, and images using multimedia tools.
- Identify issues and solutions in implementing security for multimedia applications.
- Model and render the 3D objects using animation tools.
- Develop interactive animations using multimedia tools

TEXT BOOKS:

1. John F. KoegelBufend, "Multimedia systems", Pearson Education, Delhi, 2002
2. Parekh R, "Principles of Multimedia", Tata McGraw-Hill, 2006.
3. Isaac V.Kerlow, "The Art of 3D Computer Animation and Effects", Wiley Publications, 4th Edition,2009

REFERENCES:

1. Mohammed Dastbaz, "Designing Interactive Multimedia", McGraw Hill Publication, 2002.
2. Ralf Steinmetz and KlaraNahrstedt, "Multimedia Applications", Springer, 2007

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BoS (CSE)

20IT501OE **FUNDAMENTALS OF OPERATING SYSTEMS** **L T P C**
3 0 0 3

OBJECTIVES:

The Student should be made to:

- Acquire basic knowledge of operating system structures and its functioning
- Study the concept of process management
- Learn the basics of memory management
- Understand the structure of file systems
- Familiarize with different operating systems

UNIT I OPERATING SYSTEMS OVERVIEW **9**

Introduction to operating systems – Computer system organization – architecture – Operating system structure – operations – Process, memory, storage management – Open source operating systems – OS services – User interface – System calls – System programs – Process concept – scheduling – Operations on processes – Cooperating processes – Inter-process communication – Threads.

UNIT II PROCESS MANAGEMENT **9**

Basic concepts – Scheduling algorithms – Algorithm evaluation – The critical section problem – Synchronization hardware – Semaphores – Classic problems of synchronization – Deadlocks – Deadlock characterization – Methods for handling deadlocks – Deadlock prevention – Deadlock avoidance – Deadlock detection – Recovery from deadlock.

UNIT III MEMORY MANAGEMENT **9**

Memory management – Swapping – Contiguous memory allocation – Paging – Segmentation – Virtual memory: Background – Demand paging – Copy on write – Page replacement – Allocation of frames – Thrashing.

UNIT IV FILE MANAGEMENT **9**

File concept – Access methods – Directory structure – File-system mounting – Protection – Directory implementation – Allocation methods – Free space management – Disk scheduling – Disk management.

UNIT V LINUX AND WINDOWS **9**

The Linux system – History – Process management – Scheduling – Memory management – File systems – Inter Process Communication – Windows OS – History – Design principles.

TOTAL: 45 PERIODS

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OUTCOMES:

On successful completion of this course, the students will be able to,

- Identify the components of operating system and their functionalities
- Analyze the various process management algorithms
- Evaluate the performance of various memory management techniques
- Design a simple file system and analyze the performance
- Work with some popular operating systems like Linux, Windows

TEXTBOOK:

1. Abraham Silberschatz, Peter B Galvin and Greg Gagne, "Operating System Concepts Essentials", John Wiley and Sons Inc., 8th Edition, 2011.

REFERENCE BOOKS:

1. Andrew S Tanenbaum, "Modern Operating Systems", Addison Wesley, 2nd Edition, 2001.
2. Charles Crowley, "Operating Systems: A Design-Oriented Approach", Tata McGraw Hill Education, 1996.
3. Dhamdhere D M, "Operating Systems: A Concept-based Approach", Tata McGraw Hill Education, 2nd Edition, 2007.
4. William Stallings, "Operating Systems: Internals and Design Principles", Prentice Hall, 7th Edition, 2011.

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20IT502OE	INTRODUCTION TO DATABASE	L T P C 3 0 0 3

OBJECTIVES:

The Student should be made to:

- Correlate the role of database management systems in information technology applications
- Structure data using relational model
- Explore the features of structured query language
- Reduce the anomalies using Normalization
- Manage transaction and concurrency control techniques

UNIT I DATABASE FUNDAMENTALS **9**

Purpose of Database Systems – View of Data - Database System Architecture – Database Users and Administrators – Data Models – Structure of Network Model – Structure of Hierarchical Model – Entity Relationship Model – Constraints – Removing Redundant Attributes in Entity Sets – E-R Diagrams – Design Issues – Extended E-R Features – Introduction of Relational Model – E-R Reduction to Relational Schemas

UNIT II RELATIONAL DATABASE MODEL **9**

Structure of Relational Databases – Database Schema – Schema Diagrams – Relational Query Languages – Relational Algebra – Tuple Relational Calculus – Domain Relational Calculus

UNIT III STRUCTURED QUERY LANGUAGE **9**

Overview of SQL query language – SQL Data definition – Basic Structure of SQL Queries – Additional Basic Operations – Set Operations – Null values – Aggregate Operations – Nested Subqueries – Joins – Views – Integrity Constraints – Authorization. Introduction to Advanced SQL: Functions and Procedures – Triggers

UNIT IV NORMALIZATION **9**

Functional Dependencies – Non-loss Decomposition – Dependency Preservation – First, Second, Third Normal Forms – Boyce Codd Normal Form

UNIT V TRANSACTION AND CONCURRENCY CONTROL **9**

Transaction Model – ACID properties – Transaction States – Serializability – Conflict serializability – View Serializability – Testing Serializability. Concurrency Control – Lock Based Protocols – Deadlocks – Multiple Granularity – Time Stamp Based Protocols – Validation Based Protocols.

TOTAL: 45 PERIODS

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OUTCOMES:

On successful completion of this course, the students will be able to,

- Draw the ER Diagram for enterprise applications
- Design databases using relational model
- Query the database using SQL
- Apply normalization techniques on the databases
- Perform transaction and concurrency control techniques

TEXTBOOKS:

1. Henry F Korth, Abraham Silberschatz, Sudharshan S, "Database System Concepts", McGraw Hill, 6th Edition, 2011.
2. Date C J, Kannan A and Swamynathan S, "An Introduction to Database Systems", Pearson Education, 8th Edition, 2006.

REFERENCE BOOKS:

1. Elmasri R and Navathe S B, "Fundamentals of Database Systems", Pearson Education/Addison Wesley, 6th Edition, 2010.
2. Thomas Cannolly and Carolyn Begg, "Database Systems, A Practical Approach to Design, Implementation and Management", Pearson Education, 5th Edition, 2009.
3. Raghu Ramakrishnan and Johannes Gehrke, "Database Management Systems", McGraw Hill, 3rd Edition 2004.

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BoS (IT)

20EE501OE **NON-CONVENTIONAL ENERGY RESOURCES** **L T P C**
3 0 0 3

OBJECTIVES:

The student should be made to:

- Acquire knowledge on various sources of non-conventional energy
- Learn the fundamental concepts about solar energy systems and devices
- Design wind turbine system and know about facts of wind energy in electricity generation
- Understand the geothermal and biomass energy system
- Discuss other energy sources

UNIT I INTRODUCTION **9**

Electric energy from conventional sources – Energy reserves – Power scenario in India – Types of renewable energy sources – New technologies of energy resources – Impact on renewable generation on environment – Biochemical cycles – Global warming potential – Forest resources and water management in India – Biodiversity.

UNIT II SOLAR ENERGY **9**

Solar radiation – Geometry, Estimation and Measurements – Solar thermal energy storage – Solar thermal electric power plant – Solar ponds – Solar air heaters – Solar cookers – Solar air conditioning and refrigerators – Solar greenhouse – Solar photovoltaic system and its standards – Application of PV system – PV hybrid system.

UNIT III WIND ENERGY **9**

Classification of wind turbines and rotors – Terms used in wind energy – Wind energy characteristics – Land for wind energy – Design of wind turbine rotor – Modes of wind power generation – Estimation of wind energy potential – Wind resource assessment in India – Grid system and properties.

