RAJALAKSHMI ENGINEERING COLLEGE
(An Autonomous Institution Affiliated to Anna University, Chennai)

DEPARTMENT OF ELECTRONCS AND COMMUNICATION ENGINEERING

VISION

To produce globally competent Electronics and Communication Engineers with a commitment to serve the society.

MISSION

M1 To impart training with the best of teaching expertise supported by excellent laboratory infrastructure and exposure to recent trends in the industry.

M2 To ensure that the students are molded into competent Electronics and Communication engineers with the knowledge of computer applications and worthy citizens of the country.

PROGRAMME EDUCATIONAL OBJECTIVES (PEOS)

PEO I

To provide students with sound foundation in the mathematical, scientific and engineering fundamentals necessary to formulate, analyze and solve engineering problems and to prepare them for post graduate studies and for successful careers in industries.

PEO II

To develop the ability among students to define engineering problems in the fields of electronics and Communication engineering, and to employ necessary techniques, hardware, and communication tools for modern Engineering applications.

PEO III

To instill the values, skills, leadership and team spirit for comprehensive and wholesome personality, to promote entrepreneurial interest among students and to create a fervor for use of Engineering in addressing societal concerns.

PROGRAM OUTCOMES (POs)

Engineering Graduates will be able to:

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.
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.

PROGRAM SPECIFIC OUTCOMES (PSOs)

1. An ability to formulate solutions for practical societal requirements using communication engineering.
2. To design and formulate solutions for industrial requirements using Electronics and Communication engineering
3. To understand and develop solutions required in multidisciplinary engineering fields.

CURRICULUM AND SYLLABUS

REGULATIONS – 2017

CURRICULUM

SEMESTER I

Sl. No	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
THEORY								
1.	HS17151	Communicative English	HS	3	3	0	0	3
2.	MA17151	Engineering Mathematics- I	BS	5	3	2	0	4
3.	PH17151	Engineering Physics	BS	3	3	0	0	3
4.	CY17151	Engineering Chemistry	BS	3	3	0	0	3
5.	GE17151	Problem Solving and Python Programming	ES	3	3	0	0	3
6.	GE17152	Engineering Graphics	ES	6	2	0	4	4
PRACTICALS								
7.	GE17161	Problem Solving and Python Programming Laboratory	ES	4	0	0	4	2
8.	GE17162	Physics and Chemistry Laboratory	BS	4	0	0	4	2
			TOTAL	**37**	**17**	**2**	**12**	**24**

SEMESTER II

Sl. No	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
THEORY								
1.	HS17251	Technical English	HS	3	3	0	0	3
	HS17252	Professional English Communication						
2.	MA17251	Engineering Mathematics- II	BS	5	3	2	0	4
3.	PH17255	Physics for Electronics Engineering	BS	3	3	0	0	3
4.	CY17251	Environmental Science and Engineering	HS	3	3	0	0	3
5.	EC17201	Electron Devices	PC	3	3	0	0	3
6.	EC17202	Circuit Analysis	PC	4	4	0	0	4
PRACTICALS								
7.	GE17261	Engineering Practices Laboratory	ES	4	0	0	4	2
8.	EC17211	Circuits and Devices Laboratory	PC	4	0	0	4	2
			TOTAL	**29**	**19**	**2**	**8**	**24**

SEMESTER III

Sl. No	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
THEORY								
1.	MA17352	Linear Algebra and Partial Differential Equations	BS	5	3	2	0	4
2.	CS17201	Data Structures	ES	3	3	0	0	3
3.	EC17301	Electronic Circuits-I	PC	3	3	0	0	3
4.	EC17302	Digital Electronics	PC	3	3	0	0	3
5.	EC17303	Signals and systems	PC	3	3	0	0	3
6.	EE17353	Electrical and Instrumentation Engineering	ES	3	3	0	0	3
PRACTICALS								
7.	CS17211	Data Structures Laboratory	ES	4	0	0	4	2
8.	EC17311	Analog and Digital Circuits Laboratory	PC	4	0	0	4	2
9.	HS17361	Interpersonal Skills-Listening and Speaking	EEC	2	0	0	2	1
			TOTAL	**30**	**18**	**2**	**10**	**24**

SEMESTER IV

Sl. No	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
THEORY								
1.	MA17454	Transforms and Random Processes	BS	5	3	2	0	4
2.	EC17401	Electronic Circuits- II	PC	3	3	0	0	3
3.	EC17402	Communication Theory	PC	3	3	0	0	3
4.	EC17403	Control system Engineering	PC	3	3	0	0	3
5.	EC17404	Linear Integrated Circuits	PC	3	3	0	0	3
6.	EC17405	Electromagnetic Fields	PC	3	3	0	0	3
PRACTICALS								
7.	EC17411	Circuit Design and Simulation Laboratory	PC	4	0	0	4	2
8.	EC17412	Linear Integrated Circuits Laboratory	PC	4	0	0	4	2
			TOTAL	28	18	2	8	**23**

SEMESTER V

Sl. No	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
THEORY								
1.	EC17501	Digital Communication	PC	3	3	0	0	3
2.	EC17502	Digital Signal Processing	PC	5	3	2	0	4
3.	EC17503	Transmission Lines and waveguides	PC	3	3	0	0	3
4.	EC17504	Principles of Microprocessors and Microcontroller	PC	3	3	0	0	3
5.	OGE1705	Open Elective – I (Programming Logic)	OE	3	3	0	0	3
PRACTICALS								
6.	EC17511	Digital Signal Processing Laboratory	PC	4	0	0	4	2
7.	EC17512	Communication Systems Laboratory	PC	4	0	0	4	2
8.	EC17513	Microprocessors and Microcontroller with peripheral interfacing Laboratory	PC	4	0	0	4	2
			TOTAL	**29**	**15**	**2**	**12**	**22**

SEMESTER VI

Sl. No	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
THEORY								
1.	EC17601	VLSI Design	PC	3	3	0	0	3
2.	EC17602	Antennas and Wave Propagation	PC	3	3	0	0	3
3.	EC17603	Communication Networks	PC	3	3	0	0	3
4.	EC17604	Wireless Communication	PC	3	3	0	0	3
5.		Professional Elective -I	PE	3	3	0	0	3
6.	OGE1706	Open Elective – II (Advanced Programming Logic)	OE	5	1	0	4	3
PRACTICALS								
7.	EC17611	VLSI Design Laboratory	PC	4	0	0	4	2
8.	EC17612	Networks Laboratory	PC	4	0	0	4	2
			TOTAL	**26**	**18**	**0**	**8**	**22**

SEMESTER VII

Sl. No	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
THEORY								
1.	EC17701	RF and Microwave Engineering	PC	3	3	0	0	3
2.	EC17702	Optical Communication and networks	PC	3	3	0	0	3
3.	EC17703	Embedded and Real Time Systems	PC	3	3	0	0	3
4.	EC17704	Wireless Networks	PC	3	3	0	0	3
5.	GE17551	Principles of Management	HS	3	3	0	0	3
6.		Professional Elective -II	PE	3	3	0	0	3
PRACTICALS								
7.	EC17711	Embedded Laboratory	PC	4	0	0	4	2
8.	EC17712	Advanced Communication Systems Laboratory	PC	4	0	0	4	2
9.	EC17713	Mini Project	EEC	2	0	0	2	1
			TOTAL	**28**	**18**	**0**	**10**	**23**

SEMESTER VIII

Sl. No	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
THEORY								
1.		Professional Elective -III	PE	3	3	0	0	3
2.		Professional Elective- IV	PE	3	3	0	0	3
3.		Professional Elective - V	PE	3	3	0	0	3
PRACTICALS								
4.	EC17811	Project Work	EEC	20	0	0	20	10
			TOTAL	**29**	**9**	**0**	**20**	**19**

TOTAL NO. OF CREDITS: 181

PROFESSIONAL ELECTIVES (PE)

SEMESTER VI

PROFESSIONAL ELECTIVE I

Sl. No	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
1.	CS17351	Object Oriented Programming Paradigm	PE	3	3	0	0	3
2.	CS17303	Computer Architecture	PE	3	3	0	0	3
3.	EC17E61	Medical Electronics	PE	3	3	0	0	3
4.	EC17E62	Information coding Theory	PE	3	3	0	0	3
5.	EC17E63	Micro Electro Mechanical Systems	PE	3	3	0	0	3

SEMESTER VII

PROFESSIONAL ELECTIVE II

Sl. No	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
1.	EC17E64	DSP Architecture and Programming	PE	3	3	0	0	3
2.	EC17E65	Digital Image Processing	PE	3	3	0	0	3
3.	EC17E66	Soft Computing	PE	3	3	0	0	3
4.	EC17E67	Speech Processing	PE	3	3	0	0	3
5.	EC17E68	Electronics Packaging and Testing	PE	3	3	0	0	3
6.	EC17E69	Comprehensive Course on ECE	PE	3	3	0	0	3

SEMESTER VIII

PROFESSIONAL ELECTIVE III

Sl. No	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
1.	EC17E71	Advanced Digital Signal Processing	PE	3	3	0	0	3
2.	EC17E72	Cognitive Radio	PE	3	3	0	0	3
3.	MT17702	Robotics and Machine vision system	PE	3	3	0	0	3
4.	EC17E73	Video Analytics	PE	3	3	0	0	3
5.	EC17E74	Advanced Microcontrollers	PE	3	3	0	0	3

PROFESSIONAL ELECTIVE IV

Sl. No	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
1.	AE17701	Avionics	PE	3	3	0	0	3
2.	GE17E51	Human values and Professional Ethics	PE	3	3	0	0	3
3.	EC17E81	CMOS Analog IC Design	PE	3	3	0	0	3
4.	CS17504	Cryptography and Network Security	PE	3	3	0	0	3
5.	EC17E82	Multimedia Compression and Communication	PE	3	3	0	0	3

PROFESSIONAL ELECTIVE V

Sl. No	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
1.	EC17E83	Adhoc and Wireless Sensor Networks	PE	3	3	0	0	3
2.	EC17E84	Advanced Wireless Communication	PE	3	3	0	0	3
3.	EC17E85	Network Routing Algorithms	PE	3	3	0	0	3
4.	EC17E86	Satellite Communication	PE	3	3	0	0	3
5.	EC17E87	Electromagnetic interference and Compatibility	PE	3	3	0	0	3

EMPLOYABILITY ENHANCEMENT COURSES (EEC)

Sl. No	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
1.	HS17361	Interpersonal Skills-Listening and Speaking	EEC	2	0	0	2	1
2.	EC17713	Mini Project	EEC	2	0	0	2	1
3.	EC17811	Project Work	EEC	20	0	0	20	10

B.E. ELECTRONICS AND COMMUNICATION ENGINEERING										
S.NO.	**SUBJECT AREA**	**Credits per Semester**								**Credits Total**
		I	**II**	**III**	**IV**	**V**	**VI**	**VII**	**VIII**	
1.	HS	3	6			3				12
2.	BS	12	7	4	4					27
3.	ES	9	2	8						19
4.	PC		9	11	19	19	16	16		90
5.	PE						6	3	6	15
6.	OE							3	3	6
7.	EEC			1				1	10	12
	TOTAL	**24**	**24**	**24**	**23**	**22**	**22**	**23**	**19**	**181**

SYLLABUS

SEMESTER I

HS17151 COMMUNICATIVE ENGLISH L T P C
(Common to all branches of B.E. / B.Tech. Programmes) 3 0 0 3

OBJECTIVES:

- To develop the basic reading and writing skills of first year engineering and technology students.
- To help learners develop their listening skills, which will enable them listen to lectures and comprehend them by asking questions; seeking clarifications.
- To help the learners develop their speaking skills and speak fluently in real contexts.
- To help learners develop vocabulary of a general kind by developing their reading skills.

UNIT I SHARING INFORMATION RELATED TO ONESELF/FAMILY& FRIENDS 9

Reading- short comprehension passages, practice in skimming-scanning and predicting. Writing- completing sentences- developing hints. Listening- short texts- short formal and informal conversations. Speaking- introducing oneself - exchanging personal information- Language development- Why Questions- asking and answering yes or no questions. Subject-Verb agreement – regular and irregular verbs. Vocabulary development- prefixes- suffixes- articles.

UNIT II GENERAL READING AND FREE WRITING 9

Reading - comprehension-pre-reading-post reading- comprehension questions (multiple choice questions and /or short questions/ open-ended questions)-inductive reading- short narratives and descriptions from newspapers including dialogues and conversations (also used as short Listening texts)- register. Writing – paragraph writing- topic sentence- main ideas- free writing, short narrative descriptions using some suggested vocabulary and structures. Listening- telephonic conversations. Speaking – sharing information of a personal kind—greeting – taking leave. Language development – prepositions, conjunctions. Vocabulary development-guessing meanings of words in context.

UNIT III GRAMMAR AND LANGUAGE DEVELOPMENT 9

Reading- short texts and longer passages (close reading).Writing- understanding text structure- use of reference words and discourse markers-coherence-jumbled sentences. Listening – listening to longer texts and filling up the table- product description- narratives from different sources. Speaking- asking about routine actions and expressing opinions. Language development- degrees of comparison- pronouns- direct vs indirect questions. Vocabulary development – single word substitutes- adverbs.

UNIT IV READING AND LANGUAGE DEVELOPMENT 9

Reading- comprehension-reading longer texts- reading different types of texts- magazines. Writing- letter writing, informal or personal letters-emails-conventions of personal email. Listening- listening to dialogues or conversations and completing exercises based on them. Speaking- speaking about oneself- speaking about one's friend. Language development- Tenses- simple present-simple past- present continuous and past continuous. Vocabulary development- synonyms-antonyms- phrasal verbs.

UNIT V EXTENDED WRITING 9

Reading- longer texts- close reading. Writing- brainstorming -writing short essays – developing an outline-identifying main and subordinate ideas- dialogue writing. Listening – listening to talks- conversations. Speaking – participating in conversations- short group conversations. Language development-modal verbs-present/ past perfect tense. Vocabulary development-functional uses of tenses.

TOTAL= 45 PERIODS

OUTCOMES:

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

- Read articles of a general kind in magazines and newspapers.
- Participate effectively in informal conversations; introduce themselves and their friends and express opinions.
- Comprehend conversations and short talks delivered in English
- Express ideas about oneself freely
- Write short essays of a general kind and personal letters and emails in English.

TEXT BOOKS:

1. Board of Editors. Using English A Coursebook for Undergraduate Engineers and Technologists. Orient BlackSwan Limited, Hyderabad: 2015.
2. Richards, C. Jack. Interchange Students' Book-2 New Delhi: CUP, 2015.

REFERENCES:

1. Bailey, Stephen. Academic Writing: A practical guide for students. New York: Rutledge, 2011.
2. Means,L. Thomas and Elaine Langlois. English & Communication for Colleges. Cengage Learning ,USA: 2007
3. Redston, Chris & Gillies Cunningham Face2Face (Pre-intermediate Student's Book& Workbook) Cambridge University Press, New Delhi: 2005
4. Comfort, Jeremy, et al. Speaking Effectively: Developing Speaking Skills for Business English. Cambridge University Press, Cambridge: Reprint 2011
5. Dutt P. Kiranmai and Rajeevan Geeta. Basic Communication Skills, Foundation Books: 2013

MA17151 ENGINEERING MATHEMATICS- I L T P C

(Common to all branches of B.E. / B.Tech. Programmes) 3 2 0 4

OBJECTIVES:

- To learn the basics and concepts of traditional calculus.
- To provide the basic tools of calculus mainly for the purpose of modelling the engineering problems mathematically and obtaining solutions.
- To understand the concepts of single variable and multivariable calculus that plays an important role in the field of science, engineering & technology.

UNIT I MATRICES 15

Eigen values and Eigenvectors of a real matrix – Characteristic equation – Properties of Eigen values and Eigenvectors – Cayley-Hamilton theorem – Diagonalization of matrices – Reduction of a quadratic form to canonical form by orthogonal transformation – Nature of quadratic forms.

UNIT II DIFFERENTIAL CALCULUS 15

Representation of functions - Limit of a function - Continuity - Derivatives - Differentiation rules - Maxima and Minima of functions of one variable.

UNIT III FUNCTIONS OF SEVERAL VARIABLES 15

Partial differentiation – Homogeneous functions and Euler's theorem – Total derivative – Change of variables – Jacobians – Partial differentiation of implicit functions – Taylor's series for functions of two variables – Maxima and minima of functions of two variables – Lagrange's method of undetermined multipliers.

UNIT IV INTEGRAL CALCULUS 15

Definite and Indefinite integrals - Substitution rule - Techniques of Integration - Integration by parts – Bernoulli's formula, Trigonometric integrals, Trigonometric substitutions, Integration of rational functions by partial fraction, Integration of irrational functions - Improper integrals.

UNIT V MULTIPLE INTEGRALS 15

Double integrals – Change of order of integration – Double integrals in polar coordinates – Area enclosed by plane curves – Triple integrals – Volume of solids – Change of variables in double and triple integrals.

TOTAL=75 PERIODS

OUTCOMES:

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

- Apply the concept of Eigen values and eigenvectors, diagonalization of a matrix, Symmetric matrices, Positive definite matrices and similar matrices for solving problems
- Use the techniques of differentiation to differentiate functions and to apply the concept of differentiation to solve maxima and minima problems.
- To apply the concept of Partial differentiation for functions two or more variables and use different techniques for solving problems.
- Solve problems involving integration using different methods such as substitution, partial fractions, by parts.
- 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, Forty third Edition, 2014.
2. James Stewart, Calculus: Early Transcendentals, Cengage Learning, Seventh Edition, New Delhi, 2015.

REFERENCES:

1. Anton, H, Bivens, I and Davis, S, Calculus, Wiley, Tenth Edition, 2016.
2. Jain R.K. and Iyengar S.R.K., Advanced Engineering Mathematics, Narosa Publications, New Delhi, Third Edition, 2007.
3. Narayanan, S. and Manicavachagom Pillai, T. K., Calculus Volume I and II, S. Viswanathan Publishers Pvt. Ltd., Chennai, 2007.
4. Srimantha Pal and Bhunia, S.C, Engineering Mathematics Oxford University Press, 2015.
5. Weir, M.D and Joel Hass, Thomas Calculus, Twelfth Edition, Pearson India, 2016.
6. T. Veerarajan, Engineering Mathematics I & II, McGraw Hill Education, Third Edition, 2012.

PH 17151 ENGINEERING PHYSICS L T P C

(Common to all branches of B.E. / B.Tech. Programmes) 3 0 0 3

OBJECTIVE:

- To enhance the fundamental knowledge in Physics and its applications relevant to various streams of Engineering and Technology.

UNIT I PROPERTIES OF MATTER 9

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

UNIT II WAVES AND OPTICS 9

Oscillatory motion – forced and damped oscillations: differential equation and its solution – plane progressive waves – wave equation. Lasers: population of energy levels, Einstein's A and B coefficients derivation – resonant cavity, optical amplification (qualitative) –CO_2 laser - Semiconductor lasers: homojunction and

heterojunction – Fibre optics: principle, numerical aperture and acceptance angle - types of optical fibres (material, refractive index, and mode) – losses associated with optical fibers - fiber optic sensors: pressure and displacement.

UNIT III THERMAL PHYSICS 9

Transfer of heat energy – thermal expansion of solids and liquids – expansion joints - bimetallic strips - thermal conduction, convection and radiation –rectilinear heat flow – thermal conductivity - Forbe's and Lee's disc method: theory and experiment - conduction through compound media (series and parallel) – thermal insulation – applications: heat exchangers, refrigerators, ovens and solar water heaters.

UNIT IV QUANTUM PHYSICS 9

Black body radiation – Planck's theory (derivation) – Compton effect: theory and experimental verification – wave particle duality – electron diffraction – concept of wave function and its physical significance – Schrödinger's wave equation – time independent and time dependent equations – particle in a one-dimensional rigid box – tunnelling (qualitative) – electron microscope – scanning tunnelling microscope.

UNIT V CRYSTAL PHYSICS 9

Single crystalline, polycrystalline and amorphous materials – single crystals: unit cell, crystal systems, Bravais lattices, directions and planes in a crystal, Miller indices – inter-planar distances -reciprocal lattice - coordination number and packing factor for SC, BCC, FCC, and HCP –Polymorphism and allotropy: diamond and graphite structures - crystal imperfections: point defects, line defects – Burger vectors, stacking faults – role of imperfections in plastic deformation - growth of single crystals: solution and melt growth techniques.

TOTAL= 45 PERIODS

OUTCOMES:

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

- Apply the knowledge of basic properties of matter and its applications in Engineering and Technology.
- Use the concepts of waves and optical devices and their applications in fiber optics.
- Use the concepts of thermal properties of materials and their applications in heat exchangers.
- Use the advanced physics concepts of quantum theory and its applications in electron microscope and material sciences.
- Apply the basic knowledge of crystallography in materials preparation and device fabrication.

TEXT BOOKS:

1. Bhattacharya, D.K. & Poonam, T. Engineering Physics, Oxford University Press, 2015.
2. Gaur, R.K. & Gupta, S.L. Engineering Physics, Dhanpat Rai Publishers, 2012.
3. Pandey, B.K. & Chaturvedi, S. Engineering Physics, Cengage Learning India, 2012.

REFERENCES:

1. Halliday, D., Resnick, R. & Walker, J. Principles of Physics, Wiley, 2015.
2. Serway, R.A. & Jewett, J.W. Physics for Scientists and Engineers, Cengage Learning, 2010.
3. Tipler, P.A. & Mosca, G. Physics for Scientists and Engineers with Modern Physics, W.H.Freeman, 2007.
4. Arthur Besier and S. RaiChoudhury,Concepts of Modern Physics (SIE), Seventh edition, McGraw-Hill Education, 1994.
5. R. Murugeshan and Kiruthiga Sivaprasath, Modern Physics, S.Chand, 2015.

CY17151 ENGINEERING CHEMISTRY L T P C
(Common to all branches of B.E. / B.Tech. Programmes) 3 0 0 3

OBJECTIVES:

- To acquire knowledge on characteristics of boiler feed water and water treatment techniques.
- To develop an understanding on surface chemistry and its applications.
- To develop an understanding of the basic concepts of phase rule and its applications towards alloying
- To acquire knowledge on different types of fuels and its characteristics.
- To obtain knowledge on batteries and fuel cell.

UNIT I WATER AND ITS TREATMENT 9

Hardness of water – types – expression of hardness – units– boiler troubles (scale and sludge) – treatment of boiler feed water – Internal treatment (phosphate, colloidal, sodium aluminate and calgon conditioning) - External treatment – ion exchange process, zeolite process – potable water treatment – break point chlorination - desalination of brackish water - Reverse Osmosis – UASB process (Upflow Anaerobic Sludge Blanket).

UNIT II SURFACE CHEMISTRY AND CATALYSIS 9

Adsorption - types of adsorption – adsorption of gases on solids – adsorption of solute from solutions – adsorption isotherms – Freundlich's adsorption isotherm – Langmuir's adsorption isotherm – contact theory – Preparation and applications of activated carbon (up flow and down flow process) -applications of adsorption on pollution abatement.Catalysis – types of catalysis – criteria – autocatalysis – catalytic poisoning and catalytic promoters - acid base catalysis – applications (catalytic convertor) – enzyme catalysis– Michaelis – Menten equation.

UNIT III PHASE RULE, ALLOYS AND COMPOSITES 9

Phase rule - introduction, definition of terms with examples, one component system -water system - reduced phase rule - thermal analysis and cooling curves - two component systems - lead-silver system - Pattinson process.

Alloys - definition- properties of alloys- significance of alloying- functions and effect of alloying elements- nichrome and stainless steel (18/8) – heat treatment of steel.

Composites- polymer matrix composites -metal matrix composites-ceramic matrix composites.

UNIT IV FUELS AND COMBUSTION 9

Fuels - 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 - octane number - diesel oil - cetane number - natural gas - compressed natural gas (CNG) - liquefied petroleum gas (LPG) - power alcohol and biodiesel.

Combustion of fuels - introduction - calorific value - higher and lower calorific values- theoretical calculation of calorific value - ignition temperature - spontaneous ignition temperature - explosive range.

UNIT V ENERGY SOURCES AND STORAGE DEVICES 9

Batteries - components – Characteristics – voltage , current , capacity, electrical storage density, energy density, discharge rate – types of batteries – primary battery (dry cell)- secondary battery (lead acid battery, Ni- Cdbattery, lithium-ion-battery) .Fuel cells – H_2-O_2fuel cell, methanol oxygen fuel cell, Proton exchange membrane fuel cell – SOFC and Biofuel cells.

TOTAL=45 PERIODS

OUTCOMES:

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

- Get familiarized on water treatment techniques.
- Apply adsorption phenomena on various fields.
- Analyse alloying composition based on phase rule concept.
- Apply the role of fuels in day today applications.
- Design batteries and fuel cells.

TEXT BOOKS:

1. P. C. Jain and Monika Jain, Engineering Chemistry, Seventeenth edition, Dhanpat Rai Publishing Company (P) LTD, New Delhi, 2015
2. S. Vairam, P. Kalyani and Suba Ramesh, Engineering Chemistry, Wiley India PVT, LTD, New Delhi, 2013

REFERENCES:

1. Friedrich Emich, Engineering Chemistry, Scientific International PVT, LTD, New Delhi, 2014.
2. Prasanta Rath, Engineering Chemistry, Cengage Learning India PVT, LTD, Delhi, 2015.
3. ShikhaAgarwal, Engineering Chemistry-Fundamentals and Applications, Cambridge University Press, Delhi, 2015.
4. S. S. Dara and S. S. Umare, A Textbook of Engineering Chemistry, Twelfth edition, S. Chand & Company LTD, New Delhi, 2015.

GE17151 PROBLEM SOLVING AND PYTHON PROGRAMMING L T P C
(Common to all branches of B.E. / B.Tech. Programmes) 3 0 0 3

OBJECTIVES:

- To know the basics of algorithmic problem solving
- To develop Python programs with conditionals and loops.
- To define Python functions and call them.
- To use Python data structures –- lists, tuples, dictionaries.
- To do input/output with files in Python.

UNIT I ALGORITHMIC PROBLEM SOLVING 9

Introduction to computers - characteristics - basic organization of a computer – algorithms - building blocks of algorithms (instructions/statements, state, control flow, functions) - notation (pseudo code, flow chart, programming language) - algorithmic problem solving - simple strategies for developing algorithms (iteration, recursion).

UNIT II DATA, EXPRESSIONS, STATEMENTS AND CONTROL FLOW 9

Python interpreter and interactive mode - values and types - data types – variables – keywords - expressions and statements - python I/O - operators - precedence of operators – comments. Conditionals: conditional (if) - alternative (if-else) - chained conditional (if-elif-else) – nested conditional. Iteration: while – for - break – continue – pass. Illustrative programs: exchange the values of two variables - circulate the values of n variables - test for leap year.

UNIT III FUNCTIONS 9

Function calls – type conversion – math function – composition - definition and use - flow of execution - parameters and arguments. Fruitful functions: return values – parameters - scope: local and global - recursion. Strings: string slices – immutability - string functions and methods - string comparison. Illustrative programs: square root – GCD – exponentiation - sum the array of numbers - linear search - binary search.

UNIT IV COMPOUND DATA: LISTS, TUPLES AND DICTIONARIES 9

Lists - list operations - list slices - list methods - list loop – mutability – aliasing - cloning lists - list parameters. Tuples – immutable - tuple assignment - tuple as return value. Dictionaries: operations and methods – dictionaries and tuples – dictionaries and lists. Advanced list processing - list comprehension. Illustrative programs: Sorting.

UNIT V FILES, MODULES AND PACKAGES 9

Files and exception: file operation - text files - reading and writing files - format operator- command line arguments - errors and exceptions - handling exceptions – writing modules – packages. Illustrative programs: word count - copy file – case studies.

TOTAL=45 PERIODS

OUTCOMES:

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

- Develop algorithmic solutions to simple computational problems.
- Structure simple Python programs for solving problems.
- Decompose a Python program into functions.
- Represent compound data using Python lists, tuples and dictionaries.
- Read and write data from/to files in Python programs.

TEXT BOOK:

1. Allen B. Downey, Think Python: How to Think Like a Computer Scientist, Second edition, Updated for Python 3, Shroff/O'Reilly Publishers, 2016 (http://greenteapress.com/wp/think-python/)

REFERENCES:

1. Anita Goel, Ajay Mittal, Computer Fundamentals and programming in C, Pearson India Publisher, First edition, 2013.
2. John V Guttag, Introduction to Computation and Programming Using Python, Revised and expanded Edition, MIT Press , 2013
3. Robert Sedgewick, Kevin Wayne, Robert Dondero, Introduction to Programming in Python: An Inter-disciplinary Approach, Pearson India Education Services Pvt. Ltd., 2016.
4. Timothy A. Budd, Exploring Python, Mc-Graw Hill Education (India) Private Ltd. 2015.
5. Kenneth A. Lambert, Fundamentals of Python: First Programs, CENGAGE Learning, 2012.
6. Charles Dierbach, Introduction to Computer Science using Python: A Computational Problem-Solving Focus, Wiley India Edition, 2013.
7. The Python Tutorial, https://docs.python.org/2.7/tutorial/

GE17152 ENGINEERING GRAPHICS L T P C

(Common to all Branches of B.E/B.Tech. Programmes) **2 0 4 4**

OBJECTIVES:

- To develop in students, graphic skills for communication of concepts, ideas and design of engineering products.
- To expose them to existing national standards related to technical drawings.
- To study different type of projections, and practice him on free hand sketching.

CONCEPTS AND CONVENTIONS (Not for Examination) **1**

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 FREEHAND SKETCHING **7+12**

Basic Geometrical constructions, Curves used in engineering practices: Conics – Construction of ellipse, parabola and hyperbola by eccentricity method – Construction of cycloid – construction of involutes of square and circle – Drawing of tangents and normal to the above curves- Construction of helical curve.

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 SURFACE 6+12

Orthographic projection- principles-Principal planes-First angle projection-projection of points. Projection of straight lines (only First angle projections) inclined to both the principal planes - Determination of true lengths and true inclinations by rotating line method and traces Projection of planes (polygonal and circular surfaces) inclined to both the principal planes by rotating object method.

UNIT III PROJECTION OF SOLIDS 5+12

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

UNIT IV PROJECTION OF SECTIONED SOLIDS AND DEVELOPMENT OF SURFACES 5+12

Sectioning of above solids 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 cylinders and cones. Development of lateral surfaces of solids with cut-outs and holes.

UNIT V ISOMETRIC AND PERSPECTIVE PROJECTIONS 6+12

Principles of isometric projection – isometric scale –Isometric projections of simple solids and truncated solids - Prisms, pyramids, cylinders, cones- combination of two solid objects in simple vertical positions - Perspective projection of simple solids-Prisms, pyramids and cylinders by visual ray method.

