B.Tech

CURRICULUM and SYLLABUS-2015

Department of
Electrical and Electronics Engineering

KALASALINGAM UNIVERSITY
(Kalasalingam Academy of Research and Education)
Under sec.3 of UGC Ac,1956. Accredited by NAAC with 'A' Grade
Anand Nagar, Krishnankoil-626126,
Srivilliputtur (via), Virudhunagar (Dt), Tamilnadu, India.
www.kalasalingam.ac.in

KALASALINGAM UNIVERSITY

VISION

To be a Center of Excellence of International Repute in Education and Research.

MISSION

To Produce Technically Competent, Socially Committed Technocrats and Administrators through Quality Education and Research.

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

VISION

To become a centre of excellence in teaching and research in the field of Electrical and Electronics Engineering.

MISSION

To produce technically competent Electrical and Electronics Engineering graduates who are able to offer viable solutions to meet the energy security of the nation.
To provide opportunities and resources to carry out cutting edge research on energy systems.

Program Student Outcomes (PSOs):

PSO1 – **Engineering Knowledge:** Apply the knowledge of Mathematics, Science, Engineering fundamentals and Electrical and Electronics Engineering to the solution of complex problems in engineering

PSO2 – **Problem analysis:** Identify, formulate and analyze the complex problems in Electrical and Electronics Engineering using first principles of mathematics, science and Engineering to derive conclusions.

PSO3 – **Design/development of solutions:** Design and development of Electrical and Electronics products/Systems that meets specified needs with the consideration for the public health and safety, cultural, societal and environmental issues

PSO4 – **Conduct investigations of complex problems:** Analysis of complex problems in electrical apparatus and energy systems using research based knowledge and research methods to provide valid solutions.

PSO5 – **Modern Tool Usage:** Apply appropriate tools and techniques for the modelling and analysis of Electrical and Electronics devices and systems.

PSO6 – **The Engineer and Society:** Apply Knowledge gained to assess societal, safety and cultural issues relevant to the professional engineering practice.

PSO7 – **Environment and Sustainability:** Understand the impact of solutions in electrical engineering field in societal and environmental contexts and demonstrate the importance of sustainable development

PSO8 – **Ethics:** Apply ethical principles and professional responsibilities in electrical and electronics engineering practice.

PSO9 – **Individual and Team Work:** Ability to function as an individual and as a member or leader in diverse teams in the multidisciplinary environment.

PSO10 – **Communication:** Ability to communicate effectively with the engineering community and society on complex engineering activities.

PSO11 – **Project Management and Finance:** Ability to apply the knowledge of engineering and management principles to implant the projects in multidisciplinary environment.

PSO12 – **Life-long learning:** Ability to recognize the need for and engage in life-long learning.

PSO13– Analysis & Solution of complex problems in Electrical & Electronics Engineering using modern tools.

PSO14– Design and Development of Electrical & Electronics products /systems that meets specified needs.

PSO15– Understand and demonstrate the importance of sustainable energy development.

Program Educational Objectives:

PEO1: Pursue higher studies or be employed in Electrical and Electronics Engineering or related disciplines.

PEO2: Be a successful entrepreneur in creating jobs related to Electrical and Electronics Engineering or related engineering fields.

PEO3: Promote ethics, sustainability and environmental responsibility in their practice.

Students Outcomes:

ASO1 – An ability to identify, formulate, and solves complex engineering problems by applying principles of engineering, science, and mathematics.

ASO2 – An ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors.

ASO3 – An ability to communicate effectively with a range of audiences.

ASO4 – An ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts.

ASO5 – An ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives.

ASO6 – An ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions.

ASO7 – An ability to acquire and apply new knowledge as needed, using appropriate learning strategies.

CURRICULUM STRUCTURE

S.No	Category		Credits
I	Basic Science and Mathematics		31
II	Humanities and Social Science	4	16
	Soft Skills	3	
	Humanities Elective	9	
III	Basic Engineering		17
IV	**Program Core**		99
	a) Core Courses	86	
	b) Community Service Project	3	
	c) Project Work	10	
V	**Elective Courses**		21
	a) Major Elective	15	
	b) Minor Elective	6	
Total Credits			**184**

Basic Science and Mathematics:

Course code	Course Name	L	T	P	C
CHY106	Chemistry	3	0	0	3
CHY182	Chemistry Laboratory	0	0	3	1
MAT103	Mathematics I	3	0	0	3
PHY131	Physics I	3	0	0	3
CHY102	Environmental Sciences	2	0	0	2
MAT104	Mathematics II	3	0	0	3
PHY132	Physics II	3	0	0	3
PHY183	Physics Laboratory	0	0	3	1

MAT202	Mathematics III	3	0	0	3
MAT211	Numerical Methods	3	0	0	3
XXXX	Free electives from Maths and Basic Sciences	3	0	0	3
XXXX	Free electives from Maths and Basic Sciences	3	0	0	3
Total Credits		29	0	6	31

Semester I:

Code	Subject	L	T	P	C
HSS101	English for technical communication I	2	0	0	2
MAT101	Mathematics I	3	0	0	3
PHY121	Engineering Physics-I	3	0	0	3
CHY106	Engineering Chemistry	3	0	0	3
CSE102/ MEC101	Programming Languages/Engineering Drawing	2	0	0	2
EEE101/ CIV101	Basic Electrical and Electronics Engineering/ Basic Civil and Mechanical Engineering	4	0	0	4
MEC181	Work Shop	0	0	3	1
CHY182	Chemistry Laboratory	0	0	3	1
Total		16	–	6	19

Semester II:

Code	Subject	L	T	P	C
HSS102	English for technical communication II	2	0	0	2
MAT102	Mathematics II	3	0	0	3
PHY122	Engineering Physics-II	3	0	0	3
EEE101/ CIV101	Basic Electrical and Electronics Engineering/ Basic Civil and Mechanical Engineering	4	0	0	4
CHY102	Environmental Sciences	2	0	0	2
CSE102/ MEC101	Programming Languages/Engineering Drawing	2	0	0	2
MEC103	Engineering Mechanics	3	0	0	3
HSS036	Soft skills-I	1	0	0	1
PHY182	Physics Laboratory	0	0	3	1
	Soft skills	1	0	0	0
CSE181	Programming Languages Laboratory	0	0	3	1
Total		19	–	6	22

Semester III:

Code	Subject	L	T	P	C
MAT201	Mathematics III	3	0	0	3
HSSXXX	Humanities Elective I	3	0	0	3
EEE201	Electromagnetic theory	3	1	0	4
EEE202	DC Machines and Transformers	3	1	0	4
EEE203	Electric Circuit Analysis*	3	1	0	4
ECE256	Electronic Devices and circuits	3	1	0	4
HSS037	Soft skills-II	1	0	0	1
EEE281	Machines Laboratory I	0	0	3	2
ECE296	Electronic devices and Circuits Laboratory**	0	0	3	2
	Total	18	4	6	27

Semester IV:

Code	Subject	L	T	P	C
MAT211	Numerical Methods	3	0	0	3
EEE204	Control Systems*	3	1	0	4
EEE205	AC Machines	3	1	0	4
ECE266	Digital Electronics	3	1	0	4
CSE206	Object Oriented Programming	3	1	0	4
EEE206	Measurements and Instrumentation	4	0	0	4
HSS038	Soft skills	1	0	0	1
EEE282	Machines Laboratory II**	0	0	3	2
CSE285	Object Oriented Programming Laboratory	0	0	3	2
Total		18	4	6	28

Semester V:

Code	Subject	L	T	P	C
EEEXXX	Major Elective I	3	0	0	3
	Minor Elective I	3	0	0	3
EEE301	Power Electronics	3	1	0	4
EEE302	Transmission and Distribution	3	1	0	4
EEE303	Linear Integrated Circuits	3	0	0	3
EEE304	Design of Electrical Apparatus	3	1	0	4
EEE381	Power Electronics Laboratory	0	0	3	2
EEE383	Digital Circuits and Integrated Circuits Laboratory**	0	0	3	2
EEE390	Community Service Project	0	0	2	1
Total		19	3	6	26

Semester VI:

Code	Subject	L	T	P	C
HSSXXX	Humanities Elective II	3	0	0	3
EEEXXX	Major Elective II	3	0	0	3
	Free Elective I	3	0	0	3
	Minor Elective-II	3	0	0	3
EEE305	Power System Analysis	3	1	0	4
EEE306	Microprocessor and Microcontroller	3	1	0	4
EEE382	Instrumentation and control Laboratory**	0	0	3	2
EEE384	Microprocessor and Microcontroller Laboratory	0	0	3	2
EEE391	Community Service Project	0	0	2	2
Total		18	3	6	26

Semester VII:

Code	Subject	L	T	P	C
HSSXXX	Humanities Elective III	3	0	0	3
	Free Elective II	3	0	0	3
EEEXXX	Major Elective III	3	0	0	3
EEEXXX	Major Elective IV	3	0	0	3
EEE401	Protection and Switch gear	3	0	0	3
EEE403	Power System Operation and Control	3	1	0	4
EEE481	Power System Simulation Laboratory	0	0	3	2
EEE482	Microcontroller based system design laboratory	0	0	3	2
Total		18	1	6	23

Semester VIII:

Code	Subject	L	T	P	C
	Self study Elective	3	0	0	3
EEE499	Project work Total	0	0	24	10
Total		3	0	24	13

MAJOR ELECTIVES:

Code	Subject	L	T	P	C
EEE307	High voltage engineering	3	1	0	4
EEE309	Control system design	3	1	0	4
EEE311	Network analysis and synthesis	3	0	0	3
EEE312	Special Electrical Machines	3	0	0	3
EEE313	Energy Management and Energy Audit	3	0	0	3
EEE314	Solar and Wind Energy Conversions	3	0	0	3
EEE366	Embedded systems	3	0	0	3
EEE402	Electric Drives	3	1	0	4
EEE404	HVDC and FACTS	3	0	0	3
EEE405	Power system dynamics	3	1	0	4
EEE406	Power system optimization	3	1	0	4
EEE407	Electric energy generation, Utilization and conservation	3	0	0	3
EEE408	Modern control theory	3	1	0	4
EEE409	Industrial automation	3	0	0	3
EEE410	Neural network and fuzzy logic*	3	0	0	3
EEE411	Digital Protection	3	0	0	3
EEE412	Virtual Instrumentation	3	0	0	3
EEE420	Power plant Engineering	3	0	0	3
EEE421	Smart Grid Technology	3	0	0	3
EEE422	Soft Computing Techniques	3	0	0	3

MINOR ELECTIVES:

Code	Subject	L	T	P	C
CSE207	Operating systems	3	0	0	3
CSE210	Computer architecture and organization	3	0	0	3
CSE306	Data communication and networks	3	0	0	3
CSE366	Visual languages and applications	3	0	0	3
CIV416	Disaster Management and Thermo Dynamics	3	0	0	3
ECE301	Digital signal processing	3	0	0	3
ECE356	Communication engineering	3	0	0	3
CSE404	Data Mining and Ware Housing	3	0	0	3
CSE414	Advanced Java Programming	3	0	0	3
ECE431	Wireless communication	3	0	0	3
EIE409	Bio–medical Instrumentation	3	0	0	3
EIE412	Optimal and adaptive control	3	0	0	3
EIE415	Micro controller based system design	3	0	0	3
EIE420	VLSI Design	3	0	0	3
MEC403	Mechatronics	3	0	0	3

HUMANITIES ELECTIVES:

Code	Subject	L	T	P	C
HSS001	Total Quality Management	3	0	0	3
HSS002	Engineering Management	3	0	0	3
HSS004	Industrial Psychology	3	0	0	3
HSS006	Professional Ethics	3	0	0	3
HSS014	Marketing Management	3	0	0	3
HSS015	Management Concepts and Techniques	3	0	0	3
HSS016	Organizational Psychology	3	0	0	3
HSS017	International Economics	3	0	0	3
HSS018	Communication Skills	3	0	0	3
HSS020	Human Resource Management	3	0	0	3
HSS023	Entrepreneurship Development	3	0	0	3

ON-LINE COURSES

1. Introduction to Electronics Systems Package
2. Introduction to Hybrid and Electric vehicles (offered by NPTEL)
3. Analog Integrated Circuit design

ONE-CREDIT COURSES

1. Energy Conservation and Energy Audit
2. Thermal Power Plant Commissioning
3. Smart meters & Advanced metering infrastructure
4. PCB Fabrication

THEORY SUBJECT WITH PRACTICAL COMPONENT (*)

1. Electric Circuit Analysis (EEE203)
2. Control Systems (EEE204)
3. Embedded System (ECE366)
4. Neural Network & Fuzzy Logic (EEE410)

LABORATORY COURSES WITH PROJECT (**)

1. Electronic Devices and Circuits Laboratory (ECE296)
2. Machines Laboratory II (EEE282)
3. Digital Circuits and Integrated Circuits Laboratory (EEE383)
4. Instrumentation & Control Laboratory (EEE382)

HSS101	ENGLISH FOR TECHNICALCOMMUNICATION I	L	T	P	C
		3	0	0	3

Course Outcomes:

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

CO1	:	Participate in Non-verbal communication
CO2	:	Enjoy Close reading—skimming and scanning
CO3	:	Frame simple sentences to express daily activities
CO4	:	Take notes when reading and listening lectures and media events and remember nuances of Note-making, the template of Notices, Advertisements, Graphs and Charts
CO5	:	Frame Instructions, Recommendations and Short Speeches and write Short stories, anecdotes, process description, etc..

CO and PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1					M				S	S		S			
CO2					S			M	S	S		S			
CO3					S	S			S	S		S			
CO4					S	S			S	S	M	S			
CO5					S				S	S	L	S			

UNIT I FOCUS ON LANGUAGE

Parts of speech - Nominal compounds, noun phrases - Relative pronoun -Adjective - numerical, comparison and contrast, collocation and word combinations - Verb - Preposition and relative - Conjunction- connectives, expressions of purpose and function, cause and effect - Articles - adjectives - Sentence pattern - Tenses - Voice - Rewriting the sentences in impersonal/abbreviated passive grammatical structures - Concord - sentence level verb noun agreement - Gerund - rewriting infinitive into gerund - Imperative - rewriting imperative into recommendation using should - Word formation - varied grammatical function of the same word - Affixes - prefix and suffix, number prefix, negative prefix - Reported speech - Editing strategies - Conditional structures - real, unreal, no possibility, zero condition - Writing formal definition - Abbreviation and acronym - Idioms and phrases - Varieties of English - British versus American.

UNIT II LISTENING SKILLS

Comprehension practice - Vocabulary development - Familiarity to varied types of spoken English and accents - Developing ability to understand audio and video media - Aiming at overcoming barriers to listening - Listening to documentaries, radio news broadcasts, TV news telecasts - Active listening in discussions and to lectures - Taking notes while listening - Extracting information from listening.

UNIT III SPEAKING SKILLS

Oral practice - Role play - Interplay - Seminar - Transcoding visual into oral - Participating in short and longer conversation - Voice record, replay, correction of intonation, pronunciation and flow of speech - Phonemes - vowels, consonants, stress, rhythm, intonation - Group discussion - Participative learning - Acquiring proficiency, fluency, accuracy in oral communication - Speaking practice - Developing confidence - Extempore speech -Learning professional/conversational etiquette.

UNIT IV READING SKILLS

Vocabulary Extension - Improving vocabulary - Intensive reading - Reading Strategies - identifying topic sentence - guessing meaning from content - picking out specific information - professional reading - Reading practice - Predicting the content, critical and analytical reading - Reading articles in English newspapers, sports magazines, encyclopedias - Reading aloud, use of stress and intonation - Reading and Comprehending technical materials - Cloze reading.

UNIT V WRITING SKILLS

Discourse Cohesion - Improving writing skills, avoiding common grammatical errors in academic writing - Extending the hints - Writing shorter sentences - Punctuation - Dialogue writing - Paragraph writing, problems and solutions, achieving coherence, transition words, sequence words - Essays of descriptive and argumentative - Writing instructions, use of imperatives - Jumbled sentences into sequential paragraph using linguistic clues - Report writing - technical reports, industry visit reports, events reports - Writing recommendations - Letter writing - formal and informal letters - job application and resume, permission for in-plant training, business correspondence letters, calling for quotation, placing order, lodging complaint, persuasive letters - Assignment writing - Mini-project - Transcoding - transferring of information from text to pictorial/graphical representation and vice versa.