UNIT IV GEOTHERMAL AND BIOMASS ENERGY **9**

Structure of Earth's interior – Geothermal resources and its power generation – Biomass resources – Biomass conversion technology – Biochemical conversion – Biomass gasification – Biogas and its plant – Power generation from liquid waste – Biomass cogeneration – Biodiesel – Biofuel petrol.

UNIT V OTHER ENERGY SOURCES **9**

Tidal energy: Tidal characteristics – Tidal energy and its potential estimation – Development of tidal power scheme – important component of tidal power plant – Tidal power development in India. Wave Energy: Factors affecting the wave energy – Mathematical analysis of wave energy – Principle of wave energy plant – Wave energy conversion machines. Ocean Thermal Energy Conversion (OTEC): Working Principle – Closed cycle OTEC system – Thermoelectric OTEC – Application and global development.

TOTAL: 45 PERIODS

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BoS (EEE)

OUTCOMES:

On successful completion of this course, the students will be able to,

- Demonstrate the various causes of renewable energy sources with environmental aspect
- Illustrate the concept of solar energy technology
- Analyze the techniques used in wind energy sources
- Know the classification and operation of geothermal and biomass sources
- Enumerate the details of other energy sources

TEXT BOOK:

1. Kothari P, Singal K C and Rakesh Ranjan, "Renewable Energy Sources and Emerging Technologies", 2nd Edition, PHI Pvt. Ltd., New Delhi, 2011.

REFERENCES:

1. Godfrey Boyle, "Renewable Energy - Power for a Sustainable Future", Oxford University Press, U.K, 1996.
2. Twidell J W and Weir A, "Renewable Energy Sources", EFN Spon Ltd., UK, 1986.
3. Tiwari G.N, "Solar Energy – Fundamentals Design", Modelling and Applications, Narosa Publishing House, New Delhi, 2002.
4. Shobh Nath Singh, "Non-Conventional Energy Resources", Pearson Education, 2015.
5. Scott Grinnell, "Renewable Energy and Sustainable Design", Cengage Learning, USA, 2016.

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BoS (EEE)

20EE502OE **INDUSTRIAL AUTOMATION** **L T P C**
3 0 0 3

OBJECTIVES:

The student should be made to:

- Acquire knowledge on industrial automation systems
- Illustrate the field level equipment's in industrial automation
- Develop basic programming with PLC
- Understand the theory and operation of SCADA system
- Design a industrial application based problems

UNIT I INTRODUCTION **9**

Industrial control system – Automation and process control – Purpose of industrial automation – Industrial automation circuits – Computer based industrial control and automation – Architecture of the basic three level integrated industrial automation systems – Distributed control system.

UNIT II FIELD LEVEL EQUIPMENTS **9**

Sensors: Thermal overload relay – Proximity and photoelectric switch – Limit, level and flow switches – Temperature and pressure switch. Actuators: Electric motors – Pneumatic actuators – Micro Electro Mechanical System – Solenoid linear actuators – Different types of relays – Timers, Drum switches and special components – Pneumatic devices.

UNIT III PROGRAMMABLE LOGIC CONTROLLERS **9**

Introduction to PLCs – Modular construction of PLC – PLC I/O components – I/O modules – Special purpose of I/O modules – Central processing unit – PLC expansion and I/O configuration – Introduction to programming of PLCs – Basic programming instructions – PID control in the industry.

UNIT IV HMI AND SCADA **9**

HMI controls for data acquisition – Developer and runtime packages – Available tools – Definition of tags – Display of real time parameters in graphical form – Generation of various reports – Logging of alarms, trend curves and historical reports.

UNIT V COMMUNICATION PROTOCOLS **9**

Serial and Parallel communication – Communication topology – Field bus and similar standards – RTU/MTU communications.

TOTAL: 45 PERIODS

OUTCOMES:

On successful completion of this course, the students will be able to,

- Gain knowledge on the basics of industrial automation system
- Understand the working of different field level equipments
- Analyze the theory and operation of PLC programming instructions
- Impart the knowledge of SCADA system
- Develop various industrial automation applications

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TEXT BOOKS:

1. Stamatios Manesis and George Nikolakopoulos, "Introduction to Industrial Automation", CRC Press, 2018.
2. Stuart A Boyer, "SCADA: Supervisory Control and Data Acquisition", 4th Edition, ISA Press, USA, 2009.

REFERENCES:

1. John W Webb and Ronald A Reis, "Programmable Logic Controllers: Principles and Applications", Prentice Hall India, 2003.
2. William Bolton, "Programmable Logic Controllers", Elsevier, Sixth Edition, 2015.
3. Gupta A K, "Industrial Automation and Robotics: An Introduction", Mercury Learning & Information, 2016.
4. Krishna Kant, "Computer Based Industrial Control", Second Edition, Prentice Hall of India, 2010.
5. Popovic D and Bhatkar V P, "Distributed Computer Control for Industrial Automation", Marcel Dekkar Inc., Newyork, 1990.

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BoS (EEE)

20ME601OE **PRODUCTION TECHNOLOGY**

L	T	P	C
3	0	0	3

OBJECTIVES:

The student should be made to:

- Identify and select suitable materials for various engineering applications
- Understand the concept of metal casting process
- Know about the various types of welding processes
- Understand the working principles of machine tools such as Lathe, Shaping, Milling, Drilling and Grinding
- Learn about the basic concepts of Computer Numerical Control (CNC) machine tool

UNIT I ENGINEERING MATERIALS **9**

Engineering Materials – Classification – Mechanical properties of materials – strength, elasticity, plasticity, stiffness, malleability, ductility, brittleness, toughness, hardness, resilience, machinability, formability and weldability – Steels and Cast irons : Carbon steels – classifications based on percentage of carbon – properties and applications – Alloy steels: Stainless steel and tool steel.- Cast iron and its types.

UNIT II METAL CASTING PROCESSES **9**

Sand Casting : Sand mould – Type of patterns – Pattern materials – Pattern allowances – Moulding sand properties – Core – Moulding machines – Types and applications; Melting furnaces : Blast and Cupola furnaces; Principle of special casting processes: Shell – investment – Ceramic mould – Pressure die casting – Centrifugal casting - Stir casting; Defects in sand casting.

UNIT III WELDING **9**

Introduction, classification of welding processes – Gas welding, types of flames and applications. Electric arc welding, Resistance welding, Soldering and Brazing processes and their uses.

UNIT IV MACHINING **9**

Centre lathe – Constructional features – Specifications – Operations performed – Special machines: Shaper, Drilling, Milling and Grinding machines – Constructional details and its operations.

UNIT V CNC MACHINE **9**

Numerical Control (NC) machine tools – CNC: types, constructional details, special features – design considerations of CNC machines for improving machining accuracy – Structural members – Slide ways – Linear bearings – Ball screws – Spindle drives and feed drives.

TOTAL: 45 PERIODS

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BoS (MECH)

OUTCOMES:

On successful completion of this course, the students will be able to,

- Gain knowledge on engineering materials
- Know about the casting process and its defects
- Understand the construction and working principles of gas, arc welding and resistance welding process
- Identify the suitable machining process for the given component
- Describe the constructional and operational features of CNC machines

TEXT BOOKS:

1. Kalpakjian and Schmid, "Manufacturing Engineering and Technology", Pearson Education India Edition, 2014.
2. Hajra Choudry S K, "Elements of Workshop Technology-Vol. II", Media Promoters and Publishers Pvt. Ltd, 2010.