TOTAL= 90 PERIODS

OUTCOMES:

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

- Draw basic geometrical constructions of plane curves and freehand sketching of multiple views of objects.
- Draw the orthographic projection of lines and plane surfaces.
- Draw the projections solids.
- Draw the true shape of the sectioned solid and development of surfaces.
- Draw the isometric and perspective sections of simple solids.

TEXT BOOKS:

1. Bhatt N.D. and Panchal V.M., Engineering Drawing, Charotar Publishing House, 50th Edition, 2010.
2. Natrajan K.V., “A text book of Engineering Graphics”, Dhanalakshmi Publishers, Chennai, 2009.

REFERENCES:

1. Basant Agarwal and Agarwal C.M., Engineering Drawing, Tata McGraw Hill Publishing Company Limited, New Delhi, 2008.
2. Gopalakrishna K.R., Engineering Drawing (Vol.I&II combined), Subhas Stores, Bangalore, 2007.
3. Luzzader, Warren.J. and Duff, John M., Fundamentals of Engineering Drawing with an introduction to Interactive Computer Graphics for Design and Production, Eastern Economy Edition, Prentice Hall of India Pvt. Ltd, New Delhi, 2005.
4. Venugopal K. and Prabhu Raja V., Engineering Graphics, New Age International (P) Limited, 2008.
5. Shah M.B., and Rana B.C., Engineering Drawing, Pearson, Second Edition, 2009.

PUBLICATION OF BUREAU OF INDIAN STANDARDS:

1. IS 10711 – 2001: Technical products Documentation – Size and lay out of drawing sheets.
2. IS 9609 (Parts 0 & 1) – 2001: Technical products Documentation – Lettering.
3. IS 10714 (Part 20) – 2001 & SP 46 – 2003: Lines for technical drawings.
4. IS 11669 – 1986 & SP 46 – 2003: Dimensioning of Technical Drawings.
5. IS 15021 (Parts 1 to 4) – 2001: Technical drawings – Projection Methods.

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

GE17161 PROBLEM SOLVING AND PYTHON PROGRAMMING LABORATORY L T P C

(Common to all branches of B.E. / B.Tech. Programmes) 0 0 4 2

OBJECTIVES:

- To be familiar with the use of office package exposed to presentation and visualization tools.
- To implement Python programs with conditionals and loops.
- To use functions for structuring Python programs.
- To represent compound data using Python lists, tuples and dictionaries.
- To read and write data from/to files in Python.

LIST OF PROGRAMS

1. Search, generate, manipulate data using Open Office
2. Presentation and Visualization – graphs, charts, 2D, 3D
3. Problem Solving using Algorithms and Flowcharts
4. Compute the GCD of two numbers.
5. Find the square root of a number (Newton's method)
6. Exponentiation (power of a number)
7. Linear search and Binary search
8. First n prime numbers
9. Find the maximum of a list of numbers
10. Sorting
11. Removing all the duplicate elements in a list
12. Multiply matrices
13. Programs that take command line arguments (word count)
14. Find the most frequent words in a text read from a file
15. Mini Project

TOTAL=60 PERIODS

PLATFORM NEEDED:

Hardware: PC with 2 GB RAM, i3 Processor
Software: Python 3 interpreter for Windows/Linux

OUTCOMES:

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

- Develop documentation, presentation and visualization charts.
- Implement Python programs with conditionals and loops.
- Develop Python programs stepwise by defining functions and calling them.
- Use Python lists, tuples and dictionaries for representing compound data.
- Read and write data from/to files in Python

GE17162	PHYSICS AND CHEMISTRY LABORATORY (Common to all branches of B.E. / B.Tech. Programmes)	L T P C 0 0 4 2

OBJECTIVE:

- To introduce different experiments to test basic understanding of physics concepts applied in optics, thermal physics, properties of matter and liquids.

LIST OF EXPERIMENTS: PHYSICS LABORATORY (Any 5 Experiments)

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 fibre.
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 thickness of a thin wire – Air wedge method

TOTAL= 30 PERIODS

OUTCOMES:

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

- Apply the principle of elasticity viz Young's modulus & rigidity modulus of engineering materials.
- Apply the principle elasticity in determining compressibility of liquids using ultrasonic waves.
- Apply the principle of optics in fibre optical communication.
- Apply thermal properties of various insulating materials in engineering applications.
- Use the basic instruments like vernier caliper, micrometer and microscope for various basic measurements.

CHEMISTRY LABORATORY: (Any seven experiments to be conducted)

OBJECTIVES:

The student should be able to:

- Acquire practical skills in the determination of water quality parameters.
- Gain the knowledge about spectrophotometer and flame photometer.
- Acquire knowledge on the determination of corrosion rate.

LIST OF EXPERIMENTS: CHEMISTRY LABORATORY (Any 7 Experiments)

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 DO content of water sample by Winkler's method.
4. Determination of chloride content of water sample by argentometric method.
5. Determination of strength of given hydrochloric acid using pH meter.
6. Estimation of iron content of the given solution using potentiometer.
7. Conductometric titration of strong acid vs strong base.
8. Determination of strength of acids in a mixture of acids using conductivity meter.
9. Estimation of copper content of the given solution by Iodometry.
10. Estimation of iron content of the water sample using spectrophotometer (1, 10- Phenanthroline / thiocyanate method).
11. Estimation of sodium and potassium present in water using flame photometer.
12. Corrosion experiment-weight loss method.

TOTAL= 30 PERIODS

OUTCOMES:

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

- Apply the quantitative chemical analysis of water quality related parameters.
- Analyse characteristics of water.
- Measure the corrosion rate in metals.
- Apply instrumentation skills in analysing metallic elements in water.
- Analyse quantitatively the strength of acids and bases in water.

TEXT BOOKS:

1. Vogel's Textbook of Quantitative Chemical Analysis Eighth edition, 2014

SEMESTER II

HS17251	**TECHNICAL ENGLISH**	**L T P C**
	(Common to all branches of B.E. /B. Tech. Programmes)	**3 0 0 3**

OBJECTIVES:

- Develop strategies and skills to enhance their ability to read and comprehend engineering and technology texts.
- Foster their ability to write convincing job applications and effective reports.
- Develop their speaking skills to make technical presentations, participate in group discussions.
- Strengthen their listening skill which will help them comprehend lectures and talks in their areas of specialisation.

UNIT I INTRODUCTION TO TECHNICAL ENGLISH 9

Listening- listening to talks mostly of a scientific/technical nature and completing information-gap exercises. Speaking –asking for and giving directions. Reading – reading short technical texts from journals-newspapers. Writing- purpose statements – extended definitions – issue- writing instructions – checklists-recommendations. Vocabulary Development- technical vocabulary. Language Development –subject verb agreement - compound words.

UNIT II READING AND STUDY SKILLS 9

Listening- listening to longer technical talks and completing exercises based on them. Speaking – describing a process. Reading – reading longer technical texts- identifying the various transitions in a text- paragraphing. Writing- interpreting charts, graphs. Vocabulary Development-vocabulary used in formal letters/emails and reports. Language Development- impersonal passive voice, numerical adjectives.

UNIT III TECHNICAL WRITING AND GRAMMAR 9

Listening- listening to classroom lectures/ talks on engineering/technology. Speaking – introduction to technical presentations. Reading – longer texts both general and technical, practice in speed reading. Writing-Describing a process, use of sequence words. Vocabulary Development- sequence words. Misspelled words. Language Development- embedded sentences

UNIT IV REPORT WRITING 9

Listening- listening to documentaries and making notes. Speaking – mechanics of presentations. Reading – reading for detailed comprehension. Writing- email etiquette- job application – cover letter. Résumé

preparation (via email and hard copy)- analytical essays and issue based essays. Vocabulary Development- finding suitable synonyms-paraphrasing. Language Development- clauses- if conditionals.

UNIT V GROUP DISCUSSION AND JOB APPLICATIONS 9

Listening- TED talks; Speaking –participating in a group discussion. Reading– reading and understanding technical articles. Writing– writing reports- minutes of a meeting- accident and survey. Vocabulary Development- verbal analogies, foreign words and phrases Language Development- reported speech, common errors in English.

TOTAL= 45 PERIODS

OUTCOMES:

On completion of the course, students will be able to

- Read technical texts and write area- specific texts effortlessly.
- Listen and comprehend lectures and talks in their area of specialisation successfully.
- Speak appropriately and effectively in varied formal and informal contexts.
- Write reports and winning job applications.
- Write error free language.

TEXT BOOKS:

1. Board of editors. Fluency in English A Course book for Engineering and Technology. Orient Blackswan, Hyderabad: 2016
2. Sudharshana.N.P and Saveetha. C. English for Technical Communication. Cambridge University Press: New Delhi, 2016.

REFERENCES

1. Raman, Meenakshi and Sharma, Sangeetha- Technical Communication Principles and Practice.Oxford University Press: New Delhi,2014.
2. Kumar, Suresh. E. Engineering English. Orient Blackswan: Hyderabad,2015
3. Booth-L. Diana, Project Work, Oxford University Press, Oxford: 2014.
4. Grussendorf, Marion, English for Presentations, Oxford University Press, Oxford: 2007
5. Means, L. Thomas and Elaine Langlois, English & Communication For Colleges. Cengage Learning, USA: 2007

Students can be asked to read Tagore and Chetan Bhagat for supplementary reading.

HS17252 PROFESSIONAL ENGLISH COMMUNICATION L T P C

(Common to all branches of B.E. /B.Tech. programmes) 3 0 0 3

OBJECTIVES

- To prepare students to be competent in a global business environment.
- To think accurately, clearly and deeply in communicative contexts.
- To improve career opportunities – get English language skills that are needed to be successful.

UNIT I CRITICAL/ INFORMATIONAL LISTENING 9

Short conversations or Monologues – Listening for specific information- Conversations or Monologues with factual information- listen to fill up missing information- business related discussions or interview (two or more speakers).

UNIT II CONVERSATIONAL/ PRESENTATION SKILLS 9

Speak about oneself - Face-to-face speaking for real-life context – pick and talk - personal opinion on business related topics- mini presentations on a business theme- discussion with another candidate on business related topics.

UNIT III INTENSIVE/ EXTENSIVE READING AND INTERPRETING 9

Short texts (signs, messages, emails, labels and notes) -Short descriptions-graph or chart. Reading to find factual information- decision making from a written text- a leaflet or a newspaper- magazine or article- reading to understand correct grammar, contextually- reading to understand the structure of a text-read and transfer information from memos, advertisements, notices.

UNIT IV FORMAL COMMUNICATION 9

Business Correspondence - writing business letters to people outside the company. Internal Company Communication- a note, a message, a memo or an email.

UNIT V VERBAL ABILITY/ FUNCTIONAL GRAMMAR 9

Grammar – tenses – concord- prepositions – articles- punctuations. Vocabulary – advanced vocabulary – synonyms and antonyms. Sentence correction – sentence completion - cloze passage - verbal reasoning: analogies, meaning - usage match.

TOTAL= 45 PERIODS

OUTCOMES

On completion of the course students will be able to

- Listen to, understand and give opinions in meetings.
- Apply for new jobs and develop their career.
- Write short business messages and reports.
- Use language in both official and unofficial contexts.
- Speak effectively in business communication

TEXT BOOK:

1. Board of Editors. Sure Outcomes. A Communication Skills Course for Undergraduate Engineers and Technologists. Orient Black Swan Limited, Hyderabad, 2013.

REFERENCE BOOKS:

1. Hartley, Mary. “The Power of Listening,” Jaico Publishing House; First Edition (2015).
2. Chambers, Harry. “Effective Communication Skills for Scientific and Technical Professionals,” Persues Publishing, Cambridge, Massachusetts, 2000.
3. Lesikar V. Raymond, Flatley E. Marie, Rentz, Kathryn and Pande, Neerja. “Business Communication,” Eleventh Edition, Tata McGraw Hill Education Private Limited.

MA17251 ENGINEERING MATHEMATICS – II L T P C
(Common to all branches of B.E. /B.Tech. programmes) 3 2 0 4

OBJECTIVES*:*

- To handle practical problems arising in the field of engineering and technology.
- To solve problems using the concept of Differential Equation, Vectors calculus, Complex analysis, Laplace transforms.

UNIT I DIFFERENTIAL EQUATIONS 15

Higher order linear differential equations with constant coefficients - Method of variation of parameters – Homogenous equation of Euler's and Legendre's type – System of simultaneous linear differential equations with constant coefficients - Method of undetermined coefficients.

UNIT II VECTOR CALCULUS 15

Gradient and directional derivative – Divergence and curl - Vector identities – Irrotational and Solenoidal vector fields – Line integral over a plane curve – Surface integral - Area of a curved surface - Volume integral - Green's, Gauss divergence and Stoke's theorems – Verification and application in evaluating line, surface and volume integrals (cubes and parallelepipeds).

UNIT III ANALYTIC FUNCTIONS 15

Analytic functions – Necessary and sufficient conditions for analyticity in Cartesian and polar coordinates - Properties – Harmonic conjugates – Construction of analytic function - Conformal mapping – Mapping by functions $w = z + c, cz, \frac{1}{z}, z^2$ - Bilinear transformation.

UNIT IV COMPLEX INTEGRATION 15

Cauchy's integral theorem – Cauchy's integral formula – Taylor's and Laurent's series – Singularities – Residues – Residue theorem – Application of residue theorem for evaluation of real integrals – Use of circular contour and semicircular contour.

UNIT V LAPLACE TRANSFORMS 15

Existence conditions – 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 – Inverse transforms – Convolution theorem – Transform of periodic functions – Application to solution of linear second order ordinary differential equations with constant coefficients.

TOTAL= 75 PERIODS

OUTCOMES:

On completion of the course students will be able to:

- Apply various techniques in solving differential equations.
- Use the concept of Gradient, divergence and curl of a vector point function and related identities in different areas of Engineering.
- Evaluate line, surface and volume integrals using Gauss, Stokes and Green's theorems and their verification.
- Use the concept of Analytic functions, conformal mapping and complex integration for solving problems.
- Use Laplace transform and inverse transform techniques in solving differential equations.

TEXT BOOKS:

1. Grewal B.S., "Higher Engineering Mathematics", Khanna Publishers, New Delhi, 43rd Edition, 2014.
2. Kreyszig Erwin, "Advanced Engineering Mathematics ", John Wiley and Sons, 10th Edition, New Delhi, 2016.

REFERENCES:

1. Bali N., Goyal M. and Watkins C., "Advanced Engineering Mathematics", Firewall Media (An imprint of Lakshmi Publications Pvt., Ltd.,), New Delhi, 7th Edition, 2009.
2. Jain R.K. and Iyengar S.R.K., " Advanced Engineering Mathematics ", Narosa Publications, New Delhi , 3rd Edition, 2007.
3. O'Neil, P.V. "Advanced Engineering Mathematics", Cengage Learning India Pvt., Ltd, New Delhi, 2007.
4. Sastry, S.S, "Engineering Mathematics", Vol. I & II, PHI Learning Pvt. Ltd, 4th Edition, New Delhi, 2014.
5. Wylie, R.C. and Barrett, L.C., "Advanced Engineering Mathematics "Tata McGraw Hill Education Pvt. Ltd, 6th Edition, New Delhi, 2012.
6. T. Veerarajan, Engineering Mathematics I & II, McGraw Hill Education, 3rd Edition, 2012.

PH17255	PHYSICS FOR ELECTRONICS ENGINEERING (Common to B.E. ECE and EEE)	L T P C 3 0 0 3

OBJECTIVES:

- To understand the essential principles of Physics of semiconductor device and Electron transport properties.
- To become proficient in magnetic, dielectric and optical properties of materials and nano devices.

UNIT I ELECTRICAL PROPERTIES OF MATERIALS 9

Classical free electron theory - Expression for electrical conductivity -Thermal conductivity, expression – Wiedemann-Franz law - Success and failures - electrons in metals - Particle in a three dimensional box - degenerate states - Fermi- Dirac statistics - Density of energy states – Electron in periodic potential: Bloch theorem– metals and insulators - Energy bands in solids– tight binding approximation - Electron effective mass – concept of hole.

UNIT II SEMICONDUCTOR PHYSICS 9

Intrinsic Semiconductors - Energy band diagram - direct and indirect semiconductors - Carrier concentration in intrinsic semiconductors -–extrinsic semiconductors - Carrier concentration in N-type and P-type semiconductors. Carrier transport: Velocity-electric field relations - drift and diffusion transport – Einstein's relation. Hall effect and devices. Zener and avalanche breakdown in p-n junctions - Ohmic contacts - tunnel diode – Schottky diode MOS capacitor - power transistor.

UNIT III MAGNETIC AND DIELECTRIC PROPERTIES OF MATERIALS 9

Magnetism in materials - magnetic field and induction - magnetization - magnetic permeability and susceptibility - types of magnetic materials - microscopic classification of magnetic materials. Ferromagnetism: origin and exchange interaction - saturation magnetization and Curie temperature - domain

theory. Dielectric materials: Polarization processes - dielectric loss - internal field - Clausius-Mosotti relation-dielectric breakdown - high-k dielectrics.

UNIT IV OPTICAL PROPERTIES OF MATERIALS 9

Classification of optical materials - carrier generation and recombination processes. Absorption, emission and scattering of light in metals, insulators and semiconductors (concepts only). Photo current in a P- N diode - solar cell - photo detectors - LED - Organic LED –-laser diodes - excitons - quantum confined - Stark effect - quantum dot laser.

UNIT V NANOELECTRONIC DEVICES 9

Introduction - electron density in bulk material - size dependence of Fermi energy- quantum confinement - quantum structures. Density of states in quantum well, quantum wire and quantum dot structures. Zener-Bloch oscillations - resonant tunneling - quantum interference effects -mesoscopic structures: conductance fluctuations and coherent transport. Coulomb blockade effects - single electron phenomena and single electron transistor - magnetic semiconductors - spintronics. Carbon nanotubes: Properties and applications.

TOTAL= 45 PERIODS

OUTCOMES:

On completion of the course, students will be able to

- Apply the conducting properties of metals in electrical devices.
- Analyze physical properties of semiconductors in electronic devices.
- Analyze the properties of magnetic and dielectric materials for electrical devices.
- Analyze the properties of optical materials in optoelectronics.
- Analyze the quantum behaiour in nanoelectronic devices.

TEXT BOOKS:

1. Kasap, S.O. “Principles of Electronic Materials and Devices”, McGraw-Hill Education, 2007.
2. Umesh K Mishra &Jasprit Singh, “Semiconductor Device Physics and Design”, Springer, 2008.
3. Wahab, M.A. “Solid State Physics: Structure and Properties of Materials”. Narosa Publishing House, 2009.

REFERENCES

1. Garcia, N. & Damask, A. “Physics for Computer Science Students”. Springer-Verlag, 2012.
2. Hanson, G.W. “Fundamentals of Nanoelectronics”. Pearson Education, 2009
3. Rogers, B., Adams, J. & Pennathur, S. “Nanotechnology: Understanding Small Systems”. CRC Press, 2014**.**
4. S. O. Pillai, Solid state physics, New Age International, 2015.

CY17251 ENVIRONMENTAL SCIENCE AND ENGINEERING L T P C
(Common to B.E. AERO, AUTO, MECH, CIVIL, CSE, ECE, EEE AND MCT) 3 0 0 3

OBJECTIVES:

To find the scientific, technological, economic and political solutions to environmental problems.

- To study the interrelationship between living organism and environment.
- To study the importance of environment by assessing its impact on the human world.
- To study the dynamic processes and understand the features of the earth’s interior and surface.

- To study the integrated themes and biodiversity, natural resources, pollution control and waste management.

UNIT I ENVIRONMENT, ECOSYSTEMS AND BIODIVERSITY 12

Definition, scope and importance of Risk and hazards; Chemical hazards, Physical hazards, Biological hazards in the environment – concept of an ecosystem – ecological succession processes – Introduction, types, characteristic features, structure and function of the forest ecosystem - grassland ecosystem - desert ecosystem - aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries) – Introduction to biodiversity definition: genetic, species and ecosystem diversity – Significance of medicinal plants - biogeographical classification of India – value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values – Biodiversity at global, national and local levels – India as a mega-diversity nation – hot-spots of biodiversity – threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts – endangered and endemic species of India – conservation of biodiversity: In-situ and ex-situ conservation of biodiversity.

UNIT II ENVIRONMENTAL POLLUTION 10

Definition - causes, effects and control measures of Air pollution (Atmospheric chemistry - Chemical composition of the atmosphere; Chemical and photochemical reactions in the atmosphere - formation of smog, PAN, acid rain, oxygen and ozone chemistry- Mitigation procedures - Control of particulate and gaseous emission, Control of SO_2, NO_X, CO and HC) - Water pollution : Physical and chemical properties of terrestrial and marine water and their environmental significance - Water quality parameters – physical, chemical and biological; absorption of heavy metals - Water treatment processes. Soil pollution - soil waste management: causes, effects and control measures of municipal solid wastes – Marine pollution - Noise pollution - Thermal pollution - Nuclear hazards– e-Waste – toxic substances in e-waste – risks related to toxic substances – role of an individual in prevention of pollution – pollution case studies.

UNIT III NATURAL RESOURCES 10

Forest resources: Use and over-exploitation, deforestation, case studies- timber extraction, mining, dams and their effects on forests and tribal people – Water resources: Use and overutilization of surface and ground water, dams-benefits and problems – Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources, case studies – Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies – Energy resources: Growing energy needs, renewable and non renewable energy sources, use of alternate energy sources - energy production from waste materials. Energy Conversion processes – Biogas – production and uses, anaerobic digestion; case studies – Land resources: Land as a resource, land degradation, man induced landslides, soil erosion and desertification – role of an individual in conservation of natural resources – Equitable use of resources for sustainable lifestyles. Introduction to Environmental Biochemistry: Proteins –Biochemical degradation of pollutants, Bioconversion of pollutants.

UNIT IV SOCIAL ISSUES AND THE ENVIRONMENT 7

From unsustainable to sustainable development – urban problems related to energy – water conservation, rain water harvesting, watershed management – resettlement and rehabilitation of people; its problems and concerns, case studies – role of non-governmental organization environmental ethics: Issues and possible solutions – Principles of green chemistry - nuclear accidents and holocaust, case studies – wasteland reclamation – consumerism and waste products – environment protection act – Air act – Water act – Wildlife protection act – Forest conservation act – The Biomedical Waste (Management and Handling) Rules; 1998 and amendments- scheme of labelling of environmentally friendly products (Ecomark). Enforcement

machinery involved in environmental legislation- central and state pollution control boards - disaster management: floods, earthquake, cyclone and landslides. Public awareness and case studies.

UNIT V HUMAN POPULATION AND THE ENVIRONMENT 6

Population growth, variation among nations – population explosion – family welfare programme – environment and human health – human rights – value education – HIV / AIDS – Dengue fever- Swine flu – women and child welfare – Environmental impact analysis (EIA)- GIS-remote sensing - role of information technology in environment and human health – Case studies. Effect of Radiation from computing devices.

TOTAL= 45 PERIODS

OUTCOMES:

On completion of the course students will be able to

- Solve problems that cannot be solved by mere laws.
- Get familiarized with ecological balance.
- Get public awareness of environment at infant stage.
- Find ways to protect the environment and play proactive roles.
- Develop and improve the standard of better living.

TEXT BOOKS:

1. Benny Joseph, 'Environmental Science and Engineering', Tata McGraw-Hill, New Delhi, 2008.
2. Gilbert M.Masters, 'Introduction to Environmental Engineering and Science', 2nd Edition, Pearson Education 2004.

REFERENCES:

1. Dharmendra S. Sengar, 'Environmental law', Prentice Hall of India PVT LTD, New Delhi, 2007.
2. R.K. Trivedi, "Handbook of Environmental Laws, Rules, Guidelines, Compliances and Standard", Vol. I and II, Enviro Media.
3. Cunningham, W.P. Cooper, T.H. Gorhani, 'Environmental Encyclopedia', JaicoPubl., House, Mumbai, 2001.
4. Rajagopalan.R, 'Environmental studies- From Crisis to Cure',3rd edition, Oxford University press, 2015.

EC17201 ELECTRON DEVICES L T P C

(Common to ECE and BME) 3 0 0 3

OBJECTIVES:

- To study the construction, theory and operation of basic electronic devices such as PN junction diode
- To study in detail about the operation and characteristic features of BJT
- To introduce the structure and terminal characteristics of FET and MOSFET
- To allow the students to acquire knowledge about special semiconductor devices
- To study the extension of semiconductor devices on power and display devices

UNIT I SEMICONDUCTOR DIODE 9

PN junction diode, current equations, energy band diagram, diffusion and drift current densities, forward and reverse bias characteristics, Transition and Diffusion capacitances, Switching characteristics, Breakdown in PN junction diodes, applications of PN diode.

UNIT II BIPOLAR JUNCTION TRANSISTORS 9

NPN & PNP Configurations -operations-Early effect-current equations – input and output characteristics of CE, CB, CC - h-parameter model -Hybrid -π model - Eber's Moll model- Multi emitter transistor.

UNIT III FIELD EFFECT TRANSISTORS 9

JFET–drain and transfer characteristics,-current equations-Pinch off voltage and its significance- MOSFET-threshold voltage -channel length modulation, D-MOSFET, E-MOSFET- characteristics – comparison of MOSFET with JFET.

UNIT IV SPECIAL SEMICONDUCTOR DEVICES 9

Metal semiconductor Junction- MESFET, FINFET, PINFET, CNTFET, DUAL GATE MOSFET- Schottky barrier diode-Zener diode-Varactor diode –Tunnel diode- Gallium Arsenide device, LASER diode, LDR – Characteristics curve and its advantages.

UNIT V POWER DEVICES AND DISPLAY DEVICES 9

UJT, SCR, Diac, Triac, Power BJT- Power MOSFET- DMOS-VMOS. Opto electronic and display devices characteristics.

TOTAL= 45 PERIODS

OUTCOMES:

The students are able to

- Describe the essence of the diode functions and its characteristics
- Analyze the BJT terminal characteristics and its utilization in circuit models
- Develop a high degree of familiarity with the FET and MOSFET
- Analyze the characteristics of special semiconductor devices for their suitable applications
- Analyze the components associated with power control and opto-electronic devices

TEXT BOOKS:

1. Donald A Neaman, "Semiconductor Physics and Devices", Fourth Edition, Tata McGraw-Hill Inc. 2012.
2. Salivahanan. S, Suresh Kumar. N, Vallavaraj.A, "Electronic Devices and circuits", Third Edition, Tata McGraw- Hill, 2008.

REFERENCES:

1. Boylestad and Louis Nashelsky, "Electron Devices and Circuit Theory" Pearson Prentice Hall, 10th edition, July 2008.
2. S.Sedha, "A Text Book of Applied Electronics" S.Chand Publications, 2006.
3. Yang, "Fundamentals of Semiconductor devices", McGraw Hill International Edition, 1978.

EC17202 CIRCUIT ANALYSIS L T P C

4 0 0 4

OBJECTIVES:

- To introduce electric circuits and its analysis.
- To impart knowledge on solving electric circuits using network theorems.
- To introduce the phenomenon of resonance in series and parallel circuits.
- To provide knowledge on obtaining the transient response of RC, RL and RLC circuits.
- To analyse two port networks.

UNIT I BASIC CIRCUITS ANALYSIS AND NETWORK TOPOLOGY 12

Ohm's Law – Kirchhoff's laws – Mesh current and node voltage method of analysis for D.C and A.C. circuits - Network terminology - Graph of a network - Incidence and reduced incidence matrices – Trees – Cutsets - Fundamental cutsets - Cutset matrix – Tie sets - Link currents and Tie set schedules -Twig voltages and Cutset schedules, Duality and dual networks.

UNIT II NETWORK THEOREMS FOR DC AND AC CIRCUITS 12

Network theorems -Superposition theorem, Thevenin's theorem, Norton's theorem, Reciprocity theorem, Millman's theorem, and Maximum power transfer theorem ,application of Network theorems- Network reduction: voltage and current division, source transformation – star delta conversion.

UNIT III RESONANCE AND COUPLED CIRCUITS 12

Resonance - Series resonance - Parallel resonance - Variation of impedance with frequency -Variation in current through and voltage across L and C with frequency – Bandwidth - Q factor -Selectivity. RL-series to parallel and parallel to series conversion- Self inductance - Mutual inductance - Dot rule - Coefficient of coupling - Analysis of multiwinding coupled circuits - Series, Parallel connection of coupled inductors - Single tuned and double tuned coupled circuits.

UNITIV TRANSIENT ANALYSIS 12

Natural response-Forced response - Transient response of RC, RL and RLC circuits to excitation by Step Signal, Impulse Signal and exponential sources - Complete response of RC, RL and RLC Circuits to sinusoidal excitation.

UNIT V TWO PORT NETWORKS 12

Two port networks, Z parameters, Y parameters, Transmission (ABCD) parameters, Hybrid(H) Parameters, Interconnection of two port networks, Symmetrical properties of T and π networks.

TOTAL= 60 PERIODS

OUTCOMES:

After completion of this course, the student will be able to:

- analyse the DC circuits
- realize the working of AC circuits
- apply circuit theorems for DC and AC circuits
- analyse the transient response of DC and AC Circuits
- obtain the Z,Y,ABCD and H parameters of T and π networks

TEXT BOOKS:

1. William H. Hayt,Jr., Jack E. Kemmerly and Steven M. Durbin, "Engineering Circuits Analysis", Tata McGraw Hill publishers, 6 th edition, New Delhi, 2003.
2. Joseph A. Edminister, Mahmood Nahri, "Electric circuits", Schaum's series, Tata McGraw-Hill, New Delhi, 2001.

REFERENCES:

1. Charles K. Alexander, Mathew N.O. Sadiku, "Fundamentals of Electric Circuits", Fifth Edition,McGraw Hill, 9th Reprint 2015.
2. A.Bruce Carlson, "Cicuits: Engineering Concepts and Analysis of Linear Electric Circuits", Cengage Learning, India Edition 2nd Indian Reprint 2009.

3. Allan H.Robbins, Wilhelm C.Miller, "Circuit Analysis Theory and Practice", Cengage Learning, Fifth Edition, 1st Indian Reprint 2013.

GE17261 ENGINEERING PRACTICES LABORATORY L T P C
(Common to all Branches of B.E/B.Tech. Programmes 0 0 4 2

OBJECTIVES:

- To provide exposure to the students with hands on experience on various basic engineering practices in Civil, Mechanical, Electrical and Electronics Engineering.

