B. TECH. (ECE) – SCHEME – 2020-2024

B. TECH.			Semester			I
S. No	Course Code	Course Name	Periods			Credit
			L	T	P	
1	BSC-101	Physics	3	1	0	4
2	BSC-103	Mathematics-I	3	1	0	4
3	ESC-101	Basic Electrical Engineering	3	1	0	4
4	ESC-103	Introduction To Computer Systems & Internet Basics	3	0	0	3
5	ESC-153	Engineering Graphics & Design Lab	0	0	6	3
6	HSS-101	English	2	0	0	2
7	BSC-151	Physics Lab	0	0	2	1
8	ESC-151	Basic Electrical Engineering Lab	0	0	2	1
9	HSS-151	English Lab	0	0	2	1
10	MC-101	Environmental Science	2	0	0	0
11	PDP-101	Introduction and Nurturing Hobbies	0	0	2	1
		TOTAL	**16**	**3**	**14**	**24**

B. TECH.			Semester			II
S. No	Course Code	Course Name	Periods			Credit
			L	T	P	
1	BSC 102	Chemistry	3	1	0	4
2	BSC-104	Mathematics-II	3	1	0	4
3	ESC-102	Programming for problem solving	3	0	0	3
4	HSS-102	Effective Technical Communication	3	0	0	3
5	ESC-154	Workshop/Manufacturing Practice	0	0	4	2
6	BSC 152	Chemistry Lab	0	0	2	1
7	ESC-152	Programming for problem solving Lab	0	0	2	2
8	PDP-102	People Connect	0	0	2	1
9	MC-102	Constitution of India	2	0	0	0
		TOTAL	**14**	**2**	**10**	**20**

B. TECH.			Semester			III
S. No	Course Code	Course Name	Periods			Credit
			L	T	P	
1	EC-201C	Electronics Devices	3	1	0	4
2	EC-203C	Digital Electronics	3	0	0	3
3	CS-201C	Data Structure & Algorithms	3	1	0	4
4	BS-201	Mathematics - III	3	1	0	4
5	HSS-201	Engineering Economics & Management	3	0	0	3
6	EC-251C	Electronics Devices Lab	0	0	2	1
7	EC-253C	Digital Electronics Lab	0	0	2	1
8	CS-251C	Data Structure Algorithms Lab	0	0	2	1
		TOTAL	**15**	**3**	**10**	**21**

B. TECH.			Semester			IV
S. No	Course Code	Course Name	Periods			Credit
			L	T	P	
1	EC-202C	Analog & Digital Communication	3	0	0	3
2	EC-204C	Analog Electronics Circuits	3	1	0	4
3	EC-206C	Signals and Systems	3	1	0	4
4	EC-208C	Digital System Design	3	0	0	3
5	CS-204C	Computer Architecture and Organization	3	0	0	3
6	CS-206C	Data Base Management System	3	0	0	3
7	EC-252C	Analog & Digital Communication Lab	0	0	2	1
8	EC-254C	Analog Electronics Circuits Lab	0	0	2	1
9	CS-256C	Data Base Management System Lab	0	0	2	1
10	EC-258C	Digital System Design Lab	0	0	2	1
		TOTAL	**18**	**2**	**8**	**24**

B. TECH.			Semester			V
S. No	Course Code	Course Name	Periods			Credit
			L	T	P	
1	EC-301	Microprocessors & Microcontroller	3	0	0	3
2	EC-303	Network Theory	3	1	0	4
3	EC-305	Digital Signal Processing	3	1	0	4
4	EC-307	Electromagnetic Waves	3	1	0	4
5	EC-309C	CMOS Design	3	0	0	3
6	CS-301C	Computer Network	3	0	0	3
7	EC-351	Microprocessors & Microcontroller Lab	0	0	2	1
8	EC-353	Network Theory Lab	0	0	2	1
9	EC-355	Digital Signal Processing Lab	0	0	2	1
10	EC-359C	CMOS Design Lab	0	0	2	1
		TOTAL	**18**	**3**	**8**	**25**

B. TECH.			Semester			VI
S. No	Course Code	Course Name	Periods			Credit
			L	T	P	
1	EC-302	Control System	3	0	0	3
2	EC-304	Probability Theory and Stochastic Process	3	1	0	4
3	EC-306	Broadband Network	3	0	0	3
4	EC-308	Internet of Things (IOT)	3	0	0	3
5	EC-310 A/B/C/D	Program Elective Course - II	3	1	0	4
6	EC-312 A/ B/C	Program Elective Course - III	3	0	0	3
7	EC-352	Control System Lab	0	0	2	1
8	EC-358	Internet of Things (IOT)Lab	0	0	2	1
9	EC-362A/B/C	Program Elective Course - III Lab	0	0	2	1
10	EC-364C	Project Work - I	0	0	4	2
		TOTAL	**18**	**2**	**10**	**25**

B. TECH.			Semester			VII
S. No	Course Code	Course Name	Periods			Credit
			L	T	P	
1	EC-401C	Smart Grid Technology	3	0	0	3
2	EC-403C	Electronics System Design	3	0	0	3
3	EC-417C	Energy Harvesting Technologies & Power Management for IOT devices	3	1	0	4
4	EC-423C	IOT Using RFID and microcontroller	3	1	0	4
5	EC-425C	Satellite communication	3	0	0	3
6	OEC	**Open Elective**	3	0	2	3
7	EC-453C	Electronics System Design Lab	0	0	2	1
8	EC-473C	IOT Using RFID and microcontroller Lab	0	0	2	1
9	EC-475C	Satellite communication Lab	0	0	2	1
10	EC-491C	Major Project	0	0	8	2
		TOTAL	**18**	**2**	**16**	**25**

B. TECH.			Semester			VIII
S. No	Course Code	Course Name	Periods			Credit
			L	T	P	
1	PEC-IV	**Programme Elective**	3	0	0	3
2	EC-483C	Major Research Project	0	0	32	16
3	EC-484C	Seminar	0	0	2	1
		TOTAL	**3**	**0**	**34**	**20**

PROGRAMME Elective						
S. No	Course Code	Course Name	Periods			Credit
			L	T	P	
PEC-II	EC-312A	Real time System	3	1	0	4
	EC-312B	High Performance Computer Network	3	1	0	4
	EC-312C	Wireless & Cellular System	3	1	0	4
	EC-312D	Fiber Optical Communication	3	1	0	4
PEC-III	EC-322A	Embedded System Design	3	0	0	3
	EC-322B	Data Communication	3	0	0	3
	EC-322C	VLSI Design	3	0	0	3
PEC-III Lab	EC-372A	Embedded System Design Lab	0	0	2	1
	EC-372B	Data Communication Lab	0	0	2	1
	EC-372C	VLSI Design Lab	0	0	2	1
PEC-IV	EC-402D	Network Security	3	0	0	3
	EC-404D	Telecommunication Switching Method	3	0	0	3
	EC-406D	Big Data Analysis	3	0	0	3
	EC-408D	INDUSTRY 4.0 and INDUSTRIAL INTERNET OF THINGS	3	0	0	3
	EC-410D	Deep Learning	3	0	0	3
	EC-412D	Wireless Sensor Network	3	0	0	3

OPEN Elective						
S. No	Course Code	Course Name	Periods			Credit
			L	T	P	
OEC	BA-271A	Human Resource Management	3	0	0	3
	BBA-214	Ethics and Corporate Social responsibility	3	0	0	3
	MEOE-401B	Robotics	3	0	0	3
	CE-423B	Hydropower engineering	3	0	0	3
	EC-485C	5G Technology				
	CS-303C	Artificial Intelligence	3	0	0	3
	CS-305C	Python Programming	3	0	0	3

DETAILED SYLLABUS

Ist Year

SEMESTER – I

BSC-101	PHYSICS	L-T-P	Credits
		3-1-0	4

Objective: The core objective is to provide a coherent foundation of physics for all majors that are usually necessary to work in areas such as computer science, electronic industry, mechanical domains and communication technologies. The contents are based on the static and dynamic state of elementary physics resulting in the field theory and wave mechanics the matter.

Course Outcomes:

CO1: The students will learn scientific understanding of different phenomena associated with light, relativity, statistical physics, atomic physics, and lasers.
CO2: learn about generation of electromagnetic field.
CO3: Student will the application of laser technology
CO4: Learn the application of wave optics.
CO5: Learn the concepts of quantum mechanics

1. **ELECTROSTATICS AND MAGNETOSTATICS (12 lectures)**
   Calculation of electric field and electrostatic potential for a charge distribution; Divergence and curl of electrostatic field; Laplace's and Poisson's equations for electrostatic potential, Boundary conditions of electric field and electrostatic potential; method of images; energy of a charge distribution and its expression in terms of electric field.
   Bio-Savart law, Divergence and curl of static magnetic field; vector potential and calculating it for a given magnetic field using Stokes' theorem; the equation for the vector potential and its solution for given current densities.

2. **MECHANICS** (**8 lectures**)
   Transformation of scalars and vectors under Rotation transformation; Forces in Nature; Newton's laws and its completeness in describing particle motion; Form invariance of Newton's Second Law; Solving Newton's equations of motion in polar coordinates; Problems including constraints and friction; Extension to cylindrical and spherical Coordinates

3. **QUANTUM MECHANICS (8 lectures)**
   Introduction to Quantum mechanics, Wave nature of Particles, Time-dependent and time independent Schrodinger equation for wave function, Born interpretation, probability current, Expectation values, Free-particle wave function and wave-packets, Uncertainty principle.

4. **WAVE OPTICS (10 lectures)**
   Huygens' principle, superposition of waves and interference of light by wave front splitting and amplitude splitting; Young's double slit experiment, Newton's rings, Michelson interferometer, Mach-Zehnder interferometer.
   Fraunhauffer diffraction from a single slit and a circular aperture, the Rayleigh criterion for limit of resolution and its application to vision; Diffraction gratings and their resolving power.
5. **LASERS (8 lectures)**
   Einstein's theory of matter radiation interaction and A and B coefficients; amplification of light by population inversion, different types of lasers: gas lasers (He-Ne, CO2), solid-state lasers (ruby, Neodymium), dye lasers; Properties of laser beams: mono-chromaticity, coherence, directionality and brightness, laser speckles, applications of lasers in science, engineering and medicine.

SUGGESTED TEXT/REFERENCE BOOKS

(i) David Griffiths, Introduction to Electrodynamics.
(ii) W. H. Hayt and J. A. Buck. Engineering Electromagnetics.
(iii) Engineering Mechanics, 2nd ed. — MK Harbola.
(iv) Introduction to Mechanics — MK Verma
(v) Eisberg and Resnick, Introduction to Quantum Physics
(vi) D. J. Griffiths, Quantum mechanics.
(vii) A. Ghatak, Optics
(viii) O. Svelto, Principles of Lasers

POs Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	**3**	**2**	2	2	1	-	-	-	-	-	2	2	1	1
CO2	**2**	**3**	1	1	1	-	-	-	-	-	1	2	1	-
CO3	**3**	**2**	3	1	-	-	-	-	-	-	2	2	-	-
CO4	**1**	**2**	1	2	-	-	-	-	-	-	2	1	2	1
CO5	**2**	**3**	3	3	-	-	-	-	-	-	1	2	-	-

BSC-103	MATHEMATICS-I	L-T-P	Credits
		3-1-0	4

Objective- The objective of this course is to familiarize the prospective engineers with techniques in calculus, multivariate analysis and linear algebra. It aims to equip the students with standard concepts and tools at an intermediate to advanced level that will serve them well towards tackling more advanced level of mathematics and applications that they would find useful in their disciplines.

Course Outcome:

CO1. Learn to apply differential and integral calculus to notions of curvature and to improper integrals. Apart from some other applications they will have a basic understanding of Beta and Gamma functions.
CO2. Learn the fallouts of Rolle's Theorem that is fundamental to application of analysis to Engineering problems.
CO3. Learn the tool of power series and Fourier series for learning advanced Engineering Mathematics.
CO4. Learn to deal with functions of several variables that are essential in most branches of engineering. The essential tool of matrices and linear algebra in a comprehensive manner.
CO5. Understand the multivariable differential Calculus.

UNIT 1

Matrices: Inverse and rank of a matrix, rank-nullity theorem; System of linear equations; Symmetric, Skew-symmetric and orthogonal matrices; Determinants; Eigenvalues and eigenvectors; Diagonalization of matrices; Cayley-Hamilton Theorem, and Orthogonal transformation.

UNIT 2

Sequences and series: Convergence of sequence and series, tests for convergence; Power series, Taylor's series, series for exponential, trigonometric and logarithm functions; Fourier series: Half range sine and cosine series, Parseval's theorem.

UNIT 3

Calculus: Evolutes and involutes; Evaluation of definite and improper integrals; Beta and Gamma functions and their properties; Applications of definite integrals to evaluate surface areas and volumes of revolutions.

UNIT 4

Calculus: Rolle's Theorem, Mean value theorems, Taylor's and Maclaurin theorems with remainders; indeterminate forms and L'Hospital's rule; Maxima and minima.

UNIT 5

Multivariable Calculus (Differentiation): Limit, continuity and partial derivatives, directional derivatives, total derivative; Tangent plane and normal line; Maxima, minima and saddle points; Method of Lagrange multipliers; Gradient, curl and divergence.

TEXT BOOK/REFERENCE BOOKS:

1. G.B. Thomas and R.L. Finney, Calculus and Analytic geometry, 9th Edition, Pearson, Reprint, 2002.
2. Erwin kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006.
3. Veerarajan T., Engineering Mathematics for first year, Tata McGraw-Hill, New Delhi, 2008.
4. Ramana B.V., Higher Engineering Mathematics, Tata McGraw Hill New Delhi, 11th Reprint, 2010.
5. D. Poole, Linear Algebra: A Modern Introduction, 2nd Edition, Brooks/Cole, 2005.
6. N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications, Reprint, 2008.
7. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 36th Edition, 2010.

POs Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	**3**	**2**	2	2	1	-	-	-	-	-	2	2	1	1
CO2	**2**	**3**	1	1	1	-	-	-	-	-	1	2	1	-
CO3	**3**	**2**	3	1	-	-	-	-	-	-	2	2	-	-
CO4	**1**	**2**	1	2	-	-	-	-	-	-	2	1	2	1
CO5	**2**	**3**	3	3	-	-	-	-	-	-	1	2	-	-

ESC-101	BASIC ELECTRICAL ENGINEERING	L T P	Cr
		3-1-0	4

OBJECTIVE: To understand and analyze basic electric and magnetic circuits
To study the working principles of electrical machines and power converters.
To introduce the components of low voltage electrical installations.

COURSE OUTCOMES:
CO1: Students are able to understand and analyze basic electric and magnetic circuits
CO2: Students are able to understand the working principles of electrical machines and power converters
CO3: Learn the application of Power convertors.

Unit 1: DC Circuits
Electrical circuit elements (R, L and C), voltage and current sources, Kirchoff current and voltage laws, analysis of simple circuits with dc excitation. Superposition, Thevenin, Norton and maximum power transfer Theorems.

Unit 2: AC Circuits
Representation of sinusoidal waveforms, peak and rms values, phasor representation, real power, reactive power, apparent power, power factor. Analysis of single-phase ac circuits consisting of R, L, C, RL, RC, RLC combinations (series and parallel), resonance. Three phase balanced circuits, voltage and current relations in star and delta connections.

Unit 3: Transformers
Construction, working principle of transformer, ideal and practical transformer, equivalent circuit, losses in transformers, regulation and efficiency. Auto-transformer and its comparison with ordinary transformer.

Unit 4: Electrical Machines
Generation of rotating magnetic fields, Construction and working of a three-phase induction motor, Significance of torque-slip characteristic, starting and speed control of induction motor. Single-phase induction motor. Construction, working, torque-speed characteristic and speed control of dc motor. Construction and working of synchronous generators.

Unit 5: Power Converters & Electrical Installations
DC-DC converters and AC-DC converters, Switches, Fuses, MCBs, Earthing and its types, Important Characteristics for Batteries and battery backup. Elementary calculations for energy consumption, power factor improvement.

Suggested Text / Reference Books

(i) D. P. Kothari and I. J. Nagrath, “Basic Electrical Engineering”, Tata McGraw Hill, 2010.
(ii) D. C. Kulshreshtha, “Basic Electrical Engineering”, McGraw Hill, 2009.

(iii)L. S. Bobrow, “Fundamentals of Electrical Engineering”, Oxford University Press, 2011.
(iv) E. Hughes, “Electrical and Electronics Technology”, Pearson, 2010.
(v) V. D. Toro, “Electrical Engineering Fundamentals”, Prentice Hall India, 1989.

POs Cos	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO 1	PSO 2
CO1	**3**	**2**	2	2	1	-	-	-	-	-	2	2	1	1
CO2	**2**	**3**	1	1	1	-	-	-	-	-	1	2	1	-
CO3	**3**	**2**	3	1	-	-	-	-	-	-	2	2	-	-
CO4	**1**	**2**	1	2	-	-	-	-	-	-	2	1	2	1
CO5	**2**	**3**	3	3	-	-	-	-	-	-	1	2	-	-

ESC-103	INTRODUCTION TO COMPUTER SYSTEMS & INTERNET BASICS	L-T-P	Credits
		3-0-0	3

OBJECTIVE: To give basic knowledge of Computer Hardware, Software systems & internets

COURSE OUTCOMES:

On successful completion of this course students will be able to:

- Identify different application areas of computers.
- Distinguish hardware and software components of the computer system.
- Use Ms-windows operating system. Make use of the basic Microsoft office applications for office use.
- Identify information resources and services available on the Internet.
- Make use of search and retrieval services on subjects of their interest.

1. **COMPUTER SYSTEMS:** Overview of Computer Systems, Evolution of Computer Systems, Generations of computers, Characteristics of Computer: speed, storage, Accuracy, Categories of computer: Micro Computers, Mini Computers, Main Frames, Super Computers, Computer Organization: Central processing unit, Arithmetic and Logic Unit, Control Unit, Memory System: Primary memory, secondary memory and Data Representation in a Computer System. Number system : decimal, Binary, Octal, Hexadecimal representation and conversion

2. **PROGRAMMING LANGUAGES & OPERATING SYSTEM BASICS:** Software Basics: Application software, System Software, Utility Software, Programming languages: Low level languages, Machine language, Assembly language, Limitations of Low level languages, High Level languages, Translator, Assembler, Interpreter, Compiler, Operating System: Need of Operating System, Function of Operating System, Types of Operating System

3. **NETWORK SYSTEMS, INTERNET & WEB:** Introduction to networking, Local and Wide Area Networks, communication media: wired and wireless, Network Topologies: Star, Ring, Bus, Networking devices: Switch, Hub, Bridge, Internet overview, Internet Architecture, The idea of hypertext and hyper media; how the browser works: MIME types, plug-ins and helper applications; XML, XHTML, XSLT and the W3C, Hosting and Domains:

4. **HYPERTEXT MARKUP LANGUAGE:** The anatomy of an HTML document; marking up for structure and style: ordered and unordered lists, Structuring content with HTML using natural divisions, Marquee, Anchor Tag, Email Link; embedding images and controlling appearance, table creation: Frames and Nesting, iframes, forms, Semantic elements of HTML5, HTML5 Form elements, Media tags in HTML5, HTML5 Data Storage

5. **COMPUTER SECURITY:** Security Threats: Intruders, Password Cracking, Different types of malicious Software: Virus, Worms, Trojan Horse, Prevention from malicious Software: Antivirus (Introduction)

TEXT BOOKS:

1. Computer Fundamentals: P. K. Sinha, BPB pub.
2. Fundamentals of Computer Science and Programming with C: A. K. Sharma, Dhanpat Rai Pub.
3. Uttam K. Roy, "Web Technology", Oxford Publication

REFERENCE BOOKS:

1. Computing Fundamentals & C Programming: E. Balaguruswamy, TMH.
2. Fundamentals of Computers: V Rajaraman, PHI

POs Cos	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO 1	PSO 2
CO1	**3**	**2**	2	2	1	-	-	-	-	-	2	2	1	1
CO2	**2**	**3**	1	1	1	-	-	-	-	-	1	2	1	-
CO3	**3**	**2**	3	1	-	-	-	-	-	-	2	2	-	-
CO4	**1**	**2**	1	2	-	-	-	-	-	-	2	1	2	1
CO5	**2**	**3**	3	3	-	-	-	-	-	-	1	2	-	-

ESC-153	ENGINEERING GRAPHICS & DESIGN	L-T-P	Credits
		0-0-6	3

Objective: All phases of manufacturing or construction require the conversion of new ideas and design concepts into the basic line language of graphics. Therefore, there are many areas (civil, mechanical, electrical, architectural and industrial) in which the skills of the CAD technicians play major roles in the design and development of new products The conversion of new ideas and design concepts into the basic line language of graphics. This course is designed to address a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability

Course Outcomes:

CO1: To read, understand and apply the knowledge of orthographic projections (production related features and instructions) in manufacturing industry, process industry and other allied engineering application.
CO2: To communicate with the globally recognized engineers and the engineers of different discipline of engineering for research and development activities.
CO3: To apply the concept of intersections of solids for various engineering applications.
CO4: Exposure to engineering graphics standards.
CO5: To understand and apply the concept of surface development for fabricating and manufacturing industrial devices.

Unit 1: Introduction to Engineering Drawing
Principles of Engineering Graphics and their significance, usage of drawing instruments, Lettering, Conic sections including the Rectangular Hyperbola (General method only); Cycloid, Epicycloid, Hypocycloid and Involute; Scales – Plain, Diagonal and Dimensioning

Unit 2: Orthographic Projections
Principles of Orthographic Projections-Conventions - Projections of Points and lines inclined to both planes;

Unit 3: Projections of Solids
Projections of planes inclined Planes - Auxiliary Planes; Projection of Regular Solids covering those inclined to both the planes, Auxiliary Views; Section of such solids and the true shape of the section.

Unit 4: Sections and Sectional Views of Right Angular Solids
Development of surfaces of Right Regular Solids - Prism, Pyramid, Cylinder and Cone; objects from industry and dwellings (foundation to slab only) Principles of Isometric projection – Isometric Scale, Isometric Views, Conventions; Isometric Views of lines, Planes, Simple and compound Solids Conversion of Isometric Views to Orthographic Views and Vice-versa

Unit 5: Overview of Computer Graphics,
Introduction to Computer Aided Drafting and CAD software [such as: The Menu System, Toolbars (Standard,Object Properties, Draw, Modify and Dimension), Drawing Area (Background, Crosshairs, Coordinate System), Dialog boxes and windows, Shortcut menus (Button Bars), The Command Line (where applicable), The Status Bar, Different methods of zoom as used in CAD, Select and erase objects.; Isometric Views of lines, Planes, Simple and compound Solids];

Suggested Text/Reference Books:

1. Bhatt N.D., Panchal V.M. & Ingle P.R., (2014), Engineering Drawing, Charotar Publishing House
2. Shah, M.B. & Rana B.C. (2008), Engineering Drawing and Computer Graphics, Pearson Education
3. Agrawal B. & Agrawal C. M. (2012), Engineering Graphics, TMH Publication
4. Narayana, K.L. & P Kannaiah (2008), Text book on Engineering Drawing, Scitech
5. Publishers (Corresponding set of) CAD Software Theory and User Manuals

POs Cos	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO 1	PSO 2
CO1	**3**	**2**	2	2	1	-	-	-	-	-	2	2	1	1
CO2	**2**	**3**	1	1	1	-	-	-	-	-	1	2	1	-
CO3	**3**	**2**	3	1	-	-	-	-	-	-	2	2	-	-
CO4	**1**	**2**	1	2	-	-	-	-	-	-	2	1	2	1
CO5	**2**	**3**	3	3	-	-	-	-	-	-	1	2	-	-

HSS-101	ENGLISH	L T P	Cr
		2-0-0	2

Objective- Recognized different styles of communication and how to improve understanding and build rapport with others. Reflected on different methods of communication and decided when each is most suitable. Appreciated the role of body language and voice tone in effective communication. Communicated their message in an effective and engaging way for the recipient.

Course Outcome:

CO1: Students will be able to understand and apply knowledge of human communication and language processes.
CO2: Students will be able to understand and evaluate key theoretical approaches used in the interdisciplinary field of communication.
CO3: students will be able to explain major theoretical frameworks, constructs, and concepts for the study of communication and language, summarize the work of central thinkers associated with particular approaches, and begin to evaluate the strengths and weaknesses of their approaches.
CO4: Students will be able to understand the research methods associated with the study of human communication, and apply at least one of those approaches to the analysis and evaluation of human communication.
CO5: Students will be able to communicate effectively orally and in writing.

UNIT 1
Vocabulary Building: The concept of Word Formation, Root words from foreign languages and their use in English, Acquaintance with prefixes and suffixes from foreign languages in English to form derivatives, Synonyms, antonyms and standard abbreviations.