REFERENCES :

1. Nagendra Parashar B S and Mittal R K, "Elements of Manufacturing Processes", Prentice Hall of India, 2011.
2. Rao P N, "Manufacturing Technology, Metal Cutting and Machine Tools", Tata McGraw Hill, New Delhi, 2013.
3. Chapman W A J, "Workshop Technology", Part I, II, III, E.L.B.S. and Edward Amold Publishers Ltd, London, 2004.

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BoS (MECH)

20ME602OE **BASICS OF AUTOMOTIVE COMPONENTS** **L T P C**
3 0 0 3

OBJECTIVES:

The student should be made to:

- Understand the various engine components of automobiles
- Illustrate the different types of transmission system used in automobiles
- Study the construction of various engine auxiliary systems
- Learn about working principles of steering, suspension and braking systems
- Describe about the fundamentals of alternative energy sources and Ignition

UNIT I ENGINE COMPONENTS **9**

Overview – Engine Components – Engine block, Crank shaft, Connecting rod, Cylinder Liners, Piston, Piston rings, Cylinder head – Camshaft, Valve, Rocker Arm, Spark Plug, Injector, Carburetor, Fuel pump.

UNIT II TRANSMISSION COMPONENTS **9**

Flywheel – Clutch – Friction plate, Clutch housing, Pressure plate. Gearbox – Propeller shaft – Differential – Conventional Differential, Rear axle.

UNIT III BODY COMPONENTS **9**

Types of automobiles – Vehicle construction and different layouts, Chassis, Frame and body – Vehicle aerodynamics.

UNIT IV STEERING, SUSPENSION SYSTEMS AND BRAKES **9**

Steering geometry and types of steering gear box-Power Steering, Types of Front Axle, Types of Suspension Systems, Pneumatic and Hydraulic Braking Systems, Antilock Braking System (ABS).

UNIT V ALTERNATIVE FUELS AND IGNITION SYSTEMS **9**

Use of Natural Gas, Liquefied Petroleum Gas, Bio-diesel, Bio-ethanol, Gasohol and Hydrogen in Automobiles. Ignition System – Battery and Magneto Ignition System – Principles of Combustion and detonation CI Engines. Lubrication and Cooling systems.

TOTAL: 45 PERIODS

OUTCOMES:

On successful completion of this course, the students will be able to,

- Recognize the various parts of the automobile and their functions
- Distinguish the working of different types of power transmission systems like clutch, gears
- Demonstrate the Vehicle construction and Vehicle aerodynamics
- Explain about the Steering, Brakes and Suspension systems
- Predict possible alternate sources of energy and ignition system for automotive Engines

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TEXT BOOKS:

1. Kirpal Singh, "Automobile Engineering", Vol. 1 and 2, Seventh Edition, Standard Publishers, New Delhi, 14th Edition 2017.
2. Ganesan V, "Internal Combustion Engines", Tata McGraw-Hill, 4th Edition, 2018.

REFERENCES:

1. Joseph Heitner, "Automotive Mechanics," East-West Press, Second Edition, 1999.
2. Jain K K and Asthana R B, "Automobile Engineering", Tata McGraw Hill Publishers, New Delhi, 2002.
3. Martin W, Stockel and Martin T Stockle, "Automotive Mechanics Fundamentals", The Good Heart-Will Cox Company Inc, USA , 1978.

CHAIRMAN
BoS (MECH)

20EC603OE **AUTOMOTIVE ELECTRONICS** **L T P C**
3 0 0 3

OBJECTIVE:

The students should be made to

- Learn the fundamental operation of automotive sub systems
- Gain the information about sensors and activators.
- Develop the skill on communications in automotive systems
- Gain knowledge on instrumentation and control
- Acquire the knowledge on motion control in vehicles

UNIT I FUNDAMENTALS OF AUTOMOTIVE SUB-SYSTEMS **9**

Automotive functional safety standards –Engine Management System (Gasoline & Diesel) – CRDI – Transmission (Manual & Automatic) – Suspension Systems – Entertainment Systems – Safety & Warning Systems – Heating and Air–conditioning – Instrument Clusters.

UNIT II AUTOMOTIVE SENSORS & ACTUATORS (QUANTITATIVE TREATMENT ONLY) **9**

Electronic Engine Control – Electronic Fuel Control System – Electronic Ignition – Air Flow Rate Sensor – Engine Crankshaft Angular Position Sensor – Hall Effect Position Sensor – Optical Position Sensor – Temperature Sensors – Exhaust Gas Oxygen Sensor – Knock Sensors – Actuators: Fuel Injection – Ignition – Hydraulic Actuators – Electrical Actuators – BLDC Motors & Drive amplifiers – MEMS based Sensors and Actuators.

UNIT III AUTOMOTIVE COMMUNICATIONS AND DIAGNOSTICS **9**

Network topologies for new generation vehicles – CAN, LIN, MOST and Flexray – Diagnostics –Fault codes & Freeze Frames – Automotive On–board and Off–board Diagnostics – Expert Systems.

UNIT IV AUTOMOTIVE INSTRUMENTATION **9**

Computer Based Instrumentation System – Fuel Quantity Measurement – Display Devices: LED, LCD, vacuum–fluorescent display – Integrated Vehicle electronic Systems –trip information system

UNIT V VEHICLE MOTION CONTROL **9**

Cruise Control Configuration – Stepper Motor Based Actuator – Vacuum Operated Actuator – Antilock Braking System – Electronic Suspension System – Electronic Steering Control.Case Study: Autonomous Vehicles.

Total: 45 Periods

OUTCOME:

At the end of the course, the students will be able to

- Analyze the operation of automotive sub system.
- Interface and control various sensors, actuators and displays in automotive systems.

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- Establish communication between various electronic peripherals in automobiles.
- Diagnostics the operation of automotive sub system.
- Interface advance instruments and apply vehicle motion control in automobiles.

TEXT BOOK:

1. William B. Ribbens, "Understanding Automotive Electronics", 6th Edition, Elsevier, 2017.
2. Robert Bosch Gmbh, "Automotive Electrics and Automotive Electronics", John Wiley & Sons, 2014.

REFERENCE

1. Ronald K. Jurgen, "Automotive Electronics Hand Book", 2nd Edition, McGraw–Hill, 1999.
2. Nathan Ida "Sensors, Actuators, and their Interfaces: A multidisciplinary introduction", Scitech Publishing, 2013.
3. Vijay K.Varadhan, K.J.Vinay, K.A.Jose, "RF MEMS and Their Applications", John Wiley & Sons, 2002.

ONLINE RESOURCES:

1. http://www.easi.com/automotive-electronic-systems.htm
2. http://www.automotive-electronics.co.uk
3. https://www.continental-automotive.com/en-gl/

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20BM701OE BIOINFORMATICS

L T P C
3 0 0 3

OBJECTIVES:

The student should be made to:

- Understand the how to acquire the DNA and protein structure and sequence
- Study the database indexing, search and sequence formats
- Learn the different data processing tools and methods
- Know the various analysis methods and software tools
- Get an awareness about the applications of Bioinformatics

UNIT I BIOLOGICAL DATA ACQUISITION 9

The form of biological information. Retrieval methods of DNA sequence, protein sequence and protein structure information

UNIT II DATABASES 9

Format and Annotation: Conventions for database indexing and specification of search terms, Common sequence file formats. Annotated sequence databases – primary sequence databases, protein sequence and structure databases, Organism specific databases

UNIT III DATA PROCESSING 9

Data – Access, Retrieval and Submission: Standard search engines; Data retrieval tools – Entrez, DBGET and SRS; Submission of (new and revised) data; Sequence Similarity Searches: Local versus Global. Distance metrics. Similarity and homology. Scoring matrices.