GROUP A (CIVIL & MECHANICAL)

I CIVIL ENGINEERING PRACTICE 15

Buildings:

(a) Study of plumbing and carpentry components of residential and industrial buildings. Safety aspects.

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:
Basic pipe connections – Mixed pipe material connection – Pipe connections with different joining components.
(e) Demonstration of plumbing requirements of high-rise buildings.

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 15

Welding:

(a) Preparation of butt joints, lap joints and T- joints by Shielded metal arc welding.
(b) Gas welding practice

Basic Machining:

(a) Simple Turning and Taper turning
(b) Drilling Practice

Sheet Metal Work:

(a) Forming & Bending:
(b) Model making – Trays and funnels.
(c) Different type of joints.

Machine assembly practice:

(a) Study of centrifugal pump
(b) Study of air conditioner

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 & ELECTRONICS)

III ELECTRICAL ENGINEERING PRACTICE 15

1. Residential house wiring using switches, fuse, indicator, lamp and energy meter.
2. Fluorescent lamp wiring.
3. Stair case wiring
4. Measurement of electrical quantities – voltage, current, power & power factor in RLC circuit.
5. Measurement of earth resistance.

IV ELECTRONICS ENGINEERING PRACTICE 15

1. Study of Electronic components and equipments – Resistance measurement using colour coding, Study of Function Generator and CRO. Measurement of AC signals parameters (peak-peak, RMS, Time period & frequency).
2. Study of logic gates AND, OR, EX-OR and NOT.
3. Generation of Clock Signal.
4. Soldering practice – Components Devices and Circuits – Using general purpose PCB.
5. Measurement of ripple factor of HWR and FWR.

TOTAL= 60 PERIODS

OUTCOMES:

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

- Fabricate carpentry components
- Fit pipe connections including plumbing works.
- Use welding equipment's to join the structures.
- Construct different types of wiring circuits.
- Construct electrical and electronic circuits

EC17211	CIRCUITS AND DEVICES LABORATORY (Common to ECE and BME)	L T P C 0 0 4 2

OBJECTIVES:

- To study the V-I characteristics of diodes, BJT's and FET's
- To analyze and design clipper, clamper and rectifier circuits
- To understand the V-I characteristics of SCR
- To analyze A.C and D.C. circuits using network theorems
- To implement RLC transient and resonant circuits

List of Experiments

1. Characteristics of PN Junction Diode
2. Zener diode Characteristics & Regulator using Zener diode
3. Common Emitter input-output Characteristics
4. Common Base input-output Characteristics
5. FET Characteristics
6. SCR Characteristics
7. Clipper and Clamper & FWR
8. Verifications of Thevinin & Norton theorem

9. Verifications of KVL & KCL
10. Verifications of Super Position Theorem
11. Verifications of maximum power transfer & reciprocity theorem
12. Determination of Resonance Frequency of Series & Parallel RLC Circuits
13. Transient analysis of RL and RC circuits

TOTAL= 60 PERIODS

COURSE OUTCOME: Students able to

- Demonstrate the V-I characteristics of diodes, BJT's and FET's
- Able to construct circuits by using diodes for various applications like clippers, clampers and rectifiers
- Verify the V-I characteristics of SCR
- Apply network theorems over any electrical circuits
- Demonstrate the transient analysis and resonance of the RLC circuits

SEMESTER III

MA 17352 LINEAR ALGEBRA AND PARTIAL DIFFERENTIAL EQUATIONS L T P C
(Common to ECE & BME) 3 2 0 4

OBJECTIVES:

- To understand the concepts of basis and dimension in vector spaces.
- To introduce the effective mathematical tools for the solutions of partial differential equations that model physical processes;
- To introduce Fourier series analysis which is central to many applications in engineering apart from its use in solving boundary value problems;

UNIT I VECTOR SPACES 15

Vector spaces – Subspaces – Linear combinations and system of Linear equations – Linear independence and Linear dependence – Bases and Dimensions – Linear Transformation – Matrix representation of Linear Transformation - Null space, Range and dimension theorem.

UNIT II INNER PRODUCT SPACES 15

Inner product and norms - Gram Schmidt orthonormalization process - Modified Gram Schmidt orthonormalization process - QR Factorization.

UNIT III PARTIAL DIFFERENTIAL EQUATIONS 15

Formation of partial differential equations – Singular integrals -- Solutions of standard types of first order pde: $f(p,q) = 0, f(z,p,q) = 0, z = px + qy + f(p,q), f(x,p) = f(y,q)$ -Lagrange's linear equation - Linear partial differential equations of second and higher order with constant coefficients of homogeneous type.

UNIT IV FOURIER SERIES 15

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

UNIT V APPLICATIONS OF PARTIAL DIFFERENTIAL EQUATION 15

Classification of partial differential equations - Solutions of one dimensional wave equation using method of separation of variables - related problems.

TOTAL= 75 PERIODS

OUTCOME

On completion of the course students will be able to

- Use concepts of basis and dimension in vector spaces in solving problems.
- Construct orthonormal basis using inner products.
- Develop skills to solve different types of partial differential equations
- Develop skills to construct Fourier series for different periodic functions and to evaluate infinite series.
- Classify different types of PDE and solve boundary value problems.

TEXT BOOKS:

1. Friedberg, A.H., Insel, A.J. and Spence, L., —Linear Algebra‖, Prentice - Hall of India, New Delhi, 2004.
2. Veerarajan T, Transforms and Partial differential equation , Mc Graw Hill, New Delhi, 3rd edition, 2016.

REFERENCES:

1. Richard Bronson, 'Theory and Problems of Matrix Operations', McGraw-Hill.
2. Strang, G., —Linear Algebra and its applications‖, Thomson (Brooks/Cole), New Delhi, 2005.
3. Kumaresan, S., —Linear Algebra – A geometric approach‖, Prentice – Hall of India, New Delhi, Reprint, 2010. 2. Strang, G., —Linear
4. Grewal B.S., —Higher Engineering Mathematics‖, Khanna Publishers, New Delhi, 43rd Edition, 2014.
5. Erwin kreyszig, —Advanced Engineering Mathematics‖, John Wiley & Sons, 9th Edition, New Delhi, 2014.
6. Ramana, B.V. —Higher Engineering Mathematics‖, Tata McGraw Hill, New Delhi, 11th Reprint , 2010.
7. Gilbert Strang , "Introduction to Linear Algebra" by, 5TH Edition, Wellesley College, 2016.

CS17201	DATA STRUCTURES	L	T	P	C
	(Common to CSE, IT, ECE, BME)	**3**	**0**	**0**	**3**

OBJECTIVES:

- To recognize and distinguish the applications of various linear and non linear data structures.
- To demonstrate the understanding of stacks, queues and their applications.
- To apply the concepts of List ADT.
- To analyze the concepts of tree and graph data structures.
- To able to incorporate various searching and sorting techniques in real time scenarios.

UNIT I BASIC DATA STRUCTURES 9

Introduction to Data Structure - Classes and Objects in Python – Stack – ADT - Stack Applications - Balancing symbols -Evaluating the Postfix expressions – Queue - ADT – Queue Applications - Dequeue - Circular Queue

UNIT II LINKED LIST 9

Linked List Implementation - Singly Linked List- Circular Linked List - Doubly Linked List – All operation (Insertion, Deletion, Merge, Traversal) - Applications of lists – Polynomial Manipulation

UNIT III TREES 9

Basic Tree Terminologies- Binary Tree, Representation of Trees, Tree Traversal, Binary Search Tree – Operations, Implementation. Binary Heap- Properties, Heap Operations.

UNIT IV GRAPHS 9

Graph Terminologies, Graph ADT, Traversal- BFS, DFS, Directed Acyclic Graph- Topological Sorting, Shortest Path- Dijkstra's Algorithm.

UNIT V SEARCHING AND SORTING 9

Searching- Linear search, Binary search, Hashing- Hash function, Collision resolution techniques- Linear probing, separate chaining. Sorting- Bubble sort, Selection sort, Insertion sort, Shell sort, Merge sort, Quick sort.

TOTAL= 45 PERIODS

OUTCOMES:

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

- Analyze the various data structure concepts.
- Apply data structures to solve various problems.
- Understand non-linear data structures.
- Correlate the uses of graphs in real life scenarios
- Apply different Sorting, Searching and Hashing algorithms.

TEXTBOOKS:

1. Bradley N. Miller, David L. Ranum, "Problem Solving with Algorithms and Data Structures Using Python", Franklin, Beedle& Associates , Second Edition, 2013. [Units 1,3,5]
2. Michael T. Goodrich , Roberto Tamassia, Michael H. Goldwasser, "Data Structures and Algorithms in Python" Wiley, 2013 . [Units 2, 4]

REFERENCES:

1. Rance D. Necaise , "Data Structures and Algorithms using Python", John Wiley & Sons, 2011.
2. David M.Reed and John Zelle, "Data Structures and Algorithms using Python and C++", Franklin Beedle& Associates 2009.

EC17301 ELECTRONIC CIRCUITS- I L T P C
3 0 0 3

OBJECTIVES:

- To study Biasing concepts of transistors such as BJT, JFET and MOSFET
- To analyze the BJT amplifiers using small signal model.
- To analyze the FET amplifiers using small signal model.
- To derive and determine frequency response of BJT and FET amplifiers
- To study the concepts and biasing of IC MOSFET

UNIT I BIASING OF DISCRETE BJT AND FET 9

DC Load line, operating point, various biasing methods for BJT, Stability-Bias compensation, Thermal stability, Design of biasing for JFET and MOSFET.

UNIT II BJT SMALL SIGNAL AMPLIFIERS 9

Small signal analysis of common emitter amplifier, AC Load line, Voltage swing limitations, Common Collector and Common Base amplifiers, Differential amplifiers, CMRR, Darlington amplifier, Bootstrap technique, Cascaded stages, Cascode amplifier.

UNIT III JFET AND MOSFET AMPLIFIERS 9

Analysis of JFET amplifiers- small signal analysis of MOSFET and JFET, Common source amplifier, voltage swing limitations, small signal analysis of MOSFET and JFET source follower and Common Gate amplifiers, BiMOS Cascode amplifier.

UNIT IV FREQUENCY ANALYSIS OF BJT AND MOSFET AMPLIFIERS 9

Low frequency analysis, Miller effect, High frequency analysis of CE and MOSFET CS amplifier, short circuit current gain of CC amplifier, cut-off frequencies of CE and CB amplifiers (fα and fβ), Gain bandwidth product, Determination of bandwidth of single stage and multistage amplifiers.

UNIT V IC MOSFET AMPLIFIERS 9

IC Amplifiers- IC biasing current steering circuit using MOSFET, MOSFET current sources, PMOS and NMOS current sources. Amplifier with active loads - enhancement load, depletion load and PMOS and NMOS current sources load, CMOS common source and source follower, CMOS differential amplifier, CMRR.

TOTAL= 45 PERIODS

OUTCOMES:

Upon completion of the course, the students will be able to:

- Design of transistor circuits with bias stability
- Perform DC and AC analysis of single stage and multi-stage BJT amplifier circuits
- Perform DC and AC analysis of FET amplifiers
- Determine the bandwidth of BJT and FET amplifiers
- Design of IC MOSFET amplifiers with active load

TEXT BOOKS:

1. Donald .A. Neamen, Electronic Circuit Analysis and Design – 2nd Edition, Tata McGraw Hill, 2009.
2. David A., “Bell Electronic Devices and Circuits”, Oxford Higher Education Press, 5th Edition, 2010

REFERENCES:

1. Adel .S. Sedra, Kenneth C. Smith, "Micro Electronic Circuits", 6th Edition, Oxford University Press, 2010.
2. BehzadRazavi, "Design of Analog CMOS Integrated Circuits", Tata McGraw Hill, 2007.
3. Paul Gray, Hurst, Lewis, Meyer "Analysis and Design of Analog Integrated Circuits", 4th Edition,John Willey & Sons 2005
4. Millman.J. and Halkias C.C, "Integrated Electronics", McGraw Hill, 2001.
5. D.Schilling and C.Belove, "Electronic Circuits", 3rd Edition, McGraw Hill, 1989.
6. Robert L. Boylestad and Louis Nasheresky, "Electronic Devices and Circuit Theory", 10th Edition, Pearson Education / PHI, 2008.

EC 17302 DIGITAL ELECTRONICS L T P C
3 0 0 3

OBJECTIVES:

- To educate basic postulates of Boolean algebra and infer the methods for simplifying Boolean expressions
- To illustrate the formal procedures for the analysis and design of combinational circuits and Sequential circuits
- To extrapolate the concept in the design of synchronous and asynchronous sequential circuits
- To illustrate the concept of memories and Programmable Logic Devices
  To acquire knowledge to write codes using Verilog HDL

UNIT I MINIMIZATION TECHNIQUES AND LOGIC GATES 9

Fundamentals: Boolean postulates and laws, De-Morgan's Theorem, Principle of Duality, Boolean expression, Minterm, Maxterm, Sum of Products (SOP), Product of Sums (POS). Minimization Techniques: Minimization of Boolean expressions using Boolean laws, Karnaugh map, Quine McCluskey method of minimization, Don't care conditions.

Logic Gates: Implementations of Logic Functions using gates, NAND–NOR implementations, TTL and CMOS Logic and their characteristics, Tristate gates.

UNIT II COMBINATIONAL CIRCUITS 9

Half adder, Full Adder, Half subtractor, Full subtractor, Code converters, Parity checker, Parity generators, Magnitude Comparator, Parallel Binary Adder, Fast Adder, Carry Look Ahead adder, Parallel Binary Subtractor, Parallel Binary Adder/Subtractor, BCD adder, Binary Multiplier, Binary Divider, Multiplexer, Demultiplexer, Decoder, Encoder.

UNIT III SYNCHRONOUS SEQUENTIAL CIRCUITS 9

Memory element: Latches, Flip-flops: RS, JK, D, T. Master-Slave, Triggering of Flip Flops, Realization of one flip flop using other flip flops. Design of Synchronous counters, Synchronous Up/Down counters, Programmable counters, Modulo–N counter, Asynchronous Ripple or serial counter, Asynchronous Up/Down counter. Universal Shift Registers, Shift Register Counters: Ring counter, Shift counters. Sequence generators, Sequence Detector, Serial Adder/Subtractor.

UNIT IV ASYNCHRONOUS SEQUENTIAL CIRCUITS 9

Asynchronous Sequential Circuits: Fundamental Mode and Pulse Mode Circuits Design, Incompletely Specified State Machines, Problems in Asynchronous Circuits, Design of Hazard Free Switching circuits.

UNIT V PROGRAMMABLE LOGIC DEVICES & HDL 9

Programmable Logic Devices(PLD): Programmable Logic Array (PLA), Programmable Array Logic (PAL), Field Programmable Gate Arrays (FPGA), Implementation of Combinational Logic Circuits using ROM, PLA, PAL. Introduction to Verilog HDL with simple programs.

TOTAL= 45 PERIODS

OUTCOMES:

Students will be able to:

- Reproduce the basic postulates of Boolean algebra and recognize & solve the suitable method for simplifying Boolean expressions
- Apply the procedure to Design and Implement Combinational and Sequential circuits
- Design and Implement Synchronous and Asynchronous Sequential circuits.
- Design of Programmable Logic Devices
- Familiar with Verilog HDL codes for Combinational and Sequential circuits

TEXT BOOKS:

1.M. Morris Mano, “Digital Design”, 4th Edition, Prentice Hall of India Pvt. Ltd., 2008 / Pearson Education (Singapore) Pvt. Ltd., New Delhi, 2003.
2. Charles H.Roth. “Fundamentals of Logic Design”, 7th Edition, Thomson Learning, 2014.

REFERENCES:

1.Thomas L. Floyd, “Digital Fundamentals”, 10th Edition, Pearson Education Inc, 2011.
2. John F.Wakerly, “Digital Design”, Fourth Edition, Pearson/PHI, 2008
3. John.M Yarbrough, “Digital Logic Applications and Design”, Thomson Learning, 2006.
4. Donald P.Leach and Albert Paul Malvino, “Digital Principles and Applications”, 6th Edition, TMH, 2006.
5. Donald D.Givone, “Digital Principles and Design”, TMH, 2003.

EC17303 SIGNALS AND SYSTEMS L T P C

3 0 0 3

OBJECTIVES:

- To understand the basic properties of Signals & Systems and the various methods of classification
- To learn Laplace Transform & Fourier transform and their properties
- To characterize LTI systems in Frequency domain
- To know about the concepts of DTFT and Z Transform
- To characterize LTI systems in DTFT and Z Transform

UNIT I CLASSIFICATION OF SIGNALS AND SYSTEMS 9

Continuous time signals (CT signals) - Discrete time signals (DT signals), Step, Ramp, Pulse, Impulse, Sinusoidal, Exponential, Classification of CT and DT signals, Periodic & Aperiodic signals, Deterministic & Random signals, Energy & Power signals, CT systems and DT systems, Classification of systems: Static & Dynamic, Linear & Nonlinear, Time-variant & Time-invariant, Causal & Non-causal, Stable & Unstable.

UNIT II ANALYSIS OF CONTINUOUS TIME SIGNALS 9

Fourier series analysis-spectrum of Continuous Time (CT) signals, Fourier and Laplace Transforms in CT signal analysis and its Properties.

UNIT III LINEAR TIME INVARIANT- CONTINUOUS TIME SYSTEMS 9

Differential Equation-Block diagram representation, Impulse response, Convolution integrals, Fourier and Laplace transforms in analysis of CT systems.

UNIT IV ANALYSIS OF DISCRETE TIME SIGNALS 9

Baseband Sampling and Reconstruction, DTFT, Properties of DTFT, Z Transform and its Properties.

UNIT V LINEAR TIME INVARIANT-DISCRETE TIME SYSTEMS 9

Difference Equations, Block diagram representation, Impulse response, Convolution sum, Discrete Time Fourier and Z Transform analysis of Recursive & Non-Recursive systems.

TOTAL= 45 PERIODS

OUTCOMES:

Students will be able to:

- Analyze the properties of Signals & Systems
- Apply Laplace transform, Fourier transform in signal analysis
- Analyze continuous time LTI systems using Fourier and Laplace Transforms
- Apply Z -transform and DTFT in signal analysis
- Analyze discrete time LTI systems using Z transform and DTFT

TEXT BOOK:

1. Allan V.Oppenheim, S.Wilsky and S.H.Nawab, “Signals and Systems”, Pearson, 2007.

REFERENCES:

1.B. P. Lathi, “Principles of Linear Systems and Signals”, Second Edition, Oxford, 2009.
2.R.E.Zeimer, W.H.Tranter and R.D.Fannin, “Signals & Systems - Continuous and Discrete”, Pearson, 2007.
3.John Alan Stuller, “An Introduction to Signals and Systems”, Thomson, 2007.
4.M.J.Roberts, “Signals & Systems Analysis using Transform Methods & MATLAB”, Tata McGraw Hill, 2007.
5.Simon Haykin, Barry Van Veen, “Signals and Systems”, Second edition, John Wiley & Sons, 2003.

EE17353 ELECTRICAL AND INSTRUMENTATION ENGINEERING L T P C 3 0 0 3

OBJECTIVES:

- To understand concepts in electrical generators, motors
- To impart knowledge on the performance of transformers.
- To learn working principles of various alternating machines.
- To study the basic measurement concepts and different types of transducers.
- To know the importance of analog and digital instruments.

UNIT I DC MACHINES 9

Construction of DC machines – Theory of operation of DC generator – EMF equation-– Characteristics of DC generators- Operating principle of DC motor – Types of DC motors- Torque equation - Characteristics – Speed control of DC motors- Applications.

UNIT II TRANSFORMER 9

Introduction – Single phase transformer construction and principle of operation – EMF equation of transformer-Transformer no–load phasor diagram — Transformer on–load phasor diagram —Equivalent circuit of transformer – Regulation of transformer –Transformer losses and efficiency-All day efficiency –auto transformers.

UNIT III INDUCTION MACHINES AND SYNCHRONOUS MACHINES 9

Introduction to three phase circuits - Principle of operation of three-phase induction motor – Construction – Types – Equivalent circuit –Construction of single-phase induction motor – Types of single phase induction motors – Double revolving field theory – starting methods – Principle of alternator – Construction details – Types –Equation of induced EMF – Operating principle of Synchronous motor.

UNIT IV BASICS OF MEASUREMENTS AND INSTRUMENTATION 9

Static and Dynamic Characteristics of Measurement – Errors in Measurement - Classification of Transducers – Variable resistive transducer – Strain Gauge, Thermistor, RTD –- Variable Capacitive Transducer – Capacitor Microphone - Piezo Electric Transducer – Variable Inductive transducer –LVDT, RVDT

UNIT V ANALOG AND DIGITAL INSTRUMENTS 9

Measurement of R–Wheatstone bridge, Kelvin bridge, Measurement of L-Maxwell bridge, Anderson bridge, Measurement of C-Schering bridge -Wien bridge - Q-Meter -DVM, DMM – Storage Oscilloscope - Comparison of Analog and Digital Modes of operation.

TOTAL= 45 PERIODS

OUTCOMES:

Students will be able to

- Realize the characteristics and performance of dc machines.
- Analyse the working of transformers under various operating conditions.
- Obtain and evaluate the unique characteristic features of various alternating machines.
- Evaluate various physical quantities using electronic measuring systems.
- Estimate the electrical parameters using analog and digital instruments.

TEXT BOOKS:

1. I.J Nagarath and Kothari DP, “Electrical Machines”, McGraw-Hill Education (India) Pvt Ltd4th Edition, 2010
2. A.K.Sawhney, “A Course in Electrical & Electronic Measurements and Instrumentation”, Dhanpat Rai and Co,2004.

REFERENCES:

1. Del Toro, “Electrical Engineering Fundamentals” Pearson Education, New Delhi, 2007.
2. W.D.Cooper&A.D.Helfrick, “Modern Electronic Instrumentation and Measurement Techniques”, 5th Edition, PHI, 2002.
3. John Bird, “Electrical Circuit Theory and Technology”, Elsevier, First Indian Edition, 2006.
4. Thereja .B.L, “Fundamentals of Electrical Engineering and Electronics”, S Chand & Co Ltd, 2008.
5. H.S.Kalsi, “Electronic Instrumentation”, Tata Mc Graw-Hill Education, 2004.
6. J.B.Gupta, “Measurements and Instrumentation”, S K Kataria& Sons, Delhi, 2003.

CS17211 DATA STRUCTURES LABORATORY L T P C
(Common to CSE, IT, ECE, BME) 0 0 4 2

OBJECTIVES:

- To learn and implement the various linear and non linear data structures.
- To understand the tree and graph traversal methods.
- To apply searching and sorting techniques for practical scenarios.

LIST OF EXPERIMENTS

1. Basics of classes and objects
2. Stack implementation and its applications
3. Queue implementation
4. Linked List Operations
5. Binary Search Tree
6. Tree Traversals
7. Graph Traversals
8. Sorting Techniques
9. Searching Techniques
10. Mini Project on Application of Data Structures

(Printing Tasks, Hot Potato Game, Palindrome Checker, Push Down Automata)

TOTAL= 60 PERIODS

OUTCOMES:

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

- Design and implement stacks, queues and linked lists.
- Work with various data structures and map its applications to appropriate scenarios.
- Apply good programming design methods for program development.
- Design and implement trees and graph concepts.
- Idealize new sorting and searching algorithms.
-

PLATFORM NEEDED:

Hardware: PC with 4 GB RAM, i3 Processor
Software: Python 3 interpreter for Windows/Linux

EC17311 ANALOG AND DIGITAL CIRCUITS LABORATORY L T P C
0 0 4 2

OBJECTIVES:

- To understand the characteristics and analyze the frequency response of CE, CB, CC and CS amplifiers
- To study the transfer characteristics of differential amplifier
- To perform PSPICE simulation of electronic circuits
- To introduce the basics of digital experiments like converters, adder/ subtractor, and encoder/decoder
- To design and implementation of counters and shift register using flip-flops

LIST OF ANALOG EXPERIMENTS:

1. Frequency Response of CE / CB / CC amplifier
2. Frequency response of CS amplifiers
3. Darlington amplifier
4. Differential amplifier- Transfer characteristics / CMRR measurement
5. Cascade / Cascode amplifier
6. PSPICE Simulation of Common Emitter and Common Source amplifiers

LIST OF DIGITAL EXPERIMENTS:

7. Design and implementation of code converters using logic gates
8. Design and implementation of BCD adder using IC 7483
9. Design and implementation of Multiplexer and De-multiplexer using logic gates
10. Design and implementation of Synchronous and Asynchronous counters
11. Implementation of SISO, SIPO, PISO and PIPO shift registers using flip- flops
12. Realization of digital circuits using Verilog HDL
    Mini Project

TOTAL = 60 PERIODS

OUTCOMES:

Upon Completion of the course, the students will be able to:

- Design and analyse CE, CB, CC and CS amplifier
- Differentiate Cascade and Cascode amplifier
- Measure CMRR in differential amplifier
- Simulate amplifiers using PSPICE
- Design and implementation of combinational and sequential circuits

HS17361 INTERPERSONAL SKILLS- LISTENING AND SPEAKING L T P C
(Common to CSE, ECE, IT, MECH, BT, AUTO, CIVIL, MCT& BME) 0 0 2 1

OBJECTIVES

- To upgrade the learners' listening and speaking skills for educational purposes.
- To enhance the employability skills of the learners with a special focus on listening and speaking skills.

UNIT I INTRODUCTION 6

Importance of listening and Types of Listening – listening to TED Talks, lectures, etc.

Speaking: group discussions on general topics like how to grow organic potted plants, to furnish an apartment inexpensively, etc. – Phonetics

UNIT II APPRECIATIVE LISTENING AND IMPROMPTU 6

Listening - Listening to motivational speeches, music and poetry. Speaking – pick and talk, short talks on any event on topics- a trip to remember, a job I'd love to have, etc. –

Vocabulary: Collocation.

UNIT III INFORMATIVE LISTENING AND PERSUASIVE SPEAKING 6

Listening – Listening- to gather information such as facts, directions, news or instructions. Speaking – Persuasive speaking- convincing the audience with the speaker's view on the topics- food additives and unhealthiness, financial education is important in today's world, etc. – **Vocabulary:** Idioms and Phrases.

UNIT IV CRITICAL LISTENING AND SPEAKING ON SPECIAL OCCASION 6

Listening – Critical Listening- listening to examine and evaluate the message for logic and truth - televised debate, election campaign. Speaking – speech to commemorate a person or an event- speech of Introduction, etc. – Vocabulary: Foreign Words and Phrases.

UNIT V EMPATHETIC LISTENING AND DEMONSTRATIVE SPEAKING 6

Listening– Empathetic Listening – paying attention to another person with empathy – listening to problems and issues (videos). Speaking – Demonstrative speaking – Demonstrate a process using visual aids (charts, graphs, maps, pictures, etc.) – Grammar: Different types of Questions.

TOTAL= 30 PERIODS

OUTCOMES

On completion of the course students will be able to

- Identify the different types of listening and speaking for effective interpersonal communication.
- Discuss and respond to content of a listening passage.
- Comprehend and answer questions based on the texts/passages given.
- Understand different genres of texts and comprehend the materials to improve their vocabulary and are familiar with new words, phrases, sentence structures and ideas.
- Make inferences and predictions about spoken discourse.

REFERENCES

1. "Technical Communication – Principles and Practice," Second Edition – Meenakshi Raman and Sangeetha Sharma, Oxford University Press, December, 2011.
2. "Interpersonal Skills: How to develop Interpersonal Skills for work and home," Henry Lee (Kindle Edition)
3. "Teaching the Core Skills of Listening and Speaking," Erik Palmer (Kindle Edition)

SEMESTER IV

MA 17454 TRANSFORMS AND RANDOM PROCESSES L T P C

3 2 0 4

OBJECTIVE:

- To acquaint the student with Fourier transform techniques used in wide variety of situations.
- To provide the required mathematical support in real life problems and develop probabilistic models which can be used in several areas of science and engineering.

UNIT I FOURIER TRANSFORMS 15

Statement of Fourier integral theorem – Fourier transform pair – Fourier sine and cosine transforms – Properties – Transforms of simple functions – Convolution theorem –Parseval's identity - Application to boundary value problems.

UNIT II ONE - DIMENSIONAL RANDOM VARIABLE 15

Discrete and continuous random variables – Moments – Moment generating functions – Binomial, Poisson, Uniform, Exponential, Gamma, Rayleigh, Weibull and Normal distributions – Functions of Random Variable.

UNIT III TWO - DIMENSIONAL RANDOM VARIABLES 15

Joint distributions – Marginal and conditional distributions – Covariance – Correlation and Linear regression – Transformation of random variables – Applications of Central Limit Theorem.

UNIT IV RANDOM PROCESSES 15

Classification – Stationary process – Markov process - Poisson process and its properties – Random telegraph process.

UNIT V SPECTRAL DENSITIES AND LINEAR SYSTEMS 15

Auto correlation functions – Cross correlation functions – Power spectral density – Cross spectral density – Properties-Linear time invariant system – System transfer function – Linear systems with random inputs.

TOTAL= 75 PERIODS

OUTCOMES:

On completion of the course students will be able to

- Develop skills to solve problems using Fourier transform techniques
- Apply the basic concepts of probability, one dimensional and two dimensional Random Variables.
- Apply the concept of correlation and regression in real life situation.
- Analyze signals which evolve with respect to time in a probabilistic manner.
- Develop skills in solving problems on power spectral density function in linear time invariant systems.

TEXT BOOKS:

1. T.Veerarajan, ‘Probability, Statistics and Random Processes with Queueing Theory and Queueing Networks’ , Mc Graw Hill, 2016.
2. Peebles. P.Z., "Probability, Random Variables and Random Signal Principles", Tata McGraw-Hill, 4th Edition, New Delhi, 2002.

REFERENCES:

1. Yates. R.D. and Goodman. D.J., "Probability and Stochastic Processes", 2nd Edition, Wiley India Pvt. Ltd., Bangalore, 2012.
2. Stark. H., and Woods. J.W., "Probability and Random Processes with Applications to Signal Processing", 3rd Edition,Pearson Education, Asia, 2002.
3. Miller. S.L. and Childers. D.G., "Probability and Random Processes with Applications to Signal Processing and Communications", Academic Press, 2004.
4. Hwei Hsu, "Schaum‟s Outline of Theory and Problems of Probability, Random Variables and Random Processes", Tata Mc Graw Hill Edition, New Delhi, 2004.
5. Cooper. G.R., Mc Gillem. C.D., "Probabilistic Methods of Signal and System Analysis", 3rd Indian Edition, Oxford University Press, New Delhi, 2012.