UNIT 2
Basic Writing Skills: Sentence Structures, Use of phrases and clauses in sentences
Importance of proper punctuation, creating coherence, organizing principles of paragraphs in documents, Techniques for writing precisely, Jane Austen: *Pride and Prejudice (novel)*

UNIT 3
Identifying Common Errors in Writing: Subject-verb agreement Noun-pronoun agreement Misplaced modifiers, Articles, Prepositions, Redundancies Clichés

UNIT 4
Nature and Style of sensible Writing: Describing, Defining, Classifying, Providing examples or evidence, Writing introduction and conclusion

UNIT 5
Writing Practices: Comprehension Précis Writing, Essay Writing, Charles Dickens: *Oliver Twist* (novel)**.**
Oral Communication: (This unit involves interactive practice sessions in Language Lab) Listening Comprehension Pronunciation, Intonation, Stress and Rhythm, Common Everyday Situations: Conversations and Dialogues communication at Workplace, Interviews
Formal Presentations

Suggested Readings:

1. Practical English Usage. Michael Swan. OUP. 1995.
2. Remedial English Grammar. F.T. Wood. Macmillan.2007
3. On Writing Well. William Zinsser. Harper Resource Book. 2001
4. Study Writing. Liz Hamp-Lyons and Ben Heasly. Cambridge University Press. 2006.
5. Communication Skills. Sanjay Kumar and PushpLata. Oxford University Press. 2011.
6. Exercises in Spoken English. Parts. I-III. CIEFL, Hyderabad. Oxford University Press

POs Cos	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS 13	PSO 14
CO1	**3**	**2**	2	2	1	-	-	-	-	-	2	2	1	1
CO2	**2**	**3**	1	1	1	-	-	-	-	-	1	2	1	-
CO3	**3**	**2**	3	1	-	-	-	-	-	-	2	2	-	-
CO4	**1**	**2**	1	2	-	-	-	-	-	-	2	1	2	1
CO5	**2**	**3**	3	3	-	-	-	-	-	-	1	2	-	-

BSC-151	PHYSICS LAB	L-T-P	Credits
		0-0-2	1

Course Objective The present course is aimed to offer a broad aspect of those areas of Physics, which are specifically required as an essential background to all engineering students for their studies in higher semesters.

Course Outcomes:

CO1: The students will have sufficient scientific understanding of different phenomena associated with light, relativity, statistical physics, atomic physics, and lasers.
CO2:Learn about resoving power of Microscope.
CO3:Learn about applications of optical fiber.
CO4:Learn about LCR circuit applications.

LIST OF EXPERIMENTS:

1) To study response curve of a series LCR circuit.
2) To determine the Planck's constant using LEDs.
3) To determine the Rydberg's constant of Hydrogen atom.
4) To find the refractive index and Cauchy's constants of a prism.
5) To find the wavelength of light by Newton's rings experiment.
6) To determine the thickness of a thin wire by interference.
7) To determine the wavelength of LASER using diffraction grating.
8) To determine the resolving power of a telescope.
9) To find the numerical aperture of an optical fiber cable.
10) To find the wavelength of light using Michelson's interferometer.

POs Cos	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO 1	PSO 2
CO1	**3**	**2**	2	2	1	-	-	-	-	-	2	2	1	1
CO2	**2**	**3**	1	1	1	-	-	-	-	-	1	2	1	-
CO3	**3**	**2**	3	1	-	-	-	-	-	-	2	2	-	-
CO4	**1**	**2**	1	2	-	-	-	-	-	-	2	1	2	1
CO5	**2**	**3**	3	3	-	-	-	-	-	-	1	2	-	-

ESC-151	BASIC ELECTRICAL ENGINEERING LAB	L T P	Cr
		0-0-2	1

Objective:
The objective of this course is to build basic concepts of electrical circuits. To understand network theorems and to build fundamental concepts in the design and implementation of different electrical circuit. To build basic concepts for the understanding of different electrical components and devices.

COURSE OUTCOMES:
CO1. The Students will be able to learn Basic concepts of electrical circuits
CO2. The Students will be able to learn Implementation of network theorems.
CO3. Learn Characteristics of different electrical components
CO4. Learn Application of circuit theory in electronics circuit

List of experiments / demonstrations:

1. Basic safety precautions. Introduction and use of measuring instruments – voltmeter, ammeter, multi – meter, oscilloscope. Resistors, capacitors and inductors.
2. Demonstration of cut – out sections of machines :
3. Torque speed characteristic of dc motor.
4. Parallel operation of single phase Transformer.
5. Open circuit & short circuit test on single phase transformer.
6. To verify the Thevenin's & Norton's theorem.
7. To verify the Superposition theorem.
8. To study frequency response of series & parallel RLC Circuit.
9. Load test on D.C. Shunt generator
10. Torque – speed characteristics of three phase Induction motor & direction reversal by change of phase sequence of connection.
11. To plot field current Vs Armature voltage characteristics of synchronous generator.

POs Cos	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO 1	PSO 2
CO1	**3**	**2**	2	2	1	-	-	-	-	-	2	2	1	1
CO2	**2**	**3**	1	1	1	-	-	-	-	-	1	2	1	-
CO3	**3**	**2**	3	1	-	-	-	-	-	-	2	2	-	-
CO4	**1**	**2**	1	2	-	-	-	-	-	-	2	1	2	1
CO5	**2**	**3**	3	3	-	-	-	-	-	-	1	2	-	-

HSS-151	ENGLISH LAB	L T P	Cr
		0-0-2	1

OBJECTIVE: To expose the students to a variety of self-instructional learnerfriendly modes of language learning. To enable them to learn better pronunciation through stress on word accent, Intonation and rhythm and to increase vocabulary

COURSE OUTCOMES:

CO1. Students learn to use the basic concepts of communication in an organised set up and social context

CO2. Learn resume /CV preparation, report writing, format making etc. and to improve writing skills.

CO3. **Learn** body language a presenter

CO4. Learn to create network at meetings, college, or social activities**.**

CO5. Learn levels of concentration and improves the conversational abilities of the reader.

LIST OF PRACTICALS:

1. Self-Introduction
2. Reading Skills
3. Speaking Skills
4. Comprehension
5. Pronunciation, Intonation, Stress and Rhythm
6. Common Everyday Situations: Conversations and Dialogues communication at Workplace
7. Interviews
8. Formal Presentations
9. Personality Development
10. Telephonic Conversation

ORAL COMMUNICATION

(This unit involves interactive practice sessions in Language Lab)

- Listening Comprehension
- Pronunciation, Intonation, Stress and Rhythm
- Common Everyday Situations: Conversations and Dialogues communication at Workplace
- Interviews
- Formal Presentations

POs Cos	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO 1	PSO 2
CO1	**3**	**2**	2	2	1	-	-	-	-	-	2	2	1	1
CO2	**2**	**3**	1	1	1	-	-	-	-	-	1	2	1	-
CO3	**3**	**2**	3	1	-	-	-	-	-	-	2	2	-	-
CO4	**1**	**2**	1	2	-	-	-	-	-	-	2	1	2	1
CO5	**2**	**3**	3	3	-	-	-	-	-	-	1	2	-	-

MC-101	ENVIRONMENTAL SCIENCE	L T P	Cr
		2 -0 -0	0

Objective- Creating the awareness about environmental problems among people. Imparting basic knowledge about the environment and its allied problems. Developing an attitude of concern for the environment. Motivating public to participate in environment protection and environment improvement.

Course Outcomes:

CO1. Enable to analyze the national and global environmental issues relating to atmosphere, water, soil and land use, biodiversity, and natural resources (global warming, climate change, mineral extraction and energy resources, environmental impact assessment and environmental audit)

CO2. Enable to understand environmental politics in contemporary India, and issues in global environmentalism

CO3. Investigate the agenda of environmental agencies

CO4. Demonstrates the relationship between types of contaminants and effect on human health.

CO5. Learn skills to analyze case studies on, industrial pollution and global warming.

UNIT 1

THE MULTIDISCIPLINARY NATURE OF ENVIRONMENTAL STUDIES: Basic definitions related to environment; Scope, vis-à-vis environmental science and environmental engineering; a uses of environmental degradation, atmospheric composition and associated spheres, habitat and climate; objective, goals and principals involved in environmental education, environmental awareness, Environmental ethics, environmental organization and their involvement.

UNIT 2

NATURAL RESOURCES: Renewable and non-renewable resources; forest resources, over-exploitation, and deforestation / afforestation; water resources, impact of over-utilization of surface and ground water, floods, drought, conflicts over water, dams; mineral resources: dereliction of mines, environmental effects of extracting and using mineral resources; Food resources, modern agriculture and its impact, problem associated with fertilizer and pesticide, water logging, salinity ; energy resources, renewable, non-renewable energy sources, solar energy, wind energy, hydro energy, biomass energy, geothermal energy, nuclear energy and its associated hazards; land as a resource, land degradation, man induced landslides, soil erosion and desertification.

UNIT 3

ECOSYSTEMS: Concept of an ecosystem, structure and function of an ecosystem, producers, consumers and decomposers, energy flow in the ecosystem, ecological succession, food chains, food webs and ecological pyramids; characteristic features, structure and function of the following ecosystem -forest ecosystem, grassland ecosystem desert ecosystem and aquatic ecosystems.

UNIT 4

BIODIVERSITY AND ITS CONSERVATION: Bio-geographical classification of India; biodiversity at global, national and local levels, India as a mega-diversity nation, hot-spots of biodiversity; value of biodiversity-consumptive use, productive use, social, ethical aesthetic and option values; threats to biodiversity; conservation of biodiversity: in-situ and ex-situ conservation of biodiversity.

UNIT 5

ENVIRONMENTAL POLLUTION: Causes, effects and control measures of air pollution, water pollution, soil pollution, marine pollution, noise pollution, thermal pollution; solid waste management, e-waste management; disaster management –floods, earthquake, cyclone and landslides.

UNIT 6

SOCIAL ISSUES AND THE ENVIRONMENT: Water conservation, rain water harvesting, watershed management; climate change, global warming, acid rain, ozone layer depletion; Environmental Protection Act, Air (Prevention and Control of Pollution) Act, Water (Prevention and Control of Pollution) Act, Wildlife Protection Act, Forest Conservation Act.

UNIT 7

HUMAN POPULATION AND THE ENVIRONMENT: Population growth, population explosion –family welfare programmes; role of information technology in environment and human health; case studies, Chipko movement, Sardar Sarovar dam, mining and quarrying in Udaipur, salinity and water logging in Punjab, Haryana and Rajasthan, Bhopal gas tragedy, Chernobyl nuclear disaster, arsenic pollution in ground water.

TEXT BOOK

1. Kaushik, Anubha, and Kaushik, C.P., "Perspectives in Environmental Studies", 4th Edition, New Age International Publishers, 2004

REFERENCE BOOKS

1. Agarwal, K.C., "Environmental Biology", 2nd Edition, Nidhi Publ. Ltd., Bikaner, 2001.
2. Bharucha Erach, "The Biodiversity of India", 2nd Edition, Mapin Publishing Pvt. Ltd., 2006.
3. Brunner R. C., "Hazardous Waste Incineration", 1st Edition McGraw Hill Inc., 1989.
4. Clark R.S., "Marine Pollution", 1st Edition Clanderson Press Oxford,1989
5. .Cunningham, W.P., Cooper, T.H. Gorhani, E. & Hepworth, M.T., Environmental Encyclopedia", 2nd Edition, Jaico Publ. House, 2001.
6. De, A. K., "Environmental Chemistry", 2nd Edition, Wiley Eastern, 1989
7. Jadhav, H. and Bhosale, V.M ., "Environmental Protection and Laws", 1st Edition, Himalaya Pub. House, Delhi, 1995.
8. Mckinney, M.L. and Schocl. R.M., "Environmental Science Systems & Solutions", 2nd Edition, Web enhanced edition, 1996.
9. Rao M.N. and Datta, A.K.,"Waste Water Treatment", 2nd Edition, Oxford & IBH Publ.Co., 1987.
10. Sharma B.K., "Environmental Chemistry", 2nd Edition, Goel Publ. House, Meerut, 2001
11. Trivedi R.K. and Goel, P.K., "Introduction to Air Pollution", 2nd Edition, Techno-science Publications, 1996

POs Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	**3**	**2**	2	2	1	-	-	-	-	-	2	2	1	1
CO2	**2**	**3**	1	1	1	-	-	-	-	-	1	2	1	-
CO3	**3**	**2**	3	1	-	-	-	-	-	-	2	2	-	-
CO4	**1**	**2**	1	2	-	-	-	-	-	-	2	1	2	1
CO5	**2**	**3**	3	3	-	-	-	-	-	-	1	2	-	-

PDP101	AICTE Induction programme + Hobby Club	L T P	Cr
		0-0-2	1

Objective: To make the Environment clean and green and pollution free .The Green club is a part of academic curriculum scheme of Lingaya's Vidyapeeth and taken up by the students of First Year so that they could get the first-hand knowledge of Environment and its sustainability. This club is born with a vision to make the campus green and Eco-friendly and educate the youth about the importance of sustainable development, outside of the campus also.

Course Outcomes:

CO1: Learn the importance of Nature.
CO2: Learn the importance of Natural resources
CO3: Learn to working culture of NGO's
CO4: Learn the leadership qualities.
CO5: Learn to organize the events.

ACTIVITIES OF THE CLUB

1. Colour coded dustbins for Recyclable and Non-Recyclable.
2. Work on renovating a unusual waste area/dump to provide value to the region.
3. Recycling of waste.
4. Create Blog of "Simply Green".
5. Water conservation day.
6. Reduce water usage.
7. Recycle waste water.
8. Reduce Power Consumption.
9. Cook Using Solar Cooker.
10. Rain Water Harvesting.
11. Tree planting.
12. Practical solution of ozone depletion.
13. Speech by a notable speaker/local environmentalist.
14. Quiz and GD on environmental issues
15. Debate on environmental issue
16. Collaborate with municipality and organic clean day.
17. Green march/marathon.
18. Cycle rally.
19. Zero food wastage awareness drive.
20. Writing articles and publicity them in the local newspapers.
21. Establishing link with local NGO's and works with them to save the degraded environment.
22. Zero waste campus.

POs Cos	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO 1	PSO 2
CO1	**3**	**2**	2	2	1	-	-	-	-	-	2	2	1	1
CO2	**2**	**3**	1	1	1	-	-	-	-	-	1	2	1	-
CO3	**3**	**2**	3	1	-	-	-	-	-	-	2	2	-	-
CO4	**1**	**2**	1	2	-	-	-	-	-	-	2	1	2	1
CO5	**2**	**3**	3	3	-	-	-	-	-	-	1	2	-	-

Ist Year

SEMESTER – II

BSC 102	CHEMISTRY	L T P	Cr
		3-1-0	4

Course Objective: To familiarize the students with basic and applied concept in chemistry

Course Outcomes:

CO1: Recall the fundamentals of basic chemistry
CO2: Familiarise the students with analytical techniques used in identification of molecules
CO3: Recognise and explain the trends in periodic properties
CO4: Understand the spatial arrangement of molecules
CO5: Apply the concept of organic reactions in daily life.

Unit-I PHASE RULE
Terminology, Definition of phase rule, Derivation of phase rule equation, One component system (H_2O system and CO_2 system), two components system, Simple eutectic system (Pb – Ag), Pattinson's Process, congruent system (Zn–Mg), incongruent system (Na-K system), Merits and demerits of phase rule.

UNIT-II THERMODYNAMICS
Second law of thermodynamics, entropy change for reversible & irreversible processes, Entropy change for ideal gas, variation of free energy with temperature & pressure, Gibbs-Helmholtz equation, Clapeyron- Clausius equation & it's integrated form Thermodynamic functions: energy, entropy and free energy. Estimations of entropy and free energies. Free energy and emf. Cell potentials, the Nernst equation and applications.

UNIT-III CORROSION AND ITS PREVENTION
Definition, Types of corrosion: Dry, wet corrosion (rusting of iron), galvanic corrosion, differential aeration corrosion, stress corrosion. Factors affecting corrosion, preventive measures (proper design, Cathodic and Anodic protection, sacrificial protection and barrier protection), Soil Corrosion.

UNIT-IV SPECTROSCOPIC TECHNIQUES AND APPLICATIONS
Part-A:Principles of spectroscopy and selection rules. Electronic spectroscopy. Fluorescence and its applications in medicine. Vibrational and rotational spectroscopy of diatomic molecules. Applications. Nuclear magnetic resonance and magnetic resonance imaging, surface characterisation techniques.

UNIT-V INTERMOLECULAR FORCES AND POTENTIAL ENERGY SURFACES
Ionic, dipolar and van Der Waals interactions. Equations of state of real gases and critical phenomena, Potential energy surfaces of H_3, H_2F and HCN and trajectories on these surfaces.

UNIT-VI ORGANIC REACTIONS AND SYNTHESIS OF A DRUG MOLECULE
Introduction to reactions involving substitution, addition, elimination, oxidation, reduction, cyclization and ring openings. Synthesis of a commonly used drug molecule.

UNIT-VII STEREOCHEMISTRY
Representations of 3 dimensional structures, structural isomers and stereoisomers, configurations and symmetry and chirality, enantiomers, diastereomers, optical activity, absolute configurations and conformational analysis. Isomerism in transitional metal
compounds

Suggested Text Books :
(i)University chemistry, by B. H. Mahan
(ii)Chemistry: Principles and Applications, by M. J. Sienko and R. A. Plane
(iii)Fundamentals of Molecular Spectroscopy, by C. N. Banwell
(iv)Engineering Chemistry (NPTEL Web-book), by B. L. Tembe, Kamaluddin and M. S. Krishnan
(v)Physical Chemistry, by P. W. Atkins
(vi)Organic Chemistry: Structure and Function by K. P. C. Volhardt and N. E. Schore, 5th Edition http://bcs.whfreeman.com/vollhardtschore5e/default.asp

POs Cos	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO 1	PSO 2
CO1	**3**	**2**	2	2	1	-	-	-	-	-	2	2	1	1
CO2	**2**	**3**	1	1	1	-	-	-	-	-	1	2	1	-
CO3	**3**	**2**	3	1	-	-	-	-	-	-	2	2	-	-
CO4	**1**	**2**	1	2	-	-	-	-	-	-	2	1	2	1
CO5	**2**	**3**	3	3	-	-	-	-	-	-	1	2	-	-

BSC 104	MATHEMATICS-II	L T P	Cr
		3-1-0	4

Objective: The objective of this course is to familiarize the students with statistical techniques. It aims to equip the students with standard concepts and tools at an intermediate to advanced

Course Outcomes:

CO1: Student will learn the mathematical tools needed in evaluating multiple integrals and their usage.

CO: Develops the ability to solve higher order & first degree linear non homogenous differential equation arising in various branch of engineering and related mathematical model develops arising to form mathematical modeling of Real World Problem with its physical interpretation.

CO3: Students learn about random variables, various discrete, cotinuous probability distributions, and their properties.

CO4: Learn to expand any functions of two variables in the ascending power of variables and also develops error and approximation, extremum value of a given function related to engineering application

CO5: Develop the concepts of Laplace transformation & inverse Laplace Transform with its property to solve partial Differential equation and Ordinary Differential Equation with given boundary conditions which is helpful in all engineering & research work.

Level that will serve them well towards tackling various problems in the discipline.

Unit I: Basic Probability: (12 lectures)

Probability spaces, conditional probability, independence; Discrete random variables, Independent random variables, the multinomial distribution, Poisson approximation to the binomial distribution, infinite sequences of Bernoulli trials, sums of independent random variables; Expectation of Discrete Random Variables, Moments, Variance of a sum, Correlation coefficient, Chebyshev's Inequality.

Unit II: Continuous Probability Distributions: (6 lectures)

Continuous random variables and their properties, distribution functions and densities, normal, exponential and gamma densities.

Unit III: Complex Variable – Differentiation: (14 lectures)

Differentiation, Cauchy-Riemann equations, analytic functions, harmonic functions, finding harmonic conjugate; elementary analytic functions (exponential, trigonometric, logarithm) Contour integrals, Cauchy-Goursat theorem (without proof), Cauchy Integral formula (without proof).

Unit IV: First order ordinary differential equations: (8 lectures)

Exact, linear and Bernoulli's equations, Euler's equations, Equations not of first degree: equations solvable for p, equations solvable for y, equations solvable for x and Clairaut's type.

Unit V: Ordinary differential equations of higher orders: (10 lectures)
Second order linear differential equations with variable coefficients, method of variation of parameters, Cauchy-Euler equation; Power series solutions; Legendre polynomials, Bessel functions of the first kind and their properties.

Suggested Text/Reference Books
(i) Erwin Kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006.
(ii) P. G. Hoel, S. C. Port and C. J. Stone, Introduction to Probability Theory, Universal Book Stall, 2003 (Reprint).
(iii)S. Ross, A First Course in Probability, 6th Ed., Pearson Education India, 2002.
(iv) W. Feller, An Introduction to Probability Theory and its Applications, Vol. 1, 3rd Ed., Wiley, 1968.
(v) N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications, Reprint, 2010.
(vi) B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 35th Edition, 2000.
(vii)E. A. Coddington, An Introduction to Ordinary Differential Equations, Prentice Hall India, 1995.
(viii) E. L. Ince, Ordinary Differential Equations, Dover Publications, 1958.

POs Cos	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO 1	PSO 2
CO1	**3**	**2**	2	2	1	-	-	-	-	-	2	2	1	1
CO2	**2**	**3**	1	1	1	-	-	-	-	-	1	2	1	-
CO3	**3**	**2**	3	1	-	-	-	-	-	-	2	2	-	-
CO4	**1**	**2**	1	2	-	-	-	-	-	-	2	1	2	1
CO5	**2**	**3**	3	3	-	-	-	-	-	-	1	2	-	-

ESC-102		L T P	Cr
	PROGRAMMING FOR PROBLEM SOLVING	3-0-0	3

Course Objective: To explore computing and to introduce the art of computer programming. This course teaches the programming,

Course Outcomes:

CO1:Learn C programming
CO2:Able to develop specific application based programe
CO3:Able to set up relation between hardware and software applications
CO4: Knowledge of structured programming in program design
CO5:Learn Program testing skills

Unit-1:BASICS OF PROGRAMMING AND OVERVIEW OF C PROGRAMMING: Programming Fundamental, Problem definition, Idea of Algorithm, steps to solve logical and numerical problems, Representation of Algorithms: Flow charts/ Pseudocode with example, Types of programming languages, Translators, From algorithms to programs; source code, variables and memory location, Introduction to C, Structure of C program, C character set, Identifier and Keywords, Data types, constants, variables, Declaration, Arithmetic expressions & precedence , statements, Symbolic constants, type conversion, Types of operators, Input and output functions in C, header files, common programming errors, Control Statements, Sequencing, Selection, Condition and iteration.

Unit-2: ARRAYS AND STRING:
Declaring, Referencing and initializing arrays, array subscript, using for loop for sequential access, multi-dimensional array, String basics string library functions, assignment and substring, concatenation, string comparison.

Unit-3: FUNCTIONS AND POINTERS:
Definition of function, function prototype, Purpose of main function, passing parameters, Scope of function, recursion, Call by value and reference, Types of storage classes, Scope of variable: Global and local, static variables, Recursion.. Pointer variables, initializing pointers, pointer operators, pointer expressions, pointers and arrays, pointer and functions,

Unit-4: STRUCTURES, UNIONS & RECURSION
Defining a structure, Declaring structure variables, Structure initialization, Copying and Comparing Structure variables, Array of structures, Arrays within structure, nested structures, Unions. Recursion as a different way of solving problems. Example programs, such as Finding Factorial, Fibonacci series, Ackerman function etc.

Unit-5: DYNAMIC MEMORY ALLOCATION AND FILE PROCESSING: C's dynamic allocation functions. Streams and file types, opening and closing a data file, input and output operations, text mode versus binary mode, formatted input output operations with files, random access to files.

Reference Books:-

1. Programming in C by Schaum Series, McGraw Hills Publishers, New Delhi.
2. Let Us C by YashwantKanetkar; BPB Publication, New Delhi.
3. Exploring C by YashwantKanetkar; BPB Publications, New Delhi.
4. Application Programming in C by RS Salaria, Khanna Book Publishing Co. (P) Ltd., New Delhi.
5. Programming in C by R Subburaj, Vikas Publishing House Pvt. Ltd., Jangpura, New Delhi.
6. Programming with C Language by C Balaguruswami, Tata McGraw Hill, New Delhi.
7. Programming in C by BP Mahapatra, Khanna Publishers, New Delhi

POs Cos	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO 1	PSO 2
CO1	**3**	**2**	2	2	1	-	-	-	-	-	2	2	1	1
CO2	**2**	**3**	1	1	1	-	-	-	-	-	1	2	1	-
CO3	**3**	**2**	3	1	-	-	-	-	-	-	2	2	-	-
CO4	**1**	**2**	1	2	-	-	-	-	-	-	2	1	2	1
CO5	**2**	**3**	3	3	-	-	-	-	-	-	1	2	-	-

HSS-102		L T P	Cr
	EFFECTIVE TECHNICAL COMMUNICATION	**3-0-0**	**3**

Course Objective: To enable the students to use English language as a tool for their specific professional and individual requirements**.**

Course Outcomes:

CO1: Students will be able to communicate effectively orally and in writing
CO2: Students will develop knowledge, skills, and judgment around human communication that facilitate their ability to work collaboratively with others
CO3: students will be able to explain major theoretical frameworks, constructs, and concepts for the study of communication and language
CO4: Students will be able to understand and apply knowledge of human communication and language processes as they occur across various contexts, e.g., interpersonal, intrapersonal, small group, organizational, media, gender, family, intercultural communication, technologically mediated communication, etc. from multiple perspectives.
CO5: summarize the work of central thinkers associated with particular approaches, and begin to evaluate the strengths and weaknesses of their approaches.

Unit -1 Information and Development- Different kinds of technical documents, Information development life cycle, Organization structures, factors affecting information and document design, Strategies for organization, Information design and writing for print and for online media.

Unit 2: Technical Writing, Grammar and Editing- Technical writing process, forms of Discourse, Writing drafts and revising, Collaborative writing, creating indexes, technical writing style and language. Basics of grammar, study of advanced grammar, editing strategies to achieve appropriate technical style. Introduction to advanced technical communication, Usability, Hunan factors, Managing technical communication projects, time estimation, single sourcing, ocalization.