UNIT IV METHODS OF ANALYSIS 9

Dynamic programming algorithms, Needleman-wunsch and Smith-waterman.Heuristic Methods of sequence alignment, FASTA, and PSI BLAST.Multiple Sequence Alignment and software tools for pairwise and multiple sequence alignment.

UNIT V APPLICATIONS 9

Genome Annotation and Gene Prediction, ORF finding, Phylogenetic Analysis: Comparative genomics, orthologs, paralogs. Genome analysis – Genome annotation

TOTAL: 45 PERIODS

OUTCOMES:

On successful completion of this course, the students will be able to,

- Appreciate the DNA and protein sequence data acquisition
- Realize the database indexing, searching and various file formats
- Do Access, search and retrieval processing on data
- Analyze different methods, algorithms and software tools
- Apply the skills in different findings and do the analysis on various applications

TEXT BOOKS:

1. Arthur M Lesk, "Introduction to Bioinformatics", Fourth Edition, Oxford University Press
2. Dan Gusfield, "Algorithms on Strings, Trees and Sequences", Cambridge University Press

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REFERENCE BOOKS:

1. Pierre Baldi, Soren Brunak, "Bioinformatics The Machine Learning Approach", MIT Press
2. Durbin R, Eddy S, Krogh A, Mitchison G, "Biological Sequence Analysis Probabilistic models of proteins and nucleic acids", Cambridge University Press, 1998
3. David Mount, "Bioinformatics: Sequence and Genome Analysis", Cold Spring Harbor Laboratory Press, Second Edition
4. James D Tisdall, "Beginning Perl for Bioinformatics", O'Reilly Publisher

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20BM702OE FUNDAMENTALS OF NUTRITION

L T P C
3 0 0 3

OBJECTIVES:

The student should be made to:

- Develop knowledge in the basic area of Food Chemistry
- Know how digestion takes place in Human and the insights of Mechanical and Chemical digestion
- Learn the Glycemic and Non Glycemic indexes of Carbohydrates
- Understand food processing and technology subjects effectively
- Appreciate the similarities and complexities of the chemical components in food

UNIT I OVERVIEW OF NUTRITION 9

Definition, Six classes of nutrients, calculating energy values from food using the RDA, Nutritional status, Nutritional requirement, malnutrition, nutritional assessment of individuals and populations, dietary recommendations, Balanced diet planning: Diet planning principles, dietary guidelines; food groups, exchange lists, personal diet analysis

UNIT II DIGESTION 9

Digestion, Absorption and Transport: Anatomy and Physiology: Anatomy and Physiology of the digestive tract, Mechanical and Chemical digestion, Absorption of Nutrients

UNIT III CARBOHYDRATES 9

Glycemic and Non Glycemic carbohydrates, Blood glucose regulation, Recommendations of sugar intake for health, Health effects of fiber and starch intake, Artificial sweeteners; Importance of blood sugar regulation, Dietary recommendations for NIDDM and IDDM

UNIT IV PROTEINS AND LIPIDS 9

Proteins; Food enzymes; Texturized proteins; Food sources, functional role and uses in foods. Review of structure, composition and nomenclature of Fats. Non-glyceride components in fats and oils; Fat replacements; Food sources, functional role and uses in foods. Health effects and recommended intakes of lipids.Recommended intakes of proteins, Deficiency – short term and long term effects.

UNIT V METABOLISM, ENERGY BALANCE AND BODY COMPOSITION 9

Energy Balance, Body weight and Body composition, Health implications, Obesity, BMR and BMI Calculations, Weight control: Fat cell development, Hunger, Satiety and Satiation, Dangers of unsafe weight lost schemes, Treatment of obesity, Attitudes and behaviours toward weight control. Food and pharmaceutical grades, Toxicities, Deficiencies, Factors affecting bio availability, Stability under food processing conditions

TOTAL: 45 PERIODS

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OUTCOMES:

On successful completion of this course, the students will be able to,

- Describe the different classes nutrients
- Illustrate the digestion and absorption of Food substances
- Demonstrate the role of carbohydrates in producing the required energy
- Exhibit the energy balance and the body composition in detail
- Explain the significance of proteins and Lipids with its role

TEXT BOOKS:

1. Mann, Jim, Stewart Truswell, "Essentials of Human Nutrition", Third Edition, Oxford University Press, 2007.
2. Gibney, Michael J., et al, "Introduction to Human Nutrition", Second Edition, Blackwell, 2009.

REFERENCES:

1. Damodaran S, Parkin K L and Fennema O R, " Fennema's Food Chemistry Fourth Edition, CRC Press, 2008.
2. Belitz H D, Grosch W andSchieberle P, "Food Chemistry", Third Revised Edition, Springer, Verlag, 2004.

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BoS/BME

20CE701OE **ENVIRONMENTAL IMPACT ASSESSMENT** **L T P C**

3 0 0 3

OBJECTIVES:

The student should be made to:

- Carry out developmental projects for environmental and social assessments.
- Explain Life Cycle Assessment and elements of waste minimization.
- Develop knowledge on various hazardous waste management.
- Learn industrial air emission control measures.
- Know about EIA for various infrastructure projects.

UNIT I INTRODUCTION **9**

Definition & Concept-Hierarchy in EIA – Initial Environmental Examination (IEE) – Environmental Impact Statement (EIS) – Environmental appraisal – Rapid and Comprehensive EIA, EIS, FONSI and NDS – Need for EIA Studies – Advantages and limitation of EIA.

UNIT II METHODOLOGIES AND CLEARANCE PROCEDURE **9**

Application Forms – Category of projects – Formation of EIA study team Methods of EIA – Criteria for selection of EIA methodology – Check lists – Matrices – Network – Overlays – Cost-benefits analysis – EIS format – Teams of Reference (ToR).

UNIT III ASSESSMENT AND PREDICTION **9**

Baseline data – Assessment of Impact on land, water, air, noise, social, cultural, flora and fauna – Mathematical models – Predictive measures – Resettlement & rehabilitation – Public participation in EIA – EIA case studies for select projects.

UNIT IV ENVIRONMENTAL MANAGEMENT PLAN **9**

Environment audit – Types of audit – Definitions and concepts – Stage of environmental audit – compliance schedule – Contents of EA report – Preparation of audit report – Introduction to ISO and ISO 14000 – Environmental monitoring plan.

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UNIT V LEGISLATIONAND CASE STUDIES **9**

The Environmental Protection Act, The Water Act, The Air (Prevention & Control of pollution Act.), Motor Act, Wild life Act – Case studies and preparation of Environmental Impact assessment statement for various Industries.

TOTAL: 45 PERIODS

OUTCOMES:

On successful completion of this course, the students will be able to,

- Prepare and review environment impact assessment for various projects.
- Apply waste minimization strategies and waste reduction techniques.
- Reduce the generation of hazardous waste with proper disposal methods.
- Design industrial air emission control equipments with its standards.
- Apply EIA for various multi disciplinary projects.

TEXT BOOKS:

1. Gerard Kiely, "Environmental Engineering", Tata Mcgraw Hill Education Private Limited, New Delhi 2007.
2. Shukla S K and Srivastava P R, "Concepts in Environmental Impact Analysis",Common Wealth Publishers, New Delhi 2010.