EC17401 ELECTRONIC CIRCUITS -II L T P C
3 0 0 3

OBJECTIVES:

- To introduce the concepts of feedback topology in amplifiers
- To classify and construct RC and LC oscillators
- To analyze the small signal single and double tuned amplifiers
- To Classify and construct wave shaping and multivibrator circuits
- To construct power amplifiers and DC converters

UNIT I FEEDBACK AMPLIFIERS 9

General Feedback Structure, Properties of negative feedback, Basic Feedback Topologies, Determining the Loop Gain, Stability Problem, Nyquist Plot, Effect of feedback on amplifier poles, Frequency Compensation.

UNIT II OSCILLATORS 9

Introduction, Barkhausen Criterion, General form of an Oscillator, Analysis of LC and RC oscillators, Frequency range of RC and LC Oscillators, Quartz Crystal Oscillator, Miller and Pierce Crystal oscillators, frequency stability of oscillators.

UNIT III TUNED AMPLIFIERS 9

Coil losses, unloaded and loaded Q of tank circuits, small signal tuned amplifiers – Analysis of capacitor coupled Single tuned amplifier, Double tuned amplifier, effect of cascading single tuned and double tuned amplifiers on bandwidth, Stagger tuned amplifiers, Class C tuned amplifier-Efficiency and applications, Stability of tuned amplifiers, Hazeltine neutralization method, Class D switching amplifiers.

UNIT IV WAVE SHAPING AND MULTIVIBRATOR CIRCUITS 9

RC & RL Integrator and Differentiator circuits, Storage, Delay and Calculation of Transistor Switching Times, Speed-up Capacitor, Diode clippers, Diode comparator, Clampers. Collector coupled and Emitter coupled Astable multivibrator, Monostable multivibrator, Bistable multivibrator, Triggering methods for Bistable multivibrator, Schmitt trigger circuit.

UNIT V POWER AMPLIFIERS AND DC CONVERTERS 9

Power amplifiers-Class A, Class B, Class AB, Class C, MOSFET power amplifiers, Temperature effect, Class AB power amplifier using MOSFET, DC to DC converters, Regulators, Buck, Boost, Buck-boost converters-analysis and design.

TOTAL= 45 PERIODS

OUTCOMES:

Upon Completion of the course, the students will be able to:

- Analyse various feedback amplifiers
- Design and construct the RC and LC oscillators
- Analyse the small signal single and Double tuned amplifiers
- Design and construct the wave shaping and Multivibrator circuits
- Design the power amplifiers and DC converters

TEXT BOOKS:

1. Sedra and Smith, “Micro Electronic Circuits”; Sixth Edition, Oxford University Press, 2011.
2. Robert L. Boylestad and Louis Nasheresky, “Electronic Devices and Circuit Theory”, 10th Edition, Pearson Education / PHI, 2008.
3. David A. Bell, “Electronic Devices and Circuits”, Fifth Edition, Oxford University Press, 2008. 4. Millman J. and Taub H., “Pulse Digital and Switching Waveforms”, TMH, 2000.
4. Millman and Halkias. C., Integrated Electronics, Tata McGraw Hill International’ Edition, 2001.

REFERENCE BOOKS:

1. L. Boylestad and L. Nashelsky, “Electronic Devices and Circuit Theory”, PHI Learning Pvt. Ltd, Ninth Edition, 2008.
2. Adel .S. Sedra, Kenneth C. Smith, “Micro Electronic Circuits”, 6th Edition, Oxford University Press, 2010.
3 D.Schilling and C.Belove, “Electronic Circuits”, 3rd Edition, Mc Graw Hill, 1989.

EC17402 COMMUNICATION THEORY L T P C 3 0 0 3

OBJECTIVES:

- To introduce the concepts of Amplitude modulation and demodulation with spectral characteristics
- To introduce the concepts of Angle modulation and demodulation
- To understand the properties of random process
- To know the effect of noise on communication systems
- To understand the concepts of source coding techniques and communication channel modelling.

UNIT I AMPLITUDE MODULATION 9

Generation and detection of AM wave, DSBSC, Pre-envelope, SSB and VSB comparison, Spectra, Super heterodyne AM Receiver. Multiplexing-Frequency Division Multiplexing (FDM).

UNIT II ANGLE MODULATION 9

Phase and Frequency modulation, Narrow Band and Wideband FM, Spectrum, FM modulation and demodulation, FM Discriminator, PLL as FM Demodulator, Transmission bandwidth, Super heterodyne FM Receiver.

UNIT III NOISE 9

Noise sources and types, Noise figure and noise temperature, Noise in cascaded systems, Frii’s formula, Narrow band noise, PSD of in-phase and quadrature noise.

UNIT IV PERFORMANCE OF CW MODULATION SCHEMES 9

Noise performance in AM systems-DSBFC, DSBSC, Noise performance in FM system, FM threshold effect, Pre-emphasis and De-emphasis, Capture effect.

UNIT V INFORMATION THEORY AND CHANNEL MODELLING 9

Measure of Information, Entropy, Discrete Memoryless channel, Channel Capacity, Shannon-Hartley theorem, Source coding theorem, Huffman, Shannon-Fano codes. Mathematical Models of Communication Channel-Additive Noise Channel, Linear Filter Channel, Linear Time-Variant Filter Channel.

TOTAL= 45 PERIODS

OUTCOMES:

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

- Understand the principles of various Amplitude modulation and demodulation techniques and bandwidth requirement
- Describe principles of Angle modulation techniques
- Classify the random variables and random process
- Compare noise performance on AM and FM receivers
- Demonstrate fundamental information theory concepts and channel modelling.

TEXT BOOKS:

1. Simon Haykin, Communication Systems, John Wiley & sons, NY, 4th Edition, 2001.

REFERENCES:

1. J.G.Proakis, M.Salehi, "Fundamentals of Communication Systems", Pearson Education 2006.
2. B.P.Lathi, "Modern Digital and Analog Communication Systems", 3rd Edition, Oxford University Press, 2007.
3. H P Hsu, Schaum Outline Series - "Analog and Digital Communications" TMH 2006.

EC17403 CONTROL SYSTEM ENGINEERING L T P C

3 0 0 3

OBJECTIVES:

- To introduce the elements of control system and their modeling using various Techniques by determining the transfer function of the systems
- To introduce methods for analyzing the time response of the systems
- To introduce methods for analyzing frequency response of the systems
- To introduce methods for analyzing the stability of the systems
- To introduce the state variable analysis method

UNIT I CONTROL SYSTEM MODELING 9

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

UNIT II TIME RESPONSE ANALYSIS 9

Time response analysis, First order systems, Impulse and Step response analysis of second order systems, Steady state errors, P, PI, PD and PID Compensation.

UNIT III FREQUENCY RESPONSE ANALYSIS 9

Frequency Response, Bode Plot, Polar Plot, Nyquist Plot, Frequency Domain specifications from the plots, Constant M and N Circles, Nichol's Chart, Use of Nichol's chart in control system analysis. Series, parallel, series-parallel Compensators, Lead, Lag, and Lead-Lag Compensators.

UNIT IV STABILITY ANALYSIS 9

Stability, Routh-Hurwitz criterion, Root Locus technique, construction of Root Locus, stability, dominant Poles, Application of Root Locus diagram, Nyquist Stability criterion, Relative Stability.

UNIT V STATE VARIABLE ANALYSIS 9

State space representation of Continuous Time systems, State equations, Transfer function from state variable representation, Solutions of the state equations, Concepts of Controllability and Observability, Introduction to State space representation for Discrete time systems.

TOTAL= 45 PERIODS

OUTCOMES:

Upon completion of the course, students will be able to:

- Compute the transfer function of different physical systems
- Analyze the time domain specifications and calculate the steady state error
- Illustrate the frequency response characteristics of open loop and closed loop system response
- Analyze the stability using Routh-Hurwitz, Nyquist stability criteria and Root Locus technique
- Illustrate the state space model of a physical system and discuss the concepts of sampled data control system

TEXT BOOK:

1. J.Nagrath and M.Gopal, "Control System Engineering", New Age International Publishers, 5th Edition, 2007.

REFERENCES:

1. Benjamin.C.Kuo, "Automatic control systems", Prentice Hall of India, 7th Edition, 1995.
2. M.Gopal, "Control System – Principles and Design", Tata McGraw Hill, 2nd Edition, 2006.
3. Schaum"s Outline Series, "Feedback and Control Systems" Tata Mc Graw-Hill, 2007.
4. Joseph J. DiStefano, Allen R. Stubberud, Schaum's Outline of —Feedback and Control Systems, McGraw-Hill Education; 2nd edition 2013.

EC17404 LINEAR INTEGRATED CIRCUITS L T PC
3 0 0 3

OBJECTIVES:

- To introduce the concept of linear integrated circuits
- To learn the practical applications of operational amplifiers
- To introduce the applications of analog multipliers and PLL
- To study the application of ADC and DAC in real time systems
- To introduce special function ICs and its construction

UNIT I BASICS OF OPERATIONAL AMPLIFIERS 9

Current sources, Voltage sources, Voltage References, BJT Differential amplifier with active loads, Basic information about op-amps, Ideal Operational Amplifier, General operational amplifier stages, internal circuit diagrams of IC 741, DC performance characteristics, frequency compensation, slew rate, open and closed loop configurations.

UNIT II APPLICATIONS OF OPERATIONAL AMPLIFIERS 9

Inverting and Non-Inverting Amplifiers, V-to-I and I-to-V converters, Instrumentation amplifier, Integrator, Differentiator, Log and Antilog amplifier, Comparators, Multivibrator and Schmitt trigger, Triangular wave generator, Precision rectifier, Peak detector, Clipper and Clamper, Low-pass and Band-pass filters, Non-linear function generator.

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, Operation of the basic PLL, Closed loop analysis, Voltage controlled oscillator, application of PLL for AM detection, FM detection, FSK modulator and demodulator, Frequency synthesizers and compander ICs.

UNIT IV DIGITAL TO ANALOG AND ANALOG TO DIGITAL CONVERTERS 9

D/A converter: Weighted resistor type, R-2R Ladder type, Voltage mode and current mode R-2R Ladder types, switches for D/A converters. High speed sample-and-hold circuits, A/D converters: Flash type, Successive Approximation type, Single slope type, Dual slope type, A/D converter using voltage-to-time conversion, over sampling A/D converters.

UNIT V SPECIAL FUNCTION ICS 9

Timer IC 555, IC Voltage regulators: Three terminal fixed and Adjustable voltage regulators, IC 723 general purpose regulator, Monolithic switching regulator, switched capacitor filter IC MF10, Frequency to Voltage converters, Video amplifier, Isolation amplifier.

TOTAL= 45 PERIODS

OUTCOMES:

Upon Completion of the course, the students will be able to:

- Design of linear and non-linear applications using op – amp
- Design of analog linear circuits
- Design ADC and DAC using op – amp
- Generate waveforms using op – amp circuits
- Analyze special function ICs

TEXT BOOKS:

1. D.Roy Choudhry, Shail Jain, “Linear Integrated Circuits”, New Age International Pvt. Ltd., 2000.
2. Sergio Franco, “Design with Operational Amplifiers and Analog Integrated Circuits”, 3rd Edition, Tata McGraw-Hill, 2007.

REFERENCES:

1. Ramakant A. Gayakwad, —OP - AMP and Linear IC‘s —, Prentice Hall, 2012.
2. Robert F.Coughlin, Frederick F.Driscoll, “Operational Amplifiers and Linear Integrated Circuits”, Sixth Edition, PHI, 2001.
3. Gray and Meyer, —Analysis and Design of Analog Integrated Circuits —, Wiley International, 2009.
4. Michael Jacob, “Applications and Design with Analog Integrated Circuits”, Prentice Hall of India, 1996.
5. S.Salivahanan& V.S. KanchanaBhaskaran, “Linear Integrated Circuits”, TMH, 2008.
6. Botkar K.R., “Integrated Circuits”, Khanna Publishers, 1996.
7. Millman J. and Halkias C, “Integrated Electronics”, McGraw Hill, 2001.

EC17405 ELECTROMAGNETIC FIELDS L T P C
3 0 0 3

OBJECTIVES:

- To impart knowledge on the concepts, fundamentals and the computation of Electro-magnetic fields which is essential for understanding the working principle, design and analysis of Transmission lines, Antennas, Microwaves and RF Systems
- To impart knowledge on the basics of static electric field and the associated laws
- To impart knowledge on the basics of static magnetic field and the associated laws
- To study the relation between the fields under time varying situations
- To impart knowledge on applications of static field and FEM.

UNIT I ELECTROSTATICS - I 9

Orthogonal coordinate systems and transformation. Gradient, Divergence & Curl. Divergence theorem &Stokes theorem. Coulombs law, Principle of Superposition, Electric field intensity, Electric flux density, Absolute Electric potential. Electric field intensity due to finite line charge, Circular disc.

UNIT II ELECTROSTATICS - II 9

Gauss law, Applications of Gauss law for different charge distributions. Electric dipole, Electrostatic Energy and Energy density, Poisson's and Laplace equation, Capacitance, Capacitance of various geometries using Laplace equations. Boundary conditions for different interface.

UNIT III MAGNETOSTATICS 9

Statement of Biot-Savart Law, Magnetic field Intensity, Magnetic flux and magnetic flux density, Estimation of Magnetic field Intensity for finite straight conductor and Axis of circular coil. Ampere's circuital law, Application of Ampere's law on infinitely long coaxial transmission line. Scalar and Vector magnetic potentials. Inductance, Inductance of Solenoid, Toroid & Coaxial cables. Magnetic boundary condition. Energy stored in magnetic fields.

UNIT IV TIME VARYING ELECTRIC AND MAGNETIC FIELDS 9

Faraday's law, Displacement current, Maxwell's four equations in integral form and differential form. Poynting Vector and the flow of power, Power flow in a co-axial cable, Instantaneous, Average and Complex Poynting Vector. Wave Equation from Maxwell's equation.

UNIT V APPLICATIONS AND COMPUTATIONAL ELECTROMAGNETICS 9

The finite element method – finite element discretization, element governing equations, assembling all the elements, solving the resulting equations by iteration method and band matrix method. Applications – Electrostatic discharge, Magnetic Levitation.

TOTAL= 45 PERIODS

OUTCOMES:

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

- Analyze field potentials due to static charges
- Understand Electrostatic theory and apply them for modelling and analysis of capacitors
- Understand Magneto static theory and apply them for modelling and analysis of inductors
- Analyze the relation between the fields under time varying situations

- Apply the static field concepts for various applications.

TEXT BOOKS:

1. Mathew N. O. Sadiku, 'Principles of Electromagnetics', 4thEdition, Oxford University Press Inc. First India edition, 2009.
2. Joseph. A.Edminister, 'Schaum's Outline of Electromagnetics, Third Edition (Schaum's Outline Series), Tata McGraw Hill, 2010.

REFERENCES:

1. W.H.Hayt and A.Buck,Engineering Electro Magnetics , 8th Edition, Mc Graw Hill, 2011
2. Ashutosh Pramanik, 'Electromagnetism – Theory and Applications', PHI Learning Private Limited, New Delhi, Second Edition-2009
3. Kraus and Fleish, 'Electromagnetics with Applications', McGraw Hill International Editions, Fifth Edition, 2010.

EC17411 CIRCUIT DESIGN AND SIMULATION LABORATORY L T P C
0 0 4 2

OBJECTIVES:

- To study the Feedback amplifier.
- To learn the design of RC, LC and tuned amplifiers.
- To study tuned Amplifiers and Bi-stable multivibrator
- To perform PSPICE simulation of electronic circuits.

LIST OF EXPERIMENTS:

1. Design and analysis of feedback amplifiers
2. Design and analysis of RC Oscillators
3. Design and analysis of LC oscillators
4. Single Tuned Amplifier
5. Wave shaping circuits
6. Multivibrators

SIMULATION USING PSPICE

7. Double tuned and stagger tuned amplifiers
8. Astable Multivibrator
9. Free running blocking oscillators
10. Schmitt Trigger circuit with Predictable hysteresis
11. Monostable multivibrator with emitter timing and base timing
12. Voltage and Current Time base circuits

TOTAL= 60 PERIODS

OUTCOMES:

Upon Completion of the course, the students will be able to:

- Design the feedback amplifiers needed for different applications and modify the stability and gain parameters of the circuit
- Generate sinusoidal and non-sinusoidal signals at different frequencies
- Tune any given amplifier circuit at a particular frequency by adopting appropriate tank circuits

- Convert one form of the signal to other by using wave shaping circuits
- Simulate and analyze different types of analog circuits using PSPICE

EC17412 LINEAR INTEGRATED CIRCUITS LABORATORY L T P C
0 0 4 2

OBJECTIVES:

- To study the amplifiers and wave shaping circuits using ICs
- To understand characteristics of amplifiers and filters
- To analyze the characteristics of oscillators and multivibrators
- To acquire the basic knowledge of special function ICs
- To use PSPICE software for circuit design

LIST OF EXPERIMENTS:

Design and Implementation of

1. Inverting, Non-Inverting and Differential Amplifiers
2. Instrumentation Amplifier using op-amp
3. Wave shaping circuits (Integrator and Differentiator)
4. Filter design (LPF and HPF)
5. Multivibrators (Astable and Monostable)
6. Schmitt Trigger
7. Oscillators (Phase shift and Wein Bridge)
8. DC power supply using LM723
9. R-2R Ladder DAC

Simulation using PSPICE:

Design and Simulation of Experiments 1, 3, 4, 5, 6, 7 using PSPICE

TOTAL= 60 PERIODS

OUTCOMES:

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

- Design oscillators and amplifiers using operational amplifiers
- Design filters using Op-amp and perform experiment on frequency response
- Analyze the working of wave shaping circuits
- Design DC power supply using IC
- Analyze the performance of oscillators, multivibrators, amplifiers and filters using PSPICE

SEMESTER V

EC17501 DIGITAL COMMUNICATION L T P C
3 0 0 3

OBJECTIVES:

- To understand the functional components and principles of digital communication system
- To study the various time and frequency domain waveform coding schemes
- To learn the various baseband schemes and its effect on signal transmission.

- To understand the various Band pass signaling schemes
- To know the fundamentals of channel coding and spread spectrum techniques

UNIT I QUANTIZATION AND PULSE MODULATION 9

Review of Low pass Sampling-Quantization - Uniform & non-uniform quantization - Quantization noise - Logarithmic companding of speech signal- Overview of PAM, PWM and PPM.

UNIT II WAVEFORM CODING 9

Transmitter and Receiver of PCM, DPCM, Delta modulation, ADPCM & ADM sub band coding-Linear Predictive Coding-. Line codes and its properties – TDM

UNIT III BASEBAND TRANSMISSION 9

Nyquist criterion for distortion less transmission – Pulse shaping – ISI- Eye pattern - Correlative coding – M-ary schemes –Equalization- Adaptive equalization-LMS algorithm

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.

TOTAL= 45 PERIODS

OUTCOMES

After the completion of the course, the students are able to

- To illustrate the blocks in a design of digital communication system and to perform time and frequency analysis of the signals.
- To describe the various waveform coding schemes
- To interpret the various baseband transmission schemes
- To analyze the error performance of various Band pass signaling schemes
- To evaluate various channel coding techniques.

TEXT BOOK:

1. Simon Haykin, “Communication Systems”, 4th Edition, John Wiley, 2000.

REFERENCES:

1. S. Haykin, “Digital Communications”, John Wiley, 2005
2. B. Sklar, “Digital Communication Fundamentals and Applications”, 2nd Edition, Pearson Education, 2009
3. H P Hsu, Schaum Outline Series - “Analog and Digital Communications”, TMH 2006
4. J.G Proakis, “Digital Communication”, 4th Edition, Tata McGraw Hill Company, 2001.

EC17502 DIGITAL SIGNAL PROCESSING L T P C
3 2 0 4

PREREQUISITE: Knowledge on Signals and Systems

OBJECTIVES:

- To get an idea on DFT and its properties
- To get an idea on FFT and its properties
- To know the characteristics of FIR filters for filtering undesired signals
- To know the characteristics of IIR filters for filtering undesired signals
- To study the concept of power spectrum estimation and sampling rate conversion.

UNIT I DISCRETETIME SYSTEMS & DFT 12

Review of Discrete time systems- Structure of IIR system (Direct, parallel and cascade forms) and structure of FIR system (Direct and linear phase form).

DFT& IDFT, Use of DFT in linear and circular convolution, auto-correlation and cross correlation. Filtering of long data sequence – Overlap add and overlap save methods.

UNIT II FAST FOURIER TRANSFORM ALGORITHMS AND DSP PROCESSORS 12

DFT using radix-2 FFT algorithms - Decimation in time algorithm and Decimation in frequency algorithm. IDFT using FFT algorithms. Use of FFT in linear filtering. Architecture of TMS320C5416 processor.

UNIT III DESIGN OF FIR FILTERS 12

Design of FIR filters (LPF, HPF, BPF & BEF) using Fourier series, Windowing techniques (Rectangular, Hamming, Hanning & Blackmann) and Frequency sampling. Design of FIR filters using Hilbert transform.

UNIT IV DESIGN OF IIR FILTERS 12

Analog filters – Butterworth Filter and Chebyshev Type 1 Filter (upto 3rd order). Analog transformation of prototype LPF to BPF, BSF & HPF. Mapping Techniques - Bilinear transformation and impulse invariance. Design problems for LPF, HPF, BPF&BSF digital IIR filters.

UNIT V APPLICATIONS OF DSP 12

Periodogram, Power spectrum estimation of Barlett method, Welch method, Blackman and Turkey method. Decimation by a factor D, Interpolation by factor I, Sampling rate conversion by a rational factor I/D, Multistage implementation of sampling rate conversion.

TOTAL=60 PERIODS

OUTCOMES:

After the completion of the course, the students are able to

- Apply DFT for the analysis of digital signals & systems.
- Perform frequency transforms for signals and plot spectrum.
- Design analog filters and digital IIR filters
- Design digital FIR Filters
- Estimate power spectrum and perform sampling rate conversion.

TEXT BOOK:

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

REFERENCES:

1. Emmanuel C.Ifeachor, &Barrie.W.Jervis, "Digital Signal Processing", Second Edition, Pearson Education / Prentice Hall, 2002.
2. Sanjit K. Mitra, "Digital Signal Processing – A Computer Based Approach", Tata Mc Graw Hill, 2007.
3. A.V.Oppenheim, R.W. Schafer and J.R. Buck, "Discrete-Time Signal Processing", 8th Indian Reprint, Pearson, 2004.
4. M. H. Hayes, Digital Signal Processing, Schaums outlines, Tata McGraw Hill, 2007.

EC17503 TRANSMISSION LINES AND WAVEGUIDES L T P C 3 0 0 3

PREREQUISITE: Knowledge on Electromagnetic Fields

OBJECTIVES:

- To impart knowledge on filter theories.
- To introduce the basics of transmission lines and to discuss the reflections associated.
- To give understanding about impedance transformation and matching using Smith chart.
- To impart knowledge on propagation of waves between parallel planes
- To study the wave propagation in waveguide.

UNIT I PASSIVE FILTERS 9

Filter fundamentals, Design of filters: Constant K - Low Pass, High Pass, Band Pass, Band elimination, m-derived sections - low pass, high pass.

UNIT II TRANSMISSION LINE THEORY 9

A line of cascaded T sections- The transmission line: general solution - The infinite line - Wavelength, velocity of propagation - Waveform distortion - The distortion-less line -Inductance loading - Line not terminated in Zo - Reflection coefficient - Standing waves, Nodes, Standing Wave Ratio – Line calculation- Input and transfer impedance - Open and short-circuited lines.

UNIT III IMPEDANCE MATCHING IN HIGH FREQUENCY LINES 9

Impedance matching: Quarter wave transformer - Impedance matching by stubs - Single stub and double stub matching - Smith chart - Solutions of problems using Smith chart - Single and double stub matching using Smith chart.

UNIT IV GUIDED WAVES BETWEEN PARALLEL PLANES 9

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 – Characteristic impedances of planes.

UNIT V WAVE GUIDES 9

Application of Maxwell's equations to the rectangular wave guide. TM waves in the rectangular guide. TE waves in the rectangular guide¬ – Introduction to cylindrical waveguides. Excitation of wave guides.

TOTAL=45 PERIODS

OUTCOMES:

Upon completion of the course, students will be able to:

- Design different types of filters using Constant-K and m-derived sections.
- Recall general solution for the transmission lines and identify different condition for the lines.
- Construct stub matching networks using Smith chart.
- Determine the field components, wave impedance and characteristic parameters when TE, TM propagate between parallel planes.
- Analyze the propagation of waves in wave guides.

TEXT BOOKS

1. John D Ryder, "Networks, lines and fields", 2nd Edition, Prentice Hall India, 2010.

REFERENCES

1. E.C.Jordan and K.G. Balmain, —Electromagnetic Waves and Radiating Systems‖ Prentice Hall of India, 2006.
2. G.S.N Raju "Electromagnetic Field Theory and Transmission Lines‖ Pearson Education, First edition 2005.

EC17504 PRINCIPLES OF MICROPROCESSORS AND MICROCONTROLLER

L	T	P	C
3	0	0	3

PREREQUISITE: Digital Electronics

OBJECTIVES:

- Study and learn architecture, functions, programming and usage of 8085 microprocessor
- Study and learn architecture, functions, programming and usage of 8086 microprocessor
- Learn concepts and features in different forms of data transfer such as programmed IO, Interrupt driven IO and direct-memory transfer in microprocessor based systems
- Study and understand methods of interfacing peripheral devices to a microprocessor to realize different forms of Input/output functions
- Learn about address-space and methods for realizing memory and IO expansion for a microprocessor-based system
- Learn schemas and concepts of multiprocessor configurations using 8086 system bus architecture as a case study
- Study and learn architecture of 8051 microcontroller and usage of built-in special function blocks such as timers, IO ports and standard IO interfaces.

UNIT I THE 8085 MICROPROCESSOR 9

8085 Architecture - Address-space- –Instruction set –Addressing modes – Interrupts – Instruction cycle and Timing diagram – Assembly Language Programming

UNIT II THE 8086 MICROPROCESSOR 9

8086 architecture Address-space – Instruction-set, Addressing modes– Assembly Language Programming and assembler directives.

UNIT III 8086 SYSTEM BUS STRUCTURE 9

8086 signals – Maximum mode and Minimum mode- Multiprocessor configurations – Coprocessor, Closely coupled and Loosely Coupled multiprocessor configurations – Direct-memory Access

UNIT IV INTERFACING I/O AND PERIPHERALS 9

Introduction to IO - Parallel port interface (8255)–Programmable Timer/controller (8253) –Keyboard /display controller (8279) -– Serial communication interface (8251) – D/A and A/D Interface– Programmable Interrupt controller (8259) – DMA controller (8237)

UNIT V MICROCONTROLLER 9

8051 Architecture, Instruction-set and Addressing modes - Special Function Registers(SFRs) - I/O Pins / Ports - 8051 Timer Modes and Programming – Interrupts – Serial Peripheral Interface – Port and Memory expansion – Case-study using 8051 microcontroller for an application – Features in some common microcontrollers such as PIC, MSP430 and Arduino platforms.

TOTAL=45PERIODS

OUTCOMES:

Upon completion, the students will be capable of:

- Using and programming 8085 and 8086 microprocessors for an application
- Write programs to use Interrupt signals in microprocessors
- Design and program IO Interface circuits and devices for a microprocessor
- Applying Concepts
- Using multi-processor configurations with 8086
- Design and program 8051 based solution for a controller application effectively utilizing built-in peripherals such as timers and other IO ports.

TEXT BOOKS:

1.Ramesh S. Gaonkar, “Microprocessor Architecture, Programming and Applications with 8085”, Sixth edition, Penram International Publishing, 2012.

2.A.K. Ray, K.M. Bhurchandi, - Advanced Microprocessor and Peripherals, Second edition, Tata McGraw-Hill, 2010.

3.Mohamed Ali Mazidi, Janice GillispieMazidi, RolinMcKinlay, “The 8051 Microcontroller and Embedded Systems: Using Assembly and C”, Second Edition, Pearson education, 2011.

REFERENCES:

1.DoughlasV.Hall, “Microprocessors and Interfacing, Programming and Hardware”,TMH,2012

2.Kenneth J. Ayala, “The 8086 Microprocessor: Programming & Interfacing the PC”, Delmar Publishers, 2007.

3.Krishna Kant, Microprocessor and Microcontroller Architecture, Programming and System design using 8085, 8086, 8051 and 8096, PHI, 2007, Seventh Reprint, 2011

4.Barry B. Brey, The Intel Microprocessors Architecture, Programming and Interfacing, Pearson.

EC17511 DIGITAL SIGNAL PROCESSING LABORATORY L T P C

0 0 4 2

PREREQUISITE: Knowledge on Signals and Systems

OBJECTIVES:

- To implement Linear and Circular Convolution

- To implement FIR and IIR filters
- To demonstrate Finite word length effect
- To study the architecture of DSP processor

LIST OF EXPERIMENTS: MATLAB / EQUIVALENT SOFTWARE PACKAGE

1. Generation of sequences (functional & random) & correlation
2. Linear and Circular Convolution
3. Spectrum Analysis using DFT / FFT
4. FIR filter design
5. IIR filter design
6. Multirate Interpolation and Decimation
7. Finite Word Length Effect – Overlap add and save methods

DSP PROCESSOR BASED IMPLEMENTATION

8. MAC operation using various addressing modes
9. Linear Convolution
10. Circular Convolution
11. Waveform generation

TOTAL=60 PERIODS

OUTCOMES:

Students will be able to

- Carry out simulation of DSP systems
- Demonstrate their abilities towards DSP processor based implementation of DSP systems
- Analyze Finite word length effect on DSP systems
- Demonstrate the applications of FFT to DSP
- Implement the various applications of DSP such as adaptive filters and the bio-signal Processing.