Unit 3: Self Development and Assessment- Self assessment, Awareness, Perception and Attitudes, Values and belief, Personal goal setting, career planning, Self-esteem. Managing Time; Personal memory, Rapid reading, Taking notes; Complex problem solving; Creativity

Unit 4: Communication and Technical Writing- Public speaking, Group discussion, Oral presentation, Interviews, Graphic presentation, Presentation aids, Personality Development. Writing reports, project proposals, brochures, newsletters, technical articles, manuals, official notes, business letters, memos, progress reports, minutes of meetings, event report.

Unit 5: Ethics- Business ethics, Etiquettes in social and office settings, Email etiquettes, Telephone Etiquettes, Engineering ethics, Managing time, Role and responsibility of engineer, Work culture in jobs, Personal memory, Rapid reading, Taking notes, Complex problem solving, Creativity.

Text/Reference Books:

1.David F. Beer and David McMurrey, Guide to writing as an Engineer, John Willey. New York, 2004
2.Diane Hacker, Pocket Style Manual, Bedford Publication, New York, 2003. (ISBN 0312406843)
3.Shiv Khera, You Can Win, Macmillan Books, New York, 2003.
4.Raman Sharma, Technical Communications, Oxford Publication, London, 2004.
5.Dale Jungk, Applied Writing for Technicians, McGraw Hill, New York, 2004. (ISBN:07828357-4)
6.Sharma, R. and Mohan, K. Business Correspondence and Report Writing, TMH New Delhi 2002.
7.Xebec, Presentation Book, TMH New Delhi, 2000. (ISBN 0402213)

POs Cos	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO 1	PSO 2
CO1	**3**	**2**	2	2	1	-	-	-	-	-	2	2	1	1
CO2	**2**	**3**	1	1	1	-	-	-	-	-	1	2	1	-
CO3	**3**	**2**	3	1	-	-	-	-	-	-	2	2	-	-
CO4	**1**	**2**	1	2	-	-	-	-	-	-	2	1	2	1
CO5	**2**	**3**	3	3	-	-	-	-	-	-	1	2	-	-

ESC-154	WORKSHOP/MANUFACTURING PRACTICE	L T P	Cr
		0-0-4	2

Objective:

- To teach students the practices of workshop management and maintenance.
- To familiarize students with workshop machinery like drills, lathes, welding torches, files, saws, hammers, etc.
- To teach students the need to economize materials when managing a workshop.
- To teach students the safety measures needed in a workshop and how to deal with accidents at work.
- To teach student welding and manufacture of selected items.
- To teach students the practice of plumbing.
- To teach students the basics of electrical installations.

Course Outcomes:

CO1: Enhance relevant technical hand skills required by the technician working in the various engineering industries and workshops.
CO2: Identify the basics of tools and equipment used in fitting, carpentry, sheet metal, machine, welding and smithy
CO3: Learn electrical Installation.
CO4: Learn plumbing and welding
CO5: familiarize with the production of simple models in fitting, carpentry, sheet metal, machine, welding and smithy trades.

(A) FITTING TRADE:

1. Preparation of T-Shape Work piece as per the given specifications.
2. Preparation of U-Shape Work piece which contains: Filing, Sawing, Drilling, Grinding.

(B) MACHINE SHOP: Study of machine tools in particular Lathe machine (different parts, different
Operations, study of cutting tools)

1. To obtain required diameters (steps) on a cylinder work piece with the given lengths.
2. To obtain the required diameters (taper) on a cylinder work piece with the given dimensions.

(C) CARPENTRY: Study of Carpentry Tools, Equipment and different joints

1. To make a dovetail lap joint.
2. To make a cross half lap joint.

(D) FOUNDRY TRADE: Introduction to foundry, Patterns, pattern allowances, ingredients of molding sand and melting furnaces. Foundry tools and their purposes

1. To prepare a sand mold, using the given single piece pattern.
2. To prepare a sand mold, using the given split piece pattern.

(E) WELDING: Introduction, Study of Tools and welding Equipment (Gas and Arc welding)

1. To make a single v-butt joint, using the given mild steel pieces and by arc welding.

2. To make a T-joint using the given mild steel pieces and by arc welding.

(F) ELECTRICAL AND ELECTRONICS: Introduction to House wiring, different types of cables.

Types of power supply, types of motors, Starters, distribution of power supply, types of bulbs, parts of

tube light, Electrical wiring symbols.

1. Two lamps connected in series - measure and check the voltage and current using multimeter.
2. Two lamps connected in parallel - measure and check the voltage and current using multimeter.

(G) CNC MACHINING: To study the working principle of CNC machining.

REFERENCE BOOKS:

1. Mechanical Workshop Practice by K C John, PHI Learning
2. Workshop Technology Vol. 1 and 2 by Raghuvanshi B.S. DhanpatRai& Sons 1998
3. Workshop Technology by Chapman W.A. J and Arnold E. Viva low priced student edition, 1998

POs Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	**3**	**2**	2	2	1	-	-	-	-	-	2	2	1	1
CO2	**2**	**3**	1	1	1	-	-	-	-	-	1	2	1	-
CO3	**3**	**2**	3	1	-	-	-	-	-	-	2	2	-	-
CO4	**1**	**2**	1	2	-	-	-	-	-	-	2	1	2	1
CO5	**2**	**3**	3	3	-	-	-	-	-	-	1	2	-	-

BSC-152	CHEMISTRY LAB	L T P	Cr
		0-0-2	1

Course Objective: To provide an in-depth knowledge of principles of chemical engineering to address the challenges of chemical and industries

Course Outcomes:

CO1:The students will learn to Estimate rate constants of reactions from concentration of reactants/products as a function of time.

CO2: Learn the properties such as surface tension, viscosity, conductance of solutions, redox potentials, chloride content of water, etc.

CO3:Learn to Synthesis small drug molecule and analysis a the sample salt

CO4: Learn the filteration techniques used in water purification

CO5:Learn to analysis slats

LIST OF EXPERIMENTS:

Choice of 10-12 experiments from the following:

1. Determination of surface tension and viscosity
2. Thin layer chromatography
3. Ion exchange column for removal of hardness of water
4. Determination of chloride content of water
5. Colligative properties using freezing point depression
6. Determination of the rate constant of a reaction
7. Determination of cell constant and conductance of solutions
8. Potentiometric - determination of redox potentials and emfs
9. Synthesis of a polymer/drug
10. Saponification/acid value of oil
11. Chemical analysis of a salt
12. Lattice structures and packing of spheres
13. Models of potential energy surfaces
14. Chemical oscillations- Iodine clock reaction
15. Determination of the partition coefficient of a substance between two immiscible liquids
16. Adsorption of acetic acid by charcoal
17. Use of the capillary viscometers to the demonstrate of the isoelectric point as the pH of minimum viscosity for gelatin sols and/or coagulation of the white part of egg.

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CO2	**2**	**3**	1	1	1	-	-	-	-	-	1	2	1	-
CO3	**3**	**2**	3	1	-	-	-	-	-	-	2	2	-	-
CO4	**1**	**2**	1	2	-	-	-	-	-	-	2	1	2	1
CO5	**2**	**3**	3	3	-	-	-	-	-	-	1	2	-	-

ESC-152	PROGRAMMING FOR PROBLEM SOLVING LAB	L T P	Cr
		0-0-4	2

Course Objective: To learn and develop programs

Course Outcomes:

CO1: Design algorithm, flowchart and pseudopodia
CO2: Develop c programs using control structures
CO3: Develop c programs using functions and arrays
CO4: Demonstrate computer system and program development process
CO5: Develop programs for managing memory using pointers and for processing strings

LIST OF EXPERIMENTS

(Students have to do at 3-4 programs from each section)

SEQUENTIAL CONTROL STATEMENTS

1 Write a program to Print HELLO
2 Write a program to add two numbers
3 Write a program to calculate simple interest
4 Write a program to calculate average of three numbers
5 Write a program to swap two numbers
6 Write a program to illustrate mixed data types
7 Write a program to calculate area and circumference of circle
8 Write a program to evaluate a polynomial expression
9 Write a program to add digits of a four digit number
10 Write a program to check whether the person if eligible for voting or not

CONDITIONAL CONTROL STATEMENTS

11 Write a program to find greatest of two numbers
12 Write a program to find out which type of triangle it is
13 Write a program to find out greatest of three numbers
14 Write a program to evaluate performance of the student
15 Write a program to make a basic calculator

LOOP CONTROL STATEMENTS

16 Write a program to print Fibonacci up-to the given limit
17 Write a program to find the sum of digits of a number
18 Write a program to find factorial of a number
19 Write a program to print table of any number
20 Write program for printing different pyramid pattern

ARRAYS AND STRINGS

21 Write a program to enter the elements in a one dimensional array
22 Write a program to find the sum and average of five numbers
23 Write a program to sort the array elements
24 Write a program to enter the marks of 50 students an calculate the average

25 Write a program to add 2 matrix
26 Write a program to multiply 2 matrices
27 Write a program to calculate the length of string
28 Write a program to concatenate 2 strings
29 Write a program to reverse the string
30 Write a program to count the numbers of characters in a string
31 Write a program that converts lower case characters to upper case
32 Write a program without using predefined functions to check whether the string is palindrome or not

FUNCTIONS & POINTERS

33 Write a program using function to find the largest of three numbers
34 Write a program using function to sum the digits of a number
35 Write a program to calculate factorial of a number using recursive function
36 Write a program to print first n Fibonacci using recursive function
37 Write a program to illustrate the concept of chain of pointers
38 Write a program using function to swap two numbers using call by reference
39 Write a program to calculate the area and perimeter of circle using pointers
40 Write a program to copy the contents of one array into another in the reverse order using pointers

STRUCTURES

41 Write a program to read an employee record using structure and print it
42 Write a program to prepare salary chart of employee using array of structures
43 Write a program to print the name and percentage of 20 students (array of structures and arrays within structures).
44 Write a program to demonstrate structure within structure.

FILE HANDLING

45. Write a program to create, open, and close files.
46. Write a program to demonstrate the purpose of different file opening modes.
47. Write a program to count the number of characters, spaces, tabs, new line characters in a file.
48. Write a program to receive strings from keyboard and write them to a file.
49. Write a program to copy a file to another.
50. Write a program to read strings from a file and display them on screen.

POs Cos	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO 1	PSO 2
CO1	**3**	**2**	2	2	1	-	-	-	-	-	2	2	1	1
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CO3	**3**	**2**	3	1	-	-	-	-	-	-	2	2	-	-
CO4	**1**	**2**	1	2	-	-	-	-	-	-	2	1	2	1
CO5	**2**	**3**	3	3	-	-	-	-	-	-	1	2	-	-

MC-102	CONSTITUTION OF INDIA	L T P	Cr
		2-0-0	0

COURSE OBJECTIVE:
• To acquaint the students with legacies of constitutional development in India and help those to understand the most diversified legal document of India and philosophy behind it.
• To make students aware of the theoretical and functional aspects of the Indian Parliamentary System. • To channelize students' thinking towards basic understanding of the legal concepts and its implications for engineers.
• To acquaint students with latest intellectual property rights and innovation environment with related regulatory framework.
• To make students learn about role of engineering in business organizations and e-governance.

CO1: Learners should be able to Identify and explore the basic features and modalities about Indian constitution.
CO2: Differentiate and relate the functioning of Indian parliamentary system at the center and state level.
CO3: Differentiate different aspects of Indian Legal System and its related bodies.
CO4: Discover and apply different laws and regulations related to engineering practices.
CO5: Correlate role of engineers with different organizations and governance models

Unit 1--Introduction and Basic Information about Indian Constitution: Meaning of the constitution law and constitutionalism, Historical Background of the Constituent Assembly, Government of India Act of 1935 and Indian Independence Act of 1947,Enforcement of the Constitution, Indian Constitution and its Salient Features, The Preamble of the Constitution, Fundamental Rights, Fundamental Duties, Directive Principles of State Policy, Parliamentary System, Federal System, Centre-State Relations, Amendment of the Constitutional Powers and Procedure, The historical perspectives of the constitutional amendments in India, Emergency Provisions: National Emergency, President Rule, Financial Emergency, and Local Self Government – Constitutional Scheme in India.

Unit 2-Union Executive and State Executive: Powers of Indian Parliament Functions of Rajya Sabha, Functions of Lok Sabha, Powers and Functions of the President, Comparison of powers of Indian President with the United States, Powers and Functions of the Prime Minister, Judiciary – The Independence of the Supreme Court, Appointment of Judges, Judicial Review, Public Interest Litigation, Judicial Activism, LokPal, Lok Ayukta, The Lokpal and Lok ayuktas Act 2013, State Executives – Powers and Functions of the Governor, Powers and Functions of the Chief Minister, Functions of State Cabinet, Functions of State Legislature, Functions of High Court and Subordinate Courts.

Unit 3- Introduction and Basic Information about Legal System: The Legal System: Sources of Law and the Court Structure: Enacted law -Acts of Parliament are of primary legislation, Common Law or Case law, Principles taken from decisions of judges constitute binding legal rules. The Court System in India and Foreign Courtiers (District Court, District Consumer Forum, Tribunals, High Courts, Supreme Court). Arbitration: As an alternative to resolving disputes in the normal courts, parties who are in dispute can agree that this will instead be referred to arbitration. Contract law, Tort, Law at workplace.

Unit 4- Intellectual Property Laws and Regulation to Information: Intellectual Property Laws: Introduction, Legal Aspects of Patents, Filing of Patent Applications, Rights from Patents, Infringement of Patents, Copyright and its Ownership, Infringement of Copyright, Civil Remedies for Infringement, Regulation to Information Introduction, Right to Information Act, 2005, Information Technology Act, 2000, Electronic Governance, Secure Electronic Records and Digital Signatures, Digital Signature Certificates, Cyber Regulations Appellate Tribunal, Offences, Limitations of the Information Technology Act.

Unit 5 -Business Organizations and E-Governance: Sole Traders, Partnerships: Companies: The Company's Act: Introduction, Formation of a Company, Memorandum of Association, Articles of Association, Prospectus, Shares, Directors, General Meetings and Proceedings, Auditor, Winding up. E-Governance and role of engineers in E-Governance, Need for reformed engineering serving at the Union and State level, Role of I.T. professionals in Judiciary, Problem of Alienation and Secessionism in few states creating hurdles in Industrial development

Text Book:

1. Brij Kishore Sharma: Introduction to the Indian Constitution, 8th Edition, PHI Learning Pvt. Ltd. • Granville Austin: The Indian Constitution: Cornerstone of a Nation (Classic Reissue), Oxford University Press.
2. Subhash C. Kashyap: Our Constitution: An Introduction to India's Constitution and constitutional Law, NBT, 2018.

Reference Books:

3. Madhav Khosla: The Indian Constitution, Oxford University Press.
4. PM Bakshi: The Constitution of India, Latest Edition, Universal Law Publishing.
5. V.K. Ahuja: Law Relating to Intellectual Property Rights (2007)
6. Suresh T. Viswanathan: The Indian Cyber Laws, Bharat Law House, New Delhi-88
7. P. Narayan: Intellectual Property Law, Eastern Law House, New Delhi
8. Prabudh Ganguli: Gearing up for Patents: The Indian Scenario, Orient Longman.
9. BL Wadehra: Patents, Trademarks, Designs and Geological Indications Universal Law Publishing - LexisNexis.

POs Cos	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO 1	PSO 2
CO1	**3**	**2**	2	2	1	-	-	-	-	-	2	2	1	1
CO2	**2**	**3**	1	1	1	-	-	-	-	-	1	2	1	-
CO3	**3**	**2**	3	1	-	-	-	-	-	-	2	2	-	-
CO4	**1**	**2**	1	2	-	-	-	-	-	-	2	1	2	1
CO5	**2**	**3**	3	3	-	-	-	-	-	-	1	2	-	-

2nd Year

SEMESTER – III			
EC-201	**ELECTRONICS DEVICES**	**L T P**	**CR**
		3-1-0	**4**

Course Objects:

- To give exposure to students about Semiconductor Physics.
- To give the exposure about characteristics of semiconductor devices.
- To introduce the working of different semiconductor electronics devices.
- To introduce about the fabrication technologies of semiconductor electronics devices.

CO1: Understand and utilize the mathematical models of semiconductor junctions and MOS transistors for circuits and systems
CO2: Ability to analyse PN junctions in semiconductor devices under various conditions.
CO3: Ability to design and analyse simple rectifiers and voltage regulators using diodes.

CO4: Ability to design and analyse simple BJT and MOSFET circuits.
CO5: Understand various semiconductor, fabrication process

Syllabus

Unit 1: Introduction to Semiconductor Physics: Review of Quantum Mechanics, Electrons in periodic Lattices, E-k diagrams. Energy bands in intrinsic and extrinsic silicon: Carrier transport: diffusion current, drift current, mobility and resistivity, sheet resistance, design of resistors

Unit 2: Generation and recombination of carriers, Poisson and continuity equation P-N junction characteristics, I-V characteristics, and small signal switching models: Avalanche breakdown, Zener diode, Schottky diode

Unit 3: Bipolar Junction Transistor, I-V characteristics, various configurations of BJT such as CE, CB, CC and their features, Ebers-Moll Model, LED, photodiode and solar cell.

Unit 4: MOS capacitor, C-V characteristics, MOSFET, I-V characteristics, configurations of BJT such as CS, CG, CD and their features and small signal models of MOS transistor.

Unit 5: Integrated circuit fabrication process: oxidation, diffusion, ion implantation, photolithography, etching, chemical vapor deposition, sputtering, twin-tub CMOS process.

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

- Understand the principles of semiconductor Physics.
- Understand and utilize the mathematical models of semiconductor junctions and MOS transistors for circuits and systems.
- Understand the design & characteristics of semiconductor device.
- Understand various semiconductor, fabrication process.

Text /Reference Books:

1. G. Streetman, and S. K. Banerjee, “Solid State Electronic Devices,” 7th edition, Pearson,2014.
2. D. Neamen, D. Biswas "Semiconductor Physics and Devices," McGraw-Hill Education.
3. S. M. Sze and K. N. Kwok, “Physics of Semiconductor Devices,” 3rd edition, John Wiley &Sons, 2006.
4. C.T. Sah, “Fundamentals of solid state electronics,” World Scientific Publishing Co. Inc, 1991.
5. Y. Tsividis and M. Colin, “Operation and Modeling of the MOS Transistor,” Oxford Univ.Press, 2011.

POs Cos	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO 1	PSO 2
CO1	**3**	**2**	2	2	1	-	-	-	-	-	2	2	1	1
CO2	**2**	**3**	1	1	1	-	-	-	-	-	1	2	1	-
CO3	**3**	**2**	3	1	-	-	-	-	-	-	2	2	-	-
CO4	**1**	**2**	1	2	-	-	-	-	-	-	2	1	2	1
CO5	**2**	**3**	3	3	-	-	-	-	-	-	1	2	-	-

EC-203	DIGITAL ELECTRONICS	L T P	CR
		3-0-0	3

Objective:
Modern world deals with digital conditioning of various signals. Digitally manipulating signals or using digital circuits have a lot of advantages in terms of accuracy etc. This subject introduces concept of basic digital electronics: gates; combinational and sequential circuits and their designing.

Course Outcomes: After studying this course the students would gain enough knowledge

CO1. Have a thorough understanding of the fundamental concepts and techniques used in digital electronics.
CO2. To understand and examine the structure of various number systems and its application in digital design.
CO3. The ability to understand, analyze and design various combinational and sequential circuits.
CO4. Ability to identify basic requirements for a design application and propose a cost effective solution.
CO5. The ability to identify and prevent various hazards and timing problems in a digital design.

UNIT-1 INTRODUCTION OF GATES, COMBINATIONAL DESIGN BY USING GATES AND SIMPLIFICATION
Digital signal; logic gates: AND; OR; NOT; NAND; NOR; EX-OR; EX-NOR; Boolean algebra. Review of Number systems. Binary codes: BCD; Excess- 3; Gray; EBCDIC; ASCII; Error detection and correction codes; Design using gates; Karnaugh map and Quine Mcluskey methods of simplification.

UNIT-2 COMBINATIONAL DESIGN USING MSI DEVICES:
Multiplexers and Demultiplexers and their use as logic elements; Decoders; Adders/Subtractors; BCD arithmetic circuits; Encoders; Decoders/Drivers fordisplay devices.

UNIT-3 SEQUENTIAL CIRCUITS: Flip Flops : S-R; J-K; T; D; master-slave; edge triggered; shift registers; sequence generators; Counters; Asynchronous and Synchronous Ring counters and Johnson Counter; Design of Synchronous and Asynchronous sequential circuits.

UNIT-4 DIGITAL LOGIC Families: Bipolar logic families:RTL; DTL; DCTL; HTL; TTL; ECL; MOS; and CMOS logic families. Tristate logic; Interfacing of CMOS and TTL families.

UNIT-5 A/D AND D/A CONVERTERS & PLD:

Sample and hold circuit; weighted resistor and R -2 R ladder D/A Converters; specifications for D/A converters. A/D converters : successive approximation; counting type;ROM; PLA; PAL; FPGA and CPLDs.

TEXT BOOK

Jain, R.P., "Modern Digital Electronics", 4th Ed.; Tata McGraw Hill, 2003

REFERENCE BOOKS

1. Taub and Schilling, "Digital Integrated Electronics" Tata McGraw Hill,1997
2. Malvino and Leach; "Digital Principles and Applications", 6th Edition, Tata McGraw Hill, 2006
3. Mano, Morris, "Digital Design", 3rd Edition, Prentice Hall of India,1994
4. Gupta and Singhal, "Digital Electronics", 2nd Edition, Dhanpat Rai and Sons, 2000.
5. Wakerly, John F, "Digital Design Principles and Practices", 4th Edition, Prentice Hall of India,2005

POs Cos	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO 1	PSO 2
CO1	**3**	**2**	2	2	1	-	-	-	-	-	2	2	1	1
CO2	**2**	**3**	1	1	1	-	-	-	-	-	1	2	1	-
CO3	**3**	**2**	3	1	-	-	-	-	-	-	2	2	-	-
CO4	**1**	**2**	1	2	-	-	-	-	-	-	2	1	2	1
CO5	**2**	**3**	3	3	-	-	-	-	-	-	1	2	-	-

CS-201	Data Structure & Algorithms	L T P	CR
		3-1-0	4

Objective: To relay the theoretical and practical fundamental knowledge of most commonly used algorithms.

Course Outcomes:

CO1. Ability to analyze algorithms and algorithm correctness.
CO2. Ability to summarize searching and sorting techniques
CO3. Ability to describe stack, queue and linked list operation.
CO4. Ability to have knowledge of tree and graphs concepts.

UNIT-1 INTRODUCTION TO DATA STRUCTURES AND RUNNING TIME: Definition of data structures and abstract data types; linear vs. non-linear data structure; primitive vs. non-primitive data structure; static and dynamic implementations; arrays, 1,2-dimensional arrays, insertion & deletion in 1-D array; examples and real life applications. Time complexity; Big Oh notation; running times; best case, worst case, average case; factors depends on running time; introduction to recursion.

UNIT-2 STACKS AND QUEUES: Stacks: definition, array based implementation of stacks,; examples: infix, postfix, prefix representation; conversions, applications; definition of queues, circular queue; array based implementation of queues.

UNIT-3 LINKED LISTS: Lists; different type oflinked Lists; implementation of singly linked list, linked list implementation of stacks and queues; implementation of circular linked list; applications.

UNIT-4 TREES AND GRAPHS: Definition of trees and binary trees; properties of binary trees and implementation; binary traversal pre-order, post-order, in-order traversal; binary search trees: searching, insertion & deletion. Definition of undirected and directed graphs; array based implementation of graphs; adjacency matrix; path matrix implementation; linked list representation of graphs; graph traversal: breadth first traversal, depth first traversal; implementations and applications.

UNIT-5 SORTING AND SEARCHING ALGORITHMS: Introduction, selection, insertions, bubble sort, efficiency of above algorithms; merge sort, merging of sorted arrays and algorithms; quick sort algorithm analysis, heap sort,searching algorithms: straight sequential search, binary search (recursive & non–recursive algorithms)

TEXT BOOK

1. A.K. Sharma – Data structure Using C, 2nd edition pearson 2013
2. Langsam, Augentem M.J. and Tenenbaum A. M., —Data Structures using C & C++‖, Prentice Hall of India, 2009.

REFERENCE BOOKS

1. Aho A. V., Hopcroft J. E. and Ullman T. D., —Data Structures and Algorithms‖, Original Edition, Addison-Wesley, Low Priced Edition, 1983.
2. Horowitz Ellis and S ahni S artaj, —Fundamentals of Data Structures‖, Addison-Wesley Pub, 1984.
3. Horowitz, S ahni and Rajasekaran, —Fundamentals of Computer Algorithms‖ 2007.
4. Kruse Robert, —Data Structures and Program Design in C‖, Prentice Hall of India, 1994
5. Lipschetz Jr. Seymour, —Theory & Problems of Data Structures‖, S chaum ‘s Outline, Tata McGraw Hill
6. Weiss Mark Allen, —Data Structures and Algorithms Analysis in C‖, Pearson Education, 2000
7. Corm en T . H . et al., —Introduction to Algorithms‖, 2nd Edition, Prentice Hall of India, 2001.
8. Dasgupta Sanjay, Christos P. and Vazirani Umesh, —Algorithms‖, Tata McGraw Hill, 2008

WEB REFERENCES

http://www.cs.auckland.ac.nz/software/AlgAnim/ds_ToC.html

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CO1	**3**	**2**	2	2	1	-	-	-	-	-	2	2	1	1
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CO4	**1**	**2**	1	2	-	-	-	-	-	-	2	1	2	1
CO5	**2**	**3**	3	3	-	-	-	-	-	-	1	2	-	-

BSC-201	Mathematics – III	L T P	CR
		3-1-0	4

Unit-1 Solution of polynomial and transcendental equations – Bisection method, Newton-Raphson method and Regula-Falsi method. Finite differences, Relation between operators, Interpolation using Newton's forward and backward difference formulae.