REFERENCE BOOKS:

1. Canter R L, "Environmental Impact Assessment", McGraw Hill Inc, New Delhi, 2nd Edition 1996.

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BoS(CIVIL)

20CE702OE BUILDING SERVICES

L	T	P	C
3	0	0	3

OBJECTIVES:

The student should be made to:

- Understand how a building can be made comfortable and safe with the services designed and installed.
- Impart knowledge on basics of electrical wiring system.
- Recognize the importance of principles of illumination.
- Acquire awareness on various principles of refrigerant.
- Learn the principles on installation of fire safety components.

UNIT I MACHINERIES 9

Introduction of lifts and Escalators –Special features required for lifting arrangement and installation – Travelators – Controls – Machine room and equipments.

UNIT II ELECTRICAL SYSTEMS IN BUILDINGS 9

Basics of electricity distribution – Earthing systems and bonding – Electric wiring – Industrial installations – Lighting controls – Light sources, Lamps, Lighting design – Telecommunication installations.

UNIT III PRINCIPLES OF ILLUMINATION 9

Ventilation requirements – Mechanical ventilation – Fans and types – Boilers and types – Water treatments – Solar heating of water – Hot water storage cylinders.

UNIT IV REFRIGERATION PRINCIPLES 9

Heat emitters – Expansion facilities of heating system – Energy management system – Factors affecting fuels – Oil sand properties of natural gas – Air conditioning, principles and applications – Refrigerant and system characteristics – Heat recovery devices.

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UNIT V FIRE SAFETY INSTALLATION 9

Fire prevention and control systems – Fire alarms – Electrical alarm circuits –Smoke extraction and ventilation –Gas extinguishers – Types of detectors – Gas installation and components.

TOTAL: 45 PERIODS

OUTCOMES:

On successful completion of this course, the students will be able to,

- Understand the special features in installation of lifts and escalators.
- Analyze basics of electricity distribution in buildings.
- Acquire knowledge about requirements of ventilation.
- Learn the principles of air conditioning and energy management system.
- Recognize the need for fire detection and protection.

TEXT BOOKS:

1. Roger Greeno and Fred Hall, "Building Services Handbook", Elsevier Publishers 4th Edition, 2007.

REFERENCE BOOKS:

1. Steffy G, "Architectural Lighting Design", John Wiley and Sons, 3rd Edition, 2008.
2. Killinger J and Killinger L, "Heating and Cooling Essentials", Goodheart Wilcox Publishers, 2003.
3. Rao S and P Saluja H L,
4. "Electrical Safety, Fire Safety Engineering and Safety Management", Khanna Publishers, 1st Edition, 2016.
5. Ashrae, "Fundamentals and Equipment", ASHRAE Inc., Volume 4, 2005.

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20CS706OE

E-COMMERCE

(Common to BME, CIVIL, ECE, EEE and MECH)

L T P C
3 0 0 3

OBJECTIVES:

The Student should be made to:

- Study the basics of E-Commerce.
- Learn the activities involved in the E- commerce process.
- Focus the applications related to the EDI.
- Analyze the security issues in the E –commerce.
- Apply the E-commerce at various applications.

UNIT I INTRODUCTION 9

E-Commerce framework – E-Business models – Network infrastructure for E-commerce – Internet as a Network Infrastructure – E-commerce and World Wide Web.

UNIT II E-COMMERCE 9

Consumer oriented E-Commerce – Applications – Mercantile process models – Electronic Payment Systems – Digital Token based EPS – Smart cards – Credit cards – Risks – designing EPS – Study of e-commerce companies

UNIT III INTERORGANIZATIONAL COMMERCE AND EDI 9

Electronic Data Interchange: EDI applications in Business – EDI and E-Commerce – EDI standardization and implementation – Internet based EDI.

UNIT IV SECURITY ISSUES IN E-COMMERCE 9

Network Security – Client-Server Network Security – CS Security Threats – Firewalls – Data & Message Security – Encrypted Documents – Security on the Web.

UNIT V INTRAORGANIZATIONAL E-COMMERCE AND MARKETING 9

Internal Information System-Work-flow Automation and Coordination-Supply Chain Management-Document Library-Types of Digital Documents-Corporate Data Warehouses – Advertising and Marketing on the Internet .

TOTAL: 45 PERIODS

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BoS (CSE)

OUTCOMES:

On successful completion of this course, the students will be able to,

- Describe the basics of E-Commerce.
- Explain the activities involved in the E- commerce process.
- Develop the applications related to the EDI.
- Analyze the security issues in the E –commerce.
- Apply the E-commerce at various applications.

TEXT BOOKS:

1. Ravi Kalakota and Andrew B Whinston, "Frontiers of Electronic Commerce", Pearson Education Asia, 2009.

REFERENCES:

1. Marilyn Greenstein and Todd M Feinman ,"Electronic commerce: Security, Risk Management and Control", Tata McGraw-Hill , 2000.
2. Judy Strauss and Raymond Frost, "E Marketing", PHI, 2002.
3. Brenda Kienan, "Managing E Commerce Business", PHI, 2001.
4. Vivek Sharma and Rajiv Sharma, "Developing E Commerce Sites – an integrated approach", Pearson Education Asia, 2000.
5. Kamalesh K. Bajaj, "E-Commerce: The Cutting Edge & Business", Tata McGraw-Hill, 2003.

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20CS707OE **FUNDAMENTALS OF CLOUD COMPUTING** **L T P C**

(Common to ECE and EEE) **3 0 0 3**

OBJECTIVES:

The Student should be made to:

- Learn the basics and challenges of Cloud Computing
- Introduce the virtualization concepts and cloud file system
- Get an exposure on third-party cloud solutions
- Understand the cloud security and efficiency issues
- Explore the possibilities of applying cloud solutions in various applications

UNIT I INTRODUCTION TO CLOUD COMPUTING **9**

Overview of Distributed computing - Introduction to Cloud Computing: Definitions - Central idea - Properties and Characteristics - Benefits - Cloud service and deployment model - Organizational scenario - Architecture - Vocabulary - Challenges - Supporting services - Management and administration of Cloud services

UNIT II VIRTUALIZATION AND FILE SYSTEM **9**

Virtualization Techniques: Virtualization Technology - Overview of x86 virtualization - Types of virtualization - Virtualization products - VLAN - SAN - VM Migration - VM Consolidation and Management - Cloud interoperability standards Cloud File System: Distributed file system - GFS - HDFS

UNIT III CLOUD SOLUTIONS **9**

Different Cloud Providers and service comparison: Infrastructure service providers - Comparison between infrastructure service providers - Identification of business requirement - Cloud infrastructure setup procedure - Platform service providers - Comparison between platform service providers - Identification of business requirement - Cloud platform setup procedure - Cloud application development - Software service providers - Comparison between software service providers - Cloud Database - Cloud programming model - Private cloud computing platforms

UNIT IV CLOUD SECURITY - MIDDLEWARE AND TESTING **9**

Cloud Security: Fundamentals - Cloud Risk - Division - Security Architecture - VM Security Challenges - Vulnerability assessment tool for cloud - Open source security solution products - Cloud Middleware: Need for Cloud Middleware - QoS issues in cloud - Data migration and Streaming - Performance monitoring tools in cloud - Best practices - Cloud Testing: Types - Testing strategy

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UNIT V CLOUD APPLICATIONS AND CASE STUDIES **9**

Advanced Cloud Applications - Sharing and Collaborative services in cloud - Outside the cloud services - Cloud Analytics - Software plus services - Cloud Content Delivery Network services (CDN) - Mobile cloud computing - Sky computing - Cloud governance - Case Study: Cloud infrastructure adoption case study - Cloud platform adoption case study - Cloud software services adoption case study - Cloud simulation tools - Future of cloud computing

TOTAL: 45 PERIODS

OUTCOMES:

On successful completion of this course, the students will be able to,

- Identify the challenges in Cloud Computing adoption
- Implement virtualization and work with cloud file system
- Identify the various cloud-based solutions available with different providers
- Secure and optimize the cloud for delivering better performance
- Identify and provide cloud-based solution for the problem under consideration

TEXT BOOKS:

1. Rishabh Sharma, "Cloud Computing Fundamentals, Industry Approach and Trends", Wiley India, 2015.
2. Kai Hwang, Geoffrey C Fox, Jack G Dongarra, "Distributed and Cloud Computing from Parallel Processing to the Internet of Things", Morgan Kaufmann Publishers, 2012

REFERENCES:

1. Ronald L. Krutz, Russell Dean Vines, "Cloud Security – A comprehensive Guide to Secure Cloud Computing", Wiley – India, 2010.
2. John W.Rittinghouse and James F.Ransome, "Cloud Computing: Implementation, Management, and Security", CRC Press, 2010.
3. George Reese, "Cloud Application Architectures: Building Applications and Infrastructure in the Cloud" , O'Reilly

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BoS (CSE)

20EE701OE	ENERGY STORAGE SYSTEMS (COMMON TO ALL BRANCHES)	L T P C 3 0 0 3

OBJECTIVES:

The students should be made to:

- Understand the basic concepts of energy storage devices
- Learn the performance of various types of batteries
- Explain the operation of fuel cells and ultracapacitors
- Analyse the application of energy storage devices
- Know the thermal and mechanical energy storage systems

UNIT I ENERGY STORAGE TECHNOLOGIES **9**

Introduction – Need of energy storage – Battery – Components of cells and batteries – Classification – Operation of a cell – Theoretical cell voltage, capacity and energy – Electrochemical principles and reactions: Cell polarization – Electrical double–layer capacity and ionic adsorption – Mass transport to the electrode surface – Factors affecting battery performance – Standards.

UNIT II PRIMARY AND SECONDARY BATTERIES **9**

Battery parameters and specification – Performance, charging and discharging – Storage density, energy density, classical and modern batteries: Zinc–chloride, Nickel cadmium, Leadacid, Nickel hydride and Lithium battery – Principle and working.

UNIT III ADVANCED BATTERIES FOR EV APPLICATIONS **9**

Ultracapacitors: Features – Basic principles of ultracapacitors – Performance of ultracapacitors – Mathematical model. Fuel cells: Operating principles – Characteristics – Polarization loss – Fuel cells technologies – Comparison of fuel cells, hybridization of energy storage systems.

UNIT IV APPLICATIONS OF BATTERIES **9**

Storage of solar – Greenhouse heating – Power plant application – Batteries in space – Storage in electric supply networks – Automotive application in hybrid and electric vehicles – Role of ultracapacitors in EVs.

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UNIT V THERMAL AND MECHANICAL ENERGY STORAGE 9

Thermal energy storage – Energy storage in hydrogen – Energy storage in flywheels – Pumped hydro storage – Elastic energy storage – Applications.

TOTAL: 45 PERIODS

OUTCOMES:

On successful completion of this course, the students will be able to,

- Describe the working of energy storage devices
- Differentiate the characteristics of various primary and secondary batteries
- Compare the operation of ultracapacitors and fuel cells
- Summarize the applications of batteries
- Explain the different energy storage techniques

TEXT BOOK:

1. Robert A Huggins, "Energy Storage–Fundamentals, Materials and Applications", 2nd Edition, Springer, 2016.

REFERENCES:

1. Ibrahim Dincer and Marc A Rosen, "Thermal Energy Storage: Systems and Applications", 2nd Edition, John Wiley and Sons, 2011.
2. Ru-shiLiuLei Zhang, Xueliang Sun, Hansan Liu andJiujun Zhang, "Electrochemical Technologies for Energy Storage and Conversion", Wiley publications, 2012.
3. Ali Emadi, Mehrdad Ehsani and John M Miller, "Vehicular Electric Power Systems", Special Indian Edition, Marcel dekker, Inc 2010.
4. Tetsuya Osaka and MadhavDatta, "Energy Storage Systems in Electronics", Gordon and Breach Science Publishers, 2000.
5. Iqbal Hussain, "Electric and Hybrid Vehicles: Design Fundamentals", 2nd Edition, CRC Press, Taylor and Francis Group, 2011.

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BoS (EEE)

20EE702OE	ELECTRICAL SAFETY ENGINEERING (COMMON TO ALL BRANCHES)	L T P C 3 0 0 3

OBJECTIVES:

The students should be made to:

- Know the concepts of safety engineering
- Learn the various electrical hazards and safety equipment
- Analyze the grounding and bonding techniques
- Compare the safety methods for various electrical equipment
- Understand the various standards for proper maintenance of electrical equipment

UNIT I CONCEPTS IN SAFETY 9

Introduction – Electrostatics, electro magnetism, stored energy, energy radiation and electromagnetic interference – Working principles of electrical equipment – Indian electricity act and rules – Statutory requirements from electrical inspectorate – International standards on electrical safety – First aid – Cardio Pulmonary Resuscitation(CPR).

UNIT II ELECTRICAL HAZARDS AND SAFETY EQUIPMENTS 9

Primary and Secondary hazards – Arc, blast and shocks – Causes and effects – Safety equipment – Person Protection Equipment(PPE), Head and eye protection, flash and thermal protection. Rubber insulating equipment, hot sticks, insulated tools, barriers and signs, safety tags and locking devices – Voltage measuring instruments – Proximity and contact testers – Safety electrical one line diagram – Electrician's safety kit.

UNIT III GROUNDING AND BONDING TECHNIQUES 9

General requirements for grounding and bonding – Definitions – Grounding of electrical equipment – Bonding of electrically conducting materials and other equipment – Connection of grounding and bonding equipment – System grounding – Purpose of system grounding – Grounding electrode system – Grounding conductor connection to electrodes – Use of grounded circuit conductor for grounding equipment – Grounding of low voltage and high voltage systems.

UNIT IV SAFETY METHODS OF EQUIPMENT 9

The six step safety methods – Pre job briefings – Hot–Work decision tree – Safe switching of

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power system – Lockout – Tag out – Flash hazard calculation and approach distances – Calculating the required level of arc protection – Safety equipment – Procedure for low, medium and high voltage systems – The one minute safety audit.

UNIT V SAFETY SCHEDULE AND MAINTENANCE 9

Safety related case for electrical maintenance – Reliability Centered Maintenance (RCM) – Eight step maintenance programme – Frequency of maintenance – Maintenance requirement for specific equipment and location – Regulatory bodies – National electrical safety code – Standard for electrical safety in work place – Occupational safety and health administration standards.

TOTAL: 45 PERIODS

OUTCOMES:

On successful completion of this course, the students will be able to,

- Explain the basic concepts related to safety
- Describe electrical hazards and safety equipment
- Identify various grounding and bonding techniques
- Select appropriate safety method for low, medium and high voltage equipment
- Conduct proper maintenance of electrical equipment according to standards

TEXT BOOK:

1. John Cadick, Mary Capelli–Schellpfeffer, Dennis K Neitzel and Al Winfield, "Electrical Safety Handbook", 4th Edition, McGraw–Hill Education, 2012.

REFERENCES:

1. Mohamed El Sharkawi, "Electric Safety–Practice and Standards", CRC Press, 2014.
2. Maxwell Adams J, "Electrical Safety–A guide to the Causes and Prevention of Electric Hazards", 1st Edition, The Institution of Engineering and Technology, 1994.
3. Ray A Jones, Ray Jones and Jane G Jones, "Electrical Safety in the Workplace", 1st Edition, Jones and Bartlett Learning, 2000.
4. Fortham Cooper W, "Electrical Safety Engineering", 1st Edition, Butterworth and Company, London, 1998
5. Kimberly Keller, "Electrical Safety Code Manual", Elsevier, 2010.