TEXT BOOK

1. Rizvi M Ashraf, Effective Technical Communication, Tata McGraw-Hill, 2005.

REFERENCE BOOKS

1. Daniel Jones, English Pronouncing Dictionary, Universal Book Stall, New Delhi, 17th Edition, 2000.
2. Geoffrey Leech, Fan Svartvik, A Communicative Grammar of English, Pearson Education Asia, 1994.
3. Hornby, AS, Oxford Advanced Learner's Dictionary of Current English, OUP, 7th Edition, 2005.
4. Manivannan G, English for Engineers - A Book on Scientific and Technical Writing, Govi Publications, 2005.
5. Martin Cutts, Plain English Guide - How to Write Clearly and Communicate Better, Oxford University Press, 1999.

MAT103	MATHEMATICS I (Common to all branches)	L	T	P	C
		3	0	0	3

Course Outcomes:

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

CO1	:	Find the Eigen values of a matrix and to use Cayley-Hamilton theorem for finding the inverse of a matrix.
CO2	:	Explain the concept of curvature and to find envelope of a curve.
CO3	:	Apply partial derivatives to find maxima and minima.
CO4	:	Solve Second order linear differential equations with constant coefficients, Cauchy's

		equation and Legendre's equation.
CO5	:	Understand the geometry of sphere, plane and straight line in the three dimensional space.

CO and PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	S	S	S	M											
CO2	S	S	M												
CO3	S	S													
CO4	S	S		M											
CO5	S	S	S	M											

UNIT I MATRICES

Characteristic equation – Eigen values and eigen vectors of a real matrix – Properties – Cayley-Hamilton theorem (excluding proof) – Orthogonal transformation of a symmetric matrix to diagonal form – Quadratic form – Reduction of quadratic form to canonical form by orthogonal transformation.

UNIT II APPLICATIONS OF DIFFERENTIAL CALCULUS

Curvature – Cartesian and polar co-ordinates – radius of curvature – Circle of curvature – Evolutes – Envelopes - evolute as envelope of normals.

UNIT III FUNCTIONS OF SEVERAL VARIABLES

Partial derivatives – Total derivatives - higher order partial derivatives- Euler's theorem for homogenous functions - Taylor's expansion – Jacobians – Maxima and Minima – Constrained maxima and minima by Lagrangian multiplier method.

UNIT IV ORDINARY DIFFERENTIAL EQUATIONS

Solutions of second and higher order linear ODE with constant coefficients - Cauchy's and Legendre's linear equations - Simultaneous first order linear equations with constant coefficients - Method of variation of parameters

UNIT V THREE DIMENSIONAL ANALYTICAL GEOMETRY

Direction cosines and ratios - Angle between two lines - Equations of a plane - Equations of straight line - Coplanar lines - Shortest distance between two skew lines - Sphere - Tangent plane - Plane section of a sphere - Orthogonal spheres

TEXT BOOKS

1. Kreyszig, E, Advanced Engineering Mathematics, John Wiley and Sons (Asia) Limited, Singapore , 8th Edn., 2001
2. Arumugam, S., Thangapandi Isaac, A., Somasundaram, A., Mathematics for Engineers, Scitech Publications (India) Pvt. Ltd., Chennai – Edn-2008

REFERENCE BOOKS

1. Grewal , B.S., Grewal, J.S., Higher Engineering Mathematics, Khanna Publishers, New Delhi, 37th Edition., 5th Reprint 2004, 2003
2. Venkataraman, M. K., Engineering Mathematics First Year, The National Publishing Company, Chennai, 2nd Edition., Reprint 2001, 2000

PHY121	ENGINEERING PHYSICS – I (Common to all Branches)	L	T	P	C
		3	0	0	3

Course Outcomes:

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

CO1	:	Understanding the different types of sound waves and production & application of ultrasonics.
CO2	:	Understanding the basic concepts, production & applications of different types of laser sources and know the general ideas about optical fibres and their applications in various fields.
CO3	:	Learning the basic knowledge of crystallography and it's preparation techniques.
CO4	:	To gain the knowledge about the fundamentals, theory of quantum physics.
CO5	:	To gain the knowledge about various mechanical properties & thermal properties of matters.

CO and PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	S														
CO2	S	S					S								
CO3	S			S			S								
CO4	S														
CO5	S	M		M								L			

UNIT I ACOUSTICS AND STRUCTURE OF SOLIDS

Classification of sound – Reverberation - Sabine's formula - Common acoustical defects and remedies - Classification of solids- Crystal structures - X-ray diffraction - crystal growth - Crystal defects.

UNIT II LASER AND FIBRE OPTICS

Interaction of radiation with matter – quantum mechanical view - three and four Level laser system - Engineering and medical applications -Introduction of fibre optics- classification of fibre Engineering and medical applications

UNIT III QUANTUM PHYSICS

Inadequacy of classical mechanics – Black body radiation - Plancks law - Photoelectric effect - Compton effect - Einstein's photoelectric equation - Schrödinger wave equation - Particle in one - three dimensional box.

UNIT IV NDT, NEW ENGG.MATERIALS

Ultrasonics - Ultrasonics flaw detectors - X-ray photography – Fluoroscopy – Thermography -Gamma ray spectroscopy -Characterization technique Nanophase materials – Biomaterials - Non linear materials - Polymer materials.

UNIT V DIGITAL ELECTRONICS

Introduction - Analog to Digital circuits - Conversion of numbers one's complement - 2's complement - Logic gates - Boolean algebra - DeMorgan's theorem - Karnaugh's maps.

TEXT BOOK

1. Gaur R. K. and Gupta S. L., Engineering Physics, Dhanpat Rai Publishers, New Delhi, 2001.

REFERENCE BOOKS

1. Murthy V.S.R., Jena AK., Gupta K.P. and Murthy G.S., Structures and Properties of Engineering Materials, Tata McGraw Hill Publishing company Limited, New Delhi, 2003.
2. Ali Omar. M., Elementary Solid State Physics, Pearson Education (Singapore), Indian Branch, New Delhi, First Edition, 2006.
3. William F. Smith., Foundations of materials science and Engineering, McGraw-Hill, New York, 3rd Edition , 2003.
4. Mathews P.M., Venkatesan. K., Text Book of Quantum Mechanics, Tata McGraw Hill company, Delhi, 2003.
5. Gupta S.L., Kumar.V., Hand book of Electronics, Pragati Prakashan, Meerut, 28th Edition, 2001.

CHY106	ENGINEERING CHEMISTRY (Common to CSE & IT)	L	T	P	C
		3	0	0	3

Course Outcomes:

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

CO1	:	Know about the water quality and its parameters, learning the knowledge in the assessment of water quality and purification.
CO2	:	Learning the fundamental laws of thermodynamics and its derivations.
CO3	:	Understand the basic concepts of electrochemistry, batteries and corrosion.
CO4	:	Explain the preparation, properties and uses of important polymers, composites and nanomaterials.
CO5	:	Discuss the principle, instrumentation and applications of analytical techniques.

CO and PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	S					S	S								
CO2	M	M													
CO3	S	S													
CO4	S	S				L	S	S							
CO5	S	S						S							

UNIT I WATER

Water Quality Parameter (Industry and Drinking Water) – Hardness, Definition, Classifications, Expressions, Units of Hardness of Water with respect to CaCO3, Problems - Estimation of Hardness by EDTA Method (Theory Only) - Definition of Alkalinity (Theory Only) – Boiler feed water - Requirements, Disadvantages of using hard water in boilers, Removal of boiler scales and sludges - Water Softening - Zeolite Process, Demineralization (Ion – Exchange Process), Desalination.

UNIT II CORROSION SCIENCE AND CONTROL ENGINEERING

Corrosion, definitions – Electrode potential - Principles of Dry and Wet Corrosion, Factors Influencing rate of corrosion, Types of Corrosion - Corrosion Control – Impressed Current Cathodic Protection and Sacrificial Anodic Protection Method - Corrosion Inhibitors –

Protective Coatings, Surface conversion coatings, organic coatings (paints).

UNIT III POLYMERS

Introduction, Classification, Difference Between Thermoplastic and Thermosetting Plastics – Properties of Plastic -Degree of Polymerization – Types of Polymerization (Mechanism) - Phenol Formaldehyde Resin, Epoxy Resin, polyurethanes, Teflon -Amino Resins (Urea Formaldehyde, Nylon.11, Nylon.66 & Nylon 6), PET, PVC – Composites - Definition, characteristics, Constituent. Types-Fibre reinforced plastics (FRP), Metal Matrix Composites (MMC), Ceramic Matrix Composites (CMMC),Properties and Applications.

UNIT IV INSTRUMENTAL METHODS OF ANALYSIS

Electro Magnetic Radiation - Absorption of Radiation , Beer -Lambert's Law – UV-VIS. Spectroscopy – IR Spectroscopy Principle and Instrumentation (Black Diagram Only) Estimation of Iron by Colorimeter – Flame Photometry, Principle and Instrumentation (Black Diagram Only), Estimation of Na by Flame Photometry - Atomic Absorption Spectroscopy, Principle and Instrumentation (Block Diagram Only), Quantitative Estimation of Nickel by Atomic Absorption Spectroscopy.

UNIT V ENERGY AND MEMORY STORAGE DEVICES AND NANOTECHNOLOGY

Batteries - Introduction, Primary and Secondary Batteries - Dry Cell
- Alkaline Batteries, Lead Acid Storage Cell, NICAD Battery, Lithium Batteries – Fuel Cell (Hydrogen - Oxygen Fuel Cell) – Photo Galvanic Cell - Ferrites – Definition, Properties, Manufactures and uses – Ferrite Core – Magnetic Core – Transformer – Ferrite Toroids – Semiconductor storage - Optical disc Storage – Magneto-optical disc storage – Chemical sensors - Nanotechnology – Introduction, Preparation, Characterization and Application.

TEXT BOOKS

1. Jain,P.C and Monika Jain, Engineering Chemistry, Dhanpat Rai Publishing company (P) Ltd., New Delhi, 14th Edition 2002.
2. Sharma, B.K., Industrial Chemistry, Goel Publishing House, Meerut, 12th edition 2001.

REFERENCE BOOKS

1. Puri B.R.and Sharma L.R. Principles of Physical Chemistry, Shoban Lal Nagin Chand & Co., Jalandhar, 40th edition 2003.
2. Vogel A.I., A text book of Quantitative Inorganic Analysis, ELBS, London, 3rd edition 2000.
3. Mick Wilson and Kamali Kannangara, Nanotechnology: Basic science and emerging technology, Overseas India Pvt. Ltd. Press, New Delhi, Ist edition 2005.
4. Bandyopadhyay, A.K., Nano Materials, New Age International Publishers, New Delhi, 1st edition 2007.

CSE102	PROGRAMMING LANGUAGES (Common to all Branches)	L	T	P	C
		2	0	0	2

Course Outcomes:

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

CO1	:	To learn the basics of computer programming concepts using C programming language.
CO2	:	To design programs involving decision structures, and loops
CO3	:	To understand how to include functions and structure as part of the solution
CO4	:	To utilize pointers & arrays to efficiently solve problems, understand the

		dynamics of memory and understand the file system and operations on files
CO5	:	To understand the UNIX basics and also the concept of Shell Programming

CO and PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	S														
CO2			S	L	M										
CO3				S	M				M						
CO4			S	S	M	S			S			S			
CO5	S		S		M										

UNIT I BASIC ELEMENTS OF C & CONTROL STATMENTS

Introduction to C programming – C character set – Identifiers, keywords, data types, constants, variable, declarations, expressions, statements, symbolic constants, Operators and Expressions-Operator precedence and associatively of operators -Input and Output Functions-Library Functions - Header Files - Simple Computational problems. Decision Making: if statement - if-else statement - else-if ladder –Looping statements –While –do-while- Still more looping-For statement, Nested control statements- switch statement – the break statement - ? : operator - Continue statement - goto statement – Problems using Control Structures.

UNIT II USER DEFINED FUNCTION FUNCTIONS & STORAGE CLASSES

Need for User defined functions, a multifunction program- Elements of user defined functions- Definition of Functions- Return values and their Types- Function Calls-Function declaration-Category of functions- Nesting of functions –Recursion- Problems on functions & recursion functions. Storage Classes -Automatic Variables -External Variables – Static and Register Variables.

UNIT III ARRAYS AND POINTERS

Defining and Processing an Array - Passing Arrays to Functions - Multidimensional Arrays - Arrays and Strings - Enumerated data types-Programs using sorting, searching and merging of arrays. Pointer Fundaments - Pointer Declarations - Passing Pointers to Functions - Arrays and Pointers - Pointers and One-Dimensional Arrays - Pointers and Multidimensional Arrays - Operations on Pointers-Programs using Pointers with Functions.

UNIT IV DYNAMIC MEMORY MANAGEMENT, STRUCTURES & UNIONS

Dynamic Memory Allocation –Allocating a Block of memory, multiple blocks, releaseing used space, altering the size of block. – Defining a Structure - Processing a Structure – User defined Data Types – Nested structure - Structures and Pointers - Passing Structures to Functions - Self Referential Structures- Arrays and & Structures Union.

UNIT V DATA FILES AND UNIX OS

Opening and Closing a Data File - Creating a Data File – Reading & writing a data file. Processing and Updating of Data Files - Unformatted Data Files - Programs using merging, searching of data file contents. Introduction to Operating System. Shell fundamentals- shell commands – File commands- Directory commands-Miscellaneous commands

TEXT BOOK

1. Byron S. Gottfried, Programming with C, Second Edition, Tata McGraw Hill, 2006

REFERENCE BOOKS

1. Brian W. Kerninghan and Dennis M.Richie,"The C Programming language",Pearson
2. Education,2005.
3. Johnsonbaugh R.and Kalin M, "Applications Programming in ANSI C", Third Edition, Pearson Education, 2003.
4. E. Balagurusamy " Programming in ANSI C" fourth edition TMH 2008
5. V.Rajaraman "Computer Basics and C Programming" PHI 2008
6. Stephen Kochan and Patrick Wood, UNIX Shell Programming, Third Edition, Pearson education 2003.

EEE101	BASIC ELECTRICAL AND ELECTRONICS ENGINEERING	L	T	P	C
		4	0	0	4

Course Outcomes:

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

CO1	:	Apply the basic laws of electricity in DC and AC circuits
CO2	:	Describe the construction and operation of static and rotating electrical machines
CO3	:	Explain the functioning of measuring instruments and Develop the basic domestic wiring circuit.
CO4	:	Describe the constructional features and operation of fundamental electronic devices
CO5	:	Study the characteristics of electronic circuits.

CO and PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	S	S		S									S		
CO2	M	L													
CO3	S		M												
CO4	S														
CO5			S												

UNIT I DC CIRCUITS AND AC CIRCUITS

Electrical quantities - resistors - inductors - capacitors - Ohm's Law - Kirchhoff's Laws - series and parallel circuits - analysis of DC circuits - mesh, nodal - simple problems. Sinusoidal functions - phasor representation - RMS Effective values - form and peak factors - RLC circuits - power and power factor - analysis of 3 phase AC circuits - simple problems.

UNIT II ELECTRICAL MACHINES

Construction and principle of operation of DC machines - generator, motor - single phase transformers - alternators - three phase and single phase induction motors.

UNIT III MEASURING INSTRUMENTS AND WIRING CIRCUITS

Moving coil and moving iron instruments - dynamometer type wattmeter - induction type energy meter.Domestic wiring - accessories - types - staircase wiring - fluorescent tube circuits - simple layout - earthing.

UNIT IV ELECTRONIC DEVICES

Basic concepts of PN junction diodes - zener diode - bipolar junction transistor - uni polar devices - FET, MOSFET, UJT - thyristor - photoelectric devices.