Unit-2 Interpolation with unequal intervals: Newton's divided difference and Lagrange's formulae. Numerical Differentiation, Numerical integration: Trapezoidal rule and Simpson's 1/3rd and 3/8 rules.

Unit-3 Ordinary differential equations: Taylor's series, Euler and modified Euler's methods. Runge-Kutta method of fourth order for solving first and second order equations. Milne's and Adam's predicator corrector methods.

Unit-4 Partial differential equations: Finite difference solution two dimensional Laplace equation and Poission equation, Implicit and explicit methods for one dimensional heat equation (Bender-Schmidt and Crank-Nicholson methods), Finite difference explicit method for wave equation.

Textbooks/References:

1. P. Kandasamy, K. Thilagavathy, K. Gunavathi, Numerical Methods, S. Chand & Company, 2nd Edition, Reprint 2012. AICTE Model Curriculum in Mathematics Courses (UG Engineering & Technology) 405 | Page
2. S.S. Sastry, Introductory methods of numerical analysis, PHI, 4th Edition, 2005.
3. Erwin kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006.
4. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 35th Edition, 2010.

POs Cos	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO 1	PSO 2
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CO5	**2**	**3**	3	3	-	-	-	-	-	-	1	2	-	-

HSS-201	Engineering Economics & Management	L T P	CR
		3 0 0	3

OBJECTIVE The purpose of this course is to

- Acquaint the students in the basic economic concepts and their operational significance
- Stimulate him to think systematically and objectively about contemporary economic problems.

Course Outcomes:

CO1. Explain the transaction approach and cash balance approach of quantity theory of money

CO2. Describe the process of credit creation of a commercial bank, describe the balance sheet of a commercial bank, explain the functions of commercial bank

CO3. Explain the various functions of central bank

CO4. Describe the various phases of business cycle, explain the Hawtrey'stheory of trade cycle

CO5. Explain the main objective of monetary policy in under developed countries

Course Outcome

- The course is intended to provide basic understanding of Economics and Management to engineering students with following aspects:
- To impart knowledge, with respect to concepts, principles and practical applications of Economics, which govern the functioning of a firm/organization under different market conditions?
- To help the students to understand the fundamental concepts and principles of management; the basic roles, skills, functions of management, various organizational structures and basic knowledge of marketing.

Unit- 1: Introduction to Economics:

Definitions, Nature, Scope, Difference between Microeconomics & Macroeconomics Theory of Demand & Supply; meaning, determinants, law of demand, law of supply, equilibrium between demand & supply Elasticity; elasticity of demand, price elasticity, income elasticity, cross elasticity.

Unit-2: Theory of Production

production function, meaning, factors of production (meaning & characteristics of Land, Labour, capital & entrepreneur), Law of variable proportions & law of returns to scale Cost; meaning, short run & long run cost, fixed cost, variable cost, total cost, average cost, marginal cost, opportunity cost. Break even analysis; meaning, explanation, numerical

Unit- 3: Macro-Economic Indicators
Macro-Economic Indicators, Changes in the Gross Domestic Product (GDP), Gross National Product (GNP), Inflation, Employment & Unemployment Indicators, Currency Strength, Interest rates, Corporate Profits, Balance of Trade, Agricultural Production, Current Account balance, Foreign exchange, Foreign Trade, Industrial Production Index, Wholesale Price Index (WPI), Retail Price Index (RPI), Consumer Price Index (CPI),

Unit-4: Introduction to Management
Definitions, Nature, scope Management & administration, skill, types and roles of managers Management Principles; Scientific principles, Administrative principles, Maslow's Hierarchy of needs theory.

Functions to Management : Planning, Organizing, Staffing, Directing, Controlling (meaning, nature and importance) Organizational Structures; meaning, principles of organization, types- formal and informal, line, line & staff, matrix, hybrid (explanation with merits and demerits), span of control, departmentalization.

Unit-5: Introduction to Marketing & Production Management
Marketing Mix, concepts of marketing, demand forecasting and methods, market segmentation Introduction to Finance Management; meaning, scope, sources, functions

Production Management: Definitions, objectives, functions, plant layout-types & factors affecting it, plant location- factors affecting it. Introduction to Human Resource Management; definitions, objectives of manpower planning, process, sources of recruitment, process of selection

Text/Reference Books:

1. Engineering Economics, R.Paneerselvam, PHI publication.
2. Fundamentals of Management: Essential Concepts and Applications, Pearson Education, Robbins S.P. and Decenzo David A.
3. Economics: Principles of Economics, N Gregory Mankiw, Cengage Learning.
4. Principles and Practices of Management by L.M.Prasad.
5. Principles of Management by Tripathy and Reddy.
6. Modern Economic Theory, By Dr. K. K. Dewett & M. H. Navalur, S. Chand Publications.
7. Samuelson, Nordhaus: Economics (2009).
8. N. Gregory Mankiew (2007): Macroeconomics, Sixth edition.
9. Bock Gyula (2001): Makroökonómia feladatok, Tri-Mester.
10. Actual economic articles from the printed media or from the internet.

POs Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	**3**	**2**	2	2	1	-	-	-	-	-	2	2	1	1
CO2	**2**	**3**	1	1	1	-	-	-	-	-	1	2	1	-
CO3	**3**	**2**	3	1	-	-	-	-	-	-	2	2	-	-
CO4	**1**	**2**	1	2	-	-	-	-	-	-	2	1	2	1
CO5	**2**	**3**	3	3	-	-	-	-	-	-	1	2	-	-

EC-251	Electronics Devices Lab	L T P	CR
		0-0-2	1

LIST OF EXPERIMENTS

1. To study V-I characteristics of diode, and its use as a capacitance.
2. To study the V-I characteristics of Zener Diode.
3. To study the V-I characteristics of LED.
4. Study of the characteristics of transistor in Common Base configuration.
5. Study of the characteristics of transistor in Common Emitter configuration.
6. Study of the characteristics of transistor in Common Collector configuration.
7. Study of V-I characteristics of a photo-voltaic cell.
8. Study of characteristics of JFET in CS configuration.
9. Study of characteristics of MOSFET in CS configuration.
10. Study of photo-resist in metal pattern for planar technology.

POs Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	**3**	**2**	2	2	1	-	-	-	-	-	2	2	1	1
CO2	**2**	**3**	1	1	1	-	-	-	-	-	1	2	1	-
CO3	**3**	**2**	3	1	-	-	-	-	-	-	2	2	-	-
CO4	**1**	**2**	1	2	-	-	-	-	-	-	2	1	2	1
CO5	**2**	**3**	3	3	-	-	-	-	-	-	1	2	-	-

EC-253	Digital Electronics Lab	L T P	CR
		0-0-2	1

LIST OF EXPERIMENTS

1. Study of TTL gates – AND; OR; NOT; NAND; NOR; EX-OR; EX-NOR.
2. Design and realize a given function using K-maps and verify its performance.
3. To verify the operation of multiplexer and Demultiplexer.
4. To verify the operation of comparator.
5. To verify the truth tables of S-R; J-K; T and D type flip flops.
6. To verify the operation of bi-directional shift register.
7. To design and verify the operation of 3-bit synchronous counter.
8. To design and verify the operation of synchronous UP/DOWN decade counter using J K flip-flops and drive a seven-segment display using the same.
9. To design and verify the operation of asynchronous UP/DOWN decade counter using J K flip-flops and drive a seven-segment display using the same.
10. To design and realize a sequence generator for a given sequence using J-K flip-flops.
11. Study of CMOS NAND and NOR gates and interfacing between TTL and CMOS gates.
12. Design a 4-bit shift-register and verify its operation. Verify the operation of a ring counter and a Johnson counter.

POs Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	**3**	**2**	2	2	1	-	-	-	-	-	2	2	1	1
CO2	**2**	**3**	1	1	1	-	-	-	-	-	1	2	1	-
CO3	**3**	**2**	3	1	-	-	-	-	-	-	2	2	-	-
CO4	**1**	**2**	1	2	-	-	-	-	-	-	2	1	2	1
CO5	**2**	**3**	3	3	-	-	-	-	-	-	1	2	-	-

CS-251	Data Structure Algorithms Lab	L T P	CR
		0 0 2	1

LIST OF EXPERIMENTS

ARRAY OPERATIONS

1. Write a program to insert an element at given position in linear array
2. Write a program to insert an element in sorted array.
3. Write a program to delete an element from given position in linear array
4. Perform following operations on matrices using functions only

a) Addition b) Subtraction c) Multiplication d) Transpose

SEARCHING

5. Search an element in a linear array using linear search.
6. Using iteration and recursion concepts write programs for finding the element in the array using Binary Search Method

RECURSION

7. Write a program to compute factorial of given number using recursion
8. Write as program to solve Tower of Hanoi problem using recursion
9. Write a program to find power of given number using recursion

STACK & QUEUE

10. Write a program for static implementation of stack
11. Write a program for dynamic implementation of queue
12. Write a program for static implementation of circular queue
13. Write a program for dynamic implementation of queue
14. Write a program to evaluate a postfix operation

LINKED LIST

15. Create a linear linked list & perform operations such as insert, delete at end , at beg & reverse the link list
16. Create a circular linked list & perform search, insertion & delete operation
17. Create a doubly linked list & perform search, insertion & delete operation

TREE & GRAPH

18. Write program to implement binary search tree. (Insertion and Deletion in Binary Search Tree)
19. Write program to simulates the various tree traversal algorithms
20. Write program to simulate various graph traversing algorithms.

SORTING ALGORITHMS

21. Write program to implement Bubble, Insertion & selection sort.
22. Write program to implement quick sort
23. Write program to implement merge sort
24. Write a program to implement heap sort

TEXT BOOK

1. A.K. Sharma – Data structure Using C, 2nd edition pearson 2013

2. Langsam, Augentem M.J. and Tenenbaum A. M., ―Data Structures using C & C++‖, Prentice Hall of India, 2009.

REFERENCE BOOKS

1. R. S. Salaria -Data Structure Using C
2. Kruse Robert, ―Data Structures and Program Design in C‖, Prentice Hall of India, 1994
3. Lipschitz Jr. Seymour, ―Theory & Problems of Data Structures‖, Schaum‘s Outline, 2nd Edition, Tata McGraw Hill.

POs Cos	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO 1	PSO 2
CO1	3	2	2	2	1	-	-	-	-	-	2	2	1	1
CO2	2	3	1	1	1	-	-	-	-	-	1	2	1	-
CO3	3	2	3	1	-	-	-	-	-	-	2	2	-	-
CO4	1	2	1	2	-	-	-	-	-	-	2	1	2	1
CO5	2	3	3	3	-	-	-	-	-	-	1	2	-	-

2nd Year

SEMESTER – IV

EC-202C	Analog & Digital Communication	L T P	CR
		3 0 0	3

At the end of this course students will demonstrate the ability to

CO1: Analyze and compare different analog modulation schemes for their efficiency and bandwidth

CO2: Analyze the behaviour of a communication system in presence of noise

CO3: Investigate pulsed modulation system and analyze their system performance

CO4: Analyze different digital modulation schemes and can compute the bit error performance.

CO5: Able to apply concept of random variables in communication.

Unit 1: Review of signals and systems, Frequency domain representation of signals, Principles of Amplitude Modulation Systems- DSB, SSB and VSB modulations. Angle Modulation, Representation of FM and PM signals, Spectral characteristics of angle modulated signals.

Unit 2: Review of probability and random process. Gaussian and white noise characteristics, Noise in amplitude modulation systems, Noise in Frequency modulation systems. Pre-emphasis and De-emphasis, Threshold effect in angle modulation.

Unit 3: Pulse modulation. Sampling process. Pulse Amplitude and Pulse code modulation (PCM),Differential pulse code modulation. Delta modulation, Noise considerations in PCM, Time Division multiplexing, Digital Multiplexers.

Unit 4: Elements of Detection Theory, Optimum detection of signals in noise,Coherent communication with waveforms- Probability of Error evaluations. BasebandPulse Transmission-Inter symbol Interference and Nyquist criterion.Pass band Digital Modulation schemes- Phase Shift Keying, Frequency Shift Keying,Quadrature Amplitude Modulation, Continuous Phase Modulation and Minimum Shift Keying.

Unit 5: Digital Modulation tradeoffs. Optimum demodulation of digital signals over band-limited channelsMaximum likelihood sequence detection (Viterbi receiver). Equalization Techniques. Synchronization and Carrier Recovery for Digital modulation.

Text/Reference Books: 1. Haykin S., "Communications Systems", John Wiley and Sons, 2001.

2. Proakis J. G. and Salehi M., "Communication Systems Engineering", Pearson Education, 2002.

3. Taub H. and Schilling D.L., "Principles of Communication Systems", Tata McGraw Hill, 2001.

4. Wozencraft J. M. and Jacobs I. M., ``Principles of Communication Engineering",John Wiley, 1965. 5. Barry J. R., Lee E. A. and Messerschmitt D. G., ``Digital Communication", Kluwer Academic Publishers, 2004.
6. Proakis J.G., ``Digital Communications", 4th Edition, McGraw Hill, 2000.

POs Cos	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO 1	PSO 2
CO1	**3**	**2**	2	2	1	-	-	-	-	-	2	2	1	1
CO2	**2**	**3**	1	1	1	-	-	-	-	-	1	2	1	-
CO3	**3**	**2**	3	1	-	-	-	-	-	-	2	2	-	-
CO4	**1**	**2**	1	2	-	-	-	-	-	-	2	1	2	1
CO5	**2**	**3**	3	3	-	-	-	-	-	-	1	2	-	-

EC-204C	Analog Electronics Circuits	L T P	CR
		3 1 0	4

OBJECTIVE: To show the students the physical picture of the internal behavior of semiconductor diode and its different type of circuit. Among these are rectifier; clipper; clamper; and filter also gives knowledge of internal behavior of transistor; FET and its application. This subject deals with the study of circuits designed using Transistors/FETs. It also aims to impart knowledge to the students about Operational Amplifiers and their various linear and non linear applications.

COURSE OUTCOMES:

At the end of this course students will demonstrate the ability to
CO1: Understand the characteristics of diodes and transistors
CO2: Design and analyze various rectifier and amplifier circuits
CO3: Design sinusoidal and non-sinusoidal oscillators
CO4: Understand the functioning of OP-AMP and design OP-AMP based circuits
CO5: Design ADC and DAC.

Unit-1. SEMICONDUCTOR DIODE & TRANSISTOR CIRCUITS : Diode as a rectifier; switching characteristics of diode; Half-wave and full wave rectifiers; clipping circuits; clamping circuits; voltage doublers and voltage multiplier circuits. Bipolar junction transistor : V-I characteristics; Ebers-moll model of transistor; hybrid model; h-parameters; emitter follower; Miller's Theorem; frequency response of R-C coupled amplifier; Multi stage CE Amplifier.
TRANSISTOR BIASING: Operating point; bias stability; collector to base bias; self-bias; emitter bias; bias compensation; thermistor and sensistor compensation; thermal runaway.

Unit-2. **FIELD EFFECT TRANSISTORS**: Junction field effect transistor; MOSFET Enhancement and Depletion mode; V-MOSFET; Common source amplifier; source follower; biasing of FET; applications of FET as a voltage variable resistor (V V R).

Unit-3. FEEDBACK AMPLIFIERS: Feedback concept; transfer gain with feedback; general characteristics of negative feedback amplifiers; Feedback Topologies: voltage series feedback; current series feedback; current shunt feedback; voltage shunt feedback and their impact on input and output resistance.

OSCILLATORS: Sinusoidal oscillators; Barkhausen criteria; R-C phase shift oscillator; wien-bridge oscillator; crystal oscillator; General form of Oscillator Circuit; Hartley and Colpitt Oscillator.

Unit-4. POWER AMPLIFIERS: Classification of Amplifiers; Distortions in Amplifiers; Class A large signal amplifiers; higher order harmonic distortion; efficiency; transformer coupled power amplifier; class B amplifier : efficiency and distortion; class A and class B push-pull amplifiers; Introduction to Class C and Class D power amplifiers.

Unit-5. OPERATIONAL AMPLIFIERS: Introduction; Ideal and practical operational amplifiers; inverting and non-inverting and differential configuration; Emitter coupled differential amplifier; Integrator; differentiator; Comparators; Logarithmic/anti-log amplifier; multivibrators; Monolithic Timer – NE555.

FILTERS: Active RC Filters: Idealistic and Realistic response of filters (LP; BP; and HP); Butter worth and Chebyshev filter functions all pass; Notch Filter

TEXT BOOK Millman and Halkias, ‖Integrated Electronics‖, 2nd Edition, Tata McGraw Hill,1998.

MillmanHalkias, ‖Integrated Electronics‖, 6th Edition, Tata McGraw Hill, 2008

REFERENCE BOOKS

1. Neamen, D.A., ―Electronic Circuit Analysis and Design‖, 2nd Edition, Tata McGraw Hill, 2004.

2. Malvino, ―Electronics Principles‖, 6th Edition McGraw Hill, 2003.

3. Schilling, Donald L. and Boylestad, Charles Belove and Nashelsky, ―Electronics Circuits‖, 8th Edition, McGrawHill, 2005.

4 Bell, David A., ―Electronic Devices and Circuits‖, 3rd Edition, Prentice Hall of India, 2007.5 Motorstad, ‖Electronics Devices and Circuits‖, 2nd Edition, Prentice Hall of India, 2004.

5. Sedra and Smith, ‖Microelectronic Circuits‖, 2nd Edition, Oxford, 2004.
6. Gaekwad, ‖Operational Amplifier‖, 8th Edition, Prentice Hall of India, 2009.
7. Neamen, Donald A., ‖Electronic Circuit Analysis and Design‖, 2nd Edition, Tata McGraw Hill, 2002.
8. Franco, Sergio, ‖Design with Operational Amplifiers and Analog Integrated Circuit‖, 3rd Edition, Tata McGraw Hill, 2001

POs Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	**3**	**2**	2	2	1	-	-	-	-	-	2	2	1	1
CO2	**2**	**3**	1	1	1	-	-	-	-	-	1	2	1	-
CO3	**3**	**2**	3	1	-	-	-	-	-	-	2	2	-	-
CO4	**1**	**2**	1	2	-	-	-	-	-	-	2	1	2	1
CO5	**2**	**3**	3	3	-	-	-	-	-	-	1	2	-	-

EC-206C	Signals and Systems	L T P	CR
		3 1 0	4

Objectives:

To introduce students, the concept and theory of signals and systems needed in electronics and telecommunication engineering fields.

To introduce students to the basic idea of signal and system analysis and its characterization in time and frequency domain

Course Outcomes:

CO1. Understand about various types of signals and systems, classify them, analyze them, and perform various operations on them,

CO2. Understand use of transforms in analysis of signals and system in continuous and discrete time domain.

CO3. Observe the effect of various properties and operations of signals and systems.

CO4. Evaluate the time and frequency response of Continuous and Discrete time systems which are useful to understand the behaviour of electronic

Unit -1 Introduction to signals

Signals: Definition, types of signals and their representations: continuous-time/discrete-time, periodic/non-periodic, even/odd, energy/power, deterministic/ random, one-dimensional/multi-dimensional; commonly used signals (in continuous-time as well as in discrete-time): unit impulse, unit step, unit ramp (and their inter-relationships), exponential, rectangular pulse, sinusoidal; operations on continuous-time and discrete-time signals (including transformations of independent variables).

Unit- 2 Fourier Transform

Fourier Transforms (FT): (i) Definition, conditions of existence of FT, proper ties, magnitude and phase spectra, some important FT theorems, Parseval's theorem, Inverse FT

Unit – 3 Introductions to Sytems

Impulse response characterization and convolution integral for CT LTI system, signal responses to CT - LTI system, properties of convolution, LTI system response properties from impulse response.

Discrete time Fourier transform (DTFT), inverse DTFT, convergence, properties and theorems, Comparison between continuous time FT and DTFT

Unit -4- Laplace Transform

Laplace-Transform (LT): (i) One-sided LT of some common signals, important theorems and properties of LT, inverse LT, solutions of differential equations using LT, Bilateral LT, Regions

of convergence (ROC) (ii) One sided and Bilateral Z-Transforms, ZT of some common signals, ROC, Properties and theorems, solution of difference equations using one-sided ZT, s- to z-plane mapping .

Unit – 5 Z- Transform

Z-transform (ZT): Regions of convergence (ROC) (ii) One sided and Bilateral Z-transforms, ZT of some common signals, ROC, Properties and theorems, solution of difference equations using One-sided ZT, s- to z-plane mapping.

Text Books:

Signal and Systems' I J NAGRATH, R. RANJAN & Sharan, 2009 Edn., TMH, New Delhi

Reference Books:

1. V. Oppenheim, A.S. Willsky and S. Hamid Nawab,'Signals & System',PEARSON Education, Second Edition, 2003.
2. Schaume Series on Signals & Systems, HSU & RANJAN, TMH,India
3. DSP –A Practical Approach –Emmanuel C. Ifeacher, Barrie. W. Jervis, 2ndEd., Pearson Education.

POs Cos	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO 1	PSO 2
CO1	**3**	**2**	2	2	1	-	-	-	-	-	2	2	1	1
CO2	**2**	**3**	1	1	1	-	-	-	-	-	1	2	1	-
CO3	**3**	**2**	3	1	-	-	-	-	-	-	2	2	-	-
CO4	**1**	**2**	1	2	-	-	-	-	-	-	2	1	2	1
CO5	**2**	**3**	3	3	-	-	-	-	-	-	1	2	-	-

EC-208C	Digital System Design	L T P	CR
		3 0 0	3

OBJECTIVE

This course provide student with a foundation in digital system. The course will explore the essential topic related to the design of modern digital circuit and to go about designing complex, high speed digital system and implement such design using programmable logic.

1. **INTRODUCTION:** Introduction to Computer-aided design tools for digital systems. Hardware description languages; introduction to VHDL; data objects; classes and data types; Operators; Overloading; logical operators. Types of delays Entity and Architecture declaration. Introduction to behavioural; dataflow and structural models.

2. **VHDL STATEMENTS:** Assignment statements; sequential statements and process; conditional statements; Generate statement; case statement Array and loops; resolution functions; concurrent statements, Packages and Libraries; Subprograms: Application of Functions and Procedures; Structural Modelling; component declaration; structural layout and generics; Configuration Statements

3. **COMBINATIONAL AND SEQUENTIAL CIRCUIT DESIGN:** VHDL Models and Simulation of combinational circuits such as Multiplexers; Demultiplexers; encoders; decoders; code converters; comparators; implementation of Boolean functions etc.
   VHDL Models and Simulation of Sequential Circuits Flip Flops; Shift Registers; Counters etc.

4. **FINITE STATE MACHINES:** Introduction to FSM; Mealy and Moore Machines, Test Benches; ALIAS; Generate statement.

5. **PROGRAMMABLE LOGIC DEVICES:** PAL, PLA, CPLD & FPGA.

TEXT BOOK

Brown and Vranesic, ”Fundamentals of Digital Logic with VHDL Design”, Tata McGraw Hill, 2nd Edition, 2000

REFERENCE BOOKS

1. IEEE Standard VHDL Language Reference Manual, 1993.
2. Chang, K.C., “Digital Design and Modelling with VHDL and Synthesis”, 1st Edition, Wiley-IEEE Computer Society Press., 1999
3. Bhasker, "A VHDL Primmer”, 2nd Edition, Star Galaxy, 1998.
4. Roth, Charles. H., “Digital System Design Using VHDL”, PWS, 1998.
5. Navabi, Z, "VHDL-Analysis and Modelling of Digital Systems”, 2nd Edition, McGraw Hill, 1998.
6. Douglas, Perry L., “VHDL” IV Edition, Tata McGraw Hill, 2008
7. Ercegovac, Lang and Moreno, ”Introduction to Digital Systems”, PWS, 2000.
8. Jain, R.P., “Modern Digital Electronics”, 3rd Edition, Tata McGraw Hill, 2003.

Course outcomes: At the end of this course students will demonstrate the ability to

1. Design and analyze combinational logic circuits
2. Design & analyze modular combinational circuits with MUX/DEMUX, Decoder, Encoder
3. Design & analyze synchronous sequential logic circuits
4. Use HDL & appropriate EDA tools for digital logic design and simulation.

POs Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	**3**	**2**	2	2	1	-	-	-	-	-	2	2	1	1
CO2	**2**	**3**	1	1	1	-	-	-	-	-	1	2	1	-
CO3	**3**	**2**	3	1	-	-	-	-	-	-	2	2	-	-
CO4	**1**	**2**	1	2	-	-	-	-	-	-	2	1	2	1
CO5	**2**	**3**	3	3	-	-	-	-	-	-	1	2	-	-

CS-204C	Computer Architecture & Organization	L T P	CR
		3 0 0	3

OBJECTIVE: To provide basic knowledge of internals of computer, its architecture, components, terminologies, etc. at minute level and ultimately about the working of a digital computer hardware as a whole

PRE-REQUISITES: Knowledge of data structures, microprocessors and interfacing

1. GENERAL SYSTEM ARCHITECTURE & DIGITAL LOGIC: Functions and block diagram of computer, store program control concept, Flynn's classification of computers (SISD, MISD, MIMD); CPU, caches, main memory, secondary memory units & I/O; Computer registers; combinational logic blocks (adders, multiplexers, encoders, de-coder), sequential logic blocks (latches, flip-flops, registers, counters). Designing of counters.