EC17512	**COMMUNICATION SYSTEMS LABORATORY**	**L T P C**
		0 0 4 2

PREREQUISITE: Knowledge on Communication Theory

OBJECTIVES:

The student should be made to:

- To visualize the effects of sampling and TDM
- To Implement and classify AM & FM modulation and demodulation
- To implement PCM & DM
- To compare and implement FSK, PSK and DPSK schemes
- To implement Equalization algorithms
- To implement Error control coding schemes

LIST OF EXPERIMENTS:

1. Signal Sampling and reconstruction
2. Time Division Multiplexing

3. AM/FM Modulator and Demodulator
4. Pulse Code Modulation and Demodulation
5. Delta Modulation and Demodulation
6. Line coding schemes
7. Simulation of BFSK/BPSK/QAM/DPSK schemes
8. Error control coding schemes - Linear Block Codes (Simulation)
9. Communication link simulation
10. BER/EVM performance of BFSK/BPSK/QAM

TOTAL=60 PERIODS

OUTCOMES:

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

- Demonstrate their knowledge in base band signaling schemes through implementation of FSK, PSK and DPSK
- Apply various channel coding schemes & demonstrate their capabilities towards the improvement of the noise performance of communication system
- Simulate & validate the various functional modules of a communication system
- Analyse the various line coding techniques
- Design and develop a communication system

LAB REQUIREMENTS FOR A BATCH OF 30 STUDENTS (3 STUDENTS PER EXPERIMENT):

i) Kits for Signal Sampling, TDM, AM, FM, PCM, DM and Line Coding Schemes
ii) CROs – 15 Nos
iii) MATLAB / SCILAB or equivalent software package for simulation experiments
PCs - 10 Nos

EC17513	MICROPROCESSORS AND MICROCONTROLLER WITH PERIPHERAL INTERFACING LABORATORY	L T P C 0 0 4 2

PREREQUISITE: Knowledge on 8085, 8086 instruction sets and C.

OBJECTIVES:

- To introduce ALP and Embedded C concepts and features.
- To develop skill in program writing for 8085, 8086 and 8051.
- To demonstrate the difference between Serial and Parallel Interface.
- To learn the interfacing of different I/O with Microprocessors
- To train the students in MASM.

8085 Microprocessor

Writing and executing 8085 Program to realize user defined functions

1. Searching and sorting array of numbers
2. Code conversion and handling Decimal Arithmetic
3. Simple calculator function to realize Addition, Subtraction, Multiplication and Division with 16-bit arithmetic

Peripherals and Interfacing using 8085

4. 8255 - Parallel interface – Realize hand-shake driven parallel data transfer between two microprocessor systems

5.8253 – Timer – Use timers to implement real-time interrupt driven periodic data sampling; Realize Timer driven delay function; Use timer to realize dual-slope A to D conversion for slow analog input; Program and use Cascaded timers for long duration timing;

8086 Microprocessor

8086 programs using kits

6. String manipulations

8086 Programs using MASM

7. Password checking
8. Display a Message
9. File Manipulation

Interface peripheral IO to 8086 system board

10. 8279 - Key board and Display Controller – Program to configure keyboard display controller based on physical configuration and connections - Take user input from keypad and display processed information.
11. A/D interface – Program to sample and log digital data from analog input with programmable sampling rate and data capture duration; D/A interface – Synthesize sinewaves / triangular waves at programmable frequency through the D to A interface; Combine A/D and D/A interfaces to record, store and playback to realize a voice recorder
12. 8251-Serial Interface – Communicate between two 8086 system boards using serial interface to transfer data from a memory block – Configure the interface in synchronous and asynchronous modes at different baud rates and test data transfer speeds

8051 Microcontroller

8051 peripheral interfacing using Embedded C

13. Timer programming for Tone generation and PWM for waveform (Analog output) generation; Interface an ultrasound transceiver and use timer to measure distance based on delay in return echo
14. Stepper Motor Control

TOTAL =60 PERIODS

OUTCOMES:

This laboratory exercise is linked to a corresponding theory course providing the students with practical exposure to concepts learnt in the theory course. Upon completion of the laboratory exercises, the students will be able to

- Write Assembly-level programs, compile and execute them on 8085 & 8086 based system boards.
- Interface different I/O modules with 8085 & 8086 system boards and write program to configure the IO for different applications.
- Compile and execute 8086 programs using MASM on desktop systems
- Use and program 8051 microcontroller for a controller application

LAB EQUIPMENT FOR A BATCH OF 30 STUDENTS:

HARDWARE:

- System board based on 8085 – 15 units
- System board based on 8086 – 15 units
- System board based on 8051 – 15units
- Peripheral interface modules
- 8279-based Keypad and LCD / LED display controller – 3 units
- 8255-based parallel peripheral interface module – 3 units
- 8251 based programmable serial interface module – 3 units

- 8253 based Programmable timer module – 3 units
- Ultrasound transceiver module – 15 units
- Intel Desktop system with suitable OS such as Windows – 10 systems

SOFTWARE:
MASM – Installed on all the desktop systems
Proteus &Keil Microvision4 installed on all the desktop systems

SEMESTER VI

EC17601	**VLSI DESIGN**	**L T P C**
	(Common to ECE and EEE)	**3 0 0 3**

PREREQUISITE: Knowledge on Digital Electronics and IC fabrication techniques

OBJECTIVES:

- In this course, the MOS circuit realization of the various building blocks that is common to any microprocessor or digital VLSI circuit is studied.
- Architectural choices and performance tradeoffs involved in designing and realizing the circuits in CMOS technology are discussed.
- The main focus in this course is on the transistor circuit level design and realization for digital operation and the issues involved as well as the topics covered are quite distinct from those encountered in courses on CMOS Analog IC design.
- Familiar about the device fabrication based on implementation strategies.
- To understand various design methodologies such as custom, semi-custom, standard cell, arrayed logic, sea-of-gates.

UNIT I MOS TRANSISTOR PRINCIPLE 9

NMOS and PMOS transistors, Process parameters for MOS and CMOS, Electrical properties of CMOS circuits and device modeling, Scaling principles and fundamental limits, CMOS inverter scaling, propagation delays, Stick diagram, Layout diagrams.

UNITII COMBINATIONAL LOGIC CIRCUITS 9

Examples of Combinational Logic Design, Elmore's constant, Logical effort, Pass transistor Logic, Transmission gates, static and dynamic CMOS design, Power dissipation – Static & Dynamic

UNIT III SEQUENTIAL LOGIC CIRCUITS 9

Static and Dynamic Latches and Registers, Timing issues, Pipelines, Clock strategies, Memory architecture and Memory control circuits.

UNIT IV DESIGNING ARITHMETIC BUILDING BLOCKS& TESTING 9

Data path circuits, Architectures for ripple carry adders, carry look ahead adders, High speed adders, accumulators, multipliers, dividers, Barrel shifters, Need for testing- design for testability.

UNIT V IMPLEMENTATION AND FABRICATION OF DEVICES 9

Full custom and Semi-custom design, Standard cell design and cell libraries, FPGA building block architectures, FPGA interconnect routing procedures, Fabrication of devices – Isolation- Mesa, Oxide, PN-Junction isolations, self-alignment, Metallisation & Packaging.

TOTAL=45 PERIODS

OUTCOMES:

Upon completion of the course, students should be able to

- Describe the concepts of MOS based circuits to realize digital logic blocks.
- Design static and dynamic MOS circuits for combinational logic functions.
- Design and construct Sequential logic Circuits using MOS gates and analyze Timing constraints.
- Design arithmetic building blocks and memory subsystems and analyze timing performance.
- Apply and implement FPGA design flow and testing logic systems.

TEXT BOOKS:

1.Neil H.E. Weste, David Money Harris —CMOS VLSI Design: A Circuits and Systems Perspective‖, 4th Edition, Pearson , 2017 (UNIT I,II,V).

2.Jan M. Rabaey ,Anantha Chandrakasan, Borivoje. Nikolic, ‖Digital Integrated Circuits:A Design perspective‖, Second Edition , Pearson , 2016.(UNIT III,IV).

REFERENCES:

1.Sung-Mo kang, Yusuf leblebici, Chulwoo Kim —CMOS Digital Integrated Circuits:Analysis & Design‖,4th edition McGraw Hill Education,2013.

2.Wayne Wolf, —Modern VLSI Design: System On Chip‖, Pearson Education, 2007.

3.R.Jacob Baker, Harry W.LI., David E.Boyee, —CMOS Circuit Design, Layout and Simulation‖, Prentice Hall of India 2005.

EC17602 ANTENNAS AND WAVE PROPAGATION L T P C 3 0 0 3

PREREQUISITE: Knowledge on Electromagnetic Fields

OBJECTIVES:

- To give insight of the radiation parameters
- To apply array theory on antennas
- To give a thorough understanding of the radiation characteristics of practical antennas
- To learn frequency independent antennas and measurement of antenna parameters
- To create awareness about the different types of propagation of radio waves at different frequencies

UNIT I FUNDAMENTALS OF RADIATION 9

Definition of antenna parameters: Radiation pattern – Radiation pattern lobes, Isotropic, Directional and Omnidirectional patterns, Field region, Radian and steradian. Radiation power density, Radiation intensity, Beamwidth, Directivity, Antenna efficiency, Gain, Beam efficiency, Polarization – Polarization loss factor and efficiency, Input Impedance, Effective aperture, Radiation Resistance, Band width. Radiation from oscillating dipole, Power radiated by a current element.

UNIT II ANTENNA ARRAYS 9

Various forms of antenna array, N element linear array, Pattern multiplication, Broadside and End fire array - Phased arrays, Adaptive array and Smart antennas, Binomial array.

UNIT III PRACTICAL ANTENNAS 9

Half wave length dipole, Folded dipole, Yagi Uda antenna, Slot antenna, Microstrip antenna, Parabolic reflectors and its feeding system, Horn antenna.

UNIT IV SPECIAL ANTENNAS AND MEASUREMENTS 9

Principle of frequency independent antennas -Spiral antenna, Helical antenna, Log periodic. Modern antennas-Reconfigurable antenna, Active antenna. Antenna Measurements-Test Ranges, Measurement of Gain, Radiation pattern, Polarization, VSWR.

UNIT V PROPAGATION OF RADIO WAVES 9

Ground wave propagation – Plane earth reflection. Space wave propagation – Field strength relation, Super Refraction, Scattering phenomena, fading. Sky wave propagation – Structural details of the Ionosphere, Ray path, critical frequency, MUF, LUF, OF, Virtual height, Skip distance.

TOTAL=45 PERIODS

OUTCOMES:

Upon completion of the course, students will be able to:

- Write about the radiation from a current element.
- Analyze the antenna arrays.
- Explain the various types of antennas.
- Describe special antennas such as frequency independent and modern antenna.
- Summarize the various propagation mechanisms.

TEXT BOOKS:

1.John D Kraus,Ronald J Marhefka and Ahmad S Khan ” Antennas and wave propagation”, 4th Edition, Mc Graw Hill, 2013.

2.Constantine.A.Balanis “Antenna Theory Analysis & Design”, 3rd Edition, Wiley Student Edition, 2012.

REFERENCES:

1. R.E.Collin,”Antennas and Radiowave Propagation”, Mc Graw Hill 1985.
2. Rajeswari Chatterjee, “Antenna Theory and Practice” Revised Second Edition New Age International Publishers, 2006.
3. S. Drabowitch, “Modern Antennas” Second Edition, Springer Publications, 2007.

EC17603 COMMUNICATION NETWORKS L T P C

3 0 0 3

OBJECTIVES:

- Build an understanding of the fundamental concepts of communication networks
- To introduce the layered communication architectures
- To understand various physical, data link layer protocols

- To be familiar with contemporary issues in networking technologies,
- To understand application layer protocols and security issues.

UNIT I NETWORK FUNDAMENTALS AND PHYSICAL LAYER 9

Data Communication, Networks, Protocols and standards, Line configuration, Topology, Transmission mode, OSI reference model - layers and duties. TCP/IP reference model – layers and duties, Addressing.

UNIT II DATA LINK LAYER 9

Error detection and correction- Types of error, CRC, Checksum, Framing, Flow control and error control, HDLC - frames. Multiple access - Random access, Controlled access, IEEE standards: - IEEE 802.3., IEEE 802.11, Bluetooth

UNIT III NETWORKING AND ITS DEVICES 9

Connecting Devices ,Logical Addressing- IPV4, IPV6, Transition from IPV4 to IPV6, Address mapping - ARP, RARP, BOOTP and DHCP ,ICMP, IGMP, Network routing algorithms- Distance vector routing and Link state routing.

UNIT IV TRANSPORT LAYER 9

Process-process delivery: - UDP,TCP- Features ,segment, connection ,Flow control ,Error control, Congestion control in TCP, Quality of services –Technique to improve QoS.

UNIT V APPLICATION LAYER 9

Application protocols: DNS, HTTP, FTP and SMTP, Network management protocol: SNMP, Introduction to Network Security-Symmetric and Asymmetric key Cryptography.

TOTAL= 45 PERIODS

OUTCOMES:

Upon completion of the course, students will be able to:

- Ability to comprehend and appreciate the significance and role of this course in the present contemporary world
- The student would be well versed on the layered communication architectures
- Identify the different types of network devices and their functions within a network
- The student will have an exposure to networking techniques, would be able to appreciate the evolving trends.
- Identify the requirements for a web based communication systems

TEXT BOOK:

1. Behrouz.A. Forouzan, Data Communication and Networking, 4th Edition, Tata McGraw Hill,

REFERENCES:

1. Stallings.W., Data and Computer Communication, 4th Edition, Prentice Hall of India, 1996
2. Tanenboum, A.S, Computer Networks, 3rd Edition, Prentice Hall Of India, 1996
3. Keshav.S. An Engineering approach to Computer Networking, Addision – Wesley, 1999.
4. J.E.Flood, Telecommunication Switching, Traffic and networks, 1st edition, Pearson Education, 2006
5. Larry L. Peterson, Bruce S. Davie, “Computer Networks: A Systems Approach”, Fifth Edition, Morgan Kaufmann Publishers, 2011.

EC 17604 WIRELESS COMMUNICATION L T P C
3 0 0 3

PREREQUISITE: Knowledge on Communication theory and Digital Communication

OBJECTIVES:

- Know the characteristic of wireless channel
- Learn the various cellular architectures
- Understand the concepts behind various digital signaling schemes for fading channels
- Be familiar the various multipath mitigation techniques
- Understand the various multiple antenna systems

UNIT I WIRELESS CHANNELS 9

Large scale path loss – Path loss models: Free space and Two-Ray models -Outdoor propagation models -Link budget design – Small scale fading- Parameters of mobile multipath channels – Time dispersion parameters- Coherence bandwidth – Doppler spread &coherence time, Fading due to Multipath time delay spread – flat fading – frequency selective fading – Fading due to Doppler spread – fast fading – slow fading- Spread spectrum techniques. Practical illustration of wireless channel behavior.

UNIT II CELLULAR ARCHITECTURE 9

Multiple Access techniques – FDMA, TDMA, CDMA – Capacity calculations–Cellular concept- Frequency reuse – channel assignment- hand off- interference & system capacity- trunking & grade of service – Coverage and capacity improvement.

UNIT III DIGITAL SIGNALING FOR FADING CHANNELS 9

Structure of a wireless communication link, Principles of offset-QPSK, π/4-DQPSK, Minimum Shift Keying, Gaussian Minimum Shift Keying, OFDM principle – Cyclic prefix, Windowing, PAPR. Technology example- IEEE 802.11 WLAN.

UNIT IV MULTIPATH MITIGATION TECHNIQUES 9

Equalization – Adaptive equalization, Linear and non-Linear equalization, Zero forcing and LMS algorithms. Diversity – Micro and Macro diversity – transmitter diversity, receiver diversity, Error probability in fading channels with diversity reception, Rake receiver.

UNIT V MULTIPLE ANTENNA TECHNIQUES 9

MIMO systems – spatial multiplexing -System model -Pre-coding – Beam forming- Channel state information-capacity in fading and non-fading channels. Relevance to upcoming wireless communication technologies.

TOTAL= 45 PERIODS

OUTCOMES:

Upon completion of the course, students will be able to:

- Characterize wireless channels
- Design a cellular system
- Design and implement various signaling schemes for fading channels
- Compare multipath mitigation techniques and analyze their performance
- Design and implement systems with transmit/receive diversity and MIMO systems and analyze their performance

TEXT BOOKS:

1. Rappaport,T.S., "Wireless communications", Second Edition, Pearson Education, 2010.
2. Andreas.F. Molisch,"Wireless Communications", John Wiley – India, 2006.

REFERENCES:

1. David Tse and Pramod Viswanath, "Fundamentals of Wireless Communication", Cambridge University Press, 2005.
2. Upena Dalal, " Wireless Communication", Oxford University Press, 2009.
3. Van Nee, R. and Ramji Prasad, "OFDM for wireless multimedia communications", Artech House, 2000.

EC17611	VLSI DESIGN LABORATORY	L T P C
		0 0 4 2

PREREQUISITE: Electronics Circuits and Digital Electronics

OBJECTIVES:

The student should be made:

- To learn Hardware Description Language (Verilog/VHDL).
- To learn the fundamental principles of VLSI circuit design in digital and Analog domain.
- To familiarize implementation of logic circuits on FPGAs.
- To provide hands on design experience with professional design (EDA) platforms.
- To extract layout of logic circuits using EDA Tool

LIST OF EXPERIMENTS

Laboratory work on HDL and FPGA:

1. Design an Adder (Min 8 Bit) using HDL. Simulate it using Xilinx/Altera Software and implement by Xilinx/Altera FPGA .
2. Design a Multiplier (4 Bit Min) using HDL. Simulate it using Xilinx/Altera Software and implement by Xilinx/Altera FPGA.
3. Design an ALU using HDL. Simulate it using Xilinx/Altera Software and implement by Xilinx/Altera FPGA.
4. Design counters using HDL. Simulate it using Xilinx/Altera Software and implement by Xilinx/Altera FPGA
5. Design a Universal Shift Register using HDL. Simulate it using Xilinx/Altera Software and implement by Xilinx/Altera FPGA.
6. Design Finite State Machine (Moore/Mealy) using HDL. Simulate it using Xilinx/Altera Software and implement by Xilinx/Altera FPGA.

Compare pre synthesis and post synthesis simulation for experiments 1 to 6.

Requirements: Xilinx ISE/Altera Quartus/ equivalent EDA Tools along with Xilinx/Altera/equivalent FPGA Boards

Using Cadence/Mentor Graphics/Tanner/equivalent EDA Tools:

7. Design and simulate a CMOS inverter using digital flow.
8. Design and simulate a CMOS Basic Gates.
9. Manual/Automatic Layout Generation for experiments 7 and 8.
10. Analyze the power, area and timing for experiments 7 and 8 by performing Pre Layout and Post Layout Simulations.

11. Design and Simulate basic Common Source, Common Gate and Common Drain Amplifiers.
12. Design and simulate simple differential amplifier and Analyze Gain, Bandwidth and CMRR by performing Schematic Simulations.

Requirements: Cadence/Synopsis/ Mentor Graphics/Tanner/equivalent EDA Tools

TOTAL = 60 PERIODS

OUTCOMES:

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

- Write HDL code for basic as well as advanced digital circuits.
- Realize digital logic circuits on FPGA Boards.
- Synthesize Place and Route digital IPs.
- Design and Simulate Digital & Analog circuits using EDA tools.
- Extract layout of Logic circuits using EDA tool.

LAB EQUIPMENT FOR A BATCH OF 30 STUDENTS:

Xilinx or Altera FPGA - 10 nos
Xilinx software Cadence/MAGMA/Tanner or equivalent software package 10 User License
PCs-10nos

EC17612 NETWORKS LABORATORY L T P C
0 0 4 2

PREREQUISITE: Knowledge on Oops

OBJECTIVES:

The student should be made to

- Learn to communicate between two desktop computers using Inter-networking devices.
- Learn to implement the different protocols
- Be familiar with socket programming.
- Be familiar with the various routing algorithms
- Be familiar with simulation tools.

LIST OF EXPERIMENTS:

1. Implementation of Error Detection / Error Correction Techniques
2. Implementation of Stop and Wait Protocol
3. Implementation of sliding window
4. Study of socket programming and Client – Server model – ping & echo
5. Implementation of Distance vector routing algorithm
6. Implementation of Link state routing algorithm
7. Study of Network Simulator (NS) and simulation of Congestion Control Algorithms using NS
8. Encryption and Decryption.
9. Configuring network using Cisco Packet Tracer
10. Implementation of network algorithm using Python Programming.

TOTAL=60 PERIODS

OUTCOMES:

At the end of the course, the

- Communicate between two desktop computers.

- Implement the different protocols
- Program using sockets.
- Implement and compare the various routing algorithms
- Implement network algorithm using Python programming.

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS SOFTWARE

- C / C++ / Java / Equivalent Compiler
- Network simulator like NS2/ /OPNET/ Cisco Packet Tracer

HARDWARE Standalone desktops

SEMESTER VII

EC17701 RF AND MICROWAVE ENGINEERING L T P C
3 0 0 3

PREREQUISITE: Knowledge on Electromagnetic Fields

OBJECTIVES:

- To inculcate understanding of the basics required for filter and matching network of RF systems.
- To deal with the issues in the design of microwave amplifier.
- To firmly establish knowledge on the properties of various microwave components.
- To deal with the microwave generation and microwave measurement techniques
- To obtain basic knowledge on microwave RADAR engineering.

UNIT I RF FILTER AND MATCHING NETWORKS 9

Butterworth filter – Normalized parameters, Low pass filter design, High pass filter, Bandpass filter, Bandstop filter. Tchebyscheff filter – Normalised Tchebyscheff tables, Low pass filter and High pass filter design. Impedance matching using discrete components – L, T and Pi Matching Networks. Problem solving using Smith chart.

UNIT II RF AMPLIFIERS 9

Characteristics of Amplifiers, Amplifier power relations, Stability considerations, Stabilization Methods, Bilateral design of Amplifier with conjugately match - Design of Amplifier for a specific gain using available power gain circles.

UNIT III MICROWAVE PASSIVE AND ACTIVE DEVICES 9

Formulation of S-parameter, Properties of S-parameter, Theory and S-parameter formulation of passive components – E plane tee, H plane tee, Magic tee, Directional couplers, Isolator, Circulator, Terminations. Active devices - PIN diode and its application as PIN switch, Varactor diode and its application as frequency multiplier, Tunnel diode and its application as amplifier, TDO.

UNIT IV MICROWAVE GENERATION AND MEASUREMENTS 9

Microwave Tubes - Review of conventional vacuum tubes, Reflex Klystron oscillator, Traveling wave tube amplifier, Cylindrical Magnetron oscillator. Measurement of impedance, frequency, power, VSWR and attenuation.

UNIT V MICROWAVE RADAR SYSTEMS 9

Introduction, Simple RADAR, Free Space RADAR range equation, Maximum Unambiguous Range, Pulsed RADAR system, RADAR receivers, Line Pulse modulator, Doppler Effect, CW Doppler RADAR, Radio Navigational Aids.

TOTAL= 45 PERIODS

OUTCOMES:

Upon completion of the course, students will be able to:

- Analyze the RF matching networks and RF filters
- Analyze the RF transistor amplifiers and design using conjugate match/gain circle.
- Explain various active and passive microwave devices used in microwave systems.
- Measure and analyze microwave signal and parameters.
- Explain the working of RADAR systems.

TEXT BOOKS:

1. Reinhold Ludwig and Gene Bogdanov, “RF Circuit Design: Theory and Applications”, Pearson Education Inc., 2011
2. Samuel Y Liao, “Microwave Devices & Circuits”, Prentice Hall of India, 2006.

REFERENCES:

1. David M. Pozar, “Microwave Engineering”, Wiley India (P) Ltd, New Delhi, 2008.
2. Annapurna Das and Sisir K Das, “Microwave Engineering”, Tata Mc Graw Hill Publishing Company Ltd, New Delhi, 2005.
3. Robert E Colin, “Foundations for Microwave Engineering”, John Wiley & Sons Inc, 2005.
4. Byron Edde, “Radar principles, Technology, Applications” Pearson Publications,2009.
4. M.Kulkarni, "Microwave and RADAR Engineering”, Umesh Publications, Fourth edition.
5. E.DA.SILVA, “High Frequency And Microwave Engineering”, Butterworth Heinmann publications, Oxford,2001

EC17702 OPTICAL COMMUNICATION AND NETWORKS

L	T	P	C
3	0	0	3

PREREQUISITE: Knowledge on Engineering Physics and Electron devices

OBJECTIVES:

The student should be made to:

- To learn the fiber transmission mechanisms and various structures of fibers
- To study the various signal degradation factors in fibers
- To facilitate the knowledge about optical fiber sources and transmission techniques
- To explore the trends of optical fiber measurement systems.

- To enrich the idea of optical fiber networks algorithm such as SONET/SDH and optical CDMA.

UNIT I INTRODUCTION TO OPTICAL FIBERS 9

Element of an Optical Fiber Transmission link-Basic Optical Laws and Definitions-Total internal reflection, Acceptance angle, Numerical aperture, Skew rays. Optical fibermodes and Configurations. mode theory of Circular wave guides- Overview of modes, Key Modal concepts, Modes in Step-Index fibers, Linearly Polarized modes -Single mode fibers-Graded Index fiber structure.

UNIT II SIGNAL DEGRADATION IN OPTICAL FIBERS 9

Attenuation - Absorption, Scattering losses, Bending losses, Core and Cladding losses. Signal distortion in Optical Wave guides-Information capacity determination, Group delay, Material dispersion, Waveguide dispersion, Signal distortion in SM fibers, Polarization mode dispersion, Intermodal dispersion. Mode coupling. Design Optimization of SM fibers-RI profiles and cut-off wavelength.

UNIT III FIBER OPTICAL SOURCES AND COUPLING 9

Direct and indirect band gap materials-LED structures -Light source materials -Quantum efficiency and LED power, Modulation of a LED. Lasers diodes-modes and Threshold condition -Rate equations -External quantum efficiency -Resonant frequencies - Temperature effects. Introduction to Quantum laser. Power launching and coupling-Lensing schemes-Fiber -to- Fiber joints-Fiber splicing.

UNIT IV FIBER OPTIC RECEIVER AND MEASUREMENTS 9

Fundamental receiver operation- Receiver configuration– Digital receiver performance—Probability of error – Quantum limit. Pre amplifiers. Fiberattenuation measurements- Dispersion measurements – Fiberrefractive index profile measurements – Fiber cut- off wave length measurements – FiberNumerical Aperture measurements – Fiber diameter measurements.

UNIT V OPTICAL NETWORKS AND SYSTEM TRANSMISSION 9

Basic networks – SONET / SDH – Broadcast – and –select WDM networks –Wavelength routed networks – Non- linear effects on Network performance –-Link power budget -Rise time budget- Operational principles of WDM performance of WDM + EDFA system – Solutions – Optical CDMA – Ultra high capacity networks.

TOTAL=45 PERIODS

OUTCOMES:

Upon completion of the course, students will be able to:

- Describe the various optical fiber modes, configurations
- Illustrate various signal degradation factors associated with optical fiber.
- Explain the various optical sources and their use in the optical communication system.
- Measure various fiber parameters for designing optical fiber.
- Analyze the digital transmission and its associated parameters on system performance.

TEXT BOOKS:

1. Gerd Keiser, "Optical Fiber Communication" Mc Graw -Hill International, 4th edition., 2010.
2. J.Senior, "Optical Communication, Principles and Practice", Prentice Hall of India, 3rdEdition, 2008.

REFERENCES:

1. Ramaswami, Sivarajan and Sasaki “Optical Networks”, Morgan Kaufmann, 2009.
2. J.Gower, "Optical Communication System", Prentice Hall of India, 2001.

EC17703 EMBEDDED AND REAL TIME SYSTEMS L T P C
3 0 0 3

PREREQUISITE: Knowledge on Data structures and Microprocessor and Microcontroller

OBJECTIVES:

- To learn the architecture and programming of ARM processor.
- Be familiar with the embedded computing platform design and analysis.
- Be exposed to the basic concepts of real time Operating system.
- To learn the system design techniques and networks for embedded systems
- Be familiar with different applications of embedded system

UNIT I INTRODUCTION TO EMBEDDED COMPUTING AND ARM PROCESSORS 9

Complex systems and microprocessors– Embedded system design process –Design example: GPS Moving map - 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

AMBA bus - Designing with computing platforms – 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 – Multi rate systems- Preemptive real-time operating systems- Priority based scheduling- Inter process communication mechanisms – Evaluating operating system performance- Power optimization strategies for processes – Example Real Time Operating Systems-POSIX-Windows CE.

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 - Audio player - Software modem-Digital still camera - Telephone answering machine-Engine control unit – Video accelerator.

TOTAL =45 PERIODS

OUTCOMES:

Upon completion of the course, students will be able to:

- Describe the architecture and programming of ARM processor.
- Outline the concepts of embedded systems
- Explain the basic concepts of real time Operating system design.
- Use the system design techniques to develop software for embedded systems

- Differentiate between the general purpose operating system and the real time operating system and model real-time applications using embedded-system concepts

TEXT BOOK:

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

REFERENCES:

1. Jonathan W.Valvano, "Embedded Microcomputer Systems Real Time Interfacing", Third Edition Cengage Learning, 2012.
2. David. E. Simon, "An Embedded Software Primer", 1st Edition, Fifth 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.
6. Sriram V Iyer, Pankaj Gupta, "Embedded Real Time Systems Programming", Tata Mc Graw Hill, 2004.

EC17704 WIRELESS NETWORKS L T P C
3 0 0 3

OBJECTIVES:

- To study about Wireless networks, protocol stack and standards.
- To study about mobile network layer functionalities
- To study about mobile transport layer functionalities
- To study about fundamentals of 3G Services, its protocols and applications.
- To study about evolution of 4G Networks, its architecture and applications, study the concept of Software defined radio.

UNIT I WIRELESS LAN 9

Introduction-WLAN technologies: Infrared, UHF narrowband, spread spectrum -IEEE802.11: System architecture, Protocol architecture, Physical layer, MAC layer, 802.11b, 802.11a – Hiper LAN: WATM, BRAN, HiperLAN2 – Bluetooth: Architecture, Radio Layer, Baseband layer, Link manager protocol, security - IEEE802.16-WIMAX: Physical layer, MAC, Spectrum allocation for Wi-MAX.

UNIT II MOBILE NETWORK LAYER 9

Introduction - Mobile IP: IP packet delivery, Agent discovery, Tunneling and Encapsulation, IPV6Network layer in the internet- Mobile IP session initiation protocol - Mobile ad-hoc network: Routing, Destination sequence distance vector, Dynamic source routing.

UNIT III MOBILE TRANSPORT LAYER 9

TCP enhancements for wireless protocols - Traditional TCP: Congestion control, fast retransmit/fast recovery, Implications of mobility - Classical TCP improvements: Indirect TCP, Snooping TCP, Mobile TCP, Time out freezing, Selective retransmission, Transaction oriented TCP - TCP over 3G wireless networks

UNIT IV WIRELESS WIDE AREA NETWORK 9

Overview of UTMS Terrestrial Radio access network-UMTS core network architecture: 3G-MSC, 3GSGSN, 3G-GGSN, SMS-GMSC/SMS-IWMSC, Firewall, DNS/DHCP-High Speed Downlink Packet Access (HSDPA) - LTE network architecture and protocol.