UNIT V ELECTRONIC CIRCUITS

Half wave and full wave rectifier - amplifier - oscillator - RC integrator and differentiator circuits - diode clampers and clippers - multivibrators - schmitt trigger.

TEXT BOOKS

1. V.K. Mehta, "Principles of Electrical Engineering and Electronics", S. Chand & Company Ltd, 2008.
2. Kothari D P and Nagrath I J, "Basic Electrical Engineering", Tata McGraw Hill, 1991.
3. Mithal G K, Electronic Devices & Circuits, Khanna Publications, 1997.

REFERENCE BOOKS

1. T. Thyagarajan, "Fundamentals of Electrical and Electronics Engineering", SciTech publications (Ind.) Pvt. Ltd., 3rd Edition, October 2000.
2. Muraleedharan K.A, Muthususbramanian R and Salivahanan S, "Basic Electrical, Electronics and Computer Engineering" Tata McGraw Hill 1999.

PHY182	PHYSICS LABORATORY (Common to all Branches)	L	T	P	C
		0	0	3	1

Course Outcomes:

After Successful completion of course, the students will be able to,

CO1	:	Understand the practical knowledge of handling the laboratory equipments.
CO2	:	Acquire the practical skills to design the necessary components and troubleshoot the difficulties.
CO3	:	To learn the knowledge of observing the experimental data and preparing the report.

CO and PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1					S				S						
CO2					S				S						
CO3				S	S				S						

LIST OF EXPERIMENTS

1. To determine the acceleration due to gravity using Compound Pendulum
2. To determine the Rigidity Modulus of wire using Torsional Pendulum
3. To find thickness of the given two glass plates using single optic lever.
4. To determine the thermal conductivity of a bad conductor
5. To determine the refractive index of the material of the prism.
6. To find the number of rulings per cm length of the given transmission grating.
7. To determine the particle Size Using Laser
8. To determine the coefficient of viscosity of the liquid by Poiseuille's method
9. To determine the young's modulus of given material using Uniform Bending
10. To Determine the thickness of a given material using Air wedge method
11. To determine the focal length of a biconvex lens using Newton's Rings method
12. To determine the velocity of ultrasonic waves in the given medium using ultrasonic Interferometer.

CSE181	PROGRAMMING LANGUAGES LABORATORY (Common to all Branches)	L	T	P	C
		0	0	3	1

Course Outcomes:

After Successful completion of course, the students will be able to,

CO1	:	Understand problem analysis, algorithm design, and program implementation
CO2	:	Write modular, efficient and readable C programs
CO3	:	Design modular programs with structured programming constructs and ability to formulate problems and implement algorithms in C and work in a team to develop projects

CO and PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1		S			S				S						
CO2		S		S	S				S						
CO3		S		S	S	M		S	S			M			

APPLICATION PACKAGES

- Word Processing
- Spreadsheet
- Powerpoint
- Database Management

C PROGRAMMING

- Basics
- Operators and Expressions
- I/O formatting
- Control Statements

ARRAYS AND FUNCTIONS

- Arrays
- String Manipulation
- Functions

POINTERS, STRUCTURES AND FILES

- Pointers
- Structures and Unions
- File Handling

UNIX PROGRAMMING

- Basic Unix Commands
- Basic Shell Programming

HSS102	ENGLISH FOR TECHNICAL COMMUNICATION II	L	T	P	C
		2	0	0	2

Course Outcomes:

After Successful completion of course, the students will be able to,

CO1	:	Identify the errors in sentence structures.
CO2	:	The need to construct grammatically correct sentences
CO3	:	Framing conversations
CO4	:	Effectively construct utterances for a Dialogue and recall Mechanics of Manuscript Preparation
CO5	:	Prepare various components of official communication like Memos, Circulars, Notices, Agendas and write reviews of a text, that the students read or a movie that they watch.

CO and PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1					S	S			S	S		S			
CO2					S				M	S		S			
CO3					S	M			S	S		S			
CO4					S				S	S		M			
CO5					S			S	L	S		S			

Unit 1: GRAMMAR AND VOCABULARY

Grammar and Vocabulary - Introduction to grammatical models - Proper use of tenses, concord, voice, articles, punctuation, and modal auxiliaries

Unit 2: RECEPTION SKILLS

Listening and Language Development - Improving listening skills - comprehension practice - Comprehend classroom lectures, simple technically oriented passages - Listening to news bulletins, prerecorded talks, different speech styles, comprehending the essential meaning - Physical and psychological barriers to listening - Steps to overcome the barriers - Practice in note-taking while listening.

Unit 3: SPEAKING TECHNIQUES

Speaking practice - Improving conversing skills - Improving self-expression -Developing confidence and fluency in oral communication - Physical and psychological barriers to speaking - Steps to overcome the barriers - Formal and public speaking practice - Extemporary talk practice - Speech process - fluency and accuracy in speech - Developing persuasive speaking skills - Conversation in a given milieu, social and cultural surroundings - Practice in giving small talks on local topics for a minute or two - Goal oriented group discussion - Participating in seminars - Independent and effective communication.

Unit 4: READING STRATEGIES

Reading comprehension - Vocabulary extension methods - Speed reading practice - technical and non-technical materials - Practice in various reading techniques - skimming, scanning, eye reading -Looking for specific information - Comprehending the given passages, technical information.

Unit 5: WRITTEN COMMUNICATION

Basic grammatical structures - Alphabet of other languages -Paragraph writing - Expressing the idea in writing - Avoiding and correcting common errors - Effective writing techniques -

brevity, clarity, objectivity and simplicity - Discourse writing - definition, description, instruction - Note-making - Proof reading - Mechanics of writing - Writing formal, informal letters, Technical reports - Reference skills - using dictionary better.

Text Books

1. Rizvi M Ashraf, Effective Technical Communication, Tata McGraw Hill , 2005
2. Rutherfoord Andrea J, Basic Communication Skills for Technology, Pearson Education, 2002.

Reference Books

1. Deborah C Andrews, Margaret D Bickle, Technical Writing - Principles and Forms, Macmillan, 1978.
2. Manivannan G, English for Engineers - A Book on Scientific and Technical Writing, Govi Publications, 2005.
3. Sarah Freeman, Written Communication in English, Orient Longman, 2000.
4. Thomson A J & AV Martinet, A Practical English Grammar, OUP, 4th Edition, 1986.
5. Tom Hutchinson, Alan Waters, English for Specific Purpose, Cambridge University Press, 1987.

MAT104	MATHEMATICS II (Common to all branches)	L	T	P	C
		3	0	0	3

Course Outcomes:

After Successful completion of course, the students will be able to,

CO1	:	Explain the concept of double integral and triple integral.
CO2	:	Explain the concept of Gradient, divergence and curl, the concept of line, volume and surface integrals.
CO3	:	Construct conformal mappings between regions.
CO4	:	Evaluate certain real integrals using residue theorem.
CO5	:	Apply differential equations for Physical problems.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	S	S													
CO2	S	S													
CO3	S	S		M											
CO4	S	S		M											
CO5	S	S													

Unit 1: MULTIPLE INTEGRALS

Review of Riemann integrals - Double integration – Cartesian and polar coordinates – change of order of integration – change of variable between Cartesian and polar – Area as double integral – Triple integration in Cartesian, cylindrical and spherical polar coordinates – volume as triple integral

Unit 2: VECTOR CALCULUS

Gradient, Divergence and Curl – Directional derivative – Irrotational and solenoidal vector fields – Vector integration – Green's theorem in a plane, Gauss divergence theorem and Stoke's theorem (excluding proof) – Simple applications

Unit 3: ANALYTIC FUNCTION AND CONFORMAL MAPPING

Function of a complex variable – Analytic function – Necessary conditions – Cauchy –

Riemann equations – Sufficient conditions (excluding proof) – Properties of analytic function – Harmonic conjugate – Construction of Analytic functions - Conformal mapping - w = z+a, az, 1/z, e^z , sin z, cos z and bilinear transformation.

Unit 4: COMPLEX INTEGRATION

Statement and application of Cauchy's integral theorem and integral formula – Taylor and Laurent expansions – Isolated singularities – Residues - Cauchy's residue theorem - Contour integration over unit circle and semicircular contours (excluding poles on boundaries)- evaluation of real integrals using contour integration

Unit 5: APPLICATION OF ODE

Solutions of ODE related to electric circuit, bending of beams, motion of a particle in a resisting medium and simple harmonic motion

Text Books

1. Kreyszig, E, Advanced Engineering Mathematics, John Wiley and Sons (Asia) Limited, Singapore, 8th Edition, 2001
2. Arumugam, S., Thangapandi Isaac, A., Somasundaram, A., Mathematics for Engineers, Scitech Publications (India) Pvt. Ltd., Chennai – Edn-2008.

Reference Books

1. Grewal , B.S., Grewal, J.S., Higher Engineering Mathematics, Khanna Publishers, New Delhi, 37th Edition., 5th Reprint 2004, 2003
2. Venkataraman, M. K., Engineering Mathematics First Year, The National Publishing Company, Chennai, 2nd Edition., Reprint 2001, 2000
3. Venkataraman, M. K., Engineering Mathematics –III A, The National Publishing Company, Chennai, 11th Edition., Reprint 2002, 1998

PHY122	ENGINEERING PHYSICS – II (Common to ALL)	L	T	P	C
		3	0	0	3

Course Outcomes:

After Successful completion of course, the students will be able to,

CO1	:	Understand the free electron theories, formation of energy bands, energy distribution and also the electron behavior in solids and to Understand the cooper pair electron behavior, applications of superconducting materials in developing technologies
CO2	:	Gain the importance of semiconducting materials in engineering fields by projecting the view of energy bands.
CO3	:	Gain the knowledge about various kinds of magnetic materials, their properties and applications in advanced technologies.
CO4	:	Design new materials like metallic glasses, nano-materials, shape memory alloys, nonlinear materials to improve the technology.
CO5	:	Adaptability to new developments of materials in science and technology by characterizing with sophisticated instruments.

CO and PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	S	S				M									
CO2	S		L			S									

CO3	S	M													
CO4	S		S		M										
CO5	S		S			S									

Unit 1: VOLTAGE AND CURRENT LAWS

Kirchoff's current law, Kirchoff's Voltage law, Single loop circuit, single node-pair circuit, Series and parallel connected independent sources, Resistors in series and parallel, Voltage and current division.

Unit 2: CIRCUIT ANALYSIS TECHNIQUES

Linearity and superposition, Sources transformation, Thevenin and Norton equivalentcircuits, Maximum power transfer, Dela-Wye conversion, Single Phase and 3 Phase Circuits, Power factor, Power, Concept of Phasor Diagrams.

Unit 3: SEMICONDUCTOR DEVICES

Conductors, Semiconductors, Silicon crystals, ideal diode, diode approximation, zener diode, zener regulator- Bipolar transistors- Basic ideas of junction FET, Depletion mode MOSFET, Enhancement mode MOSFET and Silicon control rectifier

Unit 4: RECTIFIER, AMPLIFIER AND OSCILLATOR

Half wave Rectifier, Full wave Rectifier, Bridge Rectifier, Filter, Choke input filter, Capacitors input filter, Zener Regulator. Un-biased transistor, biased transistor, transistor currents, JFET Amplifier. Theory of Sinusoidal Oscillation, RC Oscillators, LC Oscillators, 555 Timer, 555 Circuits.

Unit 5: OPERATIONALAMPLIFIER

Introduction of an Inverting Amplifier, Non Inverting Amplifier, Basic Application of perational amplifier: Subtractor, Summing Amplifier, Digital to Analog Converter, Low Pass Filter, First Order Low Pass Filter, First Order High Pass Filter, Integrator, Differentiator, Relaxation Oscillator.

Text Books

1. Albert Paul Malvino, Electronic Principles, Tata McGraw-Hill Publishing Company Limited, Sixth Edition, 1999.

Reference Books

1. William H. Hayt, Jack E.Kemmerly, Steven M.Durbin, Engineering Circuit Analysis, Tata McGraw-Hill Publishing Company, Sixth Edition, 2002.
2. Robert L. Boylestad, Louis Nashelsky, Electronic devices and Circuit Theory, Pearson Education Asia, Eigth Edition, 2002.
3. Floyd, Electronic Devices, , Pearson Education, Sixth-Edition, 2002.
4. David A. Bell, "Electronics Devices and Circuits", Fourth Edition-Prentice Hall of India, 1999.

CIV101	**BASIC CIVIL AND MECHANICAL ENGINEERING** (Common to ALL)	**L**	**T**	**P**	**C**
		3	**0**	**0**	**3**

Course Outcomes:

After Successful completion of course, the students will be able to,

CO1	:	Describe the scientific terminologies related to construction and mechanical sciences and Familiarize with different components, equipments and technical standards
CO2	:	Know the purpose, procedures, and the materials and Understand the basic laws pertaining towards the subject.

CO3	:	Understand the procedures for construction of several structures and Create working models or prototypes of the components.
CO4	:	Explain the principle, working and application of Engines and Power plants and Understand and apply the concepts of manufacturing and the technology related.
CO5	:	Mention some of the applications of the manufacturing processes.

CO and PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	S														
CO2	S														
CO3	L		S			M									
CO4	M					M	S								
CO5	S		M			M	S					S			

Unit 1: CIVIL ENGINEERING BUILDINGS

Characteristics of good building materials such as stones, bricks, plywood and ceramic tiles, timber, cement, aggregates and concrete - Basic functions of buildings – Major components of buildings – Foundations - Purpose of a foundation – Bearing capacity of soils – types of foundations. Proper methods of construction of Brick masonry – Stone masonry – Hollow Block masonry. Beams – Lintels – Columns – Flooring – Damp proof course – surface finishes – Doors and windows – Roofing.

Unit 2: TRANSPORTATION ENGINEERING

Principles and Classification of surveying, Chain surveying, Compass surveying and leveling -Importance of roads – Classification of Highways –water bound macadam, bituminous and cement concrete roads –. Railways - Importance of railways – Gauges – Components of a permanent way. Bridges - Components of Culverts – Causeways, Slab Bridge, T-beam and slab bridge, Suspension bridge

Unit 3: MECHANICAL ENGINEERING BOILERS AND TURBINES

Boilers - boiler mountings and accessories – Cochran boiler, Locomotive boiler, Babcock and Wilcox boiler, fire and water tube boilers - Steam turbine - single stage impulse turbine, Parson's reaction turbine, difference between impulse and reaction turbines.

Unit 4: POWER PLANTS AND INTERNAL COMBUSTION (IC) ENGINE

Classification of power plants – steam, nuclear, diesel and hydro power plants - Alternate sources of energy - solar, wind, tidal, geothermal, ocean thermal energy conversion. – IC engine - components, working of four and two stroke petrol and diesel engines.

Unit 5: PRODUCTION TECHNOLOGY

Metal casting and forming process –patterns, moulding, melting of cast iron, casting – forging – rolling – extrusion – drawing - Metal joining process - welding – arc welding, gas welding, brazing and soldering - Metal machining – lathe, drilling machine, milling machine, shaping machine, planing machine, introduction to Computer Numerical Control machining.

Text Books

1. Shanmugam, G,, and Palanichamy, M.S., Basic Civil and Mechanical Engineering, Tata McGraw Hill Publishing Co., New Delhi, 1996.

Reference Books

1. Khanna, K., Justo C E G, Highway Engineering, Khanna Publishers, Roorkee, 2001
2. Arora S.P. and Bindra S.P., Building Construction, Planning Techniques and Method of Construction, Dhanpat Rai and Sons, New Delhi, 1997.

3. Venugopal K., Basic Mechanical Engineering, Anuradha Publications, Kumbakonam, 2000.
4. Shanmugam G., Basic Mechanical Engineering, Tata McGraw Hill Publishing Co.,New Delhi, 2001.