2. INSTRUCTION SET ARCHITECTURE: Instruction codes, instruction set formats(fixed, variable, hybrid), types of instructions, memory reference, register reference, I/O reference; addressing modes: register, immediate, direct, indirect, indexed; operations in the instruction set; arithmetic and logical, data transfer, control flow; types of interrupts; timing and control; instruction set based classification of processors (RISC, CISC, and their comparison).

3. BASIC NON PIPELINED CPU ARCHITECTURE: CPU Architecture types (accumulator, register, stack, memory/ register) detailed data path of a typical register based CPU, fetch-decode-execute cycle (typically 3 to 5 stage); micro-instruction formats, implementation of control unit: hardwired and micro-programmed, control memory, microinstruction sequencing.

4. MEMORY HIERARCHY & I/O TECHNIQUES: Need for a memory hierarchy (Locality of Reference Principle, memory hierarchy in practice: cache, main memory and secondary memory, memory parameters: access cycle time, cost per bit); main memory (semiconductor RAxM & ROM organization, memory expansion, static & dynamic memory types); cache memory: associative & direct mapped cache organizations.

5. INTRODUCTION TO PARALLELISM: Goals of parallelism (exploitation of concurrency, throughput enhancement); Amdahl's law; instruction level parallelism (pipelining, super scaling-basic features); processor level parallelism (multiprocessor systems overview).

TEXT BOOK

1. John P.Hayes, 'Computer architecture and Organisation', Tata McGraw-Hill, Third edition, 1998.
2. 2. V.Carl Hamacher, Zvonko G. Varanesic and Safat G. Zaky, "Computer Organisation", V edition, McGraw-Hill Inc, 1996.
3. Carpinelli, ―Computer Organization & Architecture‖ Tata McGraw Hill, 2001

REFERENCE BOOKS

1. Stallings. W, ―Computer Organization & Architecture: Designing For Performance‖, 6th Edition, Prentice Hall of India, 2002/ Pearson Education Asia, 2003

2. Mano M Morris, ―Computer System Architecture‖, 3rd Edition, Prentice Hall of India Publication, 2001 / Pearson Education Asia, 2003
3. Jotwani, ―Computer System Org anisation‖, T ata McGraw Hill, 2000.
4. Rajaraman V. and Radhakrishnan T, ―Introduction to Digital Computer Design‖, 4th Edition, Prentice Hall of India 2004.
5. Stalling William, ―Computer Organization and Architecture‖, 7th Edition, Prentice Hall of India, 2005.
6. Brey Barry, ―Intel Micro Processors‖, Pearson US Imports & PHIPEs,1998
7. Paraami, "Computer Architecture", BEH R002, Oxford Press.

POs Cos	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO 1	PSO 2
CO1	**3**	**2**	2	2	1	-	-	-	-	-	2	2	1	1
CO2	**2**	**3**	1	1	1	-	-	-	-	-	1	2	1	-
CO3	**3**	**2**	3	1	-	-	-	-	-	-	2	2	-	-
CO4	**1**	**2**	1	2	-	-	-	-	-	-	2	1	2	1
CO5	**2**	**3**	3	3	-	-	-	-	-	-	1	2	-	-

CS-206C	Data Base Management System	L T P	CR
		3 0 0	3

OBJECTIVE

To provide knowledge about various organizations and management information systems, keeping in view the aspects of share ability, availability, evaluability and integrity

PRE-REQUISITES

Knowledge of data structures, discrete mathematical structures

CO1: Understand database concepts and structures and query language
CO2: Understand the E R model and relational model
CO3: Understand Functional Dependency and Functional Decomposition.
CO4: Understand query processing and techniques involved in query optimization.
CO5: Understand the principles of storage structure and recovery management.

1. **INTRODUCTION:** What is database, Purpose of database system; advantages of using DBMS; database concept and architecture; data abstraction; data models; instances and schema; data independence; schema architecture; database languages; database administrator; database users
2. **DATA MODELING:** Entity sets attributes and keys, relationships (ER); database modeling using entity; type role and structural constraints, weak and strong entity types; enhanced entity-relationship (EER), ER diagram design of an E-R database schema; specialization and generalization
3. **RELATIONAL MODEL:** Relational model: relational model -basic concepts, enforcing data integrity constraints, Relational algebra: introduction, Selection and projection, set operations, renaming, Joins, Division, syntax, semantics. Operators; extended relational algebra operations, Calculus: Tuple relational calculus, Domain relational Calculus; Codd's rules.
4. **DATABASE DESIGN AND SQL:** Database design process; relational database design, anomalies in a database; functional dependencies membership and minimal covers normal forms, multi-valued dependencies, join dependencies, inclusion dependencies; reduction of an E-R schema to tables; effect of de-normalization on database performance, Query-by-example (QBE), Introduction to SQL, basic queries in SQL, advanced queries in SQL, functions in SQL; basic data retrieval, aggregation, categorization, updates in SQLs; views in SQL.
5. **TRANSACTION PROCESSING:** Desirable properties of transactions, implementation of atomicity and durability; reconsistent model, read only and write only model; concurrent executions, schedules and recoverability; serializability of schedules concurrency control; serializability algorithms; testing for serializability; precedence graph; concurrency control, deadlock handling - detection and resolution.

TEXT BOOK

1. Silberschatz A., Korth H. F. and Sudarshan S., “Database System Concepts”,6th edition, McGraw-Hill, International Edition,2010

2. Steven Feuerstein, Bill Pribyl , “Oracle PL/SQL”, O'Reilly Media , 4th Edition, 2005

REFERENCE BOOKS:

1. Desai Bipin, “Introduction to Database Management System”, Galgotia Publications, 1991
2. Elmasri R. and Navathe S. B., “Fundamentals of Database Systems”, 6th edition, Addison-Wesley, Low Priced Edition, 2010
3. Date C. J., “An Introduction to Database Systems”, 8th edition, Addison-Wesley, Low Priced Edition, 2003
4. Date C. J. and Darwen H., “A Guide to the SQL Standard”, 4th edition, Addison-Wesley, 2003
5. Hansen G. W. and Hansen J. V., “Database Management and Design”, 2nd edition, Prentice- Hall of India, Eastern Economy Edition, 1999
6. Majumdar A. K. and Bhattacharyya P., “Database Management Systems”, 5th edition, Tata McGraw- Hill Publishing, 1999
7. Looms, “Data Management & File Structure”, Prentice Hall of India, 1989.

POs Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	**3**	**2**	2	2	1	-	-	-	-	-	2	2	1	1
CO2	**2**	**3**	1	1	1	-	-	-	-	-	1	2	1	-
CO3	**3**	**2**	3	1	-	-	-	-	-	-	2	2	-	-
CO4	**1**	**2**	1	2	-	-	-	-	-	-	2	1	2	1
CO5	**2**	**3**	3	3	-	-	-	-	-	-	1	2	-	-

EC-252C	Analog & Digital Communication Lab	L T P	CR
		0 0 2	1

LIST OF EXPERIMENTS

1. Study of Amplitude Modulation and determination of Modulation index.
2. Study of Frequency Modulation and determination of Modulation index.
3. Study of Phase Modulation.
4. Study of Pulse Amplitude Modulation.
5. Study of Pulse Width Modulation.
6. Study of Pulse Frequency Modulation.
7. Study of Pulse Code Modulation.
8. Study of frequency Shift Keying.
9. Study of ASK and QASK.
10. Study of PSK and QPSK.
11. Project related to the scope of the course.

POs Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	**3**	**2**	2	2	1	-	-	-	-	-	2	2	1	1
CO2	**2**	**3**	1	1	1	-	-	-	-	-	1	2	1	-
CO3	**3**	**2**	3	1	-	-	-	-	-	-	2	2	-	-
CO4	**1**	**2**	1	2	-	-	-	-	-	-	2	1	2	1
CO5	**2**	**3**	3	3	-	-	-	-	-	-	1	2	-	-

EC-254C	Analog Electronics Circuits Lab	L T P	CR
		0 0 2	1

LIST OF EXPERIMENTS

1. Study the effect of voltage series; current series; voltage shunt; and current shunt feed-back on amplifier using discrete components.
2. Design and realize inverting amplifier; non-inverting and buffer amplifier using 741 Op Amp.
3. Verify the operation of a differentiator (ideal and practical) circuit using 741 op amp and show that it acts as a high pass filter.
4. Verify the operation of a integrator circuit (ideal and practical) using 741 op amp and show that it acts as a low pass filter.
5. Design and verify the operations of op amp adder and subtractor circuits.
6. Plot frequency response of AC coupled amplifier using op amp 741 and study the effect of negative feedback on the bandwidth and gain of the amplifier.
7. Design and realize using op amp 741; Sine wave oscillator.
8. To design and realize using op amp 741; triangular wave generator.
9. To design and realize using op amp 741; logarithmic amplifier and VCCS.
10. Study of Timer circuit using NE555 and configuration for monostable and astble multivibrator.
11. Realization of a V-to-I and I-to-V converter using Op-Amps.

To Study and construct class-A and class-B Power amplifier

12. To study and construct Active filters using Op amps.

POs Cos	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO 1	PSO 2
CO1	**3**	**2**	2	2	1	-	-	-	-	-	2	2	1	1
CO2	**2**	**3**	1	1	1	-	-	-	-	-	1	2	1	-
CO3	**3**	**2**	3	1	-	-	-	-	-	-	2	2	-	-
CO4	**1**	**2**	1	2	-	-	-	-	-	-	2	1	2	1
CO5	**2**	**3**	3	3	-	-	-	-	-	-	1	2	-	-

CS-256C	Data Base Management System Lab	L T P	CR
		0 0 2	1

1. Introduction to PL/SQL

2. Write a program to carry out
   a. Creation of table
   b. Insertion of data into table
   c. Viewing of data into table: All rows and all columns, Selected columns and all rows, Selected rows and all columns, Selected rows and selected columns, Elimination of duplicates from selected statements, Sorting of data into a table.
   d. Deletion of data from given table: Removal of all rows, Removal of selected rows
   e. Updating of table contents: Updating all rows, Updating of record conditionally
   f. Modifying the structure of table: Adding new column, Modifying existing column
   g. Renaming tables
   h. Destroying tables
   i. Examining objects created by user: Finding tables created by user, Finding column details of table created
   j. Computation on table data: Arithmetic operators, Logical operators (AND, OR, NOT), Range searching (BETWEEN, NOT BETWEEN), Pattern matching (LIKE, IN, NOT IN)

3. Oracle set functions (Scalar, Group & Pattern Matching Operator): AVG, SUM, MIN, MAX, COUNT, COUNT(*), ABS, ROUND, LENGTH, SUBSTR, POWER, SQRT, LOWER, UPPER, LPAD, RPAD, LTRIM, RTRIM

4. Data constraints at column level and at table level: NULL value concept, UNIQUE constraints, Primary key constraint, Foreign key constraint, Check constraint.

5. VIEWS: Creation of views, Renaming of columns in view, Selection, Updation, Destroy

6. Grouping Data from tables in SQL

7. INDEXES
8. SEQUENCES
9. Granting and Revoking Permissions in SQL
10. CURSORS & its Applications
11. Create Function and use Cursor in Function
12. TRIGGERS
13. Hands on Exercises

REFERENCE BOOKS

1. SQL, PL/SQL the Programming Language of Oracle, Ivan Bayross
2. Date C. J. and Darwen H., “A Guide to the SQL Standard”, 4th edition, Addison-Wesley, 2003

3. Desai Bipin, “Introduction to Database Management System”, Galgotia Publications, 1991
4. Date C. J., “An Introduction to Database Systems”, 8th edition, Addison-Wesley, Low Priced Edition

POs Cos	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO 1	PSO 2
CO1	**3**	**2**	2	2	1	-	-	-	-	-	2	2	1	1
CO2	**2**	**3**	1	1	1	-	-	-	-	-	1	2	1	-
CO3	**3**	**2**	3	1	-	-	-	-	-	-	2	2	-	-
CO4	**1**	**2**	1	2	-	-	-	-	-	-	2	1	2	1
CO5	**2**	**3**	3	3	-	-	-	-	-	-	1	2	-	-

EC-258C	Digital System Design Lab	L T P	CR
		0 0 2	1

LIST OF EXPERIMENTS

1. Design all gates using VHDL.
2. Write VHDL programs for the following circuits; check the wave forms and the hardware generated
   a) half adder b) full adder
3. Write VHDL programs for the following circuits; check the wave forms and the hardware generated
   a) multiplexer b) demultiplexer
4. Write VHDL programs for the following circuits; check the wave forms and the hardware generated
   a) decoder b) encoder
5. Write a VHDL program for a comparator and check the wave forms and the hardware generated.

6 Write a VHDL program for ALU.

7. Write a VHDL program for a FLIP-FLOP and check the wave forms and the hardware generated.
8. Write a VHDL program for a counter and check the wave forms and the hardware generated.
9. Write VHDL programs for the following circuits; check the wave forms and the hardware generated
   a) register b) shift register
10. Implement any three (given above) on FPGA/CPLD kit

POs Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	**3**	**2**	2	2	1	-	-	-	-	-	2	2	1	1
CO2	**2**	**3**	1	1	1	-	-	-	-	-	1	2	1	-
CO3	**3**	**2**	3	1	-	-	-	-	-	-	2	2	-	-
CO4	**1**	**2**	1	2	-	-	-	-	-	-	2	1	2	1
CO5	**2**	**3**	3	3	-	-	-	-	-	-	1	2	-	-

3rd Year

SEMESTER – V			
EC-301C	Microprocessors & Microcontroller	L T P	CR
		3 0 0	3

Objective:

This subject introduces the concept of Microprocessors to the students. It covers 8 bit (8085) and 16-bit (8086) Microprocessors: their architecture, assembly language programming and interfacing with peripheral devices

Course Outcomes:

CO1. Demonstrate the various features of microprocessor, memory and I/O devices including concepts of system bus.
CO2. Identify the hardware elements of 8085/8086 microprocessor including architecture and pin functions and programming model including registers, instruction set and addressing modes.
CO3. Select appropriate 8085/8086 instructions based on size and functions to write a given assembly language program.
CO4. Design a given interfacing system using concepts of memory and I/O interfacing.
CO5. Demonstrate the features of advance microprocessors.

UNIT-1 THE 8085 PROCESSOR:

Introduction to microprocessor; 8085 microprocessor: Architecture; Pin Diagram; instruction set; interrupt structure; Addressing modes and assembly language programming.

UNIT-2 THE 8086 MICROPROCESSOR ARCHITECTURE:

Architecture; block diagram of 8086 with details of sub-blocks; memory segmentation and physical address computations; program relocation; addressing modes; pin diagram and description of various signals; Interrupt Structure.

UNIT-3 INSTRUCTION SET OF 8086:

Data transfer instructions; arithmetic instructions; branch instructions; looping instructions; NOP and HLT instructions; flag manipulation instructions; logical instructions; shift and rotate instructions; directives; programming examples.

UNIT-4 INTERFACING DEVICE: The 8255 PPI chip: Architecture; control words and modes; interfacing and programming with 8085.

DMA: Introduction to DMA process; 8257 pin diagram; architecture; operation; command words; interfacing and programming with 8085.

UNIT-5 PROGRAMMABLE INTERRUPT CONTROLLER:
8259 pin diagram; architecture; initialization command words; operational command wards.
PROGRAMMABLE INTERVAL TIMER: 8253 pin diagram; architecture; modes.

TEXT BOOK
Gaonkar, Ramesh S., ―Microprocessor Architecture: Programming and Applications with 8085‖, 5th Edition, Prentice Hall of India, 1995

REFERENCE BOOKS

1. Brey,‖The Intel Microprocessors 8086- Pentium Processor‖, 4th Edition, 2005
2. Hall, ―Microprocessors and interfacing‖, Tata McGraw Hill, 3nd Edition, 2003
3. Liu Yu-Chang and Gibson Glenn A., ―Microcomputer Systems: The 8086/8088 Family: Architecture, Programming and Design‖, Prentice Hall of India, 2003
4. Ray A. K. and Burchandi, ―Advanced Microprocessors and Peripherals Architectures, Programming and Interfacing‖, Tata McGraw Hill, 2002
5. Rafiquzzman, ―Microprocessor based System Design UBS‖ Wiley-Interscience, 5th Edition, 2005

POs Cos	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO 1	PSO 2
CO1	**3**	**2**	2	2	1	-	-	-	-	-	2	2	1	1
CO2	**2**	**3**	1	1	1	-	-	-	-	-	1	2	1	-
CO3	**3**	**2**	3	1	-	-	-	-	-	-	2	2	-	-
CO4	**1**	**2**	1	2	-	-	-	-	-	-	2	1	2	1
CO5	**2**	**3**	3	3	-	-	-	-	-	-	1	2	-	-

EC-303C	Network Theory	L T P	CR
		3 1 0	4

Course Outcomes: At the end of this course students will demonstrate the ability to
CO1: Understand basics electrical circuits with nodal and mesh analysis.
CO2: apply electrical network theorems.
CO3: Apply Laplace Transform for steady state and transient analysis.
CO4: Determine different network functions.
CO5: learn the frequency-time domain techniques.

Unit 1: Node and Mesh Analysis, matrix approach of network containing voltage and current sources, and reactance, source transformation and duality. Network theorems: Superposition, reciprocity, Thevenin's, Norton's, Maximum power Transfer, compensation and Tallegen's theorem as applied to AC. circuits.
Unit 2: Trigonometric and exponential Fourier series: Discrete spectra and symmetry of waveform, steady state response of a network to non-sinusoidal periodic inputs, power factor, effective values, Fourier transform and continuous spectra, three phase unbalanced circuit and power calculation.
Unit 3: Laplace transforms and properties: Partial fractions, singularity functions, waveform synthesis, analysis of RC, RL, and RLC networks with and without initial conditions with Laplace transforms evaluation of initial conditions.
Unit 4: Transient behavior, concept of complex frequency, Driving points and transfer functions poles and zeros of immittance function, their properties, sinusoidal response from pole-zero locations, convolution theorem and Two four port network and interconnections.
Unit 5: Behaviors of series and parallel resonant circuits, Introduction to band pass, low pass, high pass and band reject filters.

Text/Reference Books:
1. Van, Valkenburg.; "Network analysis"; Prentice hall of India, 2000
2. Sudhakar, A., Shyammohan, S. P.; "Circuits and Network"; Tata McGraw-Hill New Delhi, 1994
3. A William Hayt, "Engineering Circuit Analysis" 8th Edition, McGraw-Hill Education.

POs Cos	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO 1	PSO 2
CO1	**3**	**2**	2	2	1	-	-	-	-	-	2	2	1	1
CO2	**2**	**3**	1	1	1	-	-	-	-	-	1	2	1	-
CO3	**3**	**2**	3	1	-	-	-	-	-	-	2	2	-	-
CO4	**1**	**2**	1	2	-	-	-	-	-	-	2	1	2	1
CO5	**2**	**3**	3	3	-	-	-	-	-	-	1	2	-	-

EC-305C	Digital Signal Processing	L T P	CR
		3 0 0	3

Objective To induce a thorough understanding of theory of DSP.
To get in-depth knowledge of various applications- Filters, MultiMate DSP, DSP to speech & Radar, Transforms etc.

Course Outcomes:

CO1. Able to obtain different Continuous and Discrete time signals.
CO2. Able to calculate Z-transforms for discrete time signals and system functions.
CO3. Ability to calculate discrete time domain and frequency domain of signals using discrete Fourier series and Fourier transform.
CO4. Ability to develop Fast Fourier Transform (FFT) algorithms for faster realization of signals and systems.
CO5. Able to design Digital IIR/FIR filters from Analog filters using various techniques (Butterworth and Chebyshev).

1. **DISCRETE-TIME SIGNALS AND SYSTEMS:** Signal classifications; frequency domain representation; time domain representation; representation of sequences by Fourier transform; properties of Fourier transform; discrete time random signals; energy and power theorems. System Classification; properties; time invariant system
2. **Z-TRANSFORM:** Introduction, properties of the region of convergence; properties of the Z-transform, inversion of the Z-transform, applications of Z-transform. DFT & FFT
3. **BASICS OF DIGITAL FILTERS:** Fundamentals of digital filtering; various types of digital filters; design techniques of digital filters: window technique for FIR, bi-linear transformation and backward difference methods for IIR filter design, analysis of finite word length effects in DSP; DSP algorithm implementation consideration. Applications of DSP.
4. **ERRORS IN DIGITAL FILTERING**: Errors resulting from rounding and truncation, round-off effects in digital filters. Finite word length effects in digital filter.
5. **MULTIRATE DIGITAL SIGNAL PROCESSING:** Introduction to multirate digital signal processing; sampling rate conversion; filter structures; multistage decimator and interpolators; digital filter banks.

TEXT BOOKS:

1.Digital Signal Processing: Principles, Algorithms & Applications J.G.Proakis & D. G. Manolakis, 4thEd., PHI.
2.Discrete Time Signal Processing Alan V Oppenheim & R. W Schaffer, PHI.
3.DSP –A Practical Approach –Emmanuel C. Ifeacher, Barrie. W. Jervis, 2nd Ed., Pearson Education.

REFERENCE BOOKS:

1.Modern Spectral Estimation: Theory & Application –S. M .Kay, 1988, PHI.
2.Multi Rate Systems and Filter Banks –P.P.Vaidyanathan –Pearson Education.

EC-307C	Electromagnetic Waves	L T P	CR
		3 1 0	4

Course Outcomes: At the end of this course students will demonstrate the ability to

1. Understand characteristics and wave propagation on high frequency transmission lines
2. Carryout impedance transformation on TL
3. Use sections of transmission line sections for realizing circuit elements
4. Characterize uniform plane wave
5. Calculate reflection and transmission of waves at media interface
6. Analyze wave propagation on metallic waveguides in modal form.
7. Understand principle of radiation and radiation characteristics of an antenna

Unit 1: Transmission Lines- Equations of Voltage and Current on TX line, Propagation constant and characteristic impedance, and reflection coefficient and VSWR, Impedance Transformation on Loss- less and Low loss Transmission line, Power transfer on TX line, Smith Chart, Admittance Smith Chart, Applications of transmission lines: Impedance Matching, use transmission line sections as circuit elements,

Unit 2: Maxwell's Equations- Basics of Vectors, Vector calculus, Basic laws of Electromagnetics, Maxwell's Equations, Boundary conditions at Media Interface. Uniform Plane Wave- Uniform plane wave, Propagation of wave, Wave polarization, Poincare's Sphere, Wave propagation in conducting medium, phase and group velocity, Power flow and Poynting vector, Surface current and power loss in a conductor.

Unit 3: Plane Waves at a Media Interface- Plane wave in arbitrary direction, Reflection and refraction at dielectric interface, Total internal reflection, wave polarization at media interface, Reflection from a conducting boundary.

Unit 4: Wave propagation in parallel planewaveguide, Analysis of waveguide general approach, Rectangular waveguide, Modal propagation in rectangular waveguide, Surface currents on the waveguide walls, Field visualization, Attenuation in waveguide.

Unit 5: Radiation: Solution for potential function, Radiation from the Hertz dipole, Power radiated by hertz dipole, Radiation Parameters of antenna, receiving antenna, Monopole and Dipole antenna.

Text/Reference Books:

1. R.K. Shevgaonkar, Electromagnetic Waves, Tata McGraw Hill India, 2005
2. E.C. Jordan & K.G. Balmain, Electromagnetic waves & Radiating Systems, Prentice Hall, India
3. Narayana Rao, N: Engineering Electromagnetics, 3rd ed., Prentice Hall, 1997.
4. David Cheng, Electromagnetics, Prentice Hall

EC-309C	CMOS Design	L T P	CR
		3 0 0	3

1. **FUNDAMENTALS OF MOS TECHNOLOGY:** Introduction to IC technology; MOS Transistor - Enhancement and Depletion mode operations; Introduction to Fabrication; CMOS and BiCMOS Devices. Equivalent circuit for MOSFET.
2. **MOS TRANSISTOR THEORY:** MOS Device Design Equations; MOS Transistor; Evaluation aspects of MOS Transistor; Threshold voltage; MOS Transistor Trans-conductance; Figure of Merit; Determination of Pull-up to Pull-down Ratio for an n-MOS inverter driven by another n-MOS inverter and by one or more pass transistor; alternative forms of Pull-up; CMOS and Bi-CMOS-inverters. Latch up in CMOS circuitry and BiCMOS Latch up susceptibility.
3. **MOS CIRCUITS AND LOGIC DESIGN:** Basic Physical Design of simple logic gates using n-MOS; p-MOS and CMOS; CMOS logic gate design considerations; CMOS logic structures.
4. **CIRCUIT CHARACTERIZATION AND PERFORMANCE ESTIMATION:** Resistance estimation; Capacitance estimation; Inductance; Switching characteristics; Voltage Transfer Characteristics (VTC) of Resistor Load n-MOS and Comparison with CMOS Inverter, Noise Margin Estimation, CMOS Gate Transistor Sizing; Power Dissipation. **DESIGN EXAMPLE USING CMOS :** ; Clocking Strategies, Incrementer/ Decrementer; Left/Right Shift Serial/Parallel Register; Comparator for two n-bit number; a two-phase non-overlapping clock generator with buffered output on both phases; design of an event driven element for EDL system
5. **VLSI FABRICATION:** Extraction of Silicon from Sand/Silica, Purification, Crystal growth and Chemical Cleaning Processes, Wafer preparation and orientations; Epitaxy; Oxidation; Lithography; Etching; Diffusion; Dielectric and Poly-silicon Film Deposition; Ion Implantation; Metallization. Yield and Reliability

TEXT BOOK

Sung-Mo Kang, Yusuf Leblebici, "CMOS Digital Integrated Circuits", Tata McGraw-Hill Education, 2003

REFERENCE BOOKS

1. Sze, S.M., "VLSI Technology", 2nd Edition, Tata McGraw Hill, 2001.
2. Sze, S.M., "Physics of Semiconductor Devices", Wiley
3. Sorab K. Ghandhi , "VLSI Fabrication Principles" 1994
4. Botkar, K.R., "Integrated Circuit", 4th Edition, Prentice Hall of India, 2000
5. Weste, N.H.F and Eshrghian, "Principal of CMOS VLSI Design", 2nd Edition, John Wiley & sons, 2000
6. Pucknell, Douglas A., "Basic VLSI Design", KamsanEshraghian, 5th Edition, Prentice Hall of India, 2005.
7. Wolf, Wayne, " Modern VLSI Design", Prentice Hall.