UNIT V 4G NETWORKS 9

Introduction – 4G vision – 4G features and challenges - Applications of 4G – 4G Technologies: Multicarrier modulation, Smart antenna techniques, OFDM-MIMO systems, Adaptive modulation and coding with time slot scheduler, BLAST system, Software Defined Radio system.

TOTAL= 45 PERIODS

OUTCOMES:

Upon completion of the course, the students will be able to

- Conversant with the latest 3G/4G and Wi MAX networks and its architecture.
- Discuss various layer functionalities in mobile networks.
- Design and implement wireless network environment for any application using latest wireless protocols and standards.
- Implement different type of applications for smart phones and mobile devices with latest network strategies.
- Identify the role of SDR in the next generation networks.

TEXT BOOKS:

1.Jochen Schiller, ”Mobile Communications”, Second Edition, Pearson Education 2012.
2.Vijay Garg , “Wireless Communications and networking”, First Edition, Elsevier 2007.

REFERENCES:

1.Erik Dahlman, Stefan Parkvall, Johan Skold and Per Beming, "3G Evolution HSPA and LTE for Mobile Broadband”, Second Edition, Academic Press, 2008.
2.Anurag Kumar, D.Manjunath, Joy kuri, “Wireless Networking”, First Ed., Elsevier 2011.
3.Simon Haykin , Michael Moher, David Koilpillai, “Modern Wireless Communications”, First Edition, Pearson Education 2013.

GE17551 PRINCIPLES OF MANAGEMENT L T P C

(Common to all branches of B.E./B.Tech) 3 0 0 3

OBJECTIVES:

- To provide an introduction to management and types of business organisations.
- To provide the knowledge of planning, strategic management and decision making, their relevance, methodologies and benefits.
- To provide the knowledge of organizing and human resources management.
- To enrich about the directing and controlling functions inorganisations.
- To provide knowledge on marketing management and international management.

UNIT I INTRODUCTION TO MANAGEMENT AND ORGANIZATIONS 9

Definition of Management – Science or Art – Manager Vs Entrepreneur - types of managers -managerial roles and skills – Evolution of Management – Scientific, human relations , system and contingency approaches – Types of Business organization - Sole proprietorship, partnership, company-public and private sector enterprises - Organization culture and Environment.

UNIT II PLANNING 9

Nature and purpose of planning – planning process – types of planning – objectives – setting objectives – policies – Planning premises – Strategic Management – Planning Tools and Techniques – Decision making steps and process.

UNIT III ORGANISING 9

Nature and purpose – Formal and informal organization – organization chart – organization structure – types – Line and staff authority – departmentalization – delegation of authority – centralization and decentralization – Job Design - Human Resource Management – HR Planning, Recruitment, selection, Training and Development, Performance Management , Career planning.

UNIT IV DIRECTING AND CONTROLLING 9

Foundations of individual and group behaviour – motivation – motivation theories – motivational techniques – job satisfaction – job enrichment – leadership – types and theories of leadership –communication – process of communication – barrier in communication – effective communication. System and process of controlling – budgetary and non-budgetary control techniques – use of computers and IT in Management control – Productivity problems and management – control and performance – direct and preventive control – reporting.

UNIT V MARKETING AND MULTINATIONAL MANAGEMENT 9

Marketing management – marketing mix and strategies – pricing – product – channels of distribution – promotion – market research.

International management – stages of internationalism - the multinational company – reasons - modes of foreign investment – problems faced by international managers-management functions in international operations.

TOTAL= 45 PERIODS

OUTCOMES:

On the successful completion of the course, students will be

- Able to know the basic aspects of management thought, its evolution and various approaches.
- Able to provide policies and objectives for the organisation, and recommend appropriate tools and techniques.
- Able to carry out structuring and restructuring of organisations and to effectively manage the human resources of the organization.
- Able to carry out directing and controlling activities in organisations.
- Able to plan, organize, direct and control marketing management and international management activities in organisations.

TEXTBOOKS:

1. Harold Koontz & Heinz Weihrich, “Essentials of Management”, Tata McGraw Hill, 1998.
2. Tripathy PC & Reddy PN, “Principles of Management”, Tata Mcgraw Hill, 1999.

REFERENCES:

1.Stephen A. Robbins & David A. Decenzo& Mary Coulter, “Fundamentals of Management” 7th Edition, Pearson Education, 2011.
2.Robert Kreitner & Mamata Mohapatra, “ Management”, Biztantra, 2008.
3. Joseph C.Messie, “Essentials ofManagement”, Prentice Hall of India, New Delhi,2003.

EC17711 EMBEDDED LABORATORY L T P C
0 0 4 2

PREREQUISITE: Knowledge on Microprocessor and Microcontroller Lab

OBJECTIVES:

- To Learn the working of ARM processor
- To Understand the Building Blocks of Embedded Systems
- To Learn the concept of memory map and memory interface
- To Know the characteristics of Real Time Systems
- To Write programs to interface memory, I/Os with processor
- To Study the interrupt performance

LIST OF EXPERIMENTS

1. Study of ARM evaluation system
2. Interfacing ADC and DAC.
3. Interfacing LED and PWM.
4. Interfacing Real Time Cock 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.

TOTAL =60 PERIODS

OUTCOMES:

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

- Write programs in ARM for a specific Application
- Interface memory and Write programs related to memory operations
- Interface A/D and D/A convertors with ARM system
- Analyse the performance of interrupt
- Formulate a mini project using embedded system

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS (3 students per batch)

1. Embedded trainer kits with ARM board 10 No.s
2. Embedded trainer kits suitable for wireless communication 10 No.s
3. Adequate quantities of Hardware, software and consumables

EC17712 ADVANCED COMMUNICATION SYSTEMS LABORATORY L T P C
0 0 4 2

PREREQUISITE: Knowledge on Communication Systems Laboratory

OBJECTIVES:

- To enable the students to get practical knowledge about transmission and reception of signals in the fiber optic link
- To study and analyse the characteristics of fiber.
- To enable the student to gain insight into the practical aspects of radiation phenomena and thoroughly understand the radiation characteristics of different types of antennas.
- To understand and implement various modulation techniques
- To introduce the relevance of this course to the existing technology through demonstrations, case studies, simulations, contributions of scientist, national/international policies with a futuristic vision along with socio-economic impact and issues

LIST OF EXPERIMENTS

OPTICAL COMMUNICATION LABORATORY:

1. DC Characteristics of LED and PHOTODIODE
2. Measurement of losses in a given optical fiber (propagation loss, bending loss) and numerical aperture
3. Analog and Digital (with TDM) communication link using optical fiber.
4. Study of optical Fiber mode Characteristics

RF AND MICROWAVE LABORATORY:

5. Reflex Klystron – Mode characteristics, Gunn Diode - VI Characteristics
6. Measurement of frequency, guide wavelength and VSWR in a microwave test bench
7. Measurement of Radiation pattern and gain of antennas
8. Directional Coupler Characteristics.
9. S-PARAMETER Measurement of the following microwave components - Isolator, Circulator, E-Plane Tee, H-Plane Tee and Magic Tee.
10. Attenuation and Power Measurement.

WIRELESS COMMUNICATION LAB:

12. Implementation of real time receivers (FM/GSM/3G/Wi-Fi) using SDR
13. Spectrum sensing in Cognitive Radio using SDR
14. Simulation / Implementation of Multicarrier Modulation

TOTAL = 60 PERIODS

OUTCOMES:

At the end of the course, students will be able to

- Get knowledge about the fibre optical link design.
- Understand the clearly the concepts related to transmitter and receiver characteristics.
- Understand the various concepts related to micro strip components.
- The student would be able to comprehensively record and report the measured data, and would be capable of analysing and interpreting the experimental measurement data and produce meaningful conclusions

- Able to modify the characteristics of wireless channel and develop a new channel model
- Ability to comprehend and appreciate the significance and role of this course in the present contemporary world.

EC17713 MINI PROJECT L T P C
0 0 2 1

OBJECTIVES:

- To make the students to do mini project in various domains such as Embedded system, Networking and Antennas

Project Domain

1. Study of Evaluation boards.
2. Interfacing Temperature and Humidity sensor with IOT.
3. LPG leakage detection using sensor.
4. Interfacing Heart rate sensor with IOT for live monitoring.
5. Line follower robot.
6. Bluetooth controlled robot.
7. Introduction to PHP and Apache HTTP server.
8. Home automation using private LAN.
9. Motor control using PLC.
10. Data transmission and Audio signal transmission using Li-Fi.
11. Antenna design using HFSS or IE3D.

OUTCOMES:

After the successful completion of this course student will be able to:

- Acquire practical knowledge within the chosen area of technology for project development
- Identify, analyze, formulate and handle projects with a comprehensive and systematic approach
- Contribute as an individual or in a team in development of technical projects
- Develop effective communication skills for presentation of project related activities
- Extend the work and make it as a final year project.

TOTAL = 30 PERIODS

PROFESSIONAL ELECTIVE I

CS17351 OBJECT ORIENTED PROGRAMMING PARADIGM L T P C
(Common to ECE and EEE) 3 0 0 3

OBJECTIVES:

• To be familiar in Object Oriented Programming Concepts of C++.
• To Understanding the Operator Overloading and Friend Functions.
• To be exposed to implement the concepts of Inheritance in JAVA.
• To learn the usage of Exception Handling and Generic Classes.
• To acquire the knowledge on Multithreading and GUI components.

UNIT I OBJECT ORIENTED PROGRAMMING FUNDAMENTALS 9

Object-Oriented Approach – Objects - Classes- Inheritance – Reusability - Polymorphisms and overloading - C++ Programming Basics - Objects and Classes - Constructors – Destructor - Functions –Passing arguments to Functions- Returning values- Reference arguments - Overloaded Function – Recursion - Inline functions - Default arguments.

UNIT II OBJECT ORIENTED PROGRAMMING CONCEPTS 7

Operator overloading- Overloading Binary Operators - Inheritance - Virtual Functions - Friend functions - Static member functions - Function Templates - Class Templates – Exception handling.

UNIT III INTRODUCTION TO JAVA 11

Introduction to Classes, Objects – Instance variable- Static members ad Methods – Access modifiers-Garbage collection – Arrays –Passing Arrays to methods – Pass-By-Value – Pass-By- Reference- Variable-Length Argument lists- Command Line Arguments - Inheritance - Polymorphism – Abstract classes and methods – Final methods and Classes- Interface.

UNIT IV STRING AND EXCEPTION 9

Strings - Class String and String Builder- String Handling Functions- Exception Handling –Exception hierarchy-Chained Exceptions -Generic Collections – Type-Wrapper Classes- Autoboxing and Auto-Unboxing- Lists-Collection methods – Sets.

UNIT V MULTITHREADING AND GUI COMPONENTS 9

Generic Classes and Methods – Implementation and Compile-Time Translation- Overloading Generic methods- Generic classes – Raw types- Wildcards in methods – Multithreading- Thread States and Life Cycle-Thread Synchronization- GUI Components –Layout management.

TOTAL= 45 PERIODS

OUTCOMES:

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

- Design problem solutions using Object Oriented Techniques.
- Apply the concepts of Encapsulation, Polymorphism and Inheritance.
- Apply the concepts of Interface and Abstract classes.
- Design problem solutions using Generic Collections and exception handling.
- Design a layout with the GUI Components

TEXTBOOKS:

1. Robert Lafore “Object Oriented Programming in C++” 4th Edition SAMS Publishing 2002
2. Paul Dietel, Harvey Dietel “Java How to Program (Early Objects)” 10th Edition 2014

REFERENCES:

1.K.R.Venugopal, B.Rajkumar and T.Ravishankar “Mastering C++” 2nd Edition Tata McGraw Hill 2013.
2.BjarneStroustrup, “The C++ Programming Language”, 4th Edition, Addison-Wesley Professional, 2013
3.Bhushan Trivedi “Programming with ANSI C++” 2nd Edition Oxford University Press 2013
4.Herbert Schildt “Java, The complete Reference” 10th Edition Oracle Press 2017.

CS17303	COMPUTER ARCHITECTURE	L T P C
	(Common to CSE, ECE & EEE)	3 0 0 3

OBJECTIVES:

- To make with a solid understanding of the fundamentals in computer architectures
- To familiarize for the implementation of arithmetic and logical unit and floating point operations
- To make quantitatively evaluate simple computer designs and their sub-modules
- To expose the students with the relation of computer architecture to system software and the performance of application programs
- To learn about the memory system design and the I/O devices

UNIT I INTRODUCTION 9

Overview of Computer Architecture – Computer components, Performance design & Assessment- Multicore, MICS & GPGPUS – Computer functions and Interconnection-Case Study: Evolution of Intel x86 architecture

UNIT II ARITHMETIC & LOGIC UNIT 9

Design of ALU, Integer Arithmetic: Addition, Subtraction, Multiplication and Division - Floating Point Arithmetic: Representation, Addition, subtraction, Multiplication & Division

UNIT III CENTRAL PROCESSING UNIT 9

MIPS Instruction Set: Machine instruction characteristics– Data path, Operations & operands, Representing instructions, Logical operations – Instructions for decision making- Addressing modes - Case Study: Intel x86 Operation Types

UNIT IV PARALLELISM 9

Pipelining & Instruction cycle – pipelining strategy – pipeline hazards – dealing with branches – RISC & CISC – Super scalar – Instruction level parallelism – Flynn's taxonomy – Multithreading - Multicore Processor - Case Study: Key Elements of ARM 11 MPCORE

UNIT V MEMORY & I/O 9

Characteristics of memory systems – Hierarchy of memory – Cache design and measuring performance – I/O modules – Programmed I/O – Interrupts & its types – DMA – I/O Processors – Virtual memory – TLB – Case Study: RAID

TOTAL= 45 PERIODS

OUTCOMES:

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

- Apply the knowledge of performance metrics to find the performance of systems
- Ability to perform computer arithmetic operations
- Understand the impact of instruction set architecture on cost-performance of computer design
- Evaluate the performance of memory systems
- Develop the system skills in the content of computer system design

TEXT BOOK:

1.William Stallings "Computer Organization and Architecture Designing for performance", PHI Pvt. Ltd., Eastern Economy Edition, Ninth Edition, 2013

REFERENCES :

1.David A Patterson and John L. Hennessy, "Computer Organization and Design: The Hardware/Software Interface", Morgan Kaufmann, Fifth Edition,2014
2.John P Hayes, "Computer Architecture and Organization", McGraw Hill,Third Edition, 2002.
3.V Carl Hamacher, ZvonksVranesic and SafeaZaky, " Computer Organization", Sixth Edition, 2012

EC17E61 MEDICAL ELECTRONICS L T P C
3 0 0 3

PREREQUISITE: Knowledge on Electron devices and Electronic circuits

OBJECTIVES:

The students are able to:

- To gain knowledge about the various physiological parameters both electrical and non-electrical on the methods of recording and on the method of transmitting these parameters.
- To acquire knowledge on Bio-chemical and non-electrical parameter measurement
- To study about the various assist devices used in the hospitals.
- To gain knowledge about equipment used for physical medicine
- To be familiar with the various recently developed diagnostic and therapeutic techniques.

UNIT I ELECTRO-PHYSIOLOGY AND BIO-POTENTIAL RECORDING 9

The origin of Bio-potentials; bio potential electrodes, biological amplifiers, ECG, EEG, EMG, EOG, PCG, lead systems and recording methods, typical waveforms and signal characteristics

UNIT II BIO-CHEMICAL AND NON ELECTRICAL PARAMETER MEASUREMENT 9

pH, PO2, PCO2, colorimeter, Photometer, Auto analyzer, Blood flow meter, cardiac output, respiratory measurement, Blood pressure, pulse, Blood Cell Counters

UNIT III ASSIST DEVICES 9

Cardiac pacemakers, DC Defibrillator, Dialyser, Heart lung machine, Tele-stimulators

UNIT IV PHYSICAL MEDICINE AND BIOTELEMETRY 9

Diathermies-techniques and waveforms, Shortwave, ultrasonic and microwave type and their applications, Surgical Diathermy, Telemetry principles, frequency selection, biotelemetry, Radio-pill, electrical safety

UNIT V IMAGING MODALITIES AND RECENT TRENDS IN MEDICAL INSTRUMENTATION 9

Introduction to X-ray, CT, MRI and PET, Thermograph, Endoscopy unit, Laser in medicine, Cryogenic application, Introduction to telemedicine

TOTAL= 45 PERIODS

OUTCOMES:

Upon completion of the course, students will be able to:

- Discuss the application of electronics in diagnostic and therapeutic area.
- Measure biochemical and various physiological information.
- Describe the working of units which will help to restore normal functioning.
- Acquire knowledge about equipment used for microsurgery and non-invasive techniques

- Appreciate the necessity of the various recently developed diagnostic and therapeutic techniques catering to health requirements of both rural and urban population

TEXTBOOKS:

1. Leslie Cromwell, "Biomedical Instrumentation and Measurement", Prentice Hall of India, New Delhi, 2007.
2. John G.Webster, "Medical Instrumentation Application and Design", 3rd Edition, Wiley India Edition, 2007.

REFERENCES:

1. Khandpur, R.S., "Handbook of Biomedical Instrumentation", TATA McGraw-Hill, New Delhi, 2003.
2. Joseph J.Carr and John M.Brown, "Introduction to Biomedical Equipment Technology", John Wiley and Sons, New York, 2004
3. L. A. Geddes, L. E. Baker., "Principles of Applied Biomedical Instrumentation", 3rd Edition, John Wiley & Sons Inc., ISBN: 978-0-471-60899-8.
4. Dr.M.Arumugam, "Bio medical Instrumentation", 2nd edition, Anuradha Publications.

Webpages:

1. http://www.sherwood-scientific.com/flame/flameanalysis.html
2. http://www.daenotes.com/electronics/industrial-electronics/x-rays-machine-block- diagram-working

EC17E62 INFORMATION CODING THEORY L T P C

3 0 0 3

OBJECTIVES

- To know the basic principles of information theory and coding.
- To study the various text and voice coding techniques.
- To learn the concepts of image formats and coding.
- To understand the principles of video coding techniques.
- To acquire knowledge on error control coding techniques.

UNIT I INFORMATION THEORY AND TEXT CODING 9

Information – Entropy, Information rate, Kraft McMillan inequality, Extended Huffman coding - Adaptive Huffman Coding, Arithmetic Coding, LZW algorithm.

UNIT II VOICE CODING 9

Adaptive Differential Pulse Code Modulation – Adaptive sub band coding, Perceptual coding, Masking techniques, Psychoacoustic model, MPEG Audio layers I,II,III, Dolby AC3 - Speech: Channel Vocoder.

UNIT III IMAGE CODING 9

Image Formats – Graphics Interchange format – Tagged Image File Format, Source input format, Common Intermediate Format, Quarter CIF – Image compression: Run length coding and JPEG standards.

UNIT IV VIDEO CODING 9

Video Compression: Principles-I, B, P frames, Motion estimation, Motion compensation, Introduction to H.261, MPEG Video standards.

UNIT V ERROR CONTROL CODING 9

Cyclic redundancy check codes, Reed Solomon codes, BCH Codes, Repetition codes, principle of Turbo coding, LDPC codes.

TOTAL=45 PERIODS

OUTCOMES:

After the completion of the course, the students are able to

- Analyze various coding techniques for text compression.
- Familiar in voice coding techniques.
- Apply the various coding techniques for image compression.
- Describe the video coding techniques.
- Evaluate the various error control coding techniques.

TEXT BOOKS:

1. K Sayood, "Introduction to Data Compression" 3/e, Elsevier 2006
2. Fred Halsall, "Multimedia Communications: Applications, Networks, Protocols and Standards", Perason Education Asia, 2002

REFERENCES

1. R Bose, "Information Theory, Coding and Crptography", TMH 2007
2. S Gravano, "Introduction to Error Control Codes", Oxford University Press 2007
3. Amitabha Bhattacharya, "Digital Communication", TMH 2006
4.Mark Nelson, "Data Compression Book", BPB Publication 1992.
5. Watkinson J, "Compression in Video and Audio", Focal Press, London, 1995.

EC17E63 MICRO ELECTRO MECHANICAL SYSTEMS L T P C
3 0 0 3

PREREQUISITE: Knowledge on Electronic devices, IC fabrication process and Engineering Chemistry

OBJECTIVES:

The students are able to:

- To introduce the fundamental concept of MEMS & Microsystem.
- To gain an understanding of standard micro-fabrication techniques.
- To understand the fundamental principles behind the operation of MEMS devices/systems.
- To apply knowledge of microfabrication techniques and applications to the design and manufacturing of MEMS devices.
- To acquire knowledge in materials and appreciate the importance of microsystem packaging

UNIT I MEMS OVERVIEW 9

MEMS and microsystems, evolution of micro fabrication, microsystem and microelectronics, intrinsic characteristics of MEMS, application of Microsystems

UNIT II MICRO SENSOR AND ACTUATORS 9

Working principles of MEMS Sensors -Acoustic wave sensors, Bio sensors, Chemical sensor, optical sensors, Micro accelerometer, Capacitive and Piezo Resistive Pressure sensors and Thermal Sensors, Micro actuation –

thermal forces, Shape Memory alloys, Piezo electric Crystal and electrostatic forces, Applications- Microgripper, Microvalve, Micropump, Micromotor

UNIT III MEMS MATERIAL AND PROCESSES 9

Structure of silicon and other materials, Silicon Compounds - silicon dioxide, silicon carbide, silicon nitride, and polycrystalline silicon, Polymer for MEMS, Silicon wafer processing, Thin-film deposition- Physical Vapor Deposition, Chemical vapor deposition, Lithography, Wet Etching and Dry Etching.

UNIT IV MICROMACHINING 9

Bulk micromachining – overview of etching, isotropic and anisotropic etching, wet etchants, etch stop, dry etching, comparison of wet and dry etching, Surface micromachining – General description, process, mechanical problems associated with surface micromachining, LIGA- General description, process, material for substrate and photoresists, Electroplating, SLIGA process

UNIT V MICROSYSTEM PACKAGING 9

Overview of packaging, packaging design, selection of packaging materials, levels of microsystem packaging, interface in microsystem packaging, essential packaging technologies, Assembly of micro systems

TOTAL = 45 PERIODS

OUTCOMES:

As an outcome of completing this course, student will be able to

- Be introduced to the field of MEMS and micro systems.
- Understand materials for MEMS applications.
- Gain knowledge of basic approaches for micro system design.
- Understand state-of-the-art micromachining and packaging technologies.
- Have a good vision to the future of MEMS.

TEXT BOOK:

1.Tai Ran Hsu, “MEMS and Microsystems Design and Manufacture”, Tata-McGraw Hill, New Delhi, 2002

REFERENCES:

1.Mark Madou, “Fundamentals of Micro fabrication”, CRC Press, New York, 1997

2.Stephen D.Senturia, “Micro system Design”, Springer International Edition, 2011.

3.Chang Liu, “Foundations of MEMS”, Pearson, 2012.

4.NadimMaluf, KirtWillams, “An Introduction to Micro electromechanical Engineering”, Artech House Publishers, London, 2004.

PROFESSIONAL ELECTIVE II

EC17E64 DSP ARCHITECTURE AND PROGRAMMING L T P C
3 0 0 3

PREREQUISITE: Knowledge on Digital Signal Processing

OBJECTIVES:
The student is able to:
- To study about MAC and memory access of DSP processors
- To understand addressing modes and instruction set of general purpose DSP processors
- To understand addressing modes and instruction set of VLIW DSP processors
- To acquire knowledge about programming using DSP processors
- To familiarize with the fundamentals of Advanced DSP architectures and some applications.

UNIT I FUNDAMENTALS OF PROGRAMMABLE DSPs 9
Multiplier and Multiplier accumulator – Modified Bus Structures and Memory access in PDSPs – Multiple access memory – Multi-port memory – VLIW architecture- Pipelining – Special Addressing modes in P-DSPs – On chip Peripherals.

UNIT II TMS320C5X PROCESSOR 9
Architecture – Assembly language syntax - Addressing modes – Assembly language Instructions - Pipeline structure, Operation – Block Diagram of DSP starter kit – Application Programs for processing real time signals.

UNIT III TMS320C6X PROCESSOR 9
Architecture of the C6x Processor - Instruction Set - DSP Development System: Introduction – DSP Starter Kit Support Tools- Code Composer Studio - Support Files - Programming Examples to Test the DSK Tools – Application Programs for processing real time signals.

UNIT IV ADSP PROCESSORS 9
Architecture of ADSP-21XX and ADSP-210XX series of DSP processors- Addressing modes and assembly language instructions – Application programs –Filter design, FFT calculation.

UNIT V ADVANCED PROCESSORS 9
Architecture of TMS320C54X: Pipe line operation, Code Composer studio –Architecture of Motorola DSP563XX – Comparison of the features of DSP family processors.

TOTAL= 45 PERIODS

OUTCOMES:
At the end of the course, the student should be able to:
- Ability to understand the internal structures of DSP Processors and memory accesses.
- Acquired knowledge about addressing instructions of DSP processors.
- Foster ability to understand programming.
- Ability to manifest the skills in interfacing different peripheral devices with TMS320C3X, TMS320C5X, TMS320C6X, ADSP 21XX DSP Chips.
- Demonstrate ability to understand the features of advanced DSP processors.

REFERENCES:

1. B.Venkataramani and M.Bhaskar, "Digital Signal Processors – Architecture, Programming and Applications" – Tata McGraw – Hill Publishing Company Limited. New Delhi, 2003.
2. Avtar Singh And S. Srinivasan, Digital Signal Processing – Implementations Using DSP Microprocessors with examples from TMS320C54xx, Cengage Learning India Private Limited, Delhi 2012
3. User Guides Texas Instrumentation, Analog Devices, Motorola.
4. RulphChassaing, Digital Signal Processing and Applications with the C6713 and C6416 Dsk, A John Wiley & Sons, Inc.,

EC17E65 DIGITAL IMAGE PROCESSING LT P C
(Common to ECE, CSE and MCT) 3 0 0 3

PREREQUISITE: Knowledge on Digital Signal Processing

OBJECTIVES:

The students are able to:

- Learn digital image fundamentals.
- Be exposed to simple image enhancement techniques.
- Understanding image restoration and segmentation.
- Be familiar with image compression techniques.
- Learn to represent image in form of features.

UNIT I DIGITAL IMAGE FUNDAMENTALS 8

Introduction – Origin – Steps in Digital Image Processing – Components – Elements of Visual Perception – Image Sensing and Acquisition – Image Sampling and Quantization – Relationships between pixels – color models.

UNIT II IMAGE ENHANCEMENT 10

Spatial Domain: Gray level transformations – Histogram processing – Basics of Spatial Filtering–Smoothing and Sharpening Spatial Filtering – Frequency Domain: Introduction to Fourier Transform – Smoothing and Sharpening frequency domain filters – Ideal, Butterworth and Gaussian filters.
Matlab programs for image enhancement -zooming, histogram equalization and High pass filter

UNIT III IMAGE RESTORATION AND SEGMENTATION 9

Noise models – Mean Filters – Order Statistics – Adaptive filters – Band reject Filters – Band pass Filters – Notch Filters – Optimum Notch Filtering – Inverse Filtering – Wiener filtering Segmentation: Detection of Discontinuities–Edge Linking via Hough Transform and Boundary detection – Region based segmentation-Morphological processing- erosion and dilation. Matlab programs for Mean, Median and Contra Harmonic filters.

UNIT IV WAVELETS AND IMAGE COMPRESSION 9

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

UNIT V IMAGE REPRESENTATION AND RECOGNITION 9

Boundary representation – Chain Code – Polygonal approximation, signature, boundary segments – Boundary

description – Shape number – Fourier Descriptor, moments- Regional Descriptors –Topological feature, Texture – Patterns and Pattern classes – Recognition based on matching- Neural network -perceptron for two pattern classes.

TOTAL = 45 PERIODS

OUTCOMES:

Upon completion of the course, students will be able to:

- Describe digital image fundamentals.
- Apply image enhancement techniques.
- Analyse Image Restoration and Segmentation Techniques.
- Use image compression Techniques.
- Demonstrate Image in the form of features.

TEXT BOOK:

1. Rafael C. Gonzales, Richard E. Woods, "Digital Image Processing", Third Edition, Pearson Education, 2010.

REFERENCES:

1. Anil Jain K. "Fundamentals of Digital Image Processing", PHI Learning Pvt. Ltd., 2011.
2. Willliam K Pratt, "Digital Image Processing", John Willey, 2002.
3. Malay K. Pakhira, "Digital Image Processing and Pattern Recognition", First Edition, PHI Learning Pvt. Ltd., 2011.
4. http://eeweb.poly.edu/~onur/lectures/lectures.html.
5. http://www.caen.uiowa.edu/~dip/LECTURE/lecture.html

EC17E66 SOFT COMPUTING L T P C

3 0 0 3

OBJECTIVES:

The students are able to:

- To introduce fuzzy set theory and fuzzy inference systems.
- To teach different optimization techniques
- To introduce neural networks using supervised and unsupervised learning
- To learn neuro-fuzzy modeling
- To teach various applications of computational intelligence

UNIT I FUZZY SET THEORY 10

Introduction to Neuro - Fuzzy and Soft Computing - Fuzzy Sets - Basic Definition and Terminology - Set-theoretic Operations - Member Function Formulation and Parameterization -
Fuzzy Rules and Fuzzy Reasoning - Extension Principle and Fuzzy Relations - Fuzzy If-Then Rules - Fuzzy Reasoning - Fuzzy Inference Systems - Mamdani Fuzzy Models - Sugeno Fuzzy Models - Tsukamoto Fuzzy Models - Input Space Partitioning and Fuzzy Modeling.

UNIT II OPTIMIZATION 8

Derivative-based Optimization - Descent Methods - The Method of Steepest Descent - Classical Newton's Method - Step Size Determination - Derivative-free Optimization - Genetic Algorithms - Simulated Annealing - Random Search - Downhill Simplex Search.

UNIT III NEURAL NETWORKS 10

Supervised Learning Neural Networks - Perceptrons - Adaline - BackpropagationMutilayer Perceptrons - Radial Basis Function Networks - Unsupervised Learning Neural Networks - Competitive Learning Networks - Kohonen Self-Organizing Networks - Learning Vector Quantization - Hebbian Learning.

UNIT IV NEURO FUZZY MODELING 9

Adaptive Neuro-Fuzzy Inference Systems - Architecture - Hybrid Learning Algorithm - Learning Methods that Cross-fertilize ANFIS and RBFN - Coactive Neuro Fuzzy Modeling- Framework Neuron Functions for Adaptive Networks - Neuro Fuzzy Spectrum.

UNIT V APPLICATIONS OF COMPUTATIONAL INTELLIGENCE 8

Printed Character Recognition - Inverse Kinematics Problems - Automobile Fuel Efficiency Prediction - Soft Computing for Color Recipe Prediction.