CHY102	ENVIRONMENTAL SCIENCES	L	T	P	C
		2	0	0	2

Course Outcomes:

After Successful completion of course, the students will be able to,

CO1	:	Know the importance of environmental studies and methods of conservation of natural resources.
CO2	:	Describe the structure and function of an ecosystem and the values and conservation of bio-diversity.
CO3	:	Explain the causes, effects and control measures of various types of pollutions.
CO4	:	Select the appropriate methods for waste management and learning the knowledge about various disaster management methods.
CO5	:	Recall social issues and legal provision

CO and PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	S														
CO2	S	S													
CO3	S	S					S					S			
CO4	S						S	S				M			
CO5	S				S	S	M								

UNIT I NATURAL RESOURCES

Definitions – Scope of Environmental Sciences - Forest Resource – Food Resource – Land Resource – Water – Mineral resources - Utilization of Natural Resource, Impact on Environment – Conservation of Natural Resources.

UNIT II ECOSYSTEM AND BIODIVERSITY

Concept – Structure and Function – Energy Flow in Ecosystem – Ecological Succession – Food Chain – Food Web, Ecological Pyramids – Biodiversity, Definition, Values, Threats to Biodiversity, Conservation of Biodiversity.

UNIT III ENVIRONMENTAL POLLUTION

Definition, Causes, Effects and Control Measures of Air, Water and Soil Pollution – Thermal and nuclear Pollution.

UNIT IV MANAGEMENT OF ENVIRONMENTAL POLLUTION

Solid Waste Management – Treatment Methods adopted for Municipal Sewage and Industrial Effluent – Hazardous and Biomedical Waste Management.

UNIT V TOOLS FOR ENVIRONMENTAL MANAGEMENT

Environment Impact Assessment – Precautionary and Polluter Pay Principle - Constitutional Provision – (Air, Water and Forest) - Waste Minimization Techniques, Cleaner Technology Options, Bioremediation.

TEXT BOOK

1. Dhameja, S.K., Environmental engineering and Management, S. K. Kataria and sons, New Delhi, 1st edition 2004.

REFERENCE BOOKS

1. Bharucha Erach, The Biodiversity of India, Mapin Publishing Pvt. Ltd., Ahmedabad, 1st edition, 2001.
2. Miller T.G. Jr., Environmental Science, Wadsworth Publishing Co. USA, 2nd edition, 2004.
3. Trivedi R.K., Handbook of Environmental Laws, Rules, Guidelines, Compliances and Standards, Vol. I and II, Enviro Media., New Delhi, 2nd edition, 2004.
4. Masters, G. M., Introduction to Environmental Engineering & Science, Prentice Hall, New Delhi, 2nd edition, 1997
5. Henry, J. G. and Heike, G. W. Environmental Science & Engineering, Prentice Hall International Inc., New Jersey, 1st edition, 2005.

MEC101	ENGINEERING DRAWING (Common to all branches)	L	T	P	C
		1	0	3	2

Course Outcomes:

After Successful completion of course, the students will be able to,

CO1	:	Familiarize with different drawing equipments and technical standards
CO2	:	Understand the projection of points, straight lines and planes and have the ability to convert the practical problems in to projections
CO3	:	Understand and apply concepts of the projection and section of simple solids.
CO4	:	Understand and apply the concepts of development of surfaces
CO5	:	Convert simple 2D orthographic projections into 3D isometric projections

CO and PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	S	M													
CO2	S	L													
CO3	S	S													
CO4	S	S		M											
CO5	S	S	S	S	S										

UNIT I INTRODUCTION

Importance of graphics – use of drafting instruments – BIS conventions and specifications – size, layout and folding of drawing sheets – lettering dimensioning and scales - Orthographic principles - free hand sketching in first angle projection from pictorial views.

UNIT II PROJECTION OF POINTS, STRAIGHT LINES AND PLANES

Projection of points, located in all quadrants - projection of straight lines located in the first quadrant, determination of true lengths and true inclinations, location of traces - projection of polygonal surface and circular lamina located in first quadrant inclined to one or both reference planes.

UNIT III PROJECTION AND SECTION OF SOLIDS

Projection of solids like prisms, pyramids, cylinder and cone when the axis is inclined to one reference plane by change of position method. Section of above solids in simple vertical position by cutting planes inclined to any one of the reference planes, obtaining true shape of section.

UNIT IV DEVELOPMENT OF SURFACES

Development of lateral surfaces of simple and truncated solids – prisms, pyramids, cylinders and cones - development of lateral surfaces of combined solids – prism and cylinder, cylinder and cylinder with axes at right angles with no offset.

UNIT V ISOMETRIC AND PERSPECTIVE PROJECTION

Principles of isometric projection – isometric view and projections of simple solids, truncated prisms, pyramids, cylinders and cones. Perspective projection of prisms, pyramids and cylinders by visual ray and vanishing point methods.

TEXT BOOK

1. Bhatt, N.D., Engineering Drawing, Charotar publishing House, New Delhi, 46th Edition,2003.

REFERENCE BOOKS

1. Nataraajan, K.V., A text book of Engineering Graphics, Dhanalakshmi Publishers, Chennai, 2006.
2. Shah, M.B., and Rana, B.C., Engineering Drawing, Pearson Education, New Delhi, 2005.
3. Gopalakrishnana, K.R., Engineering Drawing (Vol. I and II), Subhas Publications, 1998.
4. Luzadder and Duff, Fundamentals of Engineering Drawing, Prentice Hall of India Pvt Ltd, New Delhi, XI Edition, 2001.
5. Venugopal, K., Engineering Graphics, New Age International (P) Limited, 2002.

MEC103	ENGINEERING MECHANICS	L	T	P	C
		3	0	0	3

Course Outcomes:

After Successful completion of course, the students will be able to,

CO1	:	Understand the basics of static equilibrium particles in 2-D and 3-D.
CO2	:	Able to formulate the Ball and socket joint in 2-D and 3-D.
CO3	:	Understand the concepts of various types of friction.
CO4	:	Apply the knowledge of moment of inertia in T and I sections.
CO5	:	Apply the knowledge of work Energy equation in dynamic particles.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	S	M													
CO2	S	S													
CO3	S	S	S												
CO4	S	S		S											
CO5	S	S	S	S	S										

UNIT-I STATICS OF PARTICLES

Six Fundamental principles and concepts - vector algebra- basics, concurrent and non-concurrent coplanar forces - resultant and resolution of forces- static equilibrium of particles in 2-D and 3-D.

UNIT-II STATIC OF RIGID BODIES

Moment about point and about axis - Varignon's theorem - Static equilibrium of rigid body in 2-D and 3-D, free body diagram, supports and reactions - Problem formulation concept in 2-D and 3-D (Ball and socket joint).

UNIT-III FRICTION

Frictional forces- Types- laws of dry friction- simple contact friction - Sliding block, wedges, ladder friction - rolling resistance –Examples-belt and disk friction

UNIT-IV PROPERTIES OF SURFACES AND SOLIDS

Centre of gravity – T section, I section- Centroids of lines - areas, volumes, composite bodies, - Area moment of Inertia – T section, I section principal moment of inertia (T section, I section)

UNIT-V DYNAMICS OF PARTICLES

Introduction – Kinematics of particles – Displacements, velocity and acceleration, their relationship - Equations of motions– Rectilinear motions - relative motion – Curvilinear motion –Kinetics of particles - Newton's second law – Equations of motion – rectangular components – Work Energy equation of particles.

TEXT BOOK

1. Beer, F.P., and Johnson, E.R., Vector Mechanics for Engineers – Statics and Dynamics, Tata McGraw Hill, Tenth Edition in SI units.

REFERENCE BOOKS

1. Merriam, J.L., Engineering Mechanics, Volume I – Statics, and Volume – II, Dynamics 2/e, Wiley International, Seventh Edition.
2. Irving, H., Shames, Engineering Mechanics, Statics and Dynamics, Prentice Hall of India Pvt. Ltd., Fourth Edition.

CSE103	DATA STRUCTURES	L	T	P	C
		3	0	0	3

Course Outcomes:

After Successful completion of course, the students will be able to,

CO1	:	Understand different data structures and its applications
CO2	:	Develop ability to analyze algorithms, to determine algorithm correctness and time efficiency.
CO3	:	Design data structures for complex computing problems.
CO4	:	Identify, model, solve and develop code for real life problems like shortest path, network flow, and minimum spanning using graphs
CO5	:	Evaluate the performance of computing solutions in terms of time and space and Familiarize with different drawing equipments and technical standards

CO and PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	S														
CO2	S	S			S										
CO3	S	S			S										
CO4	S	S			S										
CO5	M														

UNIT1 INTRODUCTION

The Role of Algorithms in Computing - Algorithms, Algorithms as a technology - Structures in C – Implementation of structures - Unions in C - Implementation of unions - Structure parameters - Recursive definition and processes: Factorial function - Fibonacci sequence - Recursion in C - Efficiency of recursion.

UNIT II STACKS, QUEUES AND HASHING

Abstract Data Types- Stacks-Stack applications- Balancing symbols, Infix to postfix expression conversion, Postfix Expression evaluation, Function calls- Queues- Linked lists- Hash Tables - Direct-address tables, Hash tables, Hash functions - Open addressing.

UNIT III TREES

Tree Terminologies - Binary tree - Binary tree traversal - Expression tree construction- Binary Search Trees- Querying a binary search tree, Insertion and deletion–AVL trees- rotations, insertion. B-Trees-Definition of-trees- Basic operations on B-trees- insertion and deletion.

UNIT IV SORTING AND SEARCHING

Priority Queues (Heaps) – Model – Simple implementations – Binary Heap-Properties. Sorting-Bubble sort, insertion sort, selection sort, shell sort, Heap sort, quick sort, Radix sort, Merge sort. Searching- Linear search, Binary search.

UNIT V GRAPHS

Graph Terminologies - Representations of Graphs, Breadth-first search, Depth-first search, Topological sort, strongly connected components. Minimum Spanning Trees- Growing a minimum spanning tree - The algorithms of Kruskal and Prim-Shortest paths in directed acyclic graphs, Dijkstra's algorithm ,All Pairs Shortest Paths - The Floyd - Warshall algorithm.

TEXT BOOKS

1. Weiss M. A., Data Structure and Algorithm Analysis in C, Addison Wesley, .
2. Cormen T. H., Leiserson C. E., Rivest R. L. and Stein C., Introduction to Algorithms, Prentice Hall India, 2nd Edition, 2002.

REFERENCE BOOKS

1. Aaron Tenenbaum M, Yeedidyah Langsam, Moshe Augenstein J., Data structures using C, Pearson Education, 2004.
2. Horowitz E., Shan S, Fundamentals of Data Structures, Pittman, 1977.

MEC181	WORK SHOP (Common to all branches)	L	T	P	C
		0	0	3	1

Course Outcomes:

After Successful completion of course, the students will be able to,

CO1	:	Making of Joints and understanding their uses in Wooden Products like Table, Frame, etc. and metal Joining with simple saw process
CO2	:	Making of Hollow Channels, Containers using Sheet metal development and Joining of Metal using Welding process (Knowledge only)
CO3	:	Knowledge in Casting and Molding of Metals and various Machining Techniques like Drilling, Tapping, etc…

CO and PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1				S	S	S			S	S					
CO2				M	S	S	S		S	S	S				
CO3				S	S	S		L	S	S					

UNIT I CARPENTRY

Carpentry tools - practice in marking, sawing, planing and chiseling – making simple joints: lap joint, T-joint, dovetail joint, mortise and tenon joint.

UNIT II FITTING

Fitting tools - practice in marking, filing, punching, hacksawing - fitting to size and drilling - making of simple mating profiles: V, square, dovetail, half round joints.

UNIT III SHEET METAL

Study of press, die and tools - sheet metal layout - development of lateral surfaces -simple exercises: blanking, forming, bending and flanging.

UNIT IV DRILLING

Drilling and tapping in drilling machines

DEMONSTRATION ON:

- Welding operations like butt joint and lap joints in Arc welding
- Foundry operations like mould preparation for split pattern
- Smithy operations like the production of hexagonal bolt
- Preparation of plumbing line sketches – basic pipe connections involving the fittings like valves, taps, couplings, unions, reducers, elbows and other components used in household fittings.

CHY182	CHEMISTRY LABORATORY (Common to all branches)	L	T	P	C
		0	0	3	1

Course Outcomes:

After Successful completion of course, the students will be able to,

CO1	:	Analyze the various water quality parameters
CO2	:	Estimate the amount of acid and base by electrochemical methods.
CO3	:	Determine the amount of iron and alkali metals by photometric methods.

CO and PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1				S	S	S	S	L	S						
CO2				S	S	M	S	M	M	M		S			
CO3				S	S	S	S	M	M						

LIST OF EXPERIMENTS

1. Estimation of hardness of water sample by EDTA method
2. Determination of alkalinity of given water sample
3. Determination of dissolved oxygen in a water sample
4. Determination of rate constant of a reaction (Ester hydrolysis)
5. Estimation of hydrochloric acid by pH titration
6. Estimation of chloride ion in a given water sample
7. Determination of sodium and potassium by flame photometry
8. Estimation of ferrous ion by potentiometric method
9. Estimation of iron by spectrophotometry using 1,10-phenanthroline
10. Determination of strength of mixture of acids using strong base by conductometric titration
11. Estimation of fluoride ion by spectrophotometry
12. Conductometric titration of strong acid with strong base

CSE182	DATA STRUCTURES LABORATORY (Common to all branches)	L	T	P	C
		0	0	3	1

Course Outcomes:

After Successful completion of course, the students will be able to,

CO1	:	Implement stack, queue and list ADT to manage the memory using static and dynamicallocations
CO2	:	Apply binary search tree to construct expression trees used in indexing.
CO3	:	Identify and create code for real life applications of shortest path and Minimum Spanning Tree, and develop and compare the graph search algorithms and sorting algorithms using c language.

CO and PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1				S	S				S						
CO2				S	S			S	S	M		S			
CO3				L	S			S	S	S		M			

LIST OF EXPERIMENTS

1. Simple programs using structure and recursive method
2. Write a program to implement a list using an array.
3. Write a program to create a singly linked list
4. Write a program to implement a stack using an array.
5. Write a program to implement a stack using a linked list.
6. Write a program to check for balanced parentheses of an expression using array implementation of stack.
7. Write a program to check for balanced parentheses of an expression using linked list implementation of stack.
8. Write a program to evaluate a postfix expression using array implementation of stack.
9. Write a program to evaluate a postfix expression using linked list implementation of stack.
10. Write a program to implement a Queue using an array.
11. Write a program to implement a Queue using linked list.
12. Write a program to implement a binary search tree.
13. Write a program to sort a set of elements using bubble sort ,insertion sort, selection sort, Shell sort, heap sort, and quick sort
14. Write a C program to search a set of elements using linear search and binary search.
15. Write a C program to implement the Dijkstra's Algorithm
16. Write C program for the implementation of minimum panning using Kruskal and Prims algorithm.

MAT201	MATHEMATICS III	L	T	P	C
		3	0	0	3

Course Outcomes:

After Successful completion of course, the students will be able to,

CO1	:	Evaluate integrals and solve boundary value problems using Laplace transfoms.
CO2	:	Solve standard type of first order partial differential equations and higher order partial differential equations with constant coefficients.
CO3	:	Apply the concept of Fourier series to find the sum of certain series.
CO4	:	Solve difference equations using Z-transform.
CO5	:	Solve Fourier, Sine and Cosine transforms of given functions.

CO and PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	S	S		L											
CO2	S	S													
CO3	S	S													
CO4	S	S		M											
CO5	S	S		M											

UNIT I PARTIAL DIFFERENTIAL EQUATIONS

Formation of PDE - Solution of standard types of first order PDE - Lagrange's linear equation - Linear PDE of second and higher order with constant coefficients

UNIT II LAPLACE TRANSFORM

Definition of Laplace transform - Linearity property - condition for existence of Laplace transform - First and second shifting properties - Laplace transform of derivatives and integrals - Unit step functions - Diarc delta-function - Differentiation and integration of transforms - Convolution theorem - Inversion - Periodic functions - Evaluation of integrals by Laplace transform - Solution of boundary value problems

UNIT III FOURIER SERIES

Dirichlet's conditions - General Fourier series - odd and even functions - Half range sine and cosine series - complex form of Fourier series - Parseval's identity - Harmonic analysis

UNIT IV Z – TRANSFORM

Z-transform - elementary properties - Inverse Z-transform –Initial and Final value Theorems - Convolution theorem - formation of difference equation - Solution of difference equation using Z-transform.