CS-301C	Computer Network	L T P	CR
		3 0 0	3

Objective

To have a fundamental understanding of the design, performance and state of the art of wireless communication systems, Topics covered include state of the art wireless standards and research and thus changes substantially form one offering of this course to the next

Unit-1 OVERVIEW OF DATA COMMUNICATION AND NETWORKING: Introduction; Data communications: components, data, direction of data flow, Protocols, Networks: type of connection, topology: Star, Bus, Ring, Mesh, Tree, categories of network: LAN, MAN, WAN: Internet: brief history, Layered architecture of networks, OSI reference model, Functions of each layer, services and protocols of each layer, TCP / IP reference model.

Unit-2 PHYSICAL AND DATA LINK LAYER: Transmission media: Guided media, Unguided media Switching: Circuit switching, packet switching, datagram switching. Error Detection and Correction: Types of errors, detection vs correction, cyclic codes, checksum. Framing: Flow and Error Control, Protocols: Stop &wait ARQ, Go-Back-N ARQ, Selective Repeat ARQ.

Unit-3 MEDIUM ACCESS SUBLAYER Random access: Pure ALOHA, Slotted ALOHA, CSMA, CSMA/CD, Controlled Access: Reservation, Polling, Channelization: FDMA, TDMA, CDMA, IEEE Standards, Standard Ethernet, Changes in the standard, Fast Ethernet, Gigabit Ethernet

Unit-4 NETWORK LAYER: Network Devices**:** Active and Passive Hubs, Repeaters, Bridges, Two and Three layer switch, Gateway. Internet Protocol, Transmission Control Protocol, User Datagram Protocol; IP Addressing, IP address classes, subnet addressing, DNS, Internet control protocols: ARP, RARP, ICMP.

Unit-5 TRANSPORT LAYER : Process to process delivery, user datagram protocol, TCP services, features, TCP Connection, flow control, error control and congestion control; Congestion control, Quality of Service, WAN Technologies: Synchronous Digital Hierarchy (SDH) / Synchronous Optical Network (SONET); Asynchronous Transfer Mode (ATM) Frame Relay.

TEXT BOOK

Tanenbaum Andrew S, ―Computer Networks‖, 4th Edition, Pearson Education/Prentice Hall of India, 2003.

REFERENCE BOOKS

1. Forouzan Behrouz A., ―Data Communications and Networking‖, Tata McGraw Hill 2006.
2. Stallings William, ―Data and Computer Com munication‖ , 5th Edition, Prentice Hall of India, 1997.
3. Fred H alsall, ―Data Communications, Computer Networks and Open Systems‖, 4th edition,

Addison Wesley, Low Price Edition, 2000
4. Fitzgerald Jerry, ―Business Data Communications‖, Wiley, 2009.
5. Peterson Larry L. and Davie Bruce S., ―Computer Networks – A System Approach‖, 3rd Edition, Morgan Kaufmann, 2003.
6. Tittel E. D., ―Computer Networking‖, Tata McGraw Hill, 2002
7. Kurose James F. and Ross Keith W., ―Computer Networking: A Top-Down Approach Featuring the Internet‖, 2nd Edition, Pearson Education, 2003.
8. Keshav S., ―An Engineering Approach to Computer Networking‖, Addison-Wesley, 1997.
9. Comer D. E., ―Internetworking with TCP/IP‖, Volume 1, 3rd Edition, Prentice Hall of India, 1995.

EC-351C	Microprocessor & Microcontroller Lab	L T P	Cr
		0 0 2	1

1. Write a program using 8085 for: a) Addition of two 8-bit numbers. b) Addition of two 16-bit numbers
2. Write a program using 8085 for : a) 8-bit subtraction b) 16-bit subtraction
3. Write a program using 8085 for a) Multiplication of two 8- bit numbers b) Division of two 8- bit numbers
4. Write a program using 8085 to arrange an array of 10 Nos in- a) Ascending order b) Descending order.
5. Write a program using 8086 for copying 12 bytes of data from source to destination.
6. Write a program using 8086 for: a) Finding the largest number from an array. b) Finding the smallest number from an array.
7. Write an Assembly language Program (ALP) to generate 10kHz square wave.
8. Write an ALP to generate 10 kHz frequency using interrupts.
9. Write an ALP to interface one Microcontroller with other wring serial/parallel communication.
10. Develop an embedded system for the automatic motion of a car (Model of car) and Subsequent display on LCD using Microcontroller
11. Write an ALP for temperature and pressure measurement and to display on intelligent LCD display.
12. Write an ALP for PWM based speed control of motor.
13. Write an ALP for PWM based regulator of voltage.

EC-353C	Network Theory Lab	L T P	Cr
		0 0 2	1

LIST OF EXPERIMENTS

1. To calculate the 'Z' parameters of given two port network and verify the result experimentally
2. To calculate the 'Y' parameters of given two port network and verify the result experimentally
3. To calculate the 'ABCD' parameters of given two port network and verify the result experimentally
4. To calculate the 'Y' parameters of given two port network and verify the result experimentally
5. To verify the frequency response of low pass filter circuit.
6. To verify the frequency response of high pass filter circuit.
7. To plot a frequency response of Band pass filter and determine the 3 - db Bandwidth
8. To study the frequency response of a series R-L-C circuit
9. To study the frequency response of a series R-L-C circuit
10. Introduction to PSPICE.

EC-355C	Digital Signal Processing Lab	L T P	Cr
		0 0 2	1

LIST OF EXPERIMENTS Perform the experiments using MATLAB:

1. To represent basic signals (Unit step, unit impulse, ramp, exponential, sine and cosine).

2. To develop program for discrete convolution.

3. To develop program for discrete correlation.

4. To understand stability test.

5. To understand sampling theorem.
6. To design analog filter (low-pass, high pass, band-pass, band-stop).

7. To design digital IIR filters (low-pass, high pass, band-pass, band-stop).

8. To design FIR filters using windows technique.

9. To design a program to compare direct realization values of IIR digital filter

10. To develop a program for computing parallel realization values of IIR digital filter.

11. To develop a program for computing cascade realization values of IIR digital filter

12. To develop a program for computing inverse Z-transform of a rational transfer function.

EC-359C	CMOS Design Lab	L T P	Cr
		0 0 2	1

Course Outcomes:
At the end of this course students will demonstrate the ability to:
1. Designing of logic gates.
2. Implementation of combinational and sequential circuits using CMOS logic.
3. Analyze amplifier circuits.
4. Design sequential circuits such as flip flop.
5. Do the layout designing for physical analysis of the MOS transistor and MOS based circuits.

List of Experiments:

1. Design and analysis of basic of logic Gates: AND, OR, NOT, NAND, NOR, XOR, XNOR.
2. Design and implementation of Half adder and Full adder using CMOS logic.
3. To simulate the schematic of the common drain amplifier.
4. To simulate the schematic of the differential amplifier.
5. To simulate the schematic of the operational amplifier.
6. Design of 3-8 decoder using MOS technology.
7. Design a 4:1 Multiplexer.
8. Design and implementation of Flip flop circuit.
9. Layout design of PMOS, NMOS transistors.
10. Layout design of CMOS inverter and its analysis.

3rd Year

SEMESTER – VI

EC-302	Control System	L T P	Cr
		3 0 0	3

Course Outcomes:
At the end of this course, students will demonstrate the ability to understand the modeling of linear-time-invariant systems using transfer function and state space representations.
Understand the concept of stability and its assessment for linear-time invariant systems.
Design simple feedback controllers.

Unit 1: Introduction to control problem
Industrial Control examples. Mathematical models of physical systems. Control hardware and their Models. Transfer function models of linear time-invariant systems.
Feedback Control: Open-Loop and Closed-loop systems. Benefits of Feedback. Block diagram Algebra.

Unit 2: Time Response Analysis
Standard test signals. Time response of first and second order systems for standard test inputs. Application of initial and final value theorem. Design specifications for second-order systems based on the time-response. Concept of Stability. Routh-Hurwitz Criteria. Relative Stability analysis. Root-Locus technique. Construction of Root-loci.

Unit 3: Frequency-response analysis (6 hours)
Relationship between time and frequency response, Polar plots, Bode plots. Nyquist stability criterion. Relative stability using Nyquist criterion – gain and phase margin. Closed-loop frequency response.

Unit 4: Introduction to Controller Design
Stability, steady-state accuracy, transient accuracy, disturbance rejection, insensitivity and robustness of control systems.Root-loci method of feedback controller design.Design specifications in frequency-domain. Frequency-domain methods of design.
Application of Proportional, Integral and Derivative Controllers, Lead and Lag compensation in designs. Analog and Digital implementation of controllers.

Unit 5: State variable Analysis
Concepts of state variables. State space model. Diagonalization of State Matrix. Solution of state equations. Eigenvalues and Stability Analysis. Concept of controllability and observability. Pole-placement by state feedback. Discrete-time systems. Difference Equations. State-space models of linear discrete-time systems. Stability of linear discrete-time systems.
.

Text/References:
1. M. Gopal, “Control Systems: Principles and Design”, McGraw Hill Education, 1997.
2. B. C. Kuo, “Automatic Control System”, Prentice Hall, 1995.
3. K. Ogata, “Modern Control Engineering”, Prentice Hall, 1991.
4. I. J. Nagrath and M. Gopal, “Control Systems Engineering”, New Age International, 2009

EC 304	Probability and Stochastic Processes	L T P	Cr
		3 0 0	3

Objective
Learn the concept and application of Random variables

Course Outcomes
CO1 Define Probability and different Theorems of Probability
CO2 Explain single, multiple Random Variables, distribution and density functions of Random Variables.
CO3 Apply the knowledge of Mathematical operations on Random Variables to find the moments.
CO4 Test the Temporal characteristics of a Random Process.
CO5 Measure the spectral characteristics of a Random Process

Unit-1 Sets and set operations; Probability space; Conditional probability and Bayes theorem; Combinatorial probability and sampling models. Discrete random variables, probability mass function, probability distribution function, example

Unit-2 Random variables and distributions; Continuous random variables, probability density function,
Probability distribution function, example distributions;

Unit-3 Joint distributions, functions of one and two random variables, moments of random variables; Conditional distribution, densities and moments; Characteristic functions of a random variable; Markov, Chebyshev and Chernoff bounds;

Unit-4 Random sequences and modes of convergence (everywhere, almost everywhere, probability, distribution and mean square); Limit theorems; Strong and weak laws of large numbers, central limit theorem.

Unit-5 Random process. Stationary processes. Mean and covariance functions. Ergodicity. Transmission of random process through LTI. Power spectral density.

Text/Reference Books:
1. H. Stark and J. Woods, ``Probability and Random Processes with Applications to Signal Processing," Third Edition, Pearson Education
2. A.Papoulis and S. Unnikrishnan Pillai, ``Probability, Random Variables and Stochastic Processes," Fourth Edition, McGraw Hill.
3. K. L. Chung, Introduction to Probability Theory with Stochastic Processes, Springer International
4. P. G. Hoel, S. C. Port and C. J. Stone, Introduction to Probability, UBS Publishers,
5. P. G. Hoel, S. C. Port and C. J. Stone, Introduction to Stochastic Processes, UBS Publishers
6. S. Ross, Introduction to Stochastic Models, Harcourt Asia, Academic Press.

EC 306	Broadband Network	L T P	Cr
		3 0 0	3

Objective:

1. Understanding the architecture, protocols and services that are used in broadband networks, and methods for acquisition of the new future technologies and services to be introduced in the next generation networks
2. Installing and maintaining the equipment needed to operate the broadband networks

Course Outcomes:

CO1. Define services and specify their applications in modern broadband networks,
CO2. Explain communication protocols,
CO3. Analyze and compare the appropriate network architecture,
CO4. Develop, design and create broadband networks,
CO5. Choose an engineering approach to solving problems, starting with the acquired theoretical knowledge.

Unit 1. Overview of internet –concepts, challenges and history. Next Generation Internet-challenges and problems. Multicasting in Internet. Real time communication over Internet.

Unit 2. Packet scheduling Algorithms- requirements and choices. Admission control in internet. Differentiated Services in internet. Internet Telephony and voice over IP (VoIP)-RTP and RTCP.

Unit 3. Broadband ISDN and ATM Networks- ATM protocols. IP switching and MPLS-Overview of IP over ATM and its evolution to IP switching. Policy based Networking. Policy servers.

Unit 4. Web in Qos domain. Architecture for Web Qos. Web Access – Intelligent web browsing and web caching. Internet and web Traffic measurement and characterization. Prediction for network management.

Unit 5. Optical communication networks- DWDM based transport network. Issues in IP over DWDM optical IP routers and switching

Text Books

1. Residential Broadband Networks: Xdsl, HFC and Fixed Wireless Access by Utilizing D. Black Prentice Hall; 1st edition
2. An Introduction to Broadband Networks by Acampora Anthony S Springer Science Business Media

Reference Books

1.ISDN and Broadband ISDN with Frame Relay and ATM by William Stallings Pearson; 4th edition

EC-308	Internet of Things (IOT)	L T P	CR
		3 0 0	3

OBJECTIVE:
Students will be explored to the interconnection and integration of the physical world and the cyber space. They are also able to design & develop IOT Devices.

COURSE OUTCOMES:
CO1.Able to understand the application areas of IOT
CO2· Able to realize the revolution of Internet in Mobile Devices, Cloud & Sensor Networks
CO3· Able to understand building blocks of Internet of Things and characteristics.
CO4. Recognize the factors that contributed to the emergence of IoT
CO5. Use real IoT protocols for communication

UNIT I – OVERVIEW IoT
An Architectural Overview– Building an architecture, Main design principles and needed capabilities, An IoT architecture outline, standards considerations. M2M and IoT Technology Fundamentals- Devices and gateways, Local and wide area networking, Data management, Business processes in IoT, Everything as a Service(XaaS), M2M and IoT Analytics, Knowledge Management

UNIT II – REFERENCE ARCHITECTURE
IoT Architecture-State of the Art – Introduction, State of the art, Reference Model and architecture, IoT reference Model - IoT Reference ArchitectureIntroduction, Functional View, Information View, Deployment and Operational View, Other Relevant architectural views. Real-World Design Constraints- Introduction, Technical Design constraints-hardware is popular again, Data representation and visualization, Interaction and remote control.

UNIT III – IOT DATA LINK LAYER & NETWORK LAYER PROTOCOLS
PHY/MAC Layer(3GPP MTC, IEEE 802.11, IEEE 802.15), WirelessHART,Z-Wave,Bluetooth Low Energy, Zigbee Smart Energy, DASH7 - Network Layer-IPv4, IPv6, 6LoWPAN, 6TiSCH,ND, DHCP, ICMP, RPL, CORPL, CARP

UNIT IV – TRANSPORT & SESSION LAYER PROTOCOLS
Transport Layer (TCP, MPTCP, UDP, DCCP, SCTP)-(TLS, DTLS) – Session Layer-HTTP, CoAP, XMPP, AMQP, MQTT

UNIT V – SERVICE LAYER PROTOCOLS & SECURITY
Service Layer -oneM2M, ETSI M2M, OMA, BBF – Security in IoT Protocols – MAC 802.15.4 , 6LoWPAN, RPL, Application Layer

TEXTBOOK:
1. Jan Holler, VlasiosTsiatsis, Catherine Mulligan, Stefan Avesand, StamatisKarnouskos, David Boyle, “From Machine-to-Machine to the Internet of Things: Introduction to a New Age of Intelligence”, 1 st Edition, Academic Press, 2014.

REFERENCE BOOKS

1. Peter Waher, “Learning Internet of Things”, PACKT publishing, BIRMINGHAM – MUMBAI

2. Bernd Scholz-Reiter, Florian Michahelles, “Architecting the Internet of Things”, ISBN 978-3-642-19156-5 e-ISBN 978-3-642-19157-2, Springer

3. Daniel Minoli, “Building the Internet of Things with IPv6 and MIPv6: The Evolving World of M2M Communications”, ISBN: 978-1-118- 47347-4, Willy Publications

4. Vijay Madisetti and ArshdeepBahga, “Internet of Things (A Hands-onApproach)”, 1 st Edition, VPT, 2014.

5. http://www.cse.wustl.edu/~jain/cse570-15/ftp/iot_prot/index.htm

EC-310A	Real Time System	L T P	CR
		3 1 0	4

Course Objective:
This course covers the principles of real-time systems, Modeling of a Real-Time System, Task assignment and scheduling, Resource management, Real-time operating systems, RTOS services, Programming language with real-time support, System design techniques, Inter task communication, Fault tolerant techniques, Reliability evaluation methods; Performance analysis, Case studies of real-time systems.

Course Outcomes: On completion of this course, the students will be able to understand concepts of Real-Time systems and modeling recognize the characteristics of a real-time system understand and develop document on an architectural design of a real-time system develop and document Task scheduling, resource management, real-time operating systems and fault tolerant applications of Real-Time Systems.

Unit-1: Introduction to Real time systems
Issues in real time computing Structure of real time system Need for RTOS Task classes Performance measures for real time system: Properties, traditional performance measures, perform ability, cost functions and hard deadlines, and Estimating program run times. Introduction LINUX/ UNIX OS.
Unit-2: Embedded software and Task Scheduling
Examples of embedded system their characteristics and their typical hardware components embedded software architectures Scheduling algorithms: round robin, round robin with interrupts, function queue scheduling real time operating system selection, CPU scheduling algorithms: Rate monotonic, EDF, MLF. Priority Scheduling, Priority Ceiling and Priority inheritance Real time operating system: Tasks and task states, shared data and reentrancy semaphores and shared data, use of semaphores protecting shared data
Unit-3: Features of Real Time Operating System
Messages queues mailboxes pipes timer function events memory management Interrupt basic system design using an RT (OS design principles, interrupt routines, task structures and priority.) Current research in RTOS. Case Studies: Vx Works and Micro OS-II
Unit-4: Real Time Databases Real time v/s general purpose databases main memory databases transaction priorities transaction aborts concurrency control issues: pessimistic concurrency control and optimistic concurrency control Disk scheduling algorithms.
Unit-5: Fault Tolerance Techniques
Causes of failure Fault types Fault detection Fault and error containment Redundancy: hardware redundancy software redundancy Time redundancy information redundancy Data diversity Integrated failure handling
TEXT BOOKS
1. Real Time Systems Jane W. S. Liu, Pearson Education Publication
REFERENCE BOOKS
1. Real Time Systems Mall Rajib, Pearson Education
2. Real-Time Systems: Scheduling, Analysis, and Verification Albert M. K. Cheng, Wiley.

EC-310C	Wireless & Cellular System	L T P	CR
		3 1 0	4

Course Outcomes

CO1 Analyze and design wireless and mobile cellular systems.
CO2 Understand impairments due to multipath fading channel.
CO3 Understand the fundamental techniques to overcome the different fading effects.
CO4 Understand Co-channel and Non Co-channel interferences
CO5 Familiar with cell coverage for signal and traffic, diversity techniques and mobile antennas.
CO6 Understanding of frequency management, Channel assignment, and types of handoff.

UNIT-1 Introduction to Cellular Mobile Systems: Cellular Mobile Telephone Systems, A Basic Cellular System, Operation of Cellular Systems. Elements of Cellular Mobile Radio System Design: General Description of the problem, Concept of Frequency reuse channels, CoChannel Interference Reduction Factor, Handoff Mechanism, Cell Splitting.

UNIT-2 Speech Coding for Wireless Systems Applications: Introduction to Digital Signal Processing (DSP) Techniques in Wireless Telephone and Broadcast Systems, Speech Coding Techniques for Audio and Voice – Pulse Code Modulation, DPCM, Delta Modulation, Vocoder and Linear Predictive Coding, Performance Comparison of Speech Processing Techniques.

UNIT-3 Radio Propagation and Cellular Engineering Concepts: Fundamental Radio Propagation and System Concepts, Propagation Characteristics, Models of Multipath-faded radio signals – Un modulated Carrier, Envelope and Phase faded, Level Crossing rate and fade Duration, Delay Spread Measurements .

UNIT-4 Digital Modulation-Demodulation (Modem) Principles and Architectures: Coherent Modem – Baseband Modem Equivalence, Coherent and Differentially Coherent Binary Phase Shift Keying Systems, Synchronization – Carrier Recovery and Symbol Timing Recovery, Differential Encoding and Decoding Requirement, Quadrature Phase shift Keying – Coincident and offset Types, Pi/4 DQPSK Modems – Architecture.

UNIT-5 Interference In Wireless Digital Communication: Carrier-to-Interference and Carrier-to-Noise Limited Systems, Cochannel Interference, Adjacent Channel Interference. Externally caused Cochannel Interference, Definitions and performance of Spectral and Power Efficiency, Relationship of the Bit-Energy to Noise-Density Ratio and the Carrier-to-Noise Ratio,Power Efficiency and Bit-Error-Rate performance in an Additive White Gaussian Noise Environment, Concepts of Diversity Branch and Signal paths; Combining and Switching Methods.

TEXT BOOKS

1.DR Kamilo Feher Wireless Digital Communications, Prentice Hall of India, New Delhi – 1999 2.William Cy Lee, Mobile Cellular Telecommunications, 2nd Edition, MC Graw Hill.
2.Theodore S Rappaport, "Wireless Communication Principles and Practice", 2nd Ed, Pearson Education. 2002
3.Lawrence Harte, "3G Wireless Demystified", McGraw Hill Publications. 2000
4.Kaveh Pahlavan and Prashant Krishnamurthy, "Principles of Wireless Networks", PHI.2000

EC-310D	Fiber Optical Communication	L T P	CR
		3 1 0	4

OBJECTIVE
The aim of this course is to describe the various technologies, implementation, mythologies and performance measurement techniques that make optical fiber communication system possible.

COURSE OUTCOMES
CO1: understand the modulation and demodulation schemes in the coherent optical systems.
CO2: understand the various types of the optical amplifiers
CO3: analyse various multiplexing techniques used and evaluate the recent advances in this field
CO4: compare the merits and demerits, potential applications of microwave semiconductor devices.
CO5: Analyze the operating principle of optical amplifiers.

Unit-1. INTRODUCTION TO OPTICAL COMMUNICATION SYSTEMS:
Electromagnetic spectrum used for optical communication; block diagram of optical communication system. Basics of transmission of light rays. Advantages of optical fiber communication.

Unit-2. OPTICAL FIBERS:
Optical fibers structures and their types; fiber characteristics :
attenuation; scattering; absorption; fiber bend loss; dispersion; fiber couplers and connectors; splicing jointing LED LIGHT SOURCE: Light emitting diode :recombination processes; the spectrum of recombination radiation; LED characteristics; internal quantum efficiency; external quantum efficiency; LED structure; lens coupling to fiber; behavior at high frequencies.

Unit-3. LASER LIGHT SOURCE:
Basic principles of laser action in semi -conductors;
optical gain; lasing threshold; laser structures and characteristics; laser to fiber coupling; comparison with LED source. AVALANCHE AND PIN PHOTODETECTORS: Principles of optical detection; quantum efficiency; responsivity; general principles of PIN photodetector; intrinsic absorption; materials and designs for PIN photodiodes; impulse and frequency response of PIN photodiodes; noise in PIN Photodiodes; multiplication process; APD Design; APD bandwidth; APD noise.

Unit-4. OPTICAL AMPLIFIERS:
optical amplifier; optical cavity;1 Laser amplifiers; Doped
fibre amplifiers; Noise Gain saturation Inhomogeneous broadening effects Polarization effects Erbium-doped fibre amplifiers Doped fibre amplifiers for other wavelength ranges Semiconductor optical amplifier (SOA) Vertical-cavity SOA Raman amplifier Optical parametric amplifier.

Unit-5. OPTICAL MODULATORS and DEMODULATORS:
Optical modulator Electro
optic modulator ; Spatial light modulator Optical tweezers Modulating retro-reflector Optical

DPSK demodulator Delay line interferometer Michelson interferometer Optical hybrid Phase detector (section Optical phase detectors) Laserdisc Phase-shift keying T-carrier Photo elastic modulator Super heterodyne receiver Symbol rate Lock-in amplifier Orthogonal frequencydivision multiplexing (redirect Optical Orthogonal Code) Telecommunication

REFERENCE BOOKS:

1. Selvarajan, Kar Srinivas, "Optical Fiber Communication", 4th Edition, Tata MCGraw Hill, 2003.
2. Keiser, G., "Optical Fiber Communication", Tata McGraw Hill, 2000.
3. Senior, J.M., "Optical fiber Communication Principles and Practice", Prentice Hall of India, 1992.