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BoS (EEE)

20ME701OE	BASICS OF HYDRAULIC AND PNEUMATIC SYSTEMS	L	T	P	C
		3	0	0	3

OBJECTIVES:

The Students should be made to:

- Study the fundamentals of fluid power systems
- Understand the working of hydraulic pumps and actuators
- Know about control valves and accumulators in hydraulic systems
- Learn the various components of pneumatic and electro-pneumatic systems
- Identify the various trouble shoots in hydraulic and pneumatic systems

UNIT I FUNDAMENTALS OF FLUID POWER SYSTEMS 9

Introduction – fluid power systems – types – components – properties of fluids – types of fluids – applications of Pascal's law – principle of hydraulic flow - laminar and turbulent flow – Reynolds's number – Darcy's equation – losses in valves and fittings – advantages and applications of fluid power – fluid power ANSI symbols.

UNIT II HYDRAULIC PUMP AND ACTUATORS 9

Principles of hydraulic system – pumping theory – pump classification - gear pump, vane pump, piston pump – fluid power actuators – linear hydraulic actuators - single acting, double acting and special type – rotary actuators - gear, vane and piston motors – hydraulic cushioning.

UNIT III CONTROL COMPONENTS IN HYDRAULIC SYSTEMS AND ACCUMULATORS 9

Directional Control Valve (DCV) - check valve, 3/2 DCV and 4/3 DCV – pressure control valve - pressure relief valve and pressure reducing valve – flow control valve - pressure compensated and non pressure compensated – mechanical servo valves – proportional valves – comparison of servo and proportional valve – accumulators – types - weight loaded, spring loaded and gas loaded accumulators – intensifier – intensifier press circuit.

UNIT IV PNEUMATIC AND ELECTRO PNEUMATIC SYSTEMS 9

Principles of pneumatic system – properties of air – compressors – Filter, Regulator and Lubricator (FRL) unit – muffler – air control valves – pneumatic actuators – components of electrical control - switches, solenoids, relays and timers – electro pneumatic system - electro pneumatic circuits - reciprocation, sequencing and regenerative – introduction to fluidics.

UNIT V TROUBLE SHOOTING AND APPLICATIONS 9

Hydraulic and pneumatic systems: Installation, selection, maintenance, troubleshooting and remedies – low cost automation – Case studies: Conveyor feed system, car parking barriers, pick and place robot.

TOTAL: 45 PERIODS

OUTCOMES:

On successful completion of this course, the students will be able to,

- Explain the basic concepts of fluid power systems
- Describe the functions of various hydraulic pump and actuators
- Familiarize with different types of control valves and accumulators
- Understand the functions of pneumatic and electro pneumatic systems

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BoS (MECH)

- Analyse the various trouble shooting methods of hydraulic and pneumatic systems

TEXT BOOKS:

1. Anthony Esposito, "Fluid Power with Applications", Pearson Education India, 7th Edition, 2013.
2. Srinivasan R, "Hydraulic and Pneumatic Controls", Vijay Nicole, 3rd Edition, 2019.

REFERENCES:

1. Majumdar S R, "Oil Hydraulics Systems-Principles and Maintenance", Tata McGraw Hill, 2017.
2. Majumdar S R, "Pneumatic Systems-Principles and Maintenance", Tata McGraw Hill, 1st Edition, 2011.
3. Shanmugasundaram K, "Hydraulic and Pneumatic Controls", S.Chand & Co, 1st Edition, 2006.

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20ME702OE	ALTERNATIVE ENERGY FUELS	L	T	P	C
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OBJECTIVES:

The Students should be made to:

- Familiarize with various sources of energies available in universe
- Study the methods of liquid fuel extraction
- Know the concepts of fuel cells and types
- Learn the properties and preparation techniques of biodiesel
- Understand the production techniques of nuclear energy

UNIT I INTRODUCTION TO ENERGY 9

World energy consumption – petroleum – natural gas – coal – nuclear energy – geo thermal energy – renewable energy - solar, wind, tidal, biomass and hydropower.

UNIT II LIQUID FUELS 9

Introduction to coal pyrolysis – char oil energy development process – TOSCOAL process – Lurgi-Ruhr gas process – occidental flash pyrolysis process – clean coke process – coalcon process.

UNIT III FUEL CELLS 9

Introduction – basic concepts – design characteristics – operation – thermal efficiency – cell voltage – fuel cell system – general description – fuel cell classifications – low temperature fuel cells - proton exchange membrane fuel cells and alkaline fuel cells – high temperature fuel cells - molten carbonate fuel cells and solid oxide fuel cells.

UNIT IV BIODIESEL 9

Introduction – transesterification process for biodiesel manufacture – pretreatment of oil – transesterification reaction in a biodiesel reactor – product and by-product separation – purification – properties of biodiesel – cetane number – calorific value – general physical properties of biodiesel – cold flow properties – material compatibility.

UNIT V NUCLEAR ENERGY 9

Nuclear fission and nuclear reactor physics – electricity generation from nuclear reactors – nuclear fuel cycle – types of reactors – advanced reactors and concepts – hydrogen production – nuclear waste disposal – nuclear fusion.

TOTAL: 45 PERIODS

OUTCOMES:

On successful completion of this course, the students will be able to,

- Explain the various sources of energy
- Demonstrate liquid fuel extraction through pyrolysis processes
- Understand the importance and design considerations of fuel cells
- Describe the process involved in the extraction of biodiesel
- Analyse the utilization and waste disposal of nuclear energy

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TEXT BOOKS:

1. Sunggyu Lee, James G Speight, "Handbook of Alternative Fuel Technologies", CRC Press, Taylor & Francis Group, 2014.
2. Arumugam S Ramadhas, "Alternative Fuels for Transportation", Taylor & Francis, 2016.

REFERENCES :

1. Donald L Klass, "Biomass for Renewable Energy, Fuels and Chemicals", Elsevier-Academic Press, 1st Edition.
2. Sunggyu Lee, "Alternative Fuels", CRC Press, Taylor & Francis, 1st Edition.
3. Suresh M, Rajkumar S, Lakshminarayanan A K, "Alternative Energy Sources, Materials and Technologies", Trans Tech Publications Limited, 2015.

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20IT701OE	PROGRAMMING IN JAVA	L T P C 3 0 0 3

OBJECTIVES:

The students should be made to:

- Learn the fundamentals of object oriented programming in Java.
- Be familiar with the Object Oriented concepts in Java
- Be exposed to the usage of Arrays in Java programming
- Understand the mechanism in handling exceptions, Multithreading and I/O.
- Demonstrate the concepts of AWT, event handling used in GUI.