UNIT V FOURIER TRANSFORM

Fourier Integral formula - Fourier Transform - Fourier sine and cosine transforms - Linearity, Scaling, frequency shifting and time shifting properties - Self reciprocity of Fourier Transform - Convolution theorem – Parseval's Identity.

TEXT BOOKS

1. Grewal, B.S., Grewal, J.S., Higher Engineering Mathematics, Khanna Publishers, New Delhi, 37th Edition, 5th Reprint 2004, 2003

2. Arumugam, S., Thangapandi Isaac, A., Somasundaram, A., Engineering Mathematics Volume II, Scitech Publications (India) Pvt. Ltd., Chennai, 1st Edn., Reprint 2000, 1999

REFERENCE BOOKS

1. Kreyszig, E., Advanced Engineering Mathematics, John Wiley and Sons (Asia) Limited, Singapore, 8th Edition., 2001
2. Venkataraman, M. K., Engineering Mathematics –III A, The National Publishing Company, Chennai, 11th Edition., Reprint 2002, 1998
3. Venkataraman, M. K., Engineering Mathematics - III B, The National Publishing Company, Chennai, 13th Edition., Reprint 1999, 1998

EEE201	ELECTROMAGNETIC THEORY	L	T	P	C
		3	1	0	4

Course Outcomes:

After Successful completion of course, the students will be able to,

CO1	:	Understand the concept of co-ordinate system and solve the electrostatic problems using coulombs law and gauss's law
CO2	:	Understand the concept of conductors, dielectrics and capacitance
CO3	:	Solve the magnetic field problems using the laws of magnetism and vector calculus
CO4	:	Apply the Maxwell's equations to understand the electromagnetic wave propagation
CO5	:	Apply the boundary conditions and numerical methods to solve the electromagnetic problems

CO and PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	S	S	M	M	M							M			
CO2	S	S	S	S	M							M			
CO3	S	S	S	S	M							M	S		
CO4	S	S	S	S	S							M			
CO5	S	S	S	S	S							M	S		

Unit 1: GENERAL PRINCIPLES AND ELECTROSTATICS

Review of vector algebra - co-ordinate system - rectangular, cylindrical and spherical - curl, divergence and gradient - divergence theorem - Coulomb's law - electric field intensity - field due to different types of charges - electric flux density - Gauss's law and application - electric potential - potential field due to different types of charges - potential gradient.

Unit 2: CONDUCTORS, DIELECTRICS AND CAPACITANCE

Current and current density - continuity of current - conductor properties and boundary conditions - the nature of dielectric materials - boundary conditions for perfect dielectric materials -capacitance - different types of capacitances - energy density in electric field - Poisson's and Laplace's equations.

Unit 3: MAGNETOSTATICS

Magnetic field - magnetic flux - magnetic flux density - Stoke's theorem - Biot-savart law and application - Ampere's circuital law and application - scalar and vector magnetic potentials - force on a moving charge, differential current element, torque on a closed circuit -

inductance - nature of magnetic materials - magnetization and permeability - magnetic boundary conditions.

Unit 4: MAXWELLS EQUATIONS AND ELECTROMAGNETIC WAVES

Faraday's laws- Faraday's law - Lenz's law - Maxwell's equations in differential and integral forms - displacement current - Electromagnetic wave equations - wave parameters - velocity, intrinsic impedance, propagation constant - waves in free space, lossy and lossless dielectric, conductors - skin depth - Poynting theorem.

Unit 5: FIELD MODELLING AND COMPUTATION

Problem formulation - boundary condition - solutions Analytical methods - variables separable methods - conformal transformation - method of images - numerical methods - finite difference method - finite element method - charge simulation method.

Text Books

1. William, H.Hayt., "Engineering Electromagnetics", Tata McGraw Hill,2001.

Reference Books

1. John.D.Kraus., "Electromagnetics", TataMcGraw Hill Book Co., New York, 4th Edition, 1991.
2. Joseph. A.Edminister., "Theory and Problems of Electromagnetics", 2nd edition, Schaum Series, Tata McGraw Hill, 1993.
3. Sadiku., "Elements of Electromagnetics", 2nd edition, Oxford University Press,1995.

· EEE202	DC MACHINES AND TRANSFORMERS	L	T	P	C
		3	1	0	4

Course Outcomes:

After Successful completion of course, the students will be able to,

CO1	:	Develop the equivalent circuit of the given transformer and analyze its performance.
CO2	:	Analyze the basic concept of rotating machines.
CO3	:	Analyze the performance characteristics of self and separately excited DC generators.
CO4	:	Analyze the operation, starting methods and speed control of DC Motors.
CO5	:	Apply the testing procedures of electrical machines as per the standard practice

CO and PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	S	S			S								S	M	
CO2	S			S										S	
CO3	S	M		S	S								S	S	
CO4	S			S	S								S	S	
CO5	S	S		M								S	S	M	

Unit 1: TRANSFORMERS

Transformers - working principle, construction, EMF equation -elementary theory of ideal transformer - voltage transformation ratio - transformer with losses but no magnetic leakage - transformer on no load and on load - equivalent circuit, regulation, efficiency - all day efficiency - auto transformer - condition for maximum efficiency - parallel operation of single phase transformer - three phase transformer connections.

Unit 2: BASIC CONCEPTS OF ROTATING MACHINES

Principles of electromechanical energy conversion - single and multiple excited systems - MMF of distributed AC windings - rotating magnetic field - generated voltage - torque in round rotor machine

Unit 3: DC GENERATORS

DC generator - construction, principle and operation, types, EMF equation, characteristics - armature windings - single, double layer windings - losses in a DC generator - condition for maximum efficiency - armature reaction - demagnetizing , cross magnetizing conductors, demagnetizing AT per pole, cross magnetizing AT per pole - commutation - parallel operation of generators - load sharing.

Unit 4: DC MOTORS

DC motors - working principle, characteristics, EMF equation - significance of the back EMF - losses and efficiency - power stages- speed control of dc motor - necessity of starter - three point starter - four point starter.

Unit 5: TESTING OF DC MACHINES AND TRANSFORMERS

DC machines - brake test, Swinburne's test, Hopkinson's test, retardation test, field test - Transformer - open and short circuit tests**,** load test**,** polarity test**,** Sumpner's test.

Text Books

1. Kothari, D.P., and Nagrath, I.J., Electric Machines, Tata McGraw Hill Publishing Company Ltd, 2002.

Reference Books

1. Fitzgerald A.E., Charles Kingsley, Stephen.D.Umans, Electric Machinery, Tata McGraw Hill Publishing Company Ltd, 2003.
2. Gupta,J.B., Theory and Performance of Electrical Machines,S.K.Kataria and Sons 2002.
3. Theraja ,B.L., Theraja, A.K.,A text book on Electrical technology, Volume-II, S.Chand Company & Ltd.,2005.

		L	T	P	C
EEE203	**ELECTRIC CIRCUIT ANALYSIS**	**3**	**1**	**0**	**4**

Course Outcomes:

After Successful completion of course, the students will be able to,

CO1	:	Describe the various types of sources and networks and apply Mesh, Nodal analysis to solve electrical circuits.
CO2	:	Analyze the electrical circuits using various network theorems.
CO3	:	Solve AC Circuits with Series/parallel combinations.
CO4	:	Discuss the basic concepts of Resonance and three phase circuits and analyze using multisim software.
CO5	:	Analyze the steady state and transient behavior of electric circuits.

CO and PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	M	M	S										M		
CO2	S	S	S	S								M	S		
CO3	S	S	S	S								M	S		

CO4	S	S	S	M								M	S	S	
CO5	S	S	S	S									S	S	

Unit 1: DC CIRCUIT ANALYSIS

Ideal sources - dependent and independent sources - linear relation between voltage and current of network elements - source transformation - types of networks - network reduction - voltage division - current division - star and delta transformation - concept of duality - dual networks - formation of matrix equations and analysis of complex circuits using mesh-current and nodal-voltage methods.

Unit 2: NETWORK THEOREMS

Thevenin's theorem, Norton's theorem, superposition theorem, maximum power transfer theorem, substitution theorem, reciprocity theorem, Millman's theorem, Tellegen's theorem - statement, illustration, application to AC and DC circuits- Multisim based Network Theorems Verification.

Unit 3: STEADY STATE ANALYSIS OF AC CIRCUITS

Concept of phasor and complex Impedance/Admittance – Analysis of simple series and parallel circuits-Solution of RLC circuits, power, and power factor and energy relations - series resonance, parallel resonance - Q factor - bandwidth locus diagram – Multisim based Analysis of RLC circuits.

Unit 4: COUPLED CIRCUITS AND THREE PHASE CIRCUITS

Self inductance - mutual Inductance - coefficient of coupling - dot rule - ideal transformer - effective inductance of coupled coils in series and in parallel - analysis of coupled circuits - single tuned and double tuned circuits. Three phase star delta connections - characteristic equations - phasor diagram - solution of three phase balanced circuits and unbalanced circuits - three phase power measurement using watt meters- Multisim based analysis of coupled circuits.

Unit 5: TRANSIENT ANALYSIS

Concept of complex frequency - representation of network elements in time domain and frequency domain –Source free and forced responses of RL - RC - RLC circuits with DC and sinusoidal excitation- Time constant and natural frequency of oscillation – Laplace transform application to the solution of RL, RC and RLC circuits – Initial and final value theorems and their applications- Multisim based RLC circuits with DC and sinusoidal excitation.

TEXT BOOKS

1. Sudhakar, A., Shyam Mohan ,S.P., Circuits and Network Analysis and Synthesis, Tata McGraw Hill Publishing Co. Ltd., New Delhi, 1994.
2. Arumugam & Premkumar, "Electric Circuit Theory", Khanna Publishers, 2002.

REFERENCE BOOKS

1. Paranjothi S.R., 'Electric Circuit Analysis', New Age International Ltd. , Delhi, 2nd Edition, 2000.
2. Edminister, J.A., 'Theory and Problems of Electric Circuits', Schaum's outline series McGraw Hill Book Company, 2nd Edition, 1983.
3. Dorf R.C., Introduction to Electric Circuits, John Wiley & Sons Inc, New York, Second Edition, 2003.
4. Charles K.Alexander, Mathew N.O. Sadiku., Fundamentals of Electric Circuit, TataMcGraw Hill, N.Y, 2003

ECE256	ELECTRONIC DEVICES AND CIRCUITS	L	T	P	C
		3	1	0	4

Course Outcomes:

After Successful completion of course, the students will be able to,

CO1	:	Describe the construction and characteristics of various semiconductor devices
CO2	:	Analyze the characteristics of the voltage amplifiers using BJT and FET
CO3	:	Analyze the characteristics of the power amplifiers using BJT and FET
CO4	:	Apply the knowledge of feedbacks to construct various feedback amplifiers and oscillators
CO5	:	Apply the various semiconductor devices for designing the various electronic circuits

CO and PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	S														
CO2	S	S													
CO3	S	S													
CO4	S	S	S	S				M					S		
CO5	S	S	S	M				S				M	M	S	

Unit 1: SEMICONDUCTOR DEVICES

Conduction in semiconductors – types of semiconductors – N type, P type – working principle and overview of semiconductor devices – PN junction diode, zener diode, BJT, FET, UJT – operation and characteristics.

Unit 2: SMALL SIGNAL AMPLIFIERS

Biasing circuits of BJT, FET – transistor as amplifier – analysis and design of CC, CE and CB configurations – analysis and design of CS, CD, and CG configurations – multistage RC coupled amplifiers – tuned amplifier – cascade amplifier **–** thermal runaway in BJT circuits.

Unit 3: POWER AMPLIFIERS

Power amplifiers – class A, B, C and AB – class A amplifier with resistive and transformer coupled load – complementary symmetry amplifiers – push pull amplifiers – class A, class B – MOSFET power amplifiers – harmonic distortion – Darlington amplifier.

Unit 4: FEEDBACK AMPLIFIERS AND OSCILLATOR

Properties of negative feedback – types of feedback configurations – voltage shunt, voltage series, current series and current shunt. Sinusoidal oscillator – RC oscillators, Wienbridge, Colpit, Hartley, Clapp, Crystal oscillators – non-sinusoidal oscillators **–** saw tooth, triangular wave generator.

Unit 5: APPLICATIONS OF ELECTRONIC DEVICES

Regulated power supplies – rectifiers – half wave, full wave – design of filters – voltage regulators – shunt, series – clipping and clamping circuits – multivibrators – astable**,** monostable, bi-stable – unctio trigger

Text Books

1. Jacob. Millman, Christos C.Halkias, “Electronic Devices and Circuits”, Tata McGraw Hill Publishing Limited, New Delhi, 2003.

2. David A. Bell., "Electronic Devices and Circuits" Oxford University Press., 5th Edition, 2008

Reference Books

1. Donald A.Neaman., "Semiconductor Physics and Devices", 3rd edition., Tata McGraw Hill ,2002.
2. Salivahanan, S., Sureshkumar, N., Vallavaraj, A., "Electronic Devices and Circuits", 2nd edition, Tata McGraw Hill Publishing Company, 2008.

EEE281	MACHINES LABORATORY I	L	T	P	C
		0	0	3	2

Course Outcomes:

After Successful completion of course, the students will be able to,

CO1	:	Acquire the knowledge, experimental procedure in static and rotating DC machines.
CO2	:	Improve the ability of observation and mathematical manipulation of experiments in electrical machines.
CO3	:	Apply the knowledge of experiment skills of electrical machines for solving the electrical problems in industries.

CO and PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	S			S	S									S	
CO2				S	S				S	M			S	S	
CO3				S	S	S	M		S	S	M	S	S	S	S

1. Open circuit and load characteristics of DC separately and shunt generator
2. Open circuit and load characteristics of DC self excited shunt generator
3. Load characteristics of differential DC compound generator
4. Load characteristics of DC shunt motor
5. Load characteristics of DC series motor
6. Speed control of DC shunt motor
7. Swinburne's test
8. Load test on single-phase transformer
9. Load test on three phase transformer
10. Open circuit and short circuit tests on single phase transformer
11. Sumpner's test on transformers
12. Separation of no-load losses in single phase transformer
13. Parallel operation of single phase transformers.
14. Performance characteristics of DC series motor using MATLAB/SIMULINK.
15. Performance characteristics of DC shunt motor using MATLAB/SIMULINK.

ECE296	ELECTRONIC DEVICES AND CIRCUITS LABORATORY	L	T	P	C
		0	0	3	2

Course Outcomes:

After Successful completion of course, the students will be able to,

CO1	:	Handle and operate the laboratory equipment properly.
CO2	:	Construct, analyze and troubleshoot simple semiconductor devices and circuits.
CO3	:	Measure and record the experimental data, analyze the results and prepare a report

CO and PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1									S		S				
CO2					S				S	S	S		S	S	
CO3				S	S			M	S	M	S	M	S		

1. Characteristics of PN junction diode and Zener diode
2. Transistor biasing Methods.
3. Input and Output characteristics of Transistor
4. Transistor as amplifier.
5. FET characteristics and evaluation of its parameters.
6. MOSFET characteristics.
7. FET biasing methods.
8. BJT and FET as a switch.
9. Class B complementary symmetry power amplifier
10. Half and full wave rectifiers.
11. Phase shift oscillator using BJT/FET.
12. RC coupled amplifier – frequency response.
13. Application of semiconductor devices–Clipper, Clamper.
14. Multivibrators
15. Mini project

EEE204	CONTROL SYSTEMS	L	T	P	C
		3	1	0	4

Course Outcomes:

After Successful completion of course, the students will be able to,

CO1	:	Model the electric, mechanical and electromechanical systems and evaluate their performances
CO2	:	Determine the time and frequency responses of I and II order systems for various inputs
CO3	:	Analyze the stability of the system using Time domain and frequency domain methods
CO4	:	Design the compensators using Bode plot and root locus techniques
CO5	:	Solve the state equation by transformation methods.