EC-312A	Embedded System Design	L T P	CR
		3 0 0	3

Course Objectives

To introduce the Building 1.Blocks of Embedded System
2. To Educate in Various Embedded Development Strategies
3. To Introduce Bus Communication in processors, Input/output interfacing.
4. To impart knowledge in various processor scheduling algorithms.
5. To introduce Basics of Real time operating system and example tutorials to discuss on one real time operating system tool

Course Outcomes

CO1: Acquire a basic knowledge about programming and system control to perform a specific task.
CO2: Acquire knowledge about devices and buses used in embedded networking
CO3: Develop programming skills in embedded systems for various applications.
CO4: Acquire knowledge about basic concepts of circuit emulators.
CO5: Acquire knowledge about Life cycle of embedded design and its testing

UNIT I INTRODUCTION TO EMBEDDED CONCEPTS

Introduction to embedded systems, Application Areas, Categories of embedded systems, Overview of embedded system architecture, Specialties of embedded systems, recent trends in embedded systems, Architecture of embedded systems, Hardware architecture, Software architecture, Application Software, Communication Software.

UNIT II OVERVIEW OF ARM AND CORTEX-M3

Background of ARM Architecture, Architecture Versions, Processor Naming, Instruction Set Development, Thumb-2 and Instruction Set Architecture. Cortex-M3 Basics: Registers, General Purpose Registers, Stack Pointer, Link Register, Program Counter, Special Registers, Operation Mode, Exceptions and Interrupts, Vector Tables, Stack Memory Operations, Reset Sequence. Cortex-M3Instruction Sets: Assembly Basics, Instruction List, Instruction Descriptions.Cortex-M3 Implementation Overview: Pipeline, Block Diagram, Bus. Interfaces on Cortex-M3, I-Code Bus, D Code Bus, System Bus, External PPB and DAP Bus

UNIT III CORTEX EXCEPTION HANDLING AND INTERRUPTS

Exceptions: Exception Types, Priority, Vector Tables, Interrupt Inputs and Pending Behavior, Fault Exceptions, Supervisor Call and Pendable Service Call. NVIC: Nested Vectored Interrupt Controller Overview, Basic Interrupt Configuration, Software Interrupts and SYSTICK Timer. Interrupt Behavior: Interrupt/Exception Sequences, Exception Exits, Nested Interrupts, Tail-Chaining Interrupts, Late Arrivals and Interrupt Latency

UNIT IV CORTEX-M3/M4 PROGRAMMING

Cortex-M3/M4 Programming: Overview, Typical Development Flow, Using C, CMSIS (Cortex Microcontroller Software Interface Standard), Using Assembly. Exception Programming: Using Interrupts, Exception/Interrupt Handlers, Software Interrupts, Vector Table Relocation. Memory Protection Unit and other Cortex-M3 features: MPU Registers, Setting Up the MPU, Power Management, Multiprocessor Communication.

UNIT V CORTEX-M3/M4 DEVELOPMENT AND DEBUGGING TOOLS

STM32L15xxx ARM Cortex M3/M4 Microcontroller: Memory and Bus Architecture, Power

Control, Reset and Clock Control. STM32L15xxx Peripherals: GPIOs, System Configuration Controller, NVIC, ADC, Comparators, GP Timers, USART. Development & Debugging Tools: Software and Hardware tools like Cross Assembler, Compiler, Debugger, Simulator, In-Circuit Emulator (ICE), Logic Analyzer etc.

REFERENCE BOOKS

11. Joseph Yiu, " The definitive Guide to the ARM Cortex-M3", Second Edition, Elsevier Inc. 2010.
12. Andrew N Sloss, Dominic Symes, Chris Wright, "ARM System Developer's Guide Designing and Optimizing System Software" Elsevier Publications, 2006.
13. Steve Furber, "ARM System-on-Chip Architecture", 2nd Edition, Pearson Education, India, ISBN:9788131708408, 8131708403, 2015.
14. Dr. K. V. K> Prasad, "Embedded/Real-Time Systems: Concepts, Design and Programming Black Book", New ed (MISL-DT) Paperback – 12 Nov 2003.
15. David Seal "ARM Architecture Reference Manual", Addison Wesley, England; Morgan Kaufmann Publishers, 2001.
16. Cortex-M series-ARM Reference Manual
17. Cortex-M3 Technical Reference Manual (TRM)
18. STM32L152xx ARM Cortex M3 Microcontroller Reference Manual 5/97

EC-312B	Data Communication	L T P	CR
		3 0 0	3

Course Objective:
1.To understand the basic concepts of data communication, layered model, protocols and interworking between computer networks and switching components in telecommunication systems.
2. Discuss the nature, uses and implications of internet technology.
3. To understand the functioning of Frame Relay, ATM.
4. An overview of security issues related to data communication in networks

Course Outcomes
CO1 Understand the basics of data communication, networking, internet and their importance.
CO2 Analyze the services and features of various protocol layers in data networks.
CO3 Differentiate wired and wireless computer networks
CO4 Analyze TCP/IP and their protocols.
CO5 Recognize the different internet devices and their functions.

Unit-1 Introduction
Introduction: Data Communications, Networks, Network Types, Internet History, Standards and Administration, Networks Models: Protocol Layering, TCP/IP Protocol suite, The OSI model, Introduction to Physical Layer-1: Data and Signals, Digital Signals, Transmission Impairment, Data Rate limits, Performance, Digital Transmission: Digital to digital conversion (Only Line coding: Polar, Bipolar and Manchester coding)

Unit -2 Physical Layer-2
Physical Layer-2: Analog to digital conversion (only PCM), Transmission Modes, Analog Transmission: Digital to analog conversion, Bandwidth Utilization: Multiplexing and Spread Spectrum, Switching: Introduction, Circuit Switched Networks and Packet switching.

Unit -3 Error Detection and Correction
Error Detection and Correction: Introduction, Block coding, Cyclic codes, Checksum, Forward error correction, Data link control: DLC services, Data link layer protocols, HDLC, and Point to Point protocol (Framing, Transition phases only)

Unit -4 Media Access control
Media Access control: Random Access, Controlled Access and Channelization, Wired LANs Ethernet: Ethernet Protocol, Standard Ethernet, Fast Ethernet, Gigabit Ethernet and 10 Gigabit Ethernet, Wireless LANs: Introduction, IEEE 802.11 Project and Bluetooth.

Unit -5 wireless Networks
Other wireless Networks: WIMAX, Cellular Telephony, Satellite networks, Network layer Protocols : Internet Protocol, ICMPv4,Mobile IP, Next generation IP: IPv6addressing, The IPv6 Protocol, The ICMPv6 Protocol and Transition from IPv4 to IPv6.

TEXTBOOK
1.Data Communications & Networking 5th Edition- B A Forouzan- TataMcGraw-Hill.

REFERENCE BOOKS:

1. Data Communications and Networks- 2nd edition -Achyut S Godbole- and Atul Kahate Tata McGraw-Hill
2. Computer Networks- 4th Edition- Andrew S Tanenbaum- Pearson-Prentice Hall
3. Computer Networking - James F. Kurose & Keith W. Ross- PEARSON
4. Computer Communications and Networking Technologies - Michael A. Gallo & William M. Hancock- BROOKS&COLE
5. Computer Networks and Internets -Douglas E. Comer- PEARSON.
6. Data and Computer Communications- Eighth Edition- William Stallings- Pearson Education.
7. Refer the course contents at NPTEL website of IIT Khargapur of course- Communication Networks and Switching.
8. Network Security Bible, 2nd edition, Eric Cole, Wiley Publishers.
9. Data communication and networks James Irvine and David Harley- Publishers: Wiley India.

EC-312C	VLSI Design	L T P	CR
		3 0 0	3

OBJECTIVE:
1: Learn the design and realization of combinational & sequential digital circuits.
2: Architectural choices and performance tradeoffs involved in designing and realizing the circuits in CMOS technology are discussed
3: Learn the different FPGA architectures and testability of VLSI circuits.

COURSE OUTCOMES:
Upon completion of the course, students should be able to
CO1 Realize the concepts of digital building blocks using MOS transistor.
CO2 Design combinational MOS circuits and power strategies.
CO3 Design and construct Sequential Circuits and Timing systems.
CO4 Design arithmetic building blocks and memory subsystems.
CO5 Apply and implement FPGA design flow and testing.

UNIT I INTRODUCTION TO MOS TRANSISTOR
MOS Transistor, CMOS logic, Inverter, Pass Transistor, Transmission gate, Layout Design Rules, Gate Layouts, Stick Diagrams, Long-Channel I-V Charters tics, C-V Charters tics, Non ideal I-V Effects, DC Transfer characteristics, RC Delay Model, Elmore Delay, Linear Delay Model, Logical effort, Parasitic Delay, Delay in Logic Gate, Scaling.

UNIT II COMBINATIONAL MOS LOGIC CIRCUITS
Circuit Families: Static CMOS, Ratioed Circuits, Cascode Voltage Switch Logic, Dynamic Circuits, Pass Transistor Logic, Transmission Gates, Domino, Dual Rail Domino, CPL, DCVSPG, DPL, Circuit Pitfalls.
Power: Dynamic Power, Static Power, Low Power Architecture.

UNIT III SEQUENTIAL CIRCUIT DESIGN
Static latches and Registers, Dynamic latches and Registers, Pulse Registers, Sense Amplifier Based Register, Pipelining, Schmitt Trigger, Monostable Sequential Circuits, Astable Sequential Circuits.Timing Issues : Timing Classification Of Digital System, Synchronous Design.

UNIT IV DESIGN OF ARITHMETIC BUILDING BLOCKS AND SUBSYSTEM
Arithmetic Building Blocks: Data Paths, Adders, Multipliers, Shifters, ALUs, power and speed tradeoffs, Case Study: Design as a tradeoff.Designing Memory and Array structures: Memory Architectures and Building Blocks, Memory
Core, Memory Peripheral Circuitry.

UNIT V IMPLEMENTATION STRATEGIES AND TESTING
FPGA Building Block Architectures, FPGA Interconnect Routing Procedures. Design for

Testability: Ad Hoc Testing, Scan Design, BIST, IDDQ Testing, Design for Manufacturability, Boundary Scan.

TEXT/REFERENCE 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.

REFERENCES

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

EC-352C	Control System Lab	L T P	CR
		0 0 2	1

Course Objectives:

1. Will have a strong knowledge on MATLAB software.
2. To study the concept of time response and frequency response of the system
3. Students get the basic knowledge on practical control system applications on machines & electronic devices.
4. This course aims to familiarize with the modeling of dynamical systems, to simulate and analyze the stability of the system using MATLAB

Course Outcomes:

CO1. Understand the basics of Matlab and familiarize with control system tool box for designing various LTI systems.
CO2. Design, analyze various models of the systems in time domain and evaluate different response parameters
CO3. Analyze stability from root locus of the given model of the system.
CO4. Prepare professionals in laboratory to compute or to predict the characteristics of a system by visualizing experimental data and its graphical representation.
CO5. Primarily via team based laboratory activities, students will demonstrate the ability to interact effectively on a social and interpersonal level with fellow students, and will develop the ability to divide up and share task responsibilities to complete assignments.

LIST OF EXPERIMENTS:

1. To study A.C. Servo-motor and to plot its torque-speed characteristics
2. To study magnetic amplifier and to plot its load current v/s control current characteristics for (a) Series connected mode (b) Parallel connected mode
3. To implement a PID controller for temperature control of a pilot plant
4. To study different components of process control simulator kit
5. To study A.C. Motor position control through continuous command
6. To study Synchro transmitter and receiver and to plot stator voltage v/s rotor angle for synchro transmitter
7. To study lead, lag, lead-lag compensator and to draw their magnitude and phase plot
8. To study D.C. Servo-motor and to plot its torque-speed characteristics
9. To study simple open loop and closed loop control system with disturbance and without disturbance using process control simulator kit
10. To study (PD), PI, PID controllers.
11. To study a stepper motor and control the speed by 8085 microprocessor kit

ADDITIONAL EXPERIMENTS

12. Obtain the unit step response of a second order system with given zeta and Wn using MATLAB.
13. Determine the unit step response of a given close loop transfer function using MATLAB.
14. Determine the damping ratio, undamped natural frequency of oscillation and percentage overshoot of a unity feedback open loop transfer function to a unit step input using MATLAB.

EC-358	Internet of Things Lab	L T P	Cr
		0 0 2	1

Course Outcomes:

CO1 Understand the IoT Systems.
CO2 Understand the concept of M2M (machine to machine) with necessary protocols.
CO3 Create programs using python scripting language in IoT devices.
CO4 Create programs for Raspberry Pi interfaces.
CO5 Understand to communicate with IoT Systems through web-interface.

1. Study and Install Python in Eclipse and WAP for data types in python.
2. Write a Program for arithmetic operation in Python.
3. Write a Program for looping statement in Python.
4. Study and Install IDE of Arduino and different types of Arduino.
5. Write program using Arduino IDE for Blink LED.
6. Write Program for RGB LED using Arduino.
7. Study the Temperature sensor and Write Program foe monitor temperature using Arduino.
8. Study and Implement RFID, NFC using Arduino.
9. Study and implement MQTT protocol using Arduino.
10. Study and Configure Raspberry Pi.
11. WAP for LED blink using Raspberry Pi.
12. Study and Implement ZigBee Protocol using Arduino / Raspberry Pi.

EC-362A	Embedded System Design Lab	L T P	Cr
		0 0 2	1

Course Objective:

The student should be made to:

- Learn the working of ARM Processor
- Understand the building blocks of Embedded Systems.
- Learn the concept of memory map and memory interface.
- Write programs to interface memory, I/Os with processor
- Study the interrupt performance.

Course Outcome:

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

CO1: Write programs in ARM for a specific Application

CO2: Interface memory, A/D and D/A convertors with ARM system

CO3: Analyze the performance of interrupt

CO4: Write program for interfacing keyboard, display, motor and sensor.

CO5: Formulate a mini project using embedded system

List of Experiments

1. Study of ARM evaluation system
2. Interfacing stepper motor and temperature sensor
3. Implementing zigbee protocol with ARM
4. Simulation of calculator using 8051 microcontroller in Proteus software
6. UART implementation FPGA & ARM7
8. To develop a C-Language program for displaying the Key pressed in the Keypad in the LCD module.
9. To develop a C-Language program for reading the RTC, convert into decimal and to display it.
10. Interfacing keyboard and LCD.

EC-362B	Data Communication Lab	L T P	Cr
		0 0 2	1

List of Experiments

1. To study various multiplexing techniques
2. To study of network interface card (NIC)
3. To study of parallel and serial transmission
4. To study of NRZ and RZ codes
5. To study of Integrated services digital network.
6. To study of digital interface rs-232.
7. To study LAN using star topology
8. To study of twisted pair, coaxial cable and fibre optic cable.
9. To study of different types of modem.
10. To study pc to pc communication using parallel port

EC-362C	VLSI Design Lab	L T P	Cr
		0 0 2	1

Course Objective

learn Hardware Descriptive Language (Verilog/VHDL). To learn the fundamental principles of VLSI circuit design in digital and analog domain. To familiarize fusing of logical modules on FPGAs. To provide hands on design experience with professional design (EDA) platforms

Course Outcomes

CO1 Construct NMOS, PMOS, CMOS, and Bi CMOS transistors using various fabrication technologies.
CO2 Analyze the quality metrics of combinational circuits.
CO3 Acquire the knowledge in advanced technologies.
CO4 Design combinational and sequential circuits.
CO5 Analyze power dissipation and delays in sequential circuits.

Name of the Experiment

1. Digital design: Inverter
2. Digital design: Inverter Buffer
3. Digital design: Transmission gate
4. Digital design: Basic Gate and universal gate
5. Digital design: D, SR, JK & T Flip-flop
6 Digital design: Parallel adders
7 a) 4-bit counters asynchronous counter
   b) 4-bit counters synchronous counter
8 Analog design: Inverter
9 Analog design: Common source amplifier & Common drain amplifier
10 Analog design: Single stage differential amplifier

EC-364C	Project Work – I	L T P	Cr
		0 0 4	2

Objective:

The student shall be capable of identifying a problem related to the program of study and carry out wholesome research on it leading to findings which will facilitate development of a new/improved product, process for the benefit of the society.

B.Tech projects should be socially relevant and research oriented ones. Student is expected to do an individual project or in group of 3 members. The project work is carried out in two phases – Minor Project in VI semester and Major Project in VII semester. Major project of the project work shall be in continuation of Minor Project only.

This is expected to provide a good initiation for the student(s) in R&D work. The assignment to normally include:

1. Survey and study of published literature on the assigned topic;
2. Working out a preliminary Approach to the Problem relating to the assigned topic;
3. Conducting preliminary Analysis/Modelling/Simulation/Experiment/Design/Feasibility;
4. Preparing a Written Report on the Study conducted for presentation to the Department;
5. Final Seminar, as oral Presentation before a departmental committee.

At the completion of a project the student will submit a project report, which will be evaluated (end semester assessment) by duly appointed examiner(s). This evaluation will be based on the project report and a viva voce examination on the project. Student will be allowed to appear in the final viva voce examination only if he / she has submitted his / her project work in the form of paper for presentation / publication in a conference / journal and produced the proof of acknowledgement of receipt of paper from the organizers / publishers.

4 th Year

SEMESTER – VII

EC-401 C	Smart Grid Technology	L T P	Cr
		3 0 0	3

Course Objectives:

- To introduce students about the challenging issues and architecture of smart grid
- To give exposure to the students about the communication and wide area monitoring in smart grid
- To introduce the implementation of the control in computational intelligence and security issues in smart grid and the role of Power electronics and energy storage in smart grid

Course Outcomes: At the end of this course, students will demonstrate the ability to

1. Understand the challenging issues and architecture of smart grid
2. Understand the communication and wide area monitoring in smart grid
3. Rudimentary energy management issues in smart grid
4. Acquire the knowledge in computational intelligence and security issues in smart grid
5. Know the role of Power electronics and energy storage in smart grid

Unit-1

The smart grid: Introduction – Necessity of smart grid – Definition – Early smart grid initiatives – overview of the technologies required for the smart grid-Information and communication technologies, Sensing measurement, control and automation technologies, Power electronics and energy storage.

Unit-2

Data communication: Introduction – dedicated and shared communication channels – switching techniques – communication channels- layered architecture and protocols;
Communication technologies for the smart grid: Introduction –communication technologies – standards for information exchange.

Unit-3

Information Security for the smart grid: Introduction – Encryption and Decryption: Symmetric Key encryption, Public key encryption - Authentication – Digital signature: Secret key signature, Public key signature, Message digest – cyber security standards.

Unit-4

Smart metering and demand side integration: Introduction – smart metering – smart meters – Communication infrastructure and protocols for smart metering - Demand side integration.

Unit-5

Introduction to smart grid applications: Introduction – voltage and VAR control and optimization – fault detection, isolation and restoration (FDIR) – Demand response (DR) – Distributed energy resources (DERs) – wide area monitoring, control and protection (WAMCP).

Text Books:

1. "Smart Grid: Technology and Applications" by Janaka Ekanayake , Kithsiri Liyanage , Jianzhong Wu , Nick Jenkins – John Wiley & sons Limited ; 2012 first Edition.
2. "Smart Grid: Applications, communication and security" by Lars T. Berger and Krzysztof Iniewski - John Wiley & sons Limited; 2012 first Edition.

Reference Books:

1. "Smart grid: Fundamental of Design and analysis" by James Momoh "John Wiley & sons Limited IEEE Press, 2012.

EC-403C	Electronics System Design	L T P	CR
		3 0 0	3

Course Objectives:
The course treats different aspects of printed circuit boards in electronic system design with the aim that the student should learn to design, simulate and assemble an electronic system and analyze the influence of interconnects at different levels on the performance of electronic systems

Course Outcomes
At the end of the course, the student should be able to:
CO1 explain and apply basic principles and guidelines for physical architectural design for complex electronic systems from the level printed circuit boards (PCB) to higher levels
CO2 design PCBs considering signal integrity and impedance matching
CO3 analyse and budget system noise
CO4 design power distribution and analyse noise related to power supply
CO5 design impedance matching networks for electronic systems for radio frequency

UNIT-I Design of Power supply system: Unregulated D.C. power supply system with rectifiers and filters. Design of emitter follower regulator, series regulators, overload protection circuits for regulators. Design of SMPS: Step up and step down.

UNIT-II Design of class A small signal amplifiers: Emitter follower, Darlington pair amplifiers with and without Bootstrapping, Two stage direct coupled amplifier. Design of class A, Class AB audio power amplifier with drivers.

UNIT III: Design of sinusoidal oscillators: OPAMP based Wein bridge and Phase Shift oscillators with AGC circuits, Transistor based Hartley, Colpits and Crystal oscillators, Evaluation of figure of merit for all above oscillator circuits.

UNIT IV: Design of constant current sources, Design of function generators, Design of tuned amplifiers. Design of Butterworth, Chebyshev filters upto sixth order with VCVS and IGMF configuration.

BOOKS :

1. Regulated Power supply Handbook. Texas Instruments.

2. Electronics : BJT's, FETS and Microcircuits – Anielo.

3. Monograph on Electronic circuit Design : Goyal & Khetan.

EC-417C	Energy Harvesting Technologies & Power Management for IOT devices	L T P	CR
		3 0 0	3

Course Objectives:
1 Understanding the various energy sources and Energy harvesting based sensor network
2 Learn about the various piezoelectric materials and non linear techniques
3 Learn various power sources of WSN
4 Learn about the application of WSN

Course Outcomes:
At the end of the course, the student should be able to:
CO1 Understand the techniques used in Energy Harvesting
CO2 Undersatnd various power sources of WSN
CO3 Undestand the application of piezo materials
CO4 Understand the application of Bio MEMS
CO5 Develop system model for Energy harvesting

UNIT I – ENERGY HARVESTING SYSTEMS
Introduction – Energy sources – energy harvesting based sensor networks – photovoltaic cell technologies – generation of electric power in semiconductor PV cells – types

UNIT II - PIEZO-ELECTRIC ENERGY HARVESTING AND ELECTROMECHANICAL MODELING
Piezoelectric materials – transducers – harvesters – microgenerators – strategies for enhancing the performance of energy harvesters. Electromechanical modeling of Lumped parameter model and coupled distributed parameter models and closed-form solutions

UNIT III- ELECTROMAGNETIC ENERGY HARVESTING AND NON-LINEAR TECHNIQUES
Basic principles – micro fabricated coils and magnetic materials – scaling – power maximations – micro and macro scale implementations. Non-linear techniques – vibration control & steady state cases

UNIT IV- ENERGY HARVESTING WIRELESS SENSORS
Power sources for WSN – Power generation – conversion – examples – case studies. Harvesting micro electronic circuits – power conditioning and losses

UNIT V - SELECTED APPLICATIONS OF ENERGY HARVESTING SYSTEMS
Case studies for Implanted medical devices – Bio-MEMS based applications – harvesting for RF sensors and ID tags – powering wireless SHM sensor nodes

REFERENCES
1. Carlos Manuel Ferreira Carvalho, Nuno Filipe Silva VeríssimoPaulino, “CMOS Indoor Light Energy Harvesting System for Wireless Sensing Applications”, springer
2. Danick Briand, Eric Yeatman, Shad Roundy ,“Micro Energy Harvesting”

EC-423C	IoT Using RFID and Microcontroller	L T P	CR
		3 0 0	3

Course objective

1. To learn the basics of RFID and 8051 microcontrollers
2. Interfacing RFID with microcontrollers
3. To develop real time applications based on microcontrollers
4. Analyze different case studies.

UNIT 1 BAR CODES AND RFID Bar codes and RFID basics- Components of an RFID system-Data -Tags-Antennas Connectors- Cables- Readers- encoder/ printers for smart labels- Controllers software- RFID advantages over Bar codes.

UNIT 2 – MICROCONTROLLERS Intel 8051 - architecture- memory organization- special function registers- timing and control- port operation- memory interfacing - I/O interfacing- Programming the 8051 resources- interrupts- Measurement of frequency, period and pulse width of a signal power down operation.

UNIT-3 INTEL 8051 MICROCONTROLLER- INSTRUCTION SET AND PROGRAMMING Programmers model of Intel-Operand types- Operand addressing- Data transfer instructions- Arithmetic Instructions - Logic instructions- Control transfer instructions.- 8051 Interfacing and applications.

UNIT-4 - RFID APPLICATIONS Short range RFID applications- access control - personal identification - Transportation ticketing- blood, tissue and organ identification- fleet management personal identification- car body production-passport security. Long range RFID applications- supply chain management- Mail and shipping- Clothing Tags.

UNIT -5 - CASE STUDIES Reading RFID cards using 8051- RFID in the supply chain- Vehicles parking using RFID- library management system- electronic toll payment- smart shipping containers fleet monitoring and management

REFERENCES

1. Dennis E. Brown, "RFID implementation" Tata McGraw - Hill, 2007
2. Steven Shepard, "RFID: Radio frequency and Identification", Tata McGraw - Hill.
3. Ajit Pal, "Microcontrollers- principles and applications", Prentice hall of India, 2011
4. Krishna Kant. "Microprocessors and Microcontrollers", Prentice hall of India,2011
5. www.circuitstoday.com/interfacing-rfid-module-to-8051

EC-425C	Satellite communication	L T P	CR
		0 0 2	1

OBJECTIVE

The course aims to provide a comprehensive understanding of satellite communication to perform and verify link budget equations. It also discusses the modulation and multiplexing techniques for satellite, link and application areas of the satellite.