UNIT I INTRODUCTION 9

Introduction to Java – History of Java – FOP versus OOP – OOOPs Concepts - Java Programming Paradigm – Features of Java Programming – Java Programming Environment – C vs Java - Tools available for Java Programming – Java Architecture - Data types and Character set – Variables - Identifiers – Keywords – Operators - A Simple Java Program – Analysis of the program – Command line input in Java – Input using Scanner class

UNIT II CLASS, OBJECT and INHERITANCE 9

Class – Class Structure – Object declaration – Object Initialization - Declaring Multiple Classes - Adding methods to Class – Constructor – this Keyword – Multiple Constructors – Constructor Overloading - Control Statements – Inheritance – Method Overriding – Super Keyword – Abstract Class– final Keyword – Access Modifiers - Packages in Java – Interface – Iterator – Cloneable – Serializable – Comparable

UNIT III ARRAYS 9

Array in Java: Creation of Array – Storing elements in Array – Processing elements in Array – 2D Array and 3D Array – Java Scope – Static Keyword – Static Variable – Static Method – Nested Class – Recursion

UNIT IV EXCEPTION HANDLING, MUTITHREADING AND I/O STREAMS 9

Exception Handling - Multithreading –Thread – Life Cycle of Thread – Thread Control Methods – Thread Types – Thread Scheduling – Thread Synchronization - I/O Stream – Character Stream Class - Data Input Stream – Data Output Stream – File Handling - Java networking - JDBC - Connectivity

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UNIT V APPLET, AWT and SWING 9

Java Applet Programming : Applet – Building an applet – Hosting an applet – Running an Applet – Basic Structure of an applet – Basic Methods in applet – Input passing to an Applet – Application Versus Applet – Applet Events – Basics of HTML – Applet Tag Properties - AWT Programming – Classes of AWT – Components – Methods – Containers – Event Handling – Classes – Interfaces - SWING: Introduction – Swing Components – Containers – Events - Hierarchy of Swing class

OUTCOMES:

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

- Explain the fundamentals of Java programming
- Use the concept of object oriented programming in Java
- Implement the mechanism of array and recursion.
- Develop applications for concurrent processing and I/O with exception handling.
- Build interactive GUI applications in Java programming

TEXT BOOK:

1. Hebert Schildt, "Java: The Complete Reference, Eleventh Edition", 7th Edition, McGraw-Hill, 2010.

REFERENCE(S):

1. Kathy Sierra, Bert Bates, "Head First Java", 2nd Edition, O'Reilly Media, Inc., 2005.
2. Y.Daniel Liang, "Introduction to Java Programming", 11th Edition, Pearson Education, 2017.
3. https://onlinecourses.nptel.ac.in/noc21_cs56/preview

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20IT702OE **WEB DESIGN** **L T P C**
3 0 0 3

OBJECTIVES:
The Student should be made to:

- Enhance the knowledge of how to develop a Web page using HTML
- Classify the various style and dimensions of CSS
- Design the web page using JavaScript
- Design the web page using DOM
- Implement the various approach of database connectivity

UNIT I INTRODUCTION **9**

Introduction to HTML – Benefits of HTML – Structure of an HTML Document, HTML Tags: Attributes – meta Elements – Linking – Lists- Tables- Forms- Form Elements- Form Attributes – Web services.

UNIT II CASCADING STYLE SHEETS **9**

Introduction to CSS - Inline Styles – Conflicting Styles- Style Sheets- Positioning Elements – Backgrounds –Dimensions- Text Flow- Media Types – Drop-Down Menu.

UNIT III SCRIPTING LANGUAGE **9**

Introduction to Scripting Language – Data Types - Variables – Expressions – Operators and Control Statements – Arrays – User Defined Functions – Events.

UNIT IV JAVASCRIPT OBJECTS **9**

JavaScript Objects: String – Math – Date – Boolean and Number – Window – Document – Document Object Model(DOM) – DOM Collections – Dynamic Styles.

UNIT V IMPLEMENTATION STRATEGIES **9**

Introduction to PHP: Basics – String Processing and Regular Expressions – Form Processing and Business Logic – Connecting to a Database – Using Cookies – Dynamic Content – Operator Precedence Chart – Database Connectivity: SQL: DDL – DML- MySQL: Creating Database in MySQL – Mini Project.

TOTAL: 45 PERIODS

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OUTCOMES:

On successful completion of this course, the students will be able to,

- Identify different types of HTML tags, their functionality and attributes and learn the basics of web services
- Classify CSS to control the appearance of web pages and denote the background elements and media types
- Incorporate JavaScript variables, operators and functions in web pages and manipulate HTML forms to validate user inputs
- Demonstrate various JavaScript object models and create a web pages with dynamic style using JavaScript and DOM
- Demonstrate the database connectivity and simple PHP application program using web Server

TEXT BOOKS:

1. Paul Deitel, Harvey Deitel, Abbey Deitel, "Internet & World Wide Web: How to Program", 5th Edition, Pearson, 2011
2. KoGent Learning Solutions Inc., "Web Technologies: HTML, JavaScript, PHP, Java, JSP, ASP.NET, XML and AJAX", Kindle Edition, Dreamtech Press, 2012.

REFERENCES :

1. Robert. W. Sebesta, "Programming the World Wide Web", 8th Edition, Pearson Education, 2015.
2. Jeffrey C.Jackson, "Web Technologies: A Computer Science Perspective", Pearson Education, 2007.
3. http://www.w3schools.com/

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20EC801L **PROJECT WORK** **L T P C**
3 0 20 10

OBJECTIVES:

The Student should be made to:

- Learn the objective of this project is to provide opportunity for the students to implement their skills acquired in the previous semesters to practical problems/problems faced by industry/development of new facilities.
- Analyze a problem with an indepth study of reputed journal in the selected domain.
- Make the students come up with innovative/ new ideas in his area of interest.
- Identify, analyze and develop opportunities as well as to solve the selected Engineering problems
- Communicate the findings in the peer reviewed National / International Conferences/Journals.

The students in a group of 3 to 4 works on a topic approved by the head of the department under the guidance of a faculty member and prepare a comprehensive project report after completing the work to the satisfaction of the supervisor. The progress of the project is evaluated based on a minimum of three reviews. The review committee may be constituted by the Head of the Department. A project report is required at the end of the semester. The project work is evaluated based on oral presentation and the project report jointly by external and internal examiners constituted by the Head of the Department.

ROLES AND RESPONSIBILITIES

HOD/COORDINATOR

The role of HOD/Coordinator is to coordinate with supervisor, internal examiner, external examiner and students. The HOD/Coordinator should monitor the students' project progress in coordination with the respective supervisors. The HOD/Coordinator is responsible for arranging the proposal defense, midterm and final defense. The HOD/Coordinator should participate and evaluate proposal defense, midterm, and final defense.

PROJECT SUPERVISOR

The role of project supervisor is to supervise students' project throughout the semester. The supervisor should rigorously feedback and guides the students. Supervisor is to participate and evaluate proposal defense, midterm, and final defense. The supervisor should monitor the progress of projects under supervision.

INTERNAL EXAMINER

The role of internal examiner is to evaluate the students' project during different evaluation phases of the project. The internal examiner should participate and evaluate proposal defense, midterm, and final defense.

EXTERNAL EXAMINER

The role of external examiner is to evaluate the students' project during final defense evaluation. The examiner should participate and evaluate viva voce and demonstration session during the final defense.

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STUDENT

The role and responsibilities of student include development of the project, project report preparation, and defending the project work throughout each evaluation phases. Despite of project work being group work, each student should have equal role and responsibilities in the project. Each student will be evaluated individually so student should be able to demonstrate his/her contribution in the project work individually. Students should maintain a log visits with their supervisors at different dates during their work. The log should include technical feedbacks from their supervisors.

TOTAL: 300 PERIODS

OUTCOMES:

On successful completion of this course, the students will be able to,

- Get an idea and confidence in designing, analysing and executing the project
- Apply the knowledge of latest trends in fabrication/ manufacturing and Relate their ideas while executing the project.
- Have complete understanding of executing the project.
- Prepare the project reports and give proper explanation during the presentation and demonstration.
- Report/Present/Publish the findings in the peer reviewed National / International Conferences/Journals.

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