CO and PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	S	S	M	S								M			
CO2	S	S	S	S					S			M	M	S	
CO3	S	S	S	S					S			M	S		
CO4	S	S	S	S					S				S	S	
CO5	S	S	S	M											

Unit 1: SYSTEM MODELLING

Open loop and closed loop systems – mechanical systems – translational, rotational – electrical systems – force voltage and force current analogy – hydraulic and pneumatic systems – mathematical representation – transfer functions – block diagram, signal flow graph – basic components of control systems – potentiometer – synchros – tachogenerator – servo motor AC, DC.

Unit 2: TIME DOMAIN ANALYSIS

Time response – step response of first order and second order systems – time domain specification – type and order of a system – steady state error – static error and generalized error coefficient – concepts of stability – Routh Hurwitz stability – P, PI and PID controllers – Time response using LABVIEW.

Unit 3: FREQUENCY DOMAIN ANALYSIS

Frequency domain specifications of second order systems – analysis and stability using Bode plots, Polar plot, Nichols chart – Nyquist stability criterion – LABVIEW for frequency response analysis.

Unit 4: ROOT LOCUS AND COMPENSATOR

Root locus concept – rules for constructing root loci – root contours – design of lag, lead and lag lead compensators using Bode plots – Compensator design using LABVIEW.

Unit 5: STATE SPACE ANALYSIS

Concepts of state – state variable and state models – state equation – state transition matrix – solution of state equation by classical and laplace transformation method – Controllability and observability.

Text Books

1. Nagrath and Gopal., Control Systems Engineering, New Age International Publishers, 4th Edition ,2005.

Reference Books

1. Ogata K, Modern Control Engineering, Prentice Hall, U.S.A., 4th Edition, 2003.
2. Benjamin C Kuo, Automatic Control Systems, Prentice Hall, U.S.A., 7th Edition, 1995

EEE205	AC MACHINES	L	T	P	C
		3	1	0	4

Course Outcomes:

After Successful completion of course, the students will be able to,

CO1	:	Analyze the performance of alternator based on its voltage regulation methodologies and describe the parallel operation of alternators through capability curves.
CO2	:	Describe the performance of synchronous motor based on effect of increased load and effect of changing excitation.
CO3	:	Analyze the starting and running conditions of three phase induction motor & determine the induction motor parameters through equivalent circuit and circle diagram.
CO4	:	Apply the knowledge of three phase induction motor, analyze the behavior and selection of starters & speed control techniques for the practical applications.
CO5	:	Describe the operation & performance characteristics of single phase induction motor and special machines.

CO and PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	S	S		S	M								S	S	M
CO2	S	S		S										M	
CO3	S	S	M	S	S	M							S	S	S
CO4	S	M		M									S	M	
CO5	S					M							M	M	

Unit 1: SYNCHRONOUS GENERATOR

Synchronous generator – construction, working principle, EMF equation, armature windings – synchronous machine model – determination of synchronous reactance – armature reaction – regulation methods – EMF, MMF, ZPF, ASA methods – synchronizing to infinite bus bars – operating characteristics – capability curves – two reaction theory – parallel operation of synchronous generators – hunting.

Unit 2: SYNCHRONOUS MOTOR

Synchronous motor – Principle of operation of synchronous motor – methods of starting – equivalent circuit of asynchronous motor – power developed by a synchronous motor – synchronous motor with different excitations – effect of increased load with constant excitation, effect of changing excitation constant load – torque equation – V curve and inverted V curve – hunting – synchronous phase modifier – PF correction.

Unit 3: THREE PHASE INDUCTION MOTOR

Three phase induction motors – principle of operation , constructional details – Torque – slip characteristics – starting torque, condition for maximum starting torque, rotor EMF & reactance under running conditions, torque under running condition, condition for maximum torque under running condition – relation between torque and slip – losses and efficiency – power stages in an induction motor – no load and blocked rotor test – equivalent circuit – circle diagram – power balance equation – maximum power output –

induction generator.

Unit 4: STARTING AND SPEED CONTROL OF INDUCTION MOTORS

Need for starter – types of starters – starting methods of three phase induction motor – cogging & crawling – speed control – voltage control – rotor resistance control – pole changing – frequency control – slip – energy recovery scheme – double cage rotor – synchronous induction motor

Unit 5: SINGLE PHASE INDUCTION MOTORS AND SPECIAL MACHINES

Single phase induction motors – split phase induction motor, capacitor start induction run motor ,capacitor start capacitor run motor, shaded pole induction motor- principle of operation – double revolving field theory – equivalent circuit (without and with core loss) – special machines – universal motor, stepper motor, linear induction motor , reluctance motor, repulsion motor, hysteresis motor and AC series motor

TEXT BOOKS

1. Theraja,B.L., Theraja,A.K., "A text book on Electrical technology", Volume-II, S. Chand company & Ltd. 2009.
2. Kothari, D.P., and Nagrath, I.J., "Electric Machines", Tata McGraw Hill Publishing Company Ltd, 2002.

REFERENCE BOOKS

1. Fitzgerald, A.E., et.al, "Electric Machinery", Tata McGraw Hill publishing Company Ltd, 2005.
2. Gupta, J.B., "Theory and Performance of Electrical Machines", S.K.Kataria and Sons, 2005.
3. Say, M.G., "Alternating Current Machines", ELBS & Pitman, London, 5th edition, 1992.
4. Bhattacharya, "Electrical Machines", III Edition Tata McGraw–Hill Education, 2009.

ECE266	DIGITAL ELECTRONICS	L	T	P	C
		3	1	0	4

Course Outcomes:

After Successful completion of course, the students will be able to,

CO1	:	Understand the philosophy of number systems and codes.
CO2	:	Solve the logic functions using different simplification techniques
CO3	:	Design combinational logic circuits using logic gates.
CO4	:	Design Sequential circuits using Flipflop
CO5	:	Summarize the function, characteristics and structure of different memory systems and programmable logic devices

CO and PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	S														
CO2	S	S		S									S		
CO3	S	M	S	S	M				M				S	S	
CO4	S	S	S	S	S				S				S	S	
CO5	S														

Unit 1: NUMBER SYSTEMS & BOOLEAN ALGEBRA

Review of binary, octal, hexadecimal number systems – representation of signed numbers – floating point number representation – BCD –ASCII-EBCDIC – excess 3 codes – gray code – error detecting, correcting codes – Boolean Algebra- postulates and theorems of Boolean Algebra – canonical forms – simplification of logic functions using karnaugh map and Quine Mcclausky method.

Unit 2: COMBINATIONAL LOGIC DESIGN

Digital Logic families – Logic gates – implementation of combinational logic functions – encoders & decoders – multiplexers & demultiplexers – code converters – comparator – half adder, full adder – parallel adder – binary adder – parity generator/checker –implementation of logical functions using multiplexers.

Unit 3: SEQUENTIAL CIRCUITS

Flip flops – SR, D, JK and T – analysis and design of synchronous sequential circuits – state diagram, state reduction and state assignment – counters – modulus counters, shift register, Johnson counter , ring counter – Design of Asynchronous sequential circuits.

Unit 4: MEMORIES & PROGRAMMABLE LOGIC DEVICE

ROM, PROM, EPROM, Semi custom design – introduction to PLD′s – PAL – PLA – architecture of PLD's – PAL 22V10, PLS 100/101 – implementation of digital functions-FPGA

Unit 5: VHSIC HARDWARE DESCRIPTION LANGUAGE (VHDL)

RTL Design – combinational logic – Types – Operators – Packages – Sequential Circuit – Sub programs – Test Benches. (Examples: adders, counters, flipflops, FSM, multiplexers / Demultiplexers)

Text Books

1. Morris Mano, M., Digital Design, Prentice Hall of India (P) Ltd., New Delhi, 2002.

Reference Books

1. Tocci, R.J., Digital Systems – Principles & Applications, Prentice Hall of India, 2002.
2. Fletcher, W.I., An Engineering Approach to Digital Design, Prentice Hall of India, 1994.
3. Floyd, Digital Fundamentals, Prentice Hall of India, 2003.

CSE206	OBJECT ORIENTED PROGRAMMING	L	T	P	C
		3	0	0	3

Course Outcomes:

After Successful completion of course, the students will be able to,

CO1	:	Understand the role of inheritance, polymorphism, dynamic binding and generic structures in building reusable code
CO2	:	Apply concepts of operator overloading, constructors and destructors.
CO3	:	Write programs that perform explicit memory management.
CO4	:	Use object oriented programming language like C++ and associated libraries to develop object oriented programs.
CO5	:	create a program that measures or simulates performance and use it to analyze behavior

CO and PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	M	M			S										
CO2	S	S	S	S				M	M	M					
CO3	S	S		M						M					
CO4	S	S		S	S			S	S						
CO5	S	S	S	S	L							S			

Unit 1: INTRODUCTION

Introduction to OOP – basic Concepts of OOP – applications of OOP – introduction to C++ - introduction to C++ stream i/o – declarations in C++ - creating new data types in C++ - function prototypes – inline functions – reference parameters – const qualifier – dynamic memory allocation – default arguments – unary scope resolution operator – linkage specifications

Unit 2: CLASSES, CONSTRUCTORS AND FRIEND CLASS

Introduction – comparing class with structure – class scope – accessing members of a class – constructor – destructor – const objects – const member functions – friend class – friend function – this pointer – data abstraction and information hiding – container classes and iterators.

Unit 3: OVERLOADING & INHERITANCE

Operator overloading – fundamentals – restrictions – overloading stream – insertion and stream extraction operators – overloading unary & binary operators – converting between types – overloading ++ and --. Inheritance – introduction – protected members – casting base _class pointers to derived _class pointers – overloading base class members in a derived class – public, protocols and private inheritance – direct base classes and indirect base classes – using constructors and destructors in derived classes – implicit derived class object to base class object conversion.

Unit 4: VIRTUAL FUNCTIONS, STREAMS AND FILES

Introduction – type fields and switch statements – virtual functions – abstract base classes and concrete classes – polymorphism – dynamic binding – virtual destructors. C++ Stream I/O: Streams – stream input – stream output – unformatted i/o – stream manipulators – stream format states – stream error – states. Files: file operations, file pointers, error handling during file operations.

Unit 5: TEMPLATES & EXCEPTION HANDLING

Templates – function templates – class templates – overloading template functions – class template and non type parameters –templates with multiple parameters. Exception handling – when exception handling, basic of C++ exception, catching an exception, re throwing an exception, exception specifications.

Text Books

1. Goran Svenk , Object-Oriented Programming Using C++ for Engineering and Technology, Thomson Delmer Learning, 2003 .

Reference Books

1. Bjarne Struoustrup, The C++ Programming Language, Addison Wesley, 2000.
2. John R.Hubbard, Programming with C++, Schaums outline series, TMH 2003.
3. Deitel H.M., and Deitel P.J., How to program C++, PHI 2003.

EEE206	MEASUREMENTS AND INSTRUMENTATION	L	T	P	C
		4	0	0	4

Course Outcomes:

After Successful completion of course, the students will be able to,

CO1	:	Understand the fundamental Characteristics of an instrument.
CO2	:	Analyze instruments adopted for measurement of current,voltage,power,energy etc.,
CO3	:	To study different methods available for measurement of active, passive elements and various signal conditioning devices.
CO4	:	Analyze the problems in various electrical parameter measurements.
CO5	:	Study and analyze the storage of digital signal and analyzers.

CO and PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	S														
CO2	S	S	S										S		
CO3	S	M		S									S	S	
CO4	S	S	M										S		
CO5	M	M										L	M		

Unit 1: FUNDAMENTALS AND CHARACTERISTICS OF INSTRUMENTS

Functional elements of an instrument – static and dynamic characteristics – analog indicating instruments, hall effect instruments – rms, average and peak reading instruments- errors – systematic and random errors, error analysis, errors in measurement – statistical evaluation of measurement data – standards and calibration

Unit 2: MEASURING INSTRUMENTS

Permanent Magnet Moving Coil instrument (PMMC) – Moving Iron instruments – electrodynamic instruments – instrument transformer – current transformer, potential transformer – measurement of power – electrodynamic, ferrodynamic – measurement of energy – induction type – watt-hour meters – maximum demand indicators – polyphase energy meters – power factor meters – frequency meters – synchroscopes – electronic voltmeters – differential voltmeters – electronic multimeter

Unit 3: BRIDGES AND SIGNAL CONDITIONING DEVICES

Measurement of resistance – Wheatstone bridge, Kelvin‟s bridge, mega ohm bridge – measurement of self inductance – Hay‟s, Anderson‟s, Owen‟s bridges measurement of capacitance – Schering bridge – components of signal conditioning devices – current to voltage and voltage to current converter – buffer amplifier – differential amplifier – instrumentation amplifier – digital to analog converters – analog to digital converters – components of data acquisition systems.

Unit 4: TRANSDUCERS

Classification of transducers – selection of transducers – resistive, capacitive and inductive transducers – piezoelectric, optical and digital transducers – Ph electrodes – transducers for measurements – measurement of displacement, temperature, level flows, pressure, velocity, acceleration, torque, speed, viscosity and moisture

Unit 5: DIGITAL MEASURING INSTRUMENTS

Digital Voltmeters and Multi meters – Microprocessor based DMM with auto ranging and

self diagnostic features- Digital Energy meter –Frequency, Period, time interval and Pulse Width measurement.

TEXT BOOKS

1. Sawhney, A.K., A Course in Electrical & Electronic Measurements & Instrumentation, Dhanpat Rai and Co, 2004.
2. Albert D.Helfrick., William D.Cooper, Modern Electronic Instrumentation & measurement techniques, Prentice Hall of India 2003.

REFERENCE BOOKS

1. Bouwens, J., Digital Instrumentation, Tata McGraw Hill, 2002.
2. Kalsi, H.S., Electronic Instrumentation, Tata McGraw Hill, 2006.
3. Doebelin, E.O., Measurement Systems – Application and Design, Tata McGraw Hill publishing company, 2005.
4. Golding, E.W., & Widdies, F.W., Measurements & measuring instruments, sir Issar Pitman & sons (p) Ltd.,1998.
5. David.A.Bell, "Electronic Instrumentation and Measurements", 2nd edition, Oxford University Press, 2007.

EEE282	MACHINES LABORATORY II	L	T	P	C
		0	0	3	2

Course Outcomes:

After Successful completion of course, the students will be able to,

CO1	:	Acquire the knowledge, experimental procedure in synchronous and induction machines.
CO2	:	Improve the ability of observation and mathematical manipulation of experiments in AC dynamic machines.
CO3	:	Analyze the performance & characteristics of rotating AC machines based on conduction of experiments and Apply the knowledge of experiment skills of AC machines for solving the electrical problems in industries.

CO and PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	M			S	S				S				M		
CO2				S	S	M			S	S	S		S	S	S
CO3				S	S	S		M	S		S	S	S	S	S

1. Regulation of three phase alternator by EMF and MMF methods
2. Regulation of three phase alternator by ZPF and ASA methods
3. Slip test on three phase salient pole alternator
4. Measurements of negative sequence and zero sequence impedance of alternators.
5. V and inverted V curves of three phase synchronous motor.
6. Load test on three-phase induction motor.
7. Speed control of three-phase induction motors
8. Load test on synchronous induction motor
9. Load test on three phase induction generators
10. Measurement of transient and sub-transient reactance in direct and quadrature axis
11. Predetermination of performance characteristics of three-phase induction motor using computer.
12. Parallel operation of two alternators.

13. Load test on single-phase induction motor (capacitor-start and run motor).
14. Performance characteristics of Transformer.
15. Performance characteristics of alternator.
16. Mini project

CSE285	OBJECT ORIENTED PROGRAMMING LAB	L	T	P	C
		0	0	3	2

Course Outcomes:

After Successful completion of course, the students will be able to,

CO1	:	Understand object-oriented concepts and how they are supported by C++
CO2	:	Demonstrate the ability to analyze, use, and create functions, classes, to overload operators
CO3	:	Design and write interactive programs with a simple GUI interface using an object-oriented programming language and Apply appropriate advanced object-oriented programming concepts.