COURSE OUTCOMES

CO1.Explain the orbits of satellites, satellite mechanism, satellite hardware and Earth station design.
CO2. Describe the concepts of signal propagation effects, frequency and noise considerations, which affect satellite link design.
CO3. Investigate various multiple access techniques used for satellite communication.
CO4. Describe the fundamentals underlying the operation of VSAT systems and MSAT
CO5.Learn the satellite link design

1. **PRINCIPLES OF SATELLITE COMMUNICATION:**

Evolution and growth of communication satellite; Synchronous satellite; Satellite frequency allocation and Band spectrum; Advantages of satellite communication; Active and Passive satellite; Modem and Codec. Applications of satellite communication.

2. **COMMUNICATION SATELLITE LINK DESIGN:**

Introduction; General link design equations; System noise temperature; C/N and G/T ratio; Atmospheric and Ionospheric effects on link design; Complete link design; Earth station parameters.

ANALOG SATELLITE COMMUNICATION:

Introduction; Baseband analog(Voice) signal; FDM techniques; S/N and C/N ratio in frequency modulation in satellite link; S/N ratio in FM with multiplexed telephone signal in satellite link; Single channel per carrier(SCPC) systems; Companded single sideband (CSSB) systems; Analog FM/FDM TV satellite link; Intermodulation products and their effects in FM/FDM systems; Energy disposal in FM/FDM systems.

3. **DIGITAL SATELLITE COMMUNICATION:**

Advantages of digital communication; Elements of digital satellite communication systems; Digital baseband signals; Digital modulation techniques; Satellite digital link design; Time Division Multiplexing.

MULTIPLE ACCESS TECHNIQUES:

Introduction; TDMA; TDMA-Frame structure; TDMA-Burst structure; TDMA-Frame efficiency; TDMA super frame; TDMA-Frame acquisition and Synchronization; TDMA compared to FDMA; TDMA Burst Time Plan; Multiple Beam (Satellite switched) TDMA satellite system; Beam Hopping (Transponder Hopping) TDMA; CDMA and hybrid access techniques.

4. **SATELLITE ORBITS:**

Introduction; Synchronous orbit; Orbital parameters; Satellite location with respect to earth; Look angles; Earth coverage and slant range; Eclipse effect; Satellite placement in geostationary orbit; station keeping; Satellite stabilization.

5. **SPECIAL PURPOSE COMMUNICATION SATELLITES:**

BDS; INMARSAT; INTELSAT; VSAT (data broadband satellite); MSAT (Mobile Satellite Communication technique); Sarsat (Search and Rescue satellite) and LEOs (Lower earth orbit satellite); Satellite communication with respect to Fiber Optic Communication; LANDSAT; Defense satellite.

TEXT BOOK

Aggarwal, D.C., ”Satellite Communication”, Khanna, 5th Edition, 2001.

REFERENCE BOOK

1. Gagliardi, ”Satellite Communication”, 4th Edition,CBS Publications, 2003.
2. Roddy, ”Satellite Communication” 5th Edition, Tata McGraw Hill, 2006.

EC-453C	Electronics System Design Lab	L T P	CR
		0 0 2	1

Objectives:
To understand the design procedure of different power supplies.
To know to design trans receiver and voltage regulator.
To understand the working of Microprocessor and DSP based system design

Course Outcomes:
At the end of the course, the student should be able to:
CO1 Design different forms of power supply.
CO2 Design Voltage regulators
CO3 AM/FM trans receiver.
CO4 Know the design procedure of Instrumentation amplifier and Digital Indicator.
CO5 Understand the working of modems and timers.

Part A:
1. OP AMP Applications – Adder, Subtractor, Comparator Circuits.
2. Active Filter Applications – LPF, HPF (first order)
3. Function Generator using OP AMPs.
4. IC 555 Timer – Monostable and Astable Operation Circuit.
5. IC 566 – VCO Applications.
6. Voltage Regulator using IC 723.
7. 4 bit DAC using OP AMP.

Part B: Simulate the internal structure of the following Digital IC's using VHDL / VERILOG and verify the operations of the Digital IC's (Hardware) in the Laboratory

1. D Flip-Flop 7474
2. Decade counter-7490
3. shift registers-7495 7
4. 3-8 Decoder -74138
5. 4 bit Comparator-7485
6. 8 x 1 Multiplexer -74151 and 2x4 Demultiplexer-74155
7. RAM (16x4)-74189 (Read and Write operations)

Equipment required for Laboratories:

1. RPS
2. CRO, Function Generator
3. Multi Meters, Bread Boards
4. IC Trainer Kits (Optional)
5. Components:- IC741, IC555, IC566, IC1496, IC723, 7805, 7809, 7912 and other essential components.
6. Analog IC Tester

For Software Simulation

1 Computer Systems
2 LAN Connection (Optional)
3 Operating Systems
4 VHDL/ VERILOG
5 FPGAS/CPLDS (Download Tools)

EC-473C	IoT Using RFID and Microcontroller Lab	L T P	CR
		0 0 2	1

Course Objectives:
1 To learn programing of Arduino board
2 To learn website designing and publishing
3 To design Home automation system

Course Outcomes
At the end of the course, the student should be able to:
CO1 Program the Arduino Board
CO2 host website
CO3 deal with gas Sensor
CO4 learn Interfacing of LCD display with Arduino
CO5 design home automation projects

List of Experiments
1 Design an application to update the sensed value to a HTTP webpage using node -RED on IBM Cloud.
2 Assignment of IPV4 address; perform a ping operation to the PC.
3 Simulate & Write a program to blinks pin 13 of the Arduino.
4 Write a program to control the rotation of servo motor using Arduino.
5 Interfacing Temperature sensor with Arduino.
6 Interfacing of 16 *2 LCD Display with Arduino UNO.
7 Temperature Data logger using ESP 8266 & LM35 & monitoring using thing speak IOT server.
8 Interfacing of Gas sensor MQ 2 with Arduino UNO.
9 Interfacing of Moisture sensor with Arduino UNO.
10 Use an Arduino & an Ultrasonic sensor to make a door Alarm.

EC-475C	Satellite Communication Lab	L T P	CR
		0 0 2	1

Course Objectives:

1. This course will introduce the basic concepts and techniques of Satellite communication and frequency allocations.
2. The course emphasizes intuitive understanding and practical implementations of the theoretical concepts.
3. To produce graduates who understand how to analyze and manipulate digital signals and to determine the orbital issues to have the fundamental knowledge to do so, for navigation and GPS

Course Outcomes

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

CO1 Able to obtain different types of satellites
CO2 Ability to calculate the orbital determination and launching methods
CO3 Ability to develop commands, monitoring power systems and developments of antennas.
CO4 Able to calculate multiple access techniques like TDMA, CDMA, FDMA,DAMA.
CO5 Able to design antennas to provide Uplink and Down link Frequency.

List of Experiments

1 To set up a satellite communication link and study of change in uplink and downlink frequency
2 To establish an Audio-Video satellite link between Transmitter and Receiver
3 To Study Frequency Hopping Spread Spectrum (FHSS) Modulation and Demodulation Technique
4 To study generation & demodulation of DSSS modulated signal.
5 To study radiation pattern of Yagi- uda & folded dipole antenna
6 To study radiation pattern for circular & triangular patch antenna
7 Study of Data and PN Sequence Generation
8 To study GPS data like longitude, latitude using GPS receiver
9 Study of Minimum Shift Keying (MSK) Modulation Process

EC-491C	Major Project	L T P	Cr
		0-0-8	4

OBJECTIVE

The project involves in-depth study on the topic, design, development, analysis fabrication and/or experimental work – Hardware and/or Software. It is intended to give an opportunity to a student to apply his knowledge to solve real-life problem. The student has to select a project work based on a topic of interest.

OPERATION

Major Project shall comprise of Phase-I and Phase II, spread over Semester VI and VII respectively. The students may work jointly (small group) or individually. The project work is to enable the student to take up investigative study in the broad field of Electronics & Communication Engineering, either fully theoretical/practical or involving both theoretical and practical work under the guidance of a Supervisor. This is expected to provide a good initiation for the students in R&D work.

4th Year

SEMESTER – VIII

EC-402D	Network Security	L T P	CR
		3 0 0	3

OBJECTIVES

1. To understand the number theory used for network security
2. To understand the design concept of cryptography and authentication
3. To understand the design concepts of internet security
4. To develop experiments on algorithm used for security

UNIT I – CONVENTIONAL AND MODERN ENCRYPTION Model of network security – Security attacks, services and attacks – OSI security architecture – Classical encryption techniques – SDES – Block cipher PrinciplesDES – Strength of DES – Block cipher design principles – Block cipher mode of operation – Evaluation criteria for AES – RC4 - Differential and linear cryptanalysis – Placement of encryption function – traffic confidentiality.

UNIT II – PUBLIC KEY ENCRYPTION Number Theory – Prime number – Modular arithmetic – Euclid's algorithm - Fermet's and Euler's theorem – Primality – Chinese remainder theorem – Discrete logarithm – Public key cryptography and RSA – Key distribution – Key management – Diffie Hellman key exchange – Elliptic curve cryptography.

UNIT III – AUTHENTICATION Authentication requirement – Authentication function – MAC – Hash function – Security of hash function and MAC – SHA - HMAC – CMAC - Digital signature and authentication protocols – DSS.

UNIT IV – SECURITY PRACTICE Authentication applications – Kerberos – X.509 Authentication services - E-mail security – IP security - Web security

UNIT V – SYSTEM SECURITY Intruder – Intrusion detection system – Virus and related threats – Countermeasures – Firewalls design principles – Trusted systems – Practical implementation of cryptography and security

TEXT/REFERENCE BOOKS

1. William Stallings, "Cryptography & Network Security", Pearson Education, Fourth Edition 2010.
2. Charlie Kaufman, Radia Perlman, Mike Speciner, "Network Security, Private communication in public world", PHI Second Edition, 2002.
3.Bruce Schneier, Neils Ferguson, "Practical Cryptography", Wiley Dreamtech India Pvt Ltd, First Edition, 2003.
4. Douglas R Simson "Cryptography – Theory and practice", CRC Press, First Edition, 1995.
5. www.williamstallings.com/Security2e.html 5. www.ocw.mit.edu/OcwWeb/Electrical-Engineering-and-Computer-Science/ 6857Fall2003/Course Home /index.html

EC-404D	Telecommunication Switching Method	L T P	CR
		3 0 0	3

Unit-1 Introduction: Evolution of Telecommunications, Simple Telephone Communication, Manual switching system, major telecommunication Networks, Strowger Switching System, Crossbar Switching
Electronic Space Division Switching: Stored Program Control, Centralized SPC, Distributed SPC, Enhanced Services, Two stage networks, Three stage network n-stage networks.

Unit-2 Time Division Switching: Time multiplexed Space Switching, Time Multiplexed time switching, combination Switching, Three stage combination switching, n-stage combination switching. Traffic Engineering: Network Traffic load and parameters, Grade of service and blocking probability, Modeling Switching Systems, Incoming Traffic and Service Time Characterization, Blocking Models and Loss Estimates, Delay systems

Unit-3 Telephone Networks: Subscriber Loop Systems, Switching Hierarchy and Routing, Transmission Plan, Transmission Systems, Numbering Plan, Charging Plan, Signaling Techniques, In channel signaling, common channel signaling, Cellular mobile telephony.

Unit-4 Data networks: Block Diagram, features, working of EPABX Systems, Data transmission in PSTNs, Data Rates in PSTNs, Modems, Switching Techniques for data Transmission, Circuit Switching, Store and Forward Switching Data communication Architecture, ISO-OSI Reference Model, Link to Link Layers, Physical Layer, Data Link Layer, Network Layer, End to End layers, Transport Layer, Session Layer, Presentation Layer, Satellite based data networks, LAN, Metropolitan Area network, Fiber optic networks, and Data network standards

Unit-5 Integrated Services Digital Networks: Motivation for ISDN, New services, Network and Protocol architecture, Transmission Channels, User Network Interface, signalling, Numbering and Addressing, Service characterization, Interworking ,ISDN standards, Broadband ISDN ,Voice data Integration.

EC-406D	Big Data Analysis	L T P	CR
		3 0 0	3

COURSE OBJECTIVES :

Understand the Big Data Platform and its Use cases Provide an overview of Apache Hadoop

• Provide HDFS Concepts and Interfacing with HDFS

• Understand Map Reduce Jobs • Provide hands on Hodoop Eco System

• Apply analytics on Structured, Unstructured Data.

• Exposure to Data Analytics with R.

COURSE OUTCOMES:

The students will be able to:

• Identify Big Data and its Business Implications.

• List the components of Hadoop and Hadoop Eco-System

• Access and Process Data on Distributed File System

• Manage Job Execution in Hadoop Environment

• Develop Big Data Solutions using Hadoop Eco System

• Analyze Infosphere BigInsights Big Data Recommendations.

• Apply Machine Learning Techniques using R.

Pre- requisites : Should have knowledge of one Programming Language (Java preferably), Practice of SQL (queries and sub queries), exposure to Linux Environment.

UNIT I : INTRODUCTION TO BIG DATA AND HADOOP Types of Digital Data, Introduction to Big Data, Big Data Analytics, History of Hadoop, Apache Hadoop, Analysing Data with Unix tools, Analysing Data with Hadoop, Hadoop Streaming, Hadoop Echo System, IBM Big Data Strategy, Introduction to Infosphere BigInsights and Big Sheets.

UNIT II : HDFS(Hadoop Distributed File System) The Design of HDFS, HDFS Concepts, Command Line Interface, Hadoop file system interfaces, Data flow, Data Ingest with Flume and Scoop and Hadoop archives, Hadoop I/O: Compression, Serialization, Avro and File-Based Data structures.

UNIT III : Map Reduce Anatomy of a Map Reduce Job Run, Failures, Job Scheduling, Shuffle and Sort, Task Execution, Map Reduce Types and Formats, Map Reduce Features.

Unit IV : Hadoop Eco System Pig : Introduction to PIG, Execution Modes of Pig, Comparison of Pig with Databases, Grunt, Pig Latin, User Defined Functions, Data Processing operators. Hive : Hive Shell, Hive Services, Hive Metastore, Comparison with Traditional Databases, HiveQL, Tables, Querying Data and User Defined Functions. Hbase : HBasics, Concepts, Clients, Example, Hbase Versus RDBMS. Big SQL : Introduction

UNIT V : Data Analytics with R Machine Learning : Introduction, Supervised Learning, Unsupervised Learning, Collaborative Filtering. Big Data Analytics with BigR.

Text Books

• Tom White " Hadoop: The Definitive Guide" Third Edit on, O'reily Media, 2012
. • Seema Acharya, Subhasini Chellappan, "Big Data Analytics" Wiley 2015. References
• Michael Berthold, David J. Hand, "Intelligent Data Analysis", Springer, 2007.
• Jay Liebowitz, "Big Data and Business Analytics" Auerbach Publications, CRC press (2013)
• Tom Plunkett, Mark Hornick, "Using R to Unlock the Value of Big Data: Big Data Analytics with Oracle R Enterprise and Oracle R Connector for Hadoop", McGraw-Hill/Osborne Media (2013), Oracle press.
• Anand Rajaraman and Jef rey David Ulman, "Mining of Massive Datasets", Cambridge University Press, 2012.
• Bill Franks, "Taming the Big Data Tidal Wave: Finding Opportunities in Huge Data Streams with Advanced Analytics", John Wiley & sons, 2012.
• Glen J. Myat, "Making Sense of Data", John Wiley & Sons, 2007
• Pete Warden, "Big Data Glossary", O'Reily, 2011.
• Michael Mineli, Michele Chambers, Ambiga Dhiraj, "Big Data, Big Analytics: Emerging Business Intelligence and Analytic Trends for Today's Businesses", Wiley Publications, 2013.
• ArvindSathi, "BigDataAnalytics: Disruptive Technologies for Changing the Game", MC Press, 2012 • Paul Zikopoulos ,Dirk DeRoos , Krishnan Parasuraman , Thomas Deutsch , James Giles , David Corigan , "Harness the Power of Big Data The IBM Big Data Platform ", Tata McGraw Hill Publications, 2012..

EC-408D	INDUSTRY 4.0 and INDUSTRIAL INTERNET OF THINGS	L T P	CR
		3 0 0	3

Unit-1 – INDUSTRY 4.0 Cyber Physical Systems and Next Generation Sensors, Collaborative Platform and Product Lifecycle Management, Augmented Reality and Virtual Reality, Artifical Intelligence, Big Data and Advanced Analysis

Unit-2 – INDUSTRIAL IoT IIoT-Introduction, Industrial IoT: Business Model and Referece Architecture: IIoT-Business Models, Industrial IoT- Layers: IIoT Sensing, IIoT Processing, IIoT Communication, IIoT Networking

Unit-3 – IIoT ANALYTICS Big Data Analytics and Software Defined Networks, Machine Learning and Data Science, Julia Programming, Data Management with Hadoop.

Unit-4 MODULE 4 – IoT SECURITY Industrial IoT: Security and Fog Computing - Cloud Computing in IIoT, Fog Computing in IIoT, Security in IIoT

Unit-5 – CASE STUDY Industrial IoT- Application Domains: Oil, chemical and pharmaceutical industry, Applications of UAVs in Industries, Real case studies: Milk Processing and Packaging Industries, Manufacturing Industries

Text Book :

1. Industry 4.0: The Industrial Internet of Things", by Alasdair Gilchrist (Apress), 2017
2. "Industrial Internet of Things: Cybermanufacturing Systems"by Sabina Jeschke, Christian Brecher, Houbing Song, Danda B. Rawat (Springer), 2017

REFERENCE BOOKS

Hands-On Industrial Internet of Things: Create a powerful Industrial IoT by Giacomo Veneri, Antonio Capasso, Packt, 2018

EC-410D	Deep Learning	L T P	CR
		3 0 0	3

UNIT-1 Introduction Feedforward Neural networks. Gradient descent and the backpropagation algorithm. Unit saturation, aka the vanishing gradient problem, and ways to mitigate it. RelU Heuristics for avoiding bad local minima. Heuristics for faster training. Nestors accelerated gradient descent. Regularization. Dropout.

UNIT-2 Convolutional Neural Networks Architectures, convolution / pooling layers Recurrent Neural Networks LSTM, GRU, Encoder Decoder architectures Deep Unsupervised Learning Autoencoders (standard, sparse, denoising, contractive, etc), Variational Autoencoders, Adversarial Generative Networks, Autoencoder and DBM Attention and memory models,

UNIT-3 Dynamic memory networks Applications of Deep Learning to Computer Vision Image segmentation, object detection, automatic image captioning, Image generation with Generative adversarial networks, video to text with LSTM models. Attention models for computer vision tasks. Applications of Deep Learning to NLP: Introduction to NLP and

UNIT-4 Vector Space Model of Semantics) Word Vector Representations: Continuous Skip-Gram Model, Continuous Bag-ofWords model (CBOW), Glove, Evaluations and Applications in word similarity, analogy reasoning Named Entity Recognition, Opinion Mining using Recurrent Neural Networks Parsing and Sentiment Analysis using Recursive Neural Networks

UNIT-5 Sentence Classification using Convolutional Neural Networks Dialogue Generation with LSTMs Applications of Dynamic Memory Networks in NLP Recent Research in NLP using Deep Learning: Factoid Question Answering, similar question detection, Dialogue topic tracking, Neural Summarization, Smart Reply

Reference Books and Papers:

Bengio, Yoshua, Ian J. Goodfellow, and Aaron Courville. "Deep learning." An MIT Press book in preparation. (2015).

Bengio, Yoshua. "Learning deep architectures for AI." Foundations and trends in Machine Learning 2.1 (2009): 1127. Hochreiter, Sepp, and Jargen Schmidhuber. "Long short-term memory." Neural computation 9.8 (1997): 17351780.

Oquab, Maxime, et al. "Learning and transferring midlevel image representations using convolutional neural networks." Proceedings of the IEEE conference on computer vision and pattern recognition. 2014.

Bengio, Yoshua, et al. "A neural probabilistic language model." journal of machine learning research 3.Feb (2003). Collobert, Ronan, et al. "Natural language processing (almost) from scratch." Journal of Machine Learning Research 12.Aug (2011): 2493-2537.

Mikolov, Tomas, et al. "Efficient estimation of word representations in vector space." arXiv preprint arXiv:1301.3781 (2013).

Pennington, Jeffrey, Richard Socher, and Christopher D. Manning. "Glove: Global Vectors for Word Representation." EMNLP. Vol. 14. 2014.

Kim, Yoon. "Convolutional neural networks for sentence classification." EMNLP (2014).
Oquab, Maxime, et al. "Learning and transferring mid-level image representations using convolutional neural networks." Proceedings of the IEEE conference on computer vision and pattern recognition. 2014.

Kumar, Ankit, et al. "Ask me anything: Dynamic memory networks for natural language processing." arXiv preprint arXiv:1506.07285 (2015).

Sutskever, Ilya, Oriol Vinyals, and Quoc V. Le. "Sequence to sequence learning with neural networks." Advances in neural information processing systems. 2014.

Kalchbrenner, Nal, Edward Grefenstette, and Phil Blunsom. "A convolutional neural network for modelling sentences." ACL (2014).

Socher, Richard, et al. "Recursive deep models for semantic compositionality over a sentiment treebank." Proceedings of the conference on empirical methods in natural language processing (EMNLP). Vol. 1631. 2013.

Socher, Richard, et al. "Parsing with Compositional Vector Grammars." ACL. 2013.

Abadi, Martın, et al. "Tensorflow: Large-scale machine learning on heterogeneous distributed systems." arXiv preprint arXiv:1603.04467 (2016)

EC-412D	Wireless Sensor Network	L T P	CR
		3 0 0	3

UNIT I – FUNDAMENTALS OF SENSOR NETWORKS Introduction to computer and wireless sensor networks and Overview of the syllabus Motivation for a network of Wireless Sensor nodes- Sensing and sensors-challenges and constraints - node architecture-sensing subsystem, processor subsystem communication interfaces- prototypes, Application of Wireless sensors- Introduction of Tiny OS Programming and TOSSIM Simulator.

UNIT II - COMMUNICATION CHARACTERISTICS AND DEPLOYMENT MECHANISMS (15 hours) Wireless Transmission Technology and systems-Radio Technology Primer-Available Wireless Technologies - Hardware- Telosb, Micaz motes- Time Synchronization Clock and the Synchronization Problem - Basics of time synchronization-Time synchronization protocols - Localization- Ranging Techniques- Range based Localization-Range Free Localization- Event driven Localization

UNIT III - MAC LAYER (15 hours) Overview-Wireless Mac Protocols-Characteristics of MAC protocols in Sensor networks – Contention free MAC Protocols- characteristics- Traffic Adaptive Medium Access-Y-MAC, Low energy Adaptive Clustering - Contention based MAC Protocols Power Aware Multi-Access with signaling, Sensor MAC-Timeout MAC-Data gathering MAC- Case study –Implementation and Analysis of MAC player protocol in TinyOS.

UNIT IV - ROUTING IN WIRELESS SENSOR NETWORKS Design Issues in WSN routing- Data Dissemination and Gathering-Routing Challenges in WSN - Flooding-Flat Based Routing – SAR, Directed Diffusion, Hierarchical Routing- LEACH, PEGASIS - Query Based Routing- Negotiation Based Routing Geographical Based Routing- Transport layer-Transport protocol Design issues Performance of Transport Control Protocols.

UNIT V - MIDDLEWARE AND SECURITY ISSUES WSN middleware principles-Middleware architecture-Existing middleware - operating systems for wireless sensor networks-performance and traffic management - Fundamentals of network security-challenges and attacks - Protocols and mechanisms for security.

REFERENCES

1. Waltenegus Dargie, Christian Poellabauer , “Fundamentals of Wireless Sensor Networks, Theory and Practice”, Wiley Series on wireless Communication and Mobile Computing, 2011
2. Kazem Sohraby, Daniel manoli , “Wireless Sensor networks- Technology, Protocols and Applications”, Wiley InterScience Publications 2010.
3. Bhaskar Krishnamachari , “ Networking Wireless Sensors”, Cambridge University Press, 2005
4. C.S Raghavendra, Krishna M.Sivalingam, Taiebznati , “Wireless Sensor Networks”, Springer Science 2004.

EC-483C	Major Research Project	L T P	Cr
		0-0-32	16

Course Objective:-

- To enhance employ ability skills and become job ready along with real corporate exposure.
- To enhance students' knowledge in core study.
- To Increase self-confidence of students and helps in finding their own proficiency
- To cultivate student's leadership ability and responsibility to perform or execute the given task.
- To provide knowledge of a real job situation.

Course Outcomes:-

CO1. Capability to acquire and apply fundamental principles of engineering.
CO2. Become updated with all the latest changes in technological world
CO3. To be a multi-skilled engineer with good technical knowledge, management, leadership and entrepreneurship skills
CO4. Ability to identify, formulate and model problems and find engineering solution based on a systems approach
CO5. Awareness of the social, cultural, global and environmental responsibility as an engineer.
CO6. Capability and enthusiasm for self-improvement through continuous professional development and life-long learning

EC-484C	Seminar	L T P	Cr
		0-0-2	1

Course Outcomes:-

CO1. Learn to demonstrate awareness of the ethics involved in doing an internship
CO2 Learn to describe, analyze, and synthesize their learning experience in the internship in the form of presentation
CO3 Articulate new learning from the internship experience in the form of an oral presentation.
CO4 Learn to present understanding and assess the challenges carrying out an internship CO5 Learn to demonstrate meaningful and practical experience in their 6month duration of real industrial training.