TOTAL= 45 PERIODS

OUTCOMES:

Upon completion of the course, students will be able to:

- Ability to appreciate the significance and role of fuzzy logic
- Apply various optimization algorithms.
- Ability to comprehend the role of neural network and design various neural networks
- Discuss hybrid soft computing
- Appreciate the role of soft computing in computational intelligence applications.

TEXT BOOKS:

1. J.S.R.Jang, C.T.Sun and E.Mizutani,Neuro-Fuzzy and Soft Computing, PHI, 2004 Pearson Education 2004.
2. N.P.Padhy, —Artificial Intelligence and Intelligent Systems, Oxford University Press, 2006.

REFERENCES:

1. J.Ross, —Fuzzy Logic with Engineering Applications‖, McGraw-Hill, 1997.
2. Davis E.Goldberg, —Genetic Algorithms: Search, Optimization and Machine Learning, Addison Wesley, N.Y., 1989.
3. S. Rajasekaran and G.A.V.Pai, —Neural Networks, Fuzzy Logic and Genetic Algorithms, PHI, 2003.
4. R.Eberhart, P.Simpson and R.Dobbins,—Computational Intelligence- PC Tools, AP Professional, Boston, 1996.
5. Dr.S.N.Sivanandam and S.N.Deepa, —Principles of Soft Computing, Wiley India, 2007.
6. Amit Konar, —Artificial Intelligence and Soft Computing Behaviour and Cognitive model of the human brain, CRC Press, 2008

EC17E67 SPEECH PROCESSING LT P C
3 0 0 3

PREREQUISITE: Knowledge on Digital signal processing

OBJECTIVES:

- To introduce speech production and acoustic phonetics of speech.
- To apply the computation techniques such as short time Fourier transform, linear predictive coefficients and other coefficients in the analysis of speech.
- To understand different speech modeling procedures
- To implement the various issues for designing a speech recognition model
- To understand the concepts of different Text-to-Speech conversion techniques

UNIT I BASIC CONCEPTS 9

Speech Fundamentals: Articulatory Phonetics – Production and Classification of Speech Sounds; Acoustic Phonetics – Acoustics of speech production; Review of Digital Signal Processing concepts; Short-Time Fourier Transform, Filter-Bank and LPC Methods.

UNIT II SPEECH ANALYSIS 9

Features, Feature Extraction and Pattern Comparison Techniques: Speech distortion measures– mathematical and perceptual – Log–Spectral Distance, Cepstral Distances, Weighted Cepstral Distances and Filtering, Likelihood Distortions, Spectral Distortion using a Warped Frequency Scale, LPC, PLP and MFCC Coefficients, Time Alignment and Normalization – Dynamic Time Warping, Multiple Time – Alignment Paths.

UNIT III SPEECH MODELING 9

Hidden Markov Models: Markov Processes, HMMs – Evaluation, Optimal State Sequence – Viterbi Search, Baum-Welch Parameter Re-estimation, Implementation issues.

UNIT IV SPEECH RECOGNITION 9

Architecture of a large vocabulary continuous speech recognition system – acoustic models and language models – n-grams, context dependent sub-word units- creation of context dependent diphones and triphones-using inter word training to create CD units-implementation issues using CD units-position dependent units-unit splitting and clustering- State of the art Speech recognition application- dictation machine, voice command driven applications, Speech –to-Speech system.

UNIT V SPEECH SYNTHESIS 9

Text-to-Speech Synthesis: Concatenative and waveform synthesis methods, sub-word units for TTS, intelligibility and naturalness – role of prosody, Applications and present status.

TOTAL = 45 PERIODS

OUTCOMES:

Upon completion of the course, students will be able to:

- Understand speech production system and acoustic- phonetics concept of speech.
- Able to handle and process digitized speech data.
- Extract and compare different speech parameters.
- Understand and apply statistical model for Speech recognition applications.
- Understand and apply Text-to-Speech synthesis.

TEXT BOOK:

1. Lawrence Rabiner and Biing-Hwang Juang, “Fundamentals of Speech Recognition”, Pearson Education, 2003.

REFERENCES:

1. Daniel Jurafsky and James H Martin, “Speech and Language Processing – An Introduction to Natural Language Processing, Computational Linguistics, and Speech Recognition”, Pearson Education
2. Steven W. Smith, “The Scientist and Engineer’s Guide to Digital Signal Processing”, California Technical Publishing.
3. Thomas F Quatieri, “Discrete-Time Speech Signal Processing – Principles and Practice”, Pearson Education.
4. Claudio Becchetti and LucioPrinaRicotti, “Speech Recognition”, John Wiley and Sons, 1999.
5. Ben gold and Nelson Morgan, “Speech and audio signal processing”, processing and perception of speech and music, Wiley- India Edition, 2006 Edition.
6. Frederick Jelinek, “Statistical Methods of Speech Recognition”, MIT Press.

EC 17E68 ELECTRONICS PACKAGING AND TESTING L T P C
3 0 0 3

PREREQUISITE: Knowledge on Electron devices and Electrical and Instrumentation Engineering

OBJECTIVES:
The student is able to:

- To give a comprehensive introduction to the various packaging types used along with the associated same the thermal, speed, signal and integrity power issues.
- To introduce about CAD used in designing wiring boards.
- To understand the basics of testing and the testing equipment's.
- To understand the different testing methods.
- To Understand the Embedded passive technologies and testing equipment's.

UNIT I OVERVIEW OF ELECTRONIC SYSTEMS PACKAGING AND INTRODUCTION OF TESTING **9**

Definition of a system and history of semiconductors packaging-Products and levels of packaging-Packaging aspects of handheld products- Definition of PWB- Basics of Semiconductor and Process flowchart- Wafer fabrication- inspection and testing- Wafer packaging- Packaging evolution- Chip connection choices- Wire bonding- TAB and flip chip- Test process and automatic test equipment- test economics and product quality-fault modeling.

UNIT II SEMICONDUCTOR PACKAGES AND ANALOG TESTING 9

Single chip packages or modules (SCM), Commonly used packages and advanced packages- Materials in packages, Thermal mismatch in packages, Multichip modules (MCM)-types- System-in-package (SIP), Packaging roadmaps, Hybrid circuits, Electrical Design considerations in systems packaging, Interconnection. Memory Test, DSP Based Analog and Mixed Signal Test, Model based analog and mixed signal test, delay test, IIDQ test.

UNIT III CAD FOR PRINTED WIRING BOARDS AND DIGITAL TESTING 9

Introduction to CAD and its Benefits-Design rules, Design for Reliability- Printed Wiring Board Technologies, Board-level packaging aspects- Review of CAD output files for PCB fabrication- Photo plotting and mask generation- Process flow-chart- Vias, PWB substrates, Surface preparation, Photo resist and application methods, UV exposure and developing, Printing technologies for PWBs- PWB etching, PWB etching, Resist stripping, Screen-printing technology-Through-hole manufacture process steps, Panel and pattern plating methods, solder mask for PWBs, Multilayer PWBs, Logic and fault simulation, testability measures- combinational and sequential circuit test generation.

UNIT IV SURFACE MOUNT TECHNOLOGY AND DESIGN FOR TESTABILITY 9

SMD benefits; Design issues, Introduction to soldering- Reflow and Wave Soldering methods to attach SMDs, Solders, Wetting of solders, Flux and its properties, Defects in wave soldering, Vapour phase soldering, BGA soldering and Desoldering /Repair, SMT failures, SMT failure library and Tin Whisker, Tin-lead and lead-free solders, Thermal profiles for reflow soldering, Lead freevAlloys, Lead-free solder considerations, Thermal Design considerations in systems packaging. Analog test bus, Fault Dictionary, Diagnostic Tree, Testable System Design, Core Based Design and Test Wrapper Design, Test design for SOCs.

UNIT V EMBEDDED PASSIVES TECHNOLOGY AND LOADED BOARD TESTING 9

Introduction to embedded passives, Need for embedded passives, Design Library, Embedded resistor processes, Embedded capacitors, Processes for embedding capacitors, Case study examples. Unpowered short circuit tests, unpowered analog tests, Powered in-circuit analog, digital and mixed signal tests, optical and X-ray inspection procedures, functional block level design of in-circuit test equipment.

TOTAL = 45 PERIODS

OUTCOMES:

Upon completion of the course, students will be able to

- Explain different testing equipment's.
- Design the different testing schemes for a circuit.
- Discuss the need for test process.
- Given an electronic system PCB or integrated circuit design specifications, the student should be able to recommend the appropriate packaging style to be used, and propose a design procedure and solution for the same.
- Design Embedded passive circuits.

TEXT BOOKS:

1.Rao R. Tummala, "Fundamentals of Microsystems Packaging", McGraw Hill, NY, 2001

2.Michael L. Bushnell and Vishwani D. Agarwal, "Essentials of Electronic Testing for Digital, Memory & Mixed-Signal VLSI Circuits", Springer, 2006.

REFERENCES:

1. William D. Brown, "Advanced Electronic Packaging", IEEE Press, 1999.
2. DimitrisGizopouilos , "Advances in Electronic Testing" , Springer 2006.

EC17E69 COMPREHENSIVE COURSE ON ECE L T P C

0 0 0 3

Objectives:	
•	To Remember The Concepts Of Electronic Circuits
•	To Understand The Boolean Concepts In The Design Of Digital Circuits
•	To Implement The Digital Circuits Using Signal Processing Concepts
•	To Remember The Field Theory Concepts For The Design Of Antennas
•	To Understand The Fundamentals Of Communication Theory

UNIT I FUNDAMENTALS OF ELECTRONIC DEVICES AND CIRCUITS 9

PN junction and Zener diode characteristics, applications of junction diode (Half wave and full wave rectifier, positive clipper & clamper). BJT biasing (self and voltage divider bias), JFET and MOSFET –drain and transfer characteristics. Ideal op-amp, Inverting and Non-Inverting Amplifiers, Differential amplifier, Instrumentation amplifier, Integrator, Differentiator, Comparator, A/D and D/A converters.

UNIT II DIGITAL AND VLSI DESIGN 9

Boolean theorems, Minimization of Boolean expressions, Logic gates, design of combinational circuit (multiplexer, encoder, decoder). Design of synchronous sequential circuits (Flip flops, Counters), CMOS inverter, Overview of static and dynamic CMOS, power dissipation.

UNIT III SIGNAL PROCESSING 9

Classifications of signals and systems- Elementary signals, Fourier transform, Discrete Fourier Transform, Fast Fourier transform -Analysis of systems using Laplace transform and Z transform- Design of FIR and IIR filters.

UNIT IV ELECTROMAGNETICS 9

Electromagnetics: Maxwell's equations, boundary conditions, wave equation, Poynting vector; polarization, phase and group velocity, skin depth. **Transmission lines:** Equations, characteristic

impedance, impedance matching. Rectangular Waveguides: modes, boundary conditions cut-off frequencies. **Antennas:** Types, radiation pattern, gain and directivity, return loss.

UNIT V FUNDAMENTALS OF COMMUNICATION SYSTEMS 9

Introduction to modulation, AM: Balanced modulator and envelope detector. Fundamental concept of DSBSC, SSB and VSB. FM: Amstrong method & Frequency discrimination. Measure of Information, Entropy, Channel Capacity. Study of DM and ADM. BER performance comparative study of Coherent BPSK, BFSK & QPSK and QAM . Cyclic codes, Convolutional codes (with simple illustrations).

Total No. of Hours : 45

Course Outcomes: On completion of this course students will be able to	
●	Analyze Electronic Circuits For Hardware Implementation
●	Design Combinational And Sequential Circuits
●	Analyze The Lti Systems
●	Describe The Properties Of Various Antennas
●	Apply The Communication Principles In Various Applications

REFERENCES

1. David A.Bell, “Electronic Devices and Circuits”, Oxford Higher Education Press, 5th Edition, 2010.
2. D.Roy Choudhry, Shail Jain, “Linear Integrated Circuits”, New Age International Pvt. Ltd., 2000.
3. Allan V. Oppenheim, S.Wilsky and S. H. Nawab, “Signals and Systems”, Pearson Education, 2007.
4. John G. Proakis&Dimitris G. Manolakis, “Digital Signal Processing-Principles, Algorithms and Applications”, Fourth edition, Pearson Education/Prentice Hall, 2007.
5. Mathew N. O. Sadiku, ‘Principles of Electromagnetics’, 4th Edition, Oxford University Press Inc. First India edition, 2009.
6. John D Ryder, “Networks, lines and fields”, 2nd Edition, Pearson Education India, 2015.
7. John D Kraus, Ronald J Marhefka, Ahmed S Khan, “Antennas and Wave Propagation”, McGraw Hill, 5th Edition, 2017.
8. M. Morris Mano and Michael D. Ciletti, —Digital Design‖, 5th Edition, Pearson, 2014.
9. Jan M. Rabaey ,Anantha Chandrakasan, Borivoje. Nikolic, Digital Integrated Circuits: A Design perspective, Second Edition , Pearson , 2016.
10. Mohamed Ali Mazidi, Janice Gillispie Mazidi, Rolin McKinlay, —The 8051 Microcontroller and Embedded Systems: Using Assembly and C‖, Second Edition, Pearson education, 2011.
11. Neil H.E. Weste, David Money Harris —CMOS VLSI Design: A Circuits and Systems Perspective‖, 4th Edition, Pearson , 2017
12. A.K. Ray, K.M. Bhurchandi, —Advanced Microprocessor and Peripherals, Second edition, Tata McGraw-Hill, 2010
13. Simon Haykin, Communication Systems, John Wiley & sons, NY, 4th Edition, 2001

14. S. Haykin, “Digital Communications”, John Wiley, 2005

15. Rappaport,T.S., “Wireless communications”, Second Edition, Pearson Education, 2010

PROFESSIONAL ELECTIVE III

EC17E71 ADVANCED DIGITAL SIGNAL PROCESSING L T P C
3 0 0 3

PREREQUISITE: Knowledge on Signals and Systems and Probability and Random Processes.

OBJECTIVES:

• To introduce the relevance of this course to the existing technology through demonstrations, case studies, simulations, contributions of scientist, national/international policies with a futuristic vision along with socio-economic impact and issues
• To bring out the concepts related to stationary and non-stationary random signals
• To emphasize the importance of true estimation of power spectral density
• To introduce the design of linear and adaptive systems for filtering and linear prediction
• To introduce the concept of wavelet transforms in the context of image processing

UNIT I DISCRETE-TIME RANDOM SIGNALS 9

Discrete random process – Ensemble averages, Stationary and ergodic processes, Autocorrelation and Autocovariance properties and matrices, White noise, Power Spectral Density, Spectral Factorization, Innovations Representation and Process, Filtering random processes, ARMA, AR and MA processes.

UNIT II SPECTRUM ESTIMATION 9

Bias and Consistency, Periodogram, Modified periodogram, Blackman-Tukey method, Welch method, Parametric methods of spectral estimation, Levinson-Durbin recursion.

UNIT III LINEAR ESTIMATION AND PREDICTION 9

Forward and Backward linear prediction, Filtering - FIR Wiener filter- Filtering and linear prediction, non-causal and causal IIR Wiener filters.

UNIT IV ADAPTIVE FILTERS 9

Principles of adaptive filter – FIR adaptive filter – Newton‘s Steepest descent algorithm – LMS algorithm – Adaptive noise cancellation, Adaptive equalizer, Adaptive echo cancellers.

UNIT V WAVELET TRANSFORM 9

Short Time Fourier Transform, Multiresolution analysis, Continuous and discrete wavelet transform, Application of wavelet transform.

TOTAL= 45 PERIODS

OUTCOMES:

The students are able

- To comprehend and appreciate the significance and role of this course in the present contemporary world
- To identify appropriate spectrum estimation method based on type of random signal
- To design of linear and adaptive systems

- To design filters for processing random signal
- To implement multi resolution approach for signals

TEXT BOOKS:

1. Monson H, Hayes, Statistical Digital Signal Processing and Modeling, John Wiley and Sons Inc., New York, Indian Reprint, 2007.

REFERENCES:

1. Sophocles J. Orfanidis, Optimum Signal Processing, An Introduction, McGraw Hill, 1990.
2. Ramachandran K. I., Soman K. P. , Resmi N. G. , Insight into Wavelets from Theory to practice, Eastern Economy Edition , 2010 .
3. John G.Proakis, Dimitris G. Manolakis, Digital Signal Processing, Pearson, Fourth 2007.
4. Dwight F. Mix, Random Signal Processing, Prentice Hall, 1995.

EC17E72 COGNITIVE RADIO LT P C
3 0 0 3

PREREQUISITE: Knowledge on Antenna and Wave Propagation, Communication Theory, Digital Signal Processing and CommunicationNetworks

OBJECTIVES:

- To Study the basics of the software defined radio.
- Be familiar with the functions and architecture of SDR
- To learn the fundamentals and essential of Cognitive Radio.
- To know the concept of building cognitive radio architecture on SDR.
- To understand the concepts of wireless networks and next generation networks

UNIT I INTRODUCTION TO SOFTWARE DEFINED RADIO 9

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

UNIT II SDR ARCHITECTURE 9

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

UNIT III INTRODUCTION TO COGNITIVE RADIOS 9

Making radio self-aware, cognitive techniques – position awareness, environment awareness in cognitive radios, optimization of radio resources, Artificial Intelligence Techniques

UNIT IV COGNITIVE RADIO ARCHITECTURE 9

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

UNIT V NEXT GENERATION WIRELESS NETWORKS 9

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

TOTAL = 45 PERIODS

OUTCOMES:

Upon completion of the course, students will be able to:

- Demonstration of concepts and functions of various SDR modules.
- Capability of interfacing different modules of SDR architecture.
- Implementation of cognitive functions using Artificial Intelligence techniques.
- Design of wireless networks based on the functions of cognitive radio.
- Relating the concepts behind the wireless networks and next generation networks

TEXT BOOKS:

1.Joseph MitolaIII,"Software Radio Architecture: Object-Oriented Approaches to Wireless System Engineering", John Wiley & Sons Ltd. 2000.

2.Bruce A. Fette, "Cognitive Radio Technology", Elsevier, 2009.

REFERENCES:

1. Simon Haykin, "Cognitive Radio: Brain –Empowered Wireless Communications", IEEE Journal on selected areas in communications, Feb 2005.
2. HasariCelebi, HuseyinArslan, "Enabling Location and Environment Awareness in Cognitive Radios", Elsevier Computer Communications, Jan 2008.
3. Markus Dillinger, KambizMadani, Nancy Alonistioti, "Software Defined Radio", John Wiley, 2003.
4. HuseyinArslan, "Cognitive Radio, SDR and Adaptive System", Springer, 2007.
5. Alexander M. Wyglinski, Maziarnekovee,Y. Thomas Hu, "Cognitive Radio Communication and Networks",Elsevier,2010.
6. Thomas W.Rondeau, Charles W. Bostain, "Artificial Intelligence in Wireless communication", ARTECH HOUSE .2009.
7. Ian F. Akyildiz, Won – Yeol Lee, Mehmet C. Vuran, ShantidevMohanty, "Next generation dynamic spectrum access / cognitive radio wireless networks: A Survey" Elsevier Computer Networks, May 2006.

MT17702 ROBOTICS AND MACHINE VISION SYSTEM

L	T	P	C
3	0	0	3

OBJECTIVES:

- Students will learn about basics of robots laws and transmission systems
- The student will be exposed to the knowledge in different types end effectors based on their usage.
- To familiarize students with the concepts and techniques of robot manipulator, its kinematics
- The student will learn Programming and Machine vision applications in robots.

UNIT I BASICS OF ROBOTICS **9**

Introduction- Basic components of robot-Laws of robotics- classification of robot-work space- accuracy-resolution–repeatability of robot. Power transmission system: Rotary to rotary motion, Rotary to linear motion, Harmonics drives

UNIT II ROBOT END EFFECTORS **9**

Robot End effectors: Introduction-types of End effectors-Mechanical gripper-types of gripper mechanism-gripper force analysis-other types of gripper-special purpose grippers.

UNIT III ROBOT MECHANICS 10

Robot kinematics: Introduction-Matrix representation- rigid motion &homogeneous transformation- forward & inverse kinematics trajectory planning. Robot Dynamics: Introduction-Manipulator dynamics –Lagrange-Euler formulation-Newton - Euler formulation

UNIT IV MACHINE VISION FUNDAMENTALS 9

Machine vision: image acquisition, digital images-sampling and quantization-levels of computation, Feature extraction- windowing technique-segmentation-Thresholding- edge detection-binary morphology-gray morphology

UNIT V ROBOT PROGRAMMING 8

Robot programming: Robot Languages-Classification of robot language-Computer control and robot software-Val system and Languages- concepts of Artificial Intelligence- application of robots.

TOTAL= 45 PERIODS

OUTCOMES:

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

- Apply the basic engineering knowledge and laws for the design of robotics
- Explain the basic concepts like various configurations, classification and parts of end effectors compare various end effectors &grippers and tools and sensors used in robots.
- Explain the concept of kinematics, degeneracy, dexterity and trajectory planning.
- Demonstrate the image processing and image analysis techniques by machine vision system
- Analyze the concept of Artificial intelligence in robots, various types of robot programming and its applications.

TEXT BOOK:

1.Groover MP, M.Weiss ,R.N. Nagal, N.G.Odrey, "Industrial Robotics - Technology, programming and Applications" Second Edition, Tata McGraw-Hill Education Pvt. Limited, 2012

REFERENCES:

1.John.J.Craig, " Introduction to Robotics: Mechanics & control" Pearson Publication, Fourth edition, 2018.
2.Ralph Gonzale, C.S.G. Lee K. S. Fu, "Robotics: Sensing, Vision &Intelligence", Tata McGraw- Hill Publication, 2008.
3.Sathya Ranjan Deb, "Robotics Technology & flexible Automation" Second edition, Tata McGraw-Hill Publication, 2009.
4.Jazar, "Theory of Applied Robotics :Kinematics, Dynamics and Control", Springer, Indian Reprint, 2010

EC17E73 VIDEO ANALYTICS L T P C
3 0 0 3

OBJECTIVES:

- To know the fundamental concepts of big data and analytics.
- To learn various techniques for mining data streams.
- To acquire the knowledge of extracting information from surveillance videos.

- To learn Event Modelling for different applications.
- To understand the models used for recognition of objects in videos.

UNIT I INTRODUCTION TO BIG DATA AND DATA ANALYSIS 9

Introduction to Big Data Platform – Challenges of Conventional Systems – Web Data – Evolution of Analytic Scalability – Analytic Processes and Tools – Analysis Vs Reporting – Modern Data Analytic Tools – Data Analysis: Regression Modeling – Bayesian Modeling – Rule Induction.

UNIT II MINING DATA STREAMS 9

Introduction to Stream Concepts – Stream Data Model And Architecture – Stream Computing –Sampling Data in a Stream – Filtering Streams – Counting Distinct Elements in a Stream– Estimating Moments – Counting Oneness in a Window – Decaying Window – Real Time Analytics Platform (RTAP) Applications – Case Studies.

UNIT III VIDEO ANALYTICS 9

Introduction – Video Basics – Fundamentals for Video Surveillance – Scene Artifacts – Object Detection and Tracking: Adaptive Background Modelling and Subtraction – Pedestrian Detection and Tracking – Vehicle Detection and Tracking – Articulated Human Motion Tracking in Low Dimensional Latent Spaces.

UNIT IV BEHAVIOURAL ANALYSIS AND ACTIVITY RECOGNITION 9

Event Modelling – Behavioural Analysis – Human Activity Recognition – Complex Activity Recognition – Activity modeling using 3D shape – Video summarization – shape based activity models – Suspicious Activity Detection.

UNIT V HUMAN FACE RECOGNITION AND GAIT ANALYSIS 9

Introduction: Overview of Recognition algorithms – Human Recognition using Face: - Face Recognition from still images – Face Recognition from video – Evaluation of Face Recognition Technologies – Human Recognition using gait: HMM Framework for Gait Recognition – View Invariant Gait Recognition – Role of Shape and Dynamics in Gait Recognition.

TOTAL=45 PERIODS

OUTCOMES:

Upon successful completion of this course, students will be able to:

- Work with big data platform and its analysis techniques.
- Design efficient algorithms for mining the data from large volumes.
- Work with surveillance videos for analytics.
- Design optimization algorithms for better analysis and recognition of objects in a scene.
- Model a framework for Human Activity Recognition.

TEXT BOOKS

1.Michael Berthold, David J.Hand, “Intelligent Data Analysis”, Springer, 2007.
2.Anand Rajaraman and Jeffrey David Ullman, “Mining of Massive Datasets”, Cambridge, University Press, 2012.

REFERENCES

1. Yunqian Ma, Gang Qian, “Intelligent Video Surveillance: Systems and Technology”, CRC Press (Taylor and Francis Group), 2009.

2.Rama Chellappa, Amit K.Roy– Chowdhury, Kevin Zhou.S, "Recognition of Humans and their Activities using Video", Morgan & Claypool Publishers, 2005.

EC17E74 ADVANCED MICROCONTROLLERS L T P C
3 0 0 3

OBJECTIVES

- To introduce the relevance of this course to the existing technology through demonstrations, case studies, simulations, contributions of scientist, national/international policies with a futuristic vision along with socio-economic impact and issues
- To introduce the concept of microcontroller based system development.
- To introduce the concept of RISC and CISC microcontrollers.
- To study the architecture of PIC, R8C and MSP430 family microcontrollers

UNIT I RISC PROCESSORS 9

RISC Vs CISC, RISC properties and evolution, Advanced RISC microcontrollers, PIC18xx microcontroller family, Architecture, Instruction set, ROM, RAM, Timer programming, Serial port programming, Interrupt programming, ADC and DAC interfacing, CCP module and programming.

UNIT II CISC PROCESSORS 9

RL78 16 BIT Microcontroller architecture, addressing modes, on-Chip memory, ADC, interrupts, MAC unit, Barrel shifter, internal and external clock generation, memory CRC, on chip debug function and self-programming.

UNIT III MSP430 16 - BIT MICROCONTROLLER 9

The MSP430 Architecture, CPU Registers, Instruction Set, addressing modes, the MSP430 family viz. MSP430x2x, MSP430x4x, MSP430x5x. Low power aspects of MSP430 : low power modes, active Vs standby current consumption, FRAM Vs Flash for low power and reliability.

UNIT IV PROGRAMMING AND PERIPHERAL INTERFACE USING MSP430 FAMILIES 9

Memory mapped peripherals, I/O pin multiplexing, Timers, RTC, watchdog timer, PWM control, Analog interfacing and data acquisition, DMA, programming with above internal peripherals using optimal power consumption. Case study: Remote control of air conditioner and home appliances.

UNIT V COMMUNICATION INTERFACE USING MSP 430 MICROCONTROLLER 9

Serial and parallel communication, synchronous and asynchronous interfaces , Implementing and programming of : UART, I2C and SPI protocol. wireless connectivity : NFC, Zigbee, bluetooth and WiFi. MSP430 development tools. Case study: Implementing WiFi connectivity in smart electric meter.

TOTAL= 45 PERIODS

OUTCOMES:

The students will be able to

- Ability to comprehend and appreciate the significance and role of this course in the present contemporary world
- Define, formulate and analyze microcontroller based system.
- Ability to work with PIC, R8C and MSP 430 microcontroller for a specific realworld application.
- Ability to describe the architecture and programming of PIC, R8C and MSP 430 microcontroller
- Manage a project from start to finish

TEXT BOOK:

1. Alaxander G, James M. Conard, " Creating fast, Responsive and energy efficient Embedded systems using the Renesas RL78 microcontroller", micrium press, USA, reprinted by S.P Printers, haryana ISBN No.978-1-935772-98-9. © 2011

REFERENCES:

1. Muhammad Ali Mazidi, Rolind D. Mckinlay and Danny Causey. "PIC Microcontroller and Embedded Systems" Pearson Education, 2008.
2. John H. Davies, —MSP 430 Micro controller basics‖ Elsevier, 2008.

PROFESSIONAL ELECTIVE IV

AE17701 AVIONICS L T P C

3 0 0 3

OBJECTIVES

- To introduce the basic of avionics and its need for civil and military aircrafts
- To impart knowledge about the avionic architecture and various avionics data buses
- To gain more knowledge on various avionics subsystems

UNIT I INTRODUCTION TO AVIONICS 9

Need for avionics in civil and military aircraft and space systems – integrated avionics and weapon systems – typical avionics subsystems, design, technologies – Introduction to Microprocessor and memories.

UNIT II DIGITAL AVIONICS ARCHITECTURE 8

Avionics system architecture – data buses – MIL-STD-1553B – ARINC – 420 – ARINC – 629

UNIT III FLIGHT DECKS AND COCKPITS 9

Control and display technologies: CRT, LED, LCD, EL and plasma panel – Touch screen – Direct voice input (DVI) – Civil and Military Cockpits: MFDS, HUD, MFK, HOTAS

UNIT IV INTRODUCTION TO NAVIGATION SYSTEMS 10

Radio navigation – VOR/DME, Hyperbolic navigation-LORAN and OMEGA, Landing system-ILS, MLS, Inertial Navigation Systems (INS)- INS block diagram – Satellite navigation systems – GPS.

UNIT V SOFTWARE ASSESSMENT AND AUTO PILOT 9

Fault tolerant systems -Software Assessment and Validation -Civil and Military standards - Certification of Civil Avionics. Auto pilot – Basic principles, Longitudinal and lateral auto pilot.

TOTAL= 45 PERIODS

OUTCOMES

Upon the completion of the course students will be able to

- understand the concept of designing avionics systems
- Be able to understand the principle of digital avionics systems.
- Able to know the practical and working of flight deck equipments
- Students understand the principle and working of navigation system
- Be able to understand the air data systems and auto pilot.

TEXTBOOKS

1. Collinson.R.P.G. "Introduction to Avionics", Chapman and Hall, 1996.
2. Spitzer, C.R. "Digital Avionics Systems", Prentice-Hall, Englewood Cliffs, N.J., U.S.A. 1993.

REFERENCES

1. Albert Helfrick.D., "Principles of Avionics", Avionics Communications Inc., 2004
2. Middleton, D.H., Ed., "Avionics systems, Longman Scientific and Technical", Longman Group UK Ltd., England, 1989.
3. Spitzer. C.R. "The Avionics Hand Book", CRC Press, 2000
4. Pallet.E.H.J. "Aircraft Instruments and Integrated Systems", Longman Scientific
5. Jim Curren, “Trend in Advanced Avionics”, IOWA State University, 1992.