CO and PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1				S	S				S	S					
CO2				S	S			L	S	M					
CO3				S	S				S	S		M			

1. Simple C++ programs.
2. Programs using Functions.
3. Function Overloading
4. Operator Overloading
5. Simple & Multiple Inheritance
6. Multilevel & Hybrid Inheritance
7. Virtual Functions
8. Polymorphism
9. File Handling
10. Templates
11. Exception Handling

EEE301	POWER ELECTRONICS	L	T	P	C
		3	1	0	4

Course Outcomes:

After Successful completion of course, the students will be able to,

CO1	:	Describe the construction, working and Characteristics of various Power Semiconductor Devices.
CO2	:	Analyze the performance characteristics of various types of phase controlled converter.
CO3	:	Design and analyze the DC-DC converter.
CO4	:	Describe the operation of inverter and analyze its performance.
CO5	:	Design and analyze the performance of AC/ AC converter.

CO and PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	S														
CO2	S	M	S										S	S	
CO3	S	S	S	S									S	S	S
CO4	S	S	L	S									S		
CO5	S	M	S									M	M	S	

Unit 1: POWER SEMI-CONDUCTOR DEVICES

Structure, operation and characteristics of SCR, TRIAC, power transistor, MOSFET, IGBT and GTO- turn on and turn off characteristics – protection schemes and switching losses-power diode.

Unit 2: PHASE–CONTROLLED CONVERTERS

2- pulse, 3-pulse, 6-pulse and dual converters- inverter operation of fully controlled converter – effect of source inductance – distortion and displacement factor – ripple factor – triggering circuits.

Unit 3: CHOPPERS

Step-down and step-up choppers – time ratio and current limit control – switching mode regulators – buck, boost, buck-boost and cuk converter – multiphase choppers –chopper firing circuit – chopper control of DC motors.

Unit 4: INVERTERS

Classification of inverters – single phase, three phase (both 120^0 mode and 180^0 mode) inverters– series inverter – parallel inverter –voltage control of single phase, three phase inverters – current source inverters, harmonic reduction in inverters, Multilevel inverter, Inverter fed induction motor drive**.**

Unit 5: AC TO AC CONVERTERS

Single phase AC regulators – sequence control of AC regulators –three phase AC regulators – single phase to single phase cycloconverter – three phase half wave cycloconverter – control circuit output voltage equation.

TEXT BOOK

1. Muhammad H. Rashid., Power Electronics: Circuits, Devices and Applications, Prentice Hall of India, Pearson education, 4^{th} edition, 2013

REFERENCE BOOKS

1. Singh, M.D., Power Electronics, Tata McGraw Hill publications, 2nd Edition, 2008.
2. Ramamoorthy ,M., An Introduction to thyristor and their application, Affiliated East west press (P) Ltd, 2nd Edition, 1991
3. Ned Mohan.,et.al., Power Electronics: Converters, Applications and Design, John Wiley and sons, 3rd edition, 2003

Power Transmission: The HVDC Options, Wiley-Blackwell, 2007.

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EEE302	TRANSMISSION AND DISTRIBUTION	L	T	P	C
		3	1	0	4

Course Outcomes:

After Successful completion of course, the students will be able to,

CO1	:	Illustrate the structure of power system and various types of transmission and distribution system.
CO2	:	Develop the mathematical model of different types of transmission system.
CO3	:	Determine the performance of various transmission lines.
CO4	:	Explain the performance of different types of insulators and cables.
CO5	:	Evaluate the performance of distribution systems and to classify the different types of substations and grounding techniques.

CO and PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	S					M									
CO2	S	S	S	M									S	S	
CO3	S	S		S		M						S	S	S	S
CO4	S	S		M		S	M						S	S	
CO5	S	M		S		S	M						S	M	M

Unit 1: BASICS OF TRANSMISSION AND DISTRIBUTION

Structure of electric power system – types of transmission systems – AC systems, DC systems – requirements of good distribution system – types of distribution system – Extra High Voltage AC (EHVAC) Transmission – need, advantages, limitations –High Voltage Direct current Transmission (HVDC) – classifications, advantages, limitations – comparison of EHVAC and HVDC transmission –Introduction to Flexible AC Transmission System (FACTS).

Unit 2: TRANSMISSION LINE PARAMETERS

Parameters of single and three phase transmission lines with single and double circuits – resistance, inductance and capacitance of solid, stranded and bundled conductors – symmetrical and unsymmetrical spacing and transposition – application of self and mutual GMD – skin and proximity effect – interference with neighboring communication circuits.

Unit 3: MODELLING AND PERFORMANCE OF TRANSMISSION LINES

Classification of lines – short line, medium line and long line – equivalent circuits, attenuation constant, phase constant, surge impedance transmission efficiency and voltage regulation – real and reactive power flow in lines – power angle diagram –surge impedance loading, load ability limits based on thermal loading, angle and voltage stability

considerations – compensation in transmission lines, Ferranti effect and corona loss – sag and tension calculation , sag template , stringing chart – effect of atmospheric conditions on transmission lines – vibration of conductors and dampers.

Unit 4: INSULATORS AND CABLES

Properties of an insulator – insulator materials – types of insulators – insulator string – voltage distribution, string efficiency, methods of increasing string efficiency –testing of insulators – cables – comparison of underground and overhead cables– construction, types, insulating materials, dielectric stress, grading, thermal characteristics.

Unit 5: SUBSTATION, GROUNDING SYSTEM AND DISTRIBUTION SYSTEM

Types of substations – bus-bar arrangements – substation bus schemes – single bus scheme, double bus with double breaker, double bus with single breaker, main and transfer bus, ring bus, breaker – half with two main buses, double bus-bar with bypass isolators, resistance of grounding systems – resistance of driven rods, resistance of grounding point electrode, grounding grids – design principles of substation grounding system – neutral grounding. Radial and ring-main distributors – interconnectors – AC distribution –AC distributor with concentrated load – three-phase, four-wire distribution system – sub-mains – stepped and tapered mains, Distribution Automation

Text Books

1. Singh, S.N., Electric Power Generation, Transmission and Distribution, Prentice Hall of India (P) Ltd, New Delhi, 2006.
2. Gupta, B.R., Power System Analysis and Design, S.Chand Publiactions, New Delhi, 2005.

Reference Books

1. Hadi Saadat., Power System Analysis, Tata McGraw Hill Publishing Company, 2005.
2. Luces M.Fualkenberry., Walter Coffer., Electrical Power Distribution and Transmission, Pearson education, 1996.
3. V.K. Mehta, Principles of Power System, Chand(S.) & Co Ltd, India, 2005

EEE303	LINEAR INTEGRATED CIRCUITS	L	T	P	C
		3	1	0	4

Course Outcomes:

After Successful completion of course, the students will be able,

CO1	:	Understand the IC fabrication techniques.
CO2	:	Develop the various circuits using OP Amp for the given application
CO3	:	Design and analyze the characteristics of integrated circuit.
CO4	:	Design and analyze the performance of filter and timer circuits.
CO5	:	Understand the basic concept of signal converters and regulators.

CO and PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	M													M	
CO2	S	M	S	M									S	S	
CO3	S	M	S	M	M								S	S	
CO4	S	M	S	M								M	S	S	
CO5	M	L	M										S	M	

Unit 1: INTEGRATED CIRCUIT TECHNOLOGY

Monolithic integrated circuit technology – planar process – bipolar junction transistor fabrication – fabrication of FET's – CMOS Technology – monolithic diodes – metal – semiconductor contact – integrated circuit resistors – integrated circuit capacitors – integrated circuit packaging – characteristics of integrated circuit components – microelectronic circuit layout.

Unit 2: CHARACTERISTICS AND APPLICATIONS OF OP–AMP

DC Characteristics of ideal op-amp, pin configuration of 741 op-amp, bias, offsets, drift, bandwidth, A.C characteristics – slew rate, frequency compensation. Applications – inverting and non-inverting amplifiers, inverting and non-inverting summers, difference amplifier, differentiator and integrator, log and antilog amplifiers, multiplier and divider.

Unit 3: COMPARATORS AND SIGNAL GENERATORS

Comparators – regenerative comparators, input output characteristics. Signal generators – astable multivibrator, monostable multivibrator, triangular wave generators, RC-phase shift oscillator, Wein bridge oscillator.

Unit 4: ACTIVE FILTERS, TIMERS AND MULTIPLIERS

Filters – low pass, high pass, band pass and band reject, Butterworth, Chebychev filters, first and second order filters – switched capacitor filters – 555 timer functional diagram, monostable and astable operation – multiplier – application.

Unit 5: ADC, DAC, PLL AND REGULATORS

PLL – basic block diagram, operation, capture range and lock range – simple applications of PLL – AM detection, FM detection and FSK demodulation, ADC and DAC – weighted resistor DAC, R-2R and inverted R-2R DAC, monolithic DAC, Flash ADC, counter type ADC, successive approximation ADC, dual slope ADC, and conversion times of typical ADC – voltage regulator (7805 , 7809, 7812, 7905, 7909 and 7912) –op amp regulator, IC voltage regulator, IC 723 general purpose regulator, Switching regulator. Switched mode power supply regulator.

Text Books

1. Ramakant A. Gayakward., Op–amps and Linear Integrated Circuits, Pearson Education, 4th edition, 2005
2. Roy Choudhary, D., Sheil B.Jani., Linear Integrated Circuits, New Age International, 2nd edition,2003.

Reference Books

1. Robert F.Coughlin., Fredrick F.Driscoll, Op–amp and Linear Ics, Pearson Education, 6th edition, 2005.

2. Franco., Design with Operational Amplifier and Analog Integrated Circuits, Tata McGraw Hill publishing company, 2005.

EEE304	DESIGN OF ELECTRICAL APPARATUS	L	T	P	C
		3	1	0	4

Course Outcomes:

After Successful completion of course, the students will be able to,

CO1	:	Describe the concepts of magnetic circuit in static and rotating electrical machines
CO2	:	Design the stator and rotor of DC machines and analyze its performance
CO3	:	Design the core and shell type transformers and determine the loss and efficiency of it.
CO4	:	Design the stator and rotor of three phase induction motors and starters.
CO5	:	Design the main dimensions of three phase salient pole and turbo alternators.

CO and PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	S	S											S		
CO2	S	S	S										S	S	
CO3	S	S	S			S		M					S	S	
CO4	S	S	S			S							S	S	
CO5	S	S	S			M							S	S	

Unit 1: MAGNETIC CIRCUITS AND COOLING OF ELECTICAL MACHINES

Concept of magnetic circuit – MMF calculation for various types of electrical machines – real and apparent flux density of rotating machines – leakage reactance calculation for transformers, induction and synchronous machine – thermal rating –continuous, short time and intermittent short time rating of electrical machines

Unit 2: DESIGN OF DC MACHINES

Constructional details, output equation ,main dimensions, choice of specific loadings, choice of number of poles – armature design – design of field poles and field coil, design of commutator and brushes – losses and efficiency calculations – Design of DC motor starters.

Unit 3: DESIGN OF TRANSFORMERS

Constructional details of core and shell type transformers – output rating of single phase and three phase transformers – optimum design of transformers – design of core, yoke and windings for core and shell type transformers – equivalent circuit parameter from designed data – losses and efficiency calculations – design of tank and cooling tubes of transformers, computer aided design

Unit 4: DESIGN OF THREE PHASE INDUCTION MOTORS

Squirrel cage and slip ring motors – constructional details, output equation, main dimensions, choice of specific loadings – stator, squirrel cage and slip ring rotor design – equivalent circuit parameters from designed data – losses and efficiency calculations – Design of AC motor starters

Unit 5: DESIGN OF SYNCHRONOUS MACHINES

Alternators – constructional details of cylindrical pole and salient pole alternators, output equation, choice of specific loadings, main dimensions, short circuit ratio –design of stator and rotor of cylindrical pole and salient pole machines, design of field coil – performance calculation from designed data

Text Books

1. Sawhney, A.K., A Course in Electrical Machine Design, Dhanpat Rai and Sons, New Delhi, 2006.

2. Sen,S.K., Principles of Electrical Machine Design with Computer Programmes, Oxford and IBH Publishing Co.(P) Ltd., New Delhi, 2004.

Reference Books

1. Agarwal, R.K., Principles of Electrical Machine Design, S.K.Kataria and Sons, Delhi, 2002.
2. Mittle, V.N., and Mittle, A., Design of Electrical Machines, Standard Publications and Distributors, Delhi, 2002.
3. Balbir Singh, Electrical Machine Design, Brite Students Publications.

EEE381	POWER ELECTRONICS LABORATORY	L	T	P	C
		0	0	3	2

After Successful completion of course, the students will be able to,

CO1	:	Apply the knowledge of power electronic devices and converters.
CO2	:	Demonstrate the performance of Converters and power semiconductor devices.
CO3	:	Analyze the performance of converters and power electronic devices.

CO and PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1			M						M	L		S	M		
CO2				S	S				S	S	S		S	S	S
CO3				S	S				S	S	S		S	S	

1. Characteristics of MOSFET, SCR and IGBT
2. Single phase half and fully controlled converters
3. Three phase half controlled converters
4. Three phase fully controlled converters
5. Simulation of DC-DC Converter using Multi Sim
6. Simulation of inverter using Multi Sim
7. Single phase IGBT based PWM inverters
8. Step up and step down MOSFET based choppers.
9. Resonant dc-dc converters.
10. Single phase AC voltage controller
11. Three phase AC voltage controller
12. Single phase cyclo converters.
13. Mini project

Additional Experiments

1. PWM Motor Control with forward, reverse and Break Operation.

EEE382	INTRUMENTATION AND CONTROL LABORATORY	L	T	P	C
		0	0	3	2

Course Outcome:

CO1	:	Handle and operate the laboratory equipment properly.
CO2	:	Construct, analyze and trouble shoot measurements and control system.
CO3	:	Simulate and record the experimental data, analyze the results and prepare a report.

Co-Po Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1				S	S				M						
CO2					S				S				S	S	
CO3											S		S	S	

Study of displacement and pressure transducers

1. AC bridges – Anderson and Schering bridge using LABVIEW
2. DC bridges- Wheatstone and Kelvin double bridge using LABVIEW
3. Instrumentation amplifiers.
4. Simulation of transients using RLC circuits.
5. Calibration of single–phase and three – phase energy meter.
6. Measurement of three phase real, reactive and apparent power and power factor using electronic tri-vector meter.
7. Improvement of Power factor by VAR measurement with capacitor

Additional Experiments

1. Ph meter circuit
2. Single Chip high frequency voltage-to-frequency converter (VFC)
3. Fan Control circuit using LM56 IC
4. Pt 100 RTD current loop transmitter using XTR 105

CONTROL SYSTEM

1. Plot the speed torque characteristics of DC & AC servo motor**.**
2. Analog simulation of type–0 and type–1 system.
3. Digital simulation of linear & non–linear systems.
4. Design of P, PI and PID controllers.
5. Time response of open loop & closed loop control system.
6. Study of synchros.

Additional Experiments

1. To study stepper motor and control its direction of speed and number of steps.
2. To design different compensation network for the given cutoff frequency and to plot frequency response characteristics.
3. Temperature control system.

EEE383	DIGITAL CIRCUITS AND DIGITAL CIRCUITS AND INTEGRATED CIRCUITS LABORATORY	L	T	P	C
		0	0	3	2

Course Outcomes:

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

CO1	:	Handle and operate the laboratory equipment properly.
CO2	:	Construct, analyze, and troubleshoot the simple applications using Digital and integrated circuits.
CO3	:	Simulate and record the experimental data, analyze the results and prepare a report

CO and PO mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1					S			S	S						
CO2				S	S			S	S		M		S	S	
CO3				S	M			S	M			S	S	S	

(a) **Digital Circuits**

1. Implementation of combinational circuits (Adder/Subtractor)
2. Code converters(Gray to Excess 3, BCD to Gray, Gray to Binary)
3. Realisation of Ring counter
4. Encoder and Decoder
5. Multiplexer and De-multiplexer (4:1,8:1 Mux and 1:4,1:8 De–Mux)
6. Shift registers(SISO,PISO,SIPO,PIPO)
7. Mini project

2. Integrated Circuits

1. Analog to digital converters
2. Digital to analog converters
3. Astable and monostable operation using 555 timers
4. Applications of operational–amplifiers.