GE17E51 HUMAN VALUES AND PROFESSIONAL ETHICS L T P C
(Common to all branches of B.E and B.Tech) 3 0 0 3

OBJECTIVES:

- To understand morals and human values.
- To understand engineering ethics.
- To know the social responsibility as engineer
- To familiarize with professional rights.
- To familiarize with global issues.

UNIT I HUMAN VALUES 10

Morals, values and Ethics – Integrity – Work ethic – Service learning – Civic virtue – Respect for others – Living peacefully – Caring – Sharing – Honesty – Courage – Valuing time – Cooperation – Commitment – Empathy – Self confidence – Character – Spirituality – Introduction to Yoga and meditation for professional excellence and stress management.

UNIT II ENGINEERING ETHICS 9

Senses of ‘Engineering Ethics’ – Variety of moral issues – Types of inquiry – Moral dilemmas – Moral Autonomy – Kohlberg’s theory – Gilligan’s theory – Consensus and Controversy – Models of professional roles - Theories about right action – Self-interest – Customs and Religion – Uses of Ethical Theories

UNIT III ENGINEERING AS SOCIAL EXPERIMENTATION 9

Engineering as Experimentation – Engineers as responsible Experimenters – Codes of Ethics – A Balanced Outlook on Law-Case studies

UNIT IV SAFETY, RESPONSIBILITIES AND RIGHTS 9

Safety and Risk – Assessment of Safety and Risk – Risk Benefit Analysis and Reducing Risk - Respect for Authority – Collective Bargaining – Confidentiality – Conflicts of Interest – Occupational Crime – Professional Rights – Employee Rights – Intellectual Property Rights (IPR) – Discrimination

UNIT V GLOBAL ISSUES 8

Multinational Corporations – Environmental Ethics – Computer Ethics – Weapons Development – Engineers as Managers – Consulting Engineers – Engineers as Expert Witnesses and Advisors – Moral Leadership – Code of Conduct – Corporate Social Responsibility

TOTAL= 45 PERIODS

OUTCOMES:

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

- Comprehend morals and human values.
- Explain engineering ethics.
- Describe social responsibility as engineer
- Discuss professional rights.
- Comprehend global issues.

TEXTBOOKS:

1. Mike W. Martin and Roland Schinzinger, “Ethics in Engineering”, Tata McGraw Hill, New Delhi, 2003.
2. Govindarajan M, Natarajan S, Senthil Kumar V. S, “Engineering Ethics”, Prentice Hall of India, New Delhi, 2004.

REFERENCES:

1. Charles B. Fleddermann, “Engineering Ethics”, Pearson Prentice Hall, New Jersey, 2004.
2. Charles E. Harris, Michael S. Pritchard and Michael J. Rabins, “Engineering Ethics – Concepts and Cases”, Cengage Learning, 2009
3. John R Boatright, “Ethics and the Conduct of Business”, Pearson Education, New Delhi, 2003
4. Edmund G Seebauer and Robert L Barry, “Fundametals of Ethics for Scientists and Engineers”, Oxford University Press, Oxford, 2001
5. Laura P. Hartman and Joe Desjardins, “Business Ethics: Decision Making for Personal Integrity and Social Responsibility” Mc Graw Hill education, India Pvt.Ltd.,New Delhi 2013.
6. World Community Service Centre, " Value Education", Vethathiri publications, Erode, 2011

EC17E81 CMOS ANALOG IC DESIGN LT P C

3 0 0 3

PREREQUISITE: Knowledge on Digital Electronics, Electronic circuits and Linear Integrated circuits

OBJECTIVES:

- Know the architectures of building blocks that perform sampling & holding operation.
- To study design of data conversion circuits and does performance evaluation.
- To study various precision techniques.
- To study various ADC and DAC circuit architectures.
- To design & Implementation of modulators.

UNIT I SAMPLE AND HOLD 9

Properties of MOS Switches, multiplexed input architectures, recycling architecture, open and closed loop sampling architectures, switched capacitor – Integrator & dynamic circuits, current mode architectures.

UNIT II BUILDING BLOCK OF DATA CONVERSION CIRCUITS 9

Amplifiers, open loop and closed loop amplifiers, Noise & distortion, gain boosting, feedback topologies, common mode feedback, bipolar, CMOS and BiCMOS comparators.

UNIT III PRECISION TECHNIQUES 9

Comparator cancellation, input and output offset storage principles, comparators using offset cancelled latches, OP-AMP offset cancellation, ADC and DAC calibration techniques.

UNIT IV ADC/DAC ARCHITECTURES 9

DAC Performance metrics, reference multiplication and division, switching and logical functions of DACs, Current steering architectures, DAC Performance metrics, Flash ADC architecture, Gray encoding, thermometer encoding and meta stability, Mixed Signal Layout issues.

UNIT V OVER SAMPLING CONVERTERS 9

Delta sigma modulators, alternative modulator architectures, quantization and noise shaping, decimation filtering, implementation of Delta sigma modulators, delta sigma DACs.

TOTAL = 45 PERIODS

OUTCOMES:

Upon completion of the course, students will be able to:

- Build sample & hold circuits
- Build Data Conversion circuits.
- Discuss calibration techniques
- Analyze ADC/DAC Architecture and its Performance
- Design & Implement modulator circuits

TEXT BOOK:

1.B.Razavi “Data Conversion System Design” IEEE Press and John Wiley, 1995.

REFERENCE:

1.Phillip Allen and Douglas Holmberg “CMOS Analog Circuit Design” Second Edition, Oxford University Press, 2004.

CS17504 CRYPTOGRAPHY AND NETWORK SECURITY L T P C

3 0 0 3

OBJECTIVES

The student should be made to:

- Learn basics of encryption and Number Theory.
- Understand methods of public key encryption.
- Learn authentication and hash functions.
- Know the Techniques of system level securities.
- Have knowledge on current trends on wireless security.

UNIT I INTRODUCTION & NUMBER THEORY 9

Services, Mechanisms and attacks-the OSI security architecture-Network security model-Classical Encryption techniques (Symmetric cipher model, substitution techniques, transposition techniques, steganography)-Finite Fields and Number Theory: Modular arithmetic- Euclid's algorithm-Finite fields- Polynomial Arithmetic – Prime numbers-Fermat's and Euler's theorem- Testing for primality -The Chinese Remainder theorem- Discrete logarithms.

UNIT II BLOCK CIPHERS & PUBLIC KEY CRYPTOGRAPHY 9

Data Encryption Standard-Block cipher principles-block cipher modes of operation-AdvancedEncryption Standard (AES)-Triple DES. Public key cryptography: Principles of public key cryptosystems-The RSA algorithm-Key management-Attacks on RSA - Diffie Hellman Key exchange- Elliptic curve arithmetic-Elliptic curve cryptography - Side channel analysis- side channel attacks.

UNIT III HASH FUNCTIONS AND DIGITAL SIGNATURES 9

Authentication requirement – MAC – Hash function – MD5 - SHA - HMAC –-Digital signature and authentication protocols – DSS– Blockchain - Case Study: Bitcoin – Ethereum – Zcash.

UNIT IV SECURITY PRACTICE & SYSTEM SECURITY 8

Kerberos – X.509 - Firewall types and design - SET - Intrusion detection system – Malicious software - Antivirus: introduction - signatures - current trends in antivirus protection

UNIT V E-MAIL, IP, WEB & WIRELESS LAN SECURITY 10

E-mail Security: Pretty Good Privacy-S/MIME. IPSecurity: Overview of IPSec - IP and IPv6-Authentication Header-Encapsulation Security Payload (ESP)-Internet Key Exchange (Phases of IKE, ISAKMP/IKE Encoding). Web Security: SSL/TLS Basic Protocol-computing the keys- client authentication- Wireless LAN Security: Wi-Fi Protected Access (WPA).

TOTAL= 45 PERIODS

OUTCOMES:

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

- The methods of conventional encryption and Number Theory.
- The concepts of Public Key Encryption.
- Methodology for Authentication and Hashing.
- Comprehending System Level Securities.
- Perceiving Wireless Security.

TEXT BOOKS:

1. William Stallings , Cryptography and Network Security-Principles and Practices, Seventh Edition, Pearson Education, 2017
2. Christo Paar and Jan Pelzl ,Understanding Cryptography: A Textbook for Students and Practioners, First Edition, Springer, 2010

REFERENCES:

1. Yehuda Lindell and Jonathan Katz, Introduction to Modern Cryptography, Second Edition, CRC Press, 2015
2. Bruce Schneier , Applied Cryptography: Protocols, Algorithms and Source Code in C, Special Edition, Wiley, 2015
3. AtulKahaet, Cryptography and Network Security, Third Edition, Tata McGraw-Hill, 2013
4. Imran Bashir, Mastering Blockchain: Deeper insights into decentralization, cryptography, bitcoin and popular Blockchain frameworks, First Edition, Packt, 2017.
5. JoxeanKoret and Elias Bachaalany, The Antivirus Hackers Handbook, First Edition, Wiley, 2015

EC17E82 MULTIMEDIA COMPRESSION AND COMMUNICATION LT P C
3 0 0 3

PREREQUISITE: Knowledge on Communication Networks

OBJECTIVES:

- To introduce the relevance of this course to the existing technology through demonstrations, case studies, simulations, contributions of scientist, national/international policies with a futuristic vision along with socio-economic impact and issues
- To introduce probability related study of the characteristics of text, voice, image and video data
- To introduce various compression schemes for text, voice, image and video
- To analyze the compression schemes
- To introduce communication protocols for voice over internet and multimedia networking.

UNIT I MULTIMEDIA COMPONENTS 9

Introduction - Multimedia skills - Multimedia components and their characteristics - Text, sound, images, graphics, animation, video, hardware.

UNIT II AUDIO AND VIDEO COMPRESSION 9

Audio compression–DPCM-Adaptive DPCM –adaptive predictive coding-linear Predictive coding-code excited LPC-perpetual coding Video compression –principles-H.261-H.263-MPEG 1, 2, and 4.

UNIT III TEXT AND IMAGE COMPRESSION 9

Compression principles-source encoders and destination encoders-lossless and lossy compression-entropy encoding –source encoding -text compression –static Huffman coding dynamic coding – arithmetic coding – Lempel ziv-welch Compression-image compression.

UNIT IV VOIP TECHNOLOGY 9

Basics of IP transport, VoIP challenges, H.323/ SIP –Network Architecture, Protocols, Call establishment and release, VoIP and SS7, Quality of Service- CODEC Methods- VOIP applicability.

UNIT V MULTIMEDIA NETWORKING 9

Multimedia networking -Applications-streamed stored and audio-making - Best Effort service-protocols for real time interactive Applications-distributing multimedia-beyond best effort service-secluding and policing Mechanisms-integrated services-differentiated Services-RSVP.

TOTAL = 45 PERIODS

OUTCOMES:

The students are able to

- Comprehend and appreciate the significance and role of this course in the present contemporary world
- Various components of multimedia have been studied.
- Compressions and decompressions of multimedia components are explored.
- Understand VOIP challenges and its technologies.
- Know the adaptation of compression techniques in various state-of-the-art technologies.

TEXT BOOKS:

1. Fred Halshall "Multimedia communication - Applications, Networks, Protocols and Standards",Pearson Education, 2007.

2.Tay Vaughan, "Multimedia: Making It Work", 7/e, TMH, 2007.

REFERENCES:

1. Kurose and W.Ross "Computer Networking: A Top Down Approach", Pearson Education 2005

2. Marcus Goncalves "Voice over IP Networks", Mc Graw hill 1999.

3.KR. Rao, Z S Bojkovic, D A Milovanovic, "Multimedia Communication Systems: Techniques, Standards and Networks", Pearson Education 2007.

4.R. Steimnetz, K. Nahrstedt, "Multimedia Computing, Communications and Applications", Pearson Education, First ed, 1995.

5.Ranjan Parekh, "Principles of Multimedia", TMH, 2006.

PROFESSIONAL ELECTIVE V

EC17E83 ADHOC AND WIRELESS SENSOR NETWORKS LT P C

3 0 0 3

PREREQUISITE: Knowledge on Communication Networks and Wireless Networks

OBJECTIVES:

- To learn the basics of ad hoc networks.
- To learn the architecture of sensor mote.
- To understand the various MAC and routing protocols used for WSN.
- To learn the concepts of localization and synchronization.
- To learn the basics of network simulator.

UNIT I ADHOC NETWORKS AND ROUTING PROTOCOLS 9

Ad hoc Wireless Networks –Heterogeneity in Mobile Devices –Types of Ad hoc Mobile Communications – Types of Mobile Host Movements – Challenges Facing Ad hoc Mobile Networks –Issues in Designing a Routing Protocol for Ad Hoc Wireless Networks – Classifications of Routing Protocols – Table–Driven Routing Protocols – Destination Sequenced Distance Vector (DSDV) – Wireless Routing Protocol (WRP) – Cluster Switch Gateway Routing (CSGR) – Source–Initiated On–Demand Approaches – Ad hoc On–Demand Distance Vector Routing (AODV) – Dynamic Source Routing (DSR) –Temporally Ordered Routing Algorithm (TORA) – Signal Stability Routing (SSR) –Location–Aided Routing (LAR) – Power–Aware Routing (PAR) – Zone Routing Protocol (ZRP).

UNIT II MULTICAST ROUTING AND SECURITY 9

Issues in Designing a Multicast Routing Protocol – Operation of Multicast Routing Protocols – An Architecture Reference Model for Multicast Routing Protocols –Classifications of Multicast Routing Protocols – Tree–Based Multicast Routing Protocols– Mesh–Based Multicast Routing Protocols – Summary of Tree and Mesh based Protocols – Energy–Efficient Multicasting – Design Goals of a Transport Layer Protocol for Ad hoc Wireless Networks –Classification of Transport Layer Solutions – TCP over Ad hoc

Wireless Networks- Security in Ad Hoc Wireless Networks – Network Security Requirements – Issues and Challenges in Security Provisioning – Network Security Attacks –Secure Routing in Ad hoc Wireless Networks.

\UNIT III QoS 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 –Energy Management in Ad hoc Wireless Networks – Introduction – Need for Energy Management in Ad hoc Wireless Networks – Classification of Energy Management Schemes – Battery Management Schemes – Transmission Power Management Schemes.

UNIT IV ARCHITECTURE AND MAC PROTOCOLS 9

Single node architecture – Hardware components, energy consumption of sensor nodes, Network architecture – Sensor network scenarios, types of sources and sinks, single hop versus multi-hop networks, multiple sinks and sources, design principles, Development of wireless sensor networks. , physical layer and transceiver design consideration in wireless sensor networks, Energy usage profile, choice of modulation, Power Management - MAC protocols – fundamentals of wireless MAC protocols, low duty cycle protocols and wakeup concepts, contention-based protocols, Schedule-based protocols - SMAC, BMAC, Traffic-adaptive medium access protocol (TRAMA).

UNIT V ROUTING PROTOCOLS AND OPERATING SYSTEMS 9

Gossiping and agent-based uni-cast forwarding, Energy-efficient unicast, Broadcast and multicast, geographic routing, mobile nodes, Data-centric routing –Hierarchical Routing – LEACH, PEGASIS, Location Based Routing –Introduction to TinyOS – NesC, Interfaces, modules, configuration, Programming in TinyOS using NesC, Emulator TOSSIM.

TOTAL = 45 PERIODS

OUTCOMES:

Students should be able to:

- Foster the ability to understand the basics of adhoc networks.
- Demonstrate the architectural features of sensor mote.
- Analyze various MAC and routing protocols used for WSN.
- Exhibit the ability to analyze localization and synchronization issues.
- Demonstrate skills in simulating a network.

TEXT BOOK

1. C. Siva Ram Murthy and B. S. Manoj, “Ad Hoc Wireless Networks Architectures and Protocols”, Prentice Hall, PTR, 2004.

REFERENCES:

1.C. K. Toh, “Ad Hoc Mobile Wireless Networks Protocols and Systems”, Prentice Hall, PTR, 2001.

2. Charles E. Perkins, “Ad Hoc Networking”, Addison Wesley, 2000.

3. KazemSohraby, Daniel Minoli and TaiebZnati, “ Wireless Sensor Networks Technology- Protocols and Applications”, John Wiley & Sons, 2007.

4. Feng Zhao, Leonidas Guibas, “Wireless Sensor Networks: an information processing approach”, Else vier publication, 2004.

5. C.S.Raghavendra Krishna, M.Sivalingam and Taribznati, “Wireless Sensor Networks”, Springer publication, 2004.

6. Holger Karl , Andreas willig, “Protocol and Architecture for Wireless Sensor Networks”, John wiley publication, Jan 2006.

7. K.Akkaya and M.Younis, " A Survey of routing protocols in wireless sensor networks", Elsevier Adhoc Network Journal, Vol.3, no.3,pp. 325-349, 2005.
8. Philip Levis, " TinyOS Programming", 2006 – www.tinyos.net.
9. I.F. Akyildiz, W. Su, Sankarasubramaniam, E. Cayirci, "Wireless sensor networks: a survey", computer networks, Elsevier, 2002, 394 - 422.
10. Jamal N. Al-karaki, Ahmed E. Kamal, "Routing Techniques in Wireless sensor networks: A survey", IEEE wireless communication, December 2004, 6 – 28.

EC17E84 ADVANCED WIRELESS COMMUNICATION LT P C
3 0 0 3

PREREQUISITE: Knowledge on Communication theory, Digital communication and Wireless communication

OBJECTIVES:

- To learn the key aspects of MIMO communication
- To teach the importance of improving capacity of wireless channel using MIMO
- To teach the characteristic of wireless channel
- To teach techniques for channel improvements using space-time block and Trellis codes.
- To understand the UWB communication

UNIT I INTRODUCTION TO MIMO 9

MIMO systems–array Gain, diversity gain, data pipes, spatial MUX, MIMO system model .MIMO system capacity–channel known at the TX, channel unknown to the TX–capacity of deterministic channels, random channels and frequency selective channels.

UNIT II RADIOWAVE PROPAGATION 9

Radio wave propagation– macroscopic fading- free space and outdoor, small scale fading-fading measurements – direct pulse measurements, spread spectrum- correlation channel sounding –frequency domain channel sounding, antenna diversity–diversity combining methods.

UNIT III SPACE TIME BLOCK CODES 9

Delay diversity scheme, Alamouti space timecode– maximum likelihood decoding – maximum ratio combining. Transmit diversity-space time block codes forreal signal constellation and complex signal constellation- decoding of STBC.

UNIT IV SPACE TIME TRELLIS CODES 9

Space time coded systems, space time code word design criteria ,design of space time Trellis code on slow fading channels, design of STT Confast fading channels, performance analysis in slow and fast fading channels, effect of imperfect channel estimation and antenna correlation on performance, comparison of STBC &STTC.

UNIT V INTRODUCTION TO UWB 9

History, definition, FCC Mask, UWB features, UWB interference, impulse radio, pulsed multiband, multiband OFDM, features: complexity, power consumption, security and achievable data rate, UWB multiple access modulation.

TOTAL = 45 PERIODS

OUTCOMES:

Upon completion of the course, students will be able to:

- Gain the knowledge about the importance of MIMO in today's communication
- Evaluate the various methods for improving the data rate of Wireless communication system.
- Analyze and implement Space time block codes
- Evaluate the channel performance and capacity of MIMO system
- Interpret UWB technology for future wireless networks.

TEXT BOOKS:

1.Mohinder Jankiraman, "Space time codes and MIMO systems", Artech House, Boston, London. www.artechhouse.com.

2.Homayoun Nikookar and Ramjee Prasad, "Introduction to Ultra Wideband for Wireless Communications"1st Edition,Springer Science&BusinessMediaB.V.2009.

REFERENCES:

1.David Tseand PramodViswanath, "Fundamentals of Wireless Communication",Cambridge University Press, 2005.

2.Sergio Verdu, "Multi-User Detection", Cambridge University Press, 1998.

3.Andre Viterbi, "Principles of Spread Spectrum Techniques", AddisonWesley1995.

4.Volker Kuhn, "Wireless communication over MIMO channels",JohnWileyand SonsLtd.2006.

5.W. Pam Siriwongpairat and K. J. Ray Liu, "Ultra-Wideband Communications Systems:Multiband OFDM approach" John Wiley and IEEE press, Newyork 2008.

6.Paulraj Rohit Nabar, Dhananjay Gore, "Introduction of space time wireless communication Systems", Cambridge University Press, 2003.

EC17E85 NETWORK ROUTING ALGORITHMS L T P C

3 0 0 3

PREREQUISITE: Knowledge on Communication Networks and Wireless Networks

OBJECTIVES:

- To study the principles behind the data transfer mechanisms over the conventional network.
- To understand the data traversal through various cross points (routers) in the network.
- To acquire knowledge about routing algorithms of conventional networks.
- To familiarize with the various types of key routing protocols used in modern computer networks.
- To familiarize with the fundamentals of wavelength routing in optical WDM networks.

UNIT I NETWORK ROUTING 9

An Introduction to Routing algorithms, Functions of Router IP Addressing, Protocol Stack Architecture, Network Topology and Management architectures, PSTN, Communication Technologies, Network Protocol Analyzer.

UNIT II ROUTING ALGORITHMS: SHORTEST PATH AND WIDEST PATH 9

Bellman Ford algorithm and distance vector approach, Dijikstra's algorithm, Comparison of Bellman Ford algorithm and Dijikstra's algorithm, shortest and widest path computation, k-shortest path algorithms, Routing Protocols: Framework and Principles.

UNIT III ROUTING IN IP NETWORKS 9

IP Routing and Distance Vector Protocol Family, Routers, Networks, and Routing information Basics, RIP v1,v2 – IGRP – EIGRP, OSPF and integrated IS-IS, IP Traffic Engineering, BGP, Internet Routing Architectures.

UNIT IV ROUTING IN WIRELESS NETWORKS 9

Internet based mobile ad-hoc networking, Destination sequenced Distance Vector (DSDV), Dynamic source Routing (DSR), Ad-hoc on demand Distance Vector (AODV), Temporarily Ordered Routing algorithm (TORA).

UNIT V ROUTING IN OPTICAL WDM NETWORKS 9

Classification of RWA algorithms, RWA algorithms, Fairness and Admission Control, Distributed Control Protocols, Permanent Routing and Wavelength Requirements, Wavelength Rerouting Benefits and Issues, Light path Migration, Rerouting Schemes, Algorithms- AG, MWPG.

TOTAL= 45 PERIODS

OUTCOMES:

- Ability to understand the data transfer mechanisms over the conventional network.
- Foster ability to select the optimal routing algorithm for any given network based on path distance.
- Acquired knowledge about routing in IP networks.
- Ability to manifest the skills in applying suitable routing technique for wireless networks.
- Demonstrate the ability to understand the features of routing in WDM networks.

REFERENCES:

1. D.Medhi and K.Ramasamy, Network Routing: Algorithms, Protocols and Architectures, Morgan Kaufmann Publishers, First Edition 2007.
2. Steen Strub M, Routing in Communication networks, Prentice Hall International, 1995.
3. C.Siva Ram Murthy and B.S.Manoj, Adhoc Wireless Networks, Pearson Education, 2007.
4. Internetworking Technologies Handbook, Inc. Cisco Systems, ILSG Cisco.
5. William Stallings, _ High speed networks and Internets Performance and Quality of Service', IInd Edition, Pearson Education Asia. Reprint India 2002.
6. M. Steen Strub, _ Routing in Communication network, Prentice –Hall International, Newyork, 1995.
7. S. Keshav, _An engineering approach to computer networking'Addison Wesley 1999.
8. William Stallings, _High speed Networks TCP/IP and ATM Design Principles, Prentice- Hall, New York, 1995.
9. C.E Perkins, _Ad Hoc Networking', Addison – Wesley, 2001.

10. C.Siva Rama Murthy and Mohan Gurusamy, — WDM Optical Networks – Concepts, Design and Algorithms‖, Prentice Hall of India Pvt. Ltd, New Delhi –2002.

EC 17E86 SATELLITE COMMUNICATION L T P C
3 0 0 3

PREREQUISITE: Knowledge on Communication Theory, Digital Communication and Wireless Communication

OBJECTIVES:

- To understand the basics of satellite orbits.
- To analyze the satellite segment and design of uplink and downlink
- To describe the earth segment.
- To discuss various methods of satellite access.
- To understand and explain the applications of satellites**.**

UNIT I SATELLITE ORBITS 9

Kepler's Laws, Newton's law, orbital parameters, orbital elements, apogee and perigee heights, orbital perturbations, station keeping, geo stationary and non-Geo-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 power budget, E/N calculation- performance impairments-system noise, inter modulation and interference, Propagation Characteristics and Frequency considerations-System reliability and design lifetime.

UNIT III EARTH SEGMENT 9

Introduction – Receive – Only home TV systems – Outdoor unit – Indoor unit for analog (FM) TV – Master antenna TV system – Community antenna TV system – Transmit – Receive earth stations – Problems – Equivalent isotropic radiated power – Transmission losses – Free-space transmission – Feeder losses – Antenna misalignment losses – Fixed atmospheric and ionospheric losses – Link power budget equation – System noise – Antenna noise – Amplifier noise temperature – Amplifiers in cascade – Noise factor – Noise temperature of absorptive networks – Overall system noise temperature – Carrier to- Noise ratio – Uplink – Saturation flux density – Input back off – The earth station - HPA – Downlink – Output back off – Satellite TWTA output – Effects of rain – Uplink rain– Fade margin – Downlink rain – Fade margin – Combined uplink and downlink C/N ratio – Inter modulation noise.

UNIT IV SATELLITE ACCESS 9

Modulation and Multiplexing: Voice, Data, Video, Analog – digital transmission system, Digital video Broadcast, multiple access: FDMA, TDMA, CDMA, Assignment Methods, Spread Spectrum communication, compression – encryption.

UNIT V SATELLITE APPLICATIONS 9

INTELSAT Series, INSAT, VSAT, Mobile satellite services: GSM, GPS, INMARSAT, LEO, MEO, Satellite Navigational System. Direct Broadcast satellites (DBS)- Direct to home Broadcast (DTH), Digital audio broadcast (DAB)- World space services, Business TV(BTV), GRAMSAT, Specialized services – E –mail, Video conferencing, Internet.

TOTAL=45 PERIODS

OUTCOMES:

Upon Completion of the course, the students will be able to:

- Describe the satellite orbits and launching procedures
- Analyze the satellite uplink and downlink performance to calculate E/N ratio and construct the link budget table.
- Demonstrate the earth segment and space segment components to measure G/T, C/N, EIRP, antenna gain.
- Discuss the various multiple user techniques like FDMA, TDMA, CDMA and SDMA
- Analyze the satellite services such as GPS, GSM, DTH, DBS, BTV, and GRAMSAT.

TEXT BOOK:

1. Dennis Roddy, "Satellite Communication", 4th Edition, Mc Graw Hill International, 2006.

REFERENCES:

1. Wilbur L.Pritchard, Hendri G. Suyderhoud, Robert A. Nelson, "Satellite Communication Systems Engineering", Prentice Hall/Pearson, 2007.
2. N.Agarwal, "Design of Geosynchronous Space Craft", Prentice Hall, 1986.
3. Bruce R. Elbert, "The Satellite Communication Applications", Hand Book, Artech House Bostan London, 1997.
4. Tri T. Ha, "Digital Satellite Communication", II nd edition, 1990.
5. Emanuel Fthenakis, "Manual of Satellite Communications", Mc Graw Hill Book Co., 1984.
6. Robert G. Winch, "Telecommunication Trans Mission Systems", Mc Graw-Hill Book Co., 1983.
7. Brian Ackroyd, "World Satellite Communication and earth station Design", BSP professional Books, 1990.
8. G.B.Bleazard, "Introducing Satellite communications", NCC Publication, 1985.
9. M.Richharia, "Satellite Communication Systems-Design Principles", Macmillan 2003.

EC 17E87 ELECTROMAGNETIC INTERFERENCE AND COMPATIBILTY L T P C 3 0 0 3

OBJECTIVES:

The students are able to:

- To introduce the basic concepts of Electromagnetic Interference
- To teach the importance of Electromagnetic Compatible designs
- To explain the existing standards for Electromagnetic Compatibility

UNIT I BASIC THEORY 9

Introduction to EMI and EMC, Intra and inter system EMI, Elements of Interference, Sources and Victims of EMI, Conducted and Radiated EMI emission and susceptibility, Case Histories, Radiation hazards to humans, Various issues of EMC, EMC Testing categories, EMC Engineering Application.

UNIT II COUPLING MECHANISM 9

Electromagnetic field sources and Coupling paths, Coupling via the supply network, Common mode coupling, Differential mode coupling, Impedance coupling, Inductive and Capacitive coupling, Radiative coupling, Ground loop coupling, Cable related emissions and coupling, Transient sources, Automotive transients.

UNIT III EMI MITIGATION TECHNIQUES 9

Working principle of Shielding and Murphy"s Law, LF Magnetic shielding, Apertures and shielding effectiveness, Choice of Materials for H, E, and free space fields, Gasketting and sealing, PCB Level shielding, Principle of Grounding, Isolated grounds, Grounding strategies for Large systems, Grounding for mixed signal systems, Filter types and operation, Surge protection devices, Transient protection.

UNIT IV STANDARDS AND REGULATION 9

Need for Standards, Generic/General Standards for Residential and Industrial environment, Basic Standards, Product Standards, National and International EMI Standardizing Organizations; IEC, ANSI, FCC, AS/NZS, CISPR, BSI, CENELEC, ACEC. Electro Magnetic Emission and susceptibility standards and specifications, MIL461E Standards.

UNIT V EMI TEST METHODS AND INSTRUMENTATION 9

Fundamental considerations, EMI Shielding effectiveness tests, Open field test, TEM cell for immunity test, Shielded chamber , Shielded anechoic chamber, EMI test receivers, Spectrum analyzer, EMI test wave simulators, EMI coupling networks, Line impedance stabilization networks, Feed through capacitors, Antennas, Current probes, MIL -STD test methods, Civilian STD test methods.

TOTAL=45 PERIODS

OUTCOMES:

Upon the completion of the course**,** the students are able to

- Identify the various types and mechanisms of Electromagnetic Interference
- Outline the coupling mechanism
- Propose a suitable EMI mitigation technique
- Describe the various EMC standards.
- Analyse various EMI test methods and instrumentation.

TEXTBOOKS

1. Prasad Kodali.V – Engineering Electromagnetic Compatibility – S.Chand&Co – NewDelhi – 2000.
2. Clayton R.Paul – Introduction to Electromagnetic compatibility – John Wiley & Sons–1992.

REFERENCES

1. Keiser – Principles of Electromagnetic Compatibility – Artech House – 3rd Edition –1994.
2. Donwhite Consultant Incorporate – Handbook of EMI / EMC – Vol I – 1985.