EEE305	POWER SYSTEM ANALYSIS	L	T	P	C
		3	1	0	4

Course Outcomes:

After Successful completion of course, the students will be able,

CO1	:	To understand the role of power system analysis tools on the planning and operation of power system and to develop one line diagram of the given power system.
CO2	:	To form Y_{bus} and Z_{bus} matrices for power system networks and to solve the power flow problem using numerical methods.
CO3	:	To analyze the fault using Z_{bus} matrix.
CO4	:	To apply symmetrical component techniques for unsymmetrical fault analysis.
CO5	:	To develop the swing equation and analyze the stability of synchronous machine.

CO and PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	S	S	M	M									S	M	
CO2	S	S	S	S	S								S	S	
CO3	S	S	S	S	S	S							S	S	
CO4	S	S		S									S	M	
CO5	S	S	S	S		M							S	S	S

Unit 1: POWER SYSTEM MODELLING

Overview of power system analysis – importance of system planning and operational analysis – matrix formation by building algorithm – per phase analysis of symmetrical three phase system – unction of power system components – representation, single line diagram, per unit representation – network topology – primitive network and its matrices, bus admittance matrix formation – inspection method, singularity transformation method – bus impedance – π equivalent circuit of transformer with off nominal – tap ratio – phase shifting transformer.

Unit 2: POWER FLOW ANALYSIS

Importance of power flow analysis– power flow problem – classification of buses – development of power flow model in Gauss-seidel power flow – numerical problems – computation of transmission line flows, losses and slack bus power – Newton-Raphson (N-R) method (polar form)– flowchart – numerical problems – development of Fast Decoupled Power Flow (FDPF) model, flowchart, numerical problems – comparison of the three methods of load flow.

Unit 3: SYMMETRIC FAULT ANALYSIS

Need for fault analysis – common approximations made in fault analysis – symmetrical short circuits – Thevenin‟s equivalent circuit and its applications – short circuit capacity – circuit breaker selections – fault analysis using Z bus matrix.

Unit 4: UNSYMMETRICAL FAULT ANALYSIS

Unsymmetrical short circuits – short circuit analysis – symmetrical components method – derivation of fault current – LG, LL, LLG short circuits – development of interconnection of sequence networks for LG, LL and LLG faults.

Unit 5: STABILITY ANALYSIS

Importance of stability analysis – classification of power system stability – single Machine Infinite Bus (SMIB) system – development of swing equation – synchronous machine representation by classical model – power – angle equation– equal area criterion – determination of critical clearing angle and time – algorithm for numerical solution of swing equation using modified Euler method – plotting of swing curves.

Text Books

1. Nagrath, I.J., Kothari, D.P., Modern Power System Analysis, Tata McGraw Hill Publishing Company, New Delhi, 2005.

Reference Books

1. Hadi Saadat., Power System Analysis, Tata McGraw Hill Publishing Company, New Delhi, 2005.
2. John J. Grainger, W.D. Stevenson Jr., Power System Analysis, Tata McGraw Hill International Book Company, 2005.

EEE306	MICROPROCESSOR AND MICROCONTROLLER	L	T	P	C
		3	1	0	4

Course Outcomes:

After Successful completion of course, the students will be able to,

CO1	:	Illustrate the architecture and analyze the instruction sets, programming of 8 bit microprocessor 8085.
CO2	:	Describe the functional blocks, instructions of 16 bit microprocessor 8086 and its programming.
CO3	:	Study the different peripheral devices and their interfacing to 8085 and 8086
CO4	:	Illustrate the architecture of 8051 microcontroller.
CO5	:	Study the interrupt and timers of 8051 microcontroller and design the microcontroller based control circuit for electrical and electronics applications.

CO and PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1			S	S									S		
CO2			S	S	S				S						
CO3			S	S					S					S	
CO4			S	S	S										
CO5			S	S	S								S	S	

Unit 1: 8085 MICROPROCESSOR

8085 architecture – Instruction set – Addressing modes- Timing diagram – Assembly Language Programming – Counters time delays – Interrupts – Memory Interfacing – Interfacing I/O devices.

Unit 2: 8086 MICROPROCESSOR

Organization of 8086 microprocessor – Memory Segmentation – Addressing bytes and words – addressing formation – Addressing modes – Assembly Language Programming – Interrupts.

Unit 3: 8051 MICROCONTROLLER

Interfacing serial I/O (8251) – Parallel I/O (8255) – Keyboard and display controller (8279) – ADC/DAC interfacing – 8257 programmable DMA controller – 8259A programmable interrupt controller.

Unit 4: UNSYMMETRICAL FAULT ANALYSIS

8051 microcontroller hardware – I/O Pins, Ports and circuits – external memory – counters and timers – serial data input and output – interrupts – Interfacing to external memory and 8255.

Unit 5: 8051 PROGRAMMING AND APPLICATIONS

8051 Instruction set – Addressing Modes – Assembly Language Programming – I/O Port Programming – Timer and counter Programming – Serial Communication – Interrupt Programming – 8051 Interfacing, LED, ADL, Sensors – Stepper Motor – keyboard and DAC.

Text Books

1. Gaonkar, R.S., Microprocessor Architecture Programming and Application, Wiley Eastern Ltd., New Delhi, 2005.
2. John B. Peatman, Design with PIC Micro controller, Pearson Education, 2003.

Reference Books

1. Hall, D.V., Microprocessor and Interfacing Programming and Hardware, Tata McGraw Hill Publishing Company, 2nd edition, 2006.
2. YuCheng Liu & Glenn A Gibson, Microcomputer System, 8086/8088 Family, 2nd edition, Prentice Hall of India, 2005.
3. Rafiquzzaman M., Microprocessor Theory and Application – Intel and Motorola, Prentice Hall of India, 2002.

EEE384	MICROPROCESSOR AND MICRO CONTROLLER LABORATORY	L	T	P	C
		0	0	3	2

Course Outcomes:

After Successful completion of course, the students will be able to,

CO1	:	Handle and operate the laboratory equipment properly
CO2	:	Construct, Analyze and troubleshoot the simple program using Microprocessor and Microcontroller kit
CO3	:	Execute and record the experimental output and verify the output with manual calculation

CO and PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1				S	S				S						
CO2				S	S				S	S		M	S	S	
CO3				S	S				S	L		S	S	S	

8–bit Microprocessor

1. Simple arithmetic operations
2. ADC and DAC interfacing
3. Traffic Light Controller using 8255 and 8085

4. Mini project

8–bit Micro controller

1. Arithmetic operation with 8051 micro controller execution.
2. Sine wave and Square wave generation
3. ADC and DAC interfacing
4. Stepper motor control
5. Servomotor control
6. Traffic light control
7. Seven segment display
8. Basic programming using keil
9. Study of micro controllers with flash memory.

Additional Experiments

1. Simple Digital Voltmeter using 8051.
2. Digital lock using AT89C2051 with LCD and keypad assembly.
3. Data acquisition system using 8051.
4. Temperature controlled Fan.
5. Microcontroller based caller ID.
6. Bio medical monitoring system.
7. Auto Control of 3-phase Induction Motor.

EEE401	PROTECTION AND SWITCH GEAR	L	T	P	C
		3	0	0	3

Course Outcomes:

After Successful completion of course, the students will be able,

CO1	:	To understand the requirement of protective relays and circuit breakers in power system.
CO2	:	To explain the working of different type of circuit breakers.
CO3	:	To analyze the functioning of various protective systems.
CO4	:	To design the protective system for the given power system components.
CO5	:	To Explain the working of static relays.

CO and PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	S														
CO2	S												S		
CO3	S	M	S	S									S	M	
CO4	S	S	S	S									S	S	
CO5	S												S	S	S

Unit 1: PROTECTIVE RELAYS

Principles and need for protective schemes – nature and causes of faults – types of faults – essential qualities of protection – zones of protection – primary and back up protection – relay classification – principle types of electromagnetic relays – theory of induction disc relay – relay design – relay construction – general equation for electromagnetic relays – over current relays – directional relays – distance relays – differential relays.

Unit 2: CIRCUIT BREAKERS

Physics of arc phenomena – maintenance of the arc – losses – arc interruption theories – circuit breaker rating – characteristics of restriking voltage – current chopping – types of circuit breakers – air break CB, Air blast CB, Oil CB, Vacuum CB,SF_6 CB – basic steps for design of circuit breaker – testing of circuit breakers.

Unit 3: POWER SYSTEM APPARATUS PROTECTION

Over current, distance, pilot feeder, protection schemes – transformer protection – generator protection – motor protection – bus zone protection – auto reclosing –methods of testing protective gear – current transformer tests – potential transformer tests.

Unit 4: OVER VOLTAGE PROTECTION

Causes of over voltages – lightning – switching – insulation failure and arcing grounds – methods of protection – ground wires, Peterson coils, surge absorbers and diverters – location of protective apparatus – insulation coordination – neutral earthing.

Unit 5: STATIC RELAYS

Basis for static relay development – classification – components of static relays – elements of a static relay – over current relay – differential protection – static distance relay – microprocessor based relays – concepts of digital relaying.

Text Books

1. Sunil S.Rao., Protective Switch Gear, Khanna Publishers, New Delhi, 1999.
2. Ravindranath B., Chander, N., Power Systems Protection and Switch Gear, Wiley Eastern (P) Ltd., 2001.

Reference Books

4. Badri Ram., Vishwakarma, D.N., Power system protection and switchgear, Tata Mc Graw Hill publishing company Ltd., 2002.
5. Uppal, S.L., Electrical Power, Khanna Publishers, New Delhi, 2004.
6. V.K. Metha, Principles of power system, chand (s) & Co. Hd Ltd.

EEE403	POWER SYSTEM OPERATION AND CONTROL	L	T	P	C
		3	1	0	4

Course Outcomes:

After Successful completion of course, the students will be able,

CO1	:	To understand the behavior of load on power systems.
CO2	:	To understand the role of load frequency control and voltage control in power system.
CO3	:	To solve the economic dispatch and unit commitment problem using mathematical programming techniques.
CO4	:	To develop the mathematical model with load frequency controller and analyze the performance of power system with load frequency control.
CO5	:	To understand the various voltage control mechanisms in power systems and the functioning of energy control centre.

CO and PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	S												M		
CO2	S	S			S								S		S
CO3	S	S	M	M		M							S		S
CO4	S	M	S	S									S	S	
CO5	S				S	S						S	S		

Unit 1: LOADS ON POWER SYSTEM

System load variation – system load characteristics – load curves – daily, weekly and annual, load-duration curve – load factor – diversity factor – reserve requirements– installed reserves, spinning reserves, cold reserves, hot reserves – overview of system operation – load forecasting, unit commitment, load dispatching – overview of system control – governor control, LFC, EDC, AVR, system voltage control and security control.

Unit 2: ECONOMIC DISPATCH AND UNIT COMMITMENT

Incremental cost curve – co-ordination equations – without loss and with loss – solution by direct method and λ-iteration method – base point and participation factors – economic dispatch controller added to LFC control – Statement of Unit Commitment (UC) problem – constraints in UC – spinning reserve, thermal unit constraints, hydro constraints, fuel constraints and other constraints – UC solution methods – priority –list methods, forward dynamic programming approach.

Unit 3: ACTIVE POWER – FREQUENCY CONTROL

Fundamentals of speed governing mechanism and modeling – speed-load characteristics – load sharing between two synchronous machines in parallel – concept of control area – LFC control of a single-area system – static and dynamic analysis of uncontrolled and controlled cases, economic dispatch control – multi-area systems – unction of two-area system, static analysis and dynamic analysis of two area system – uncontrolled case-tie line with frequency bias control of two-area system derivation – state variable model.

Unit 4: REACTIVE POWER–VOLTAGE CONTROL

Typical excitation system – modeling, static and dynamic analysis – stability compensation; generation and absorption of reactive power – relation between voltage, power and reactive power – method of voltage control – injection of reactive power – numerical problems – system level control – generator voltage magnitude setting, static var capacitor-basic concepts- tap setting of OLTC transformer and MVAR injection of switched capacitors to maintain acceptable voltage profile and to minimize transmission loss.

Unit 5: COMPUTER CONTROL OF POWER SYSTEMS

Energy control centre – functions, monitoring, data acquisition and control – system hardware configuration – SCADA and EMS functions – network topology determination – state estimation, security analysis and control – various operating states – normal, alert, emergency, in extremis and restorative – state transition diagram showing various state transitions and control strategies.

Text Books

1. Olle. I. Elgerd., Electric Energy Systems Theory – An Introduction, Tata McGraw Hill Publishing Company Ltd, New Delhi, Revised edition, 2006.
2. Allen.J.Wood and Bruce F.Wollenberg., Power Generation, Operation and Control, John Wiley and Sons, Inc., 2004.

Reference Books

1. Kothari ,D.P., and Nagrath., I.J., Modern Power System Analysis, Tata McGraw Hill Publishing Company Limited, New Delhi, 3rd edition, 2005.

EEE481	Power System Simulation Lab	L	T	P	C
		0	0	3	2

Course Outcomes:

After Successful completion of course, the students will be able,

CO1	:	Understand the computational methods in power system analysis
CO2	:	Ability to acquire the knowledge in solving Power system problems using digital techniques
CO3	:	Analyze the transmission line parameters using various software

CO and PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	S												S		
CO2				S	S				S	M	S	S	S	S	
CO3				S	S				S	S	L	S	S	S	

1. Introduction to MATLAB and ETAP
2. Ybus Formation Using Singular Transformation Method
3. Z_{BUS} formation using bus building algorithm
4. Gaussian Elimination method
5. Load flow solution using Gauss – Seidal method
6. Load flow solution using Newton – Raphson method
7. Load flow solution using Fast Decoupled load flow method

8. Solution of economic dispatch control
9. Symmetrical fault analysis
10. Transient stability analysis
11. Automatic Generation control
12. Relay Coordination Using MIPOWER

EEE482	MICROCONTROLLER BASED SYSTEM DESIGN LABORATORY	L	T	P	C
		0	0	3	2

Course Outcomes:
After Successful completion of course, the students will be able,

CO1	:	Design Arduino based circuits for various applications
CO2	:	Design Raspberry pi based circuits for various applications
CO3	:	Apply the knowledge based Arduino and raspberry pi for designing various practical applications

CO and PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1				S	S				S		M		S	S	
CO2				S	S				S		S		S	S	
CO3	S			S	S	M		S	S	S	S		S	S	

1. To study development tools/environment for Arduino and Raspberry pi programme and Architecture
2. Assembly language program to generate 10 KHz frequency using interrupt on P1.2 using Arduino
3. Interfacing of 16X2 LCD Raspberry pi using Arduino
4. Implementation of seven segment display Raspberry pi .
5. Implementation of stepper motor angle control using Arduino
6. Implementation of DC Motor control using PWM method using Arduino
7. Implementation of position control of servo motor using Arduino
8. Implementation of Tx and Rx data through serial port Raspberry pi
9. Implementation of ADC conversion and programming of pressure and temperature measurement using Arduino
10. Interfacing of SD/MMC card interface using 18F4550
11. Angle variation of servo motor with Arduino.
12. Interrupt generation and control with Arduino.
13. Accessing EEPROM memory in Arduino.

EEE499	PROJECT WORK	L	T	P	C
		0	0	24	8

Course Outcomes:

After Successful completion of course, the students will be able,

CO1	:	Apply the engineering knowledge and identify the project based on practical applications.
CO2	:	Design hardware circuits / software.
CO3	:	Implement and demonstrate the projects for real time applications.

CO and PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1				S	S			S	M		M		S		
CO2		S	S	S	S	S	S	S	S	S	S	M	S	S	
CO3	S			S	S	S	S	S	S	S	S	S	S	S	S

MAJOR ELECTIVES

EEE307	HIGH VOLTAGE ENGINEERING	L	T	P	C
		4	0	0	4

Course Outcomes:

After Successful completion of course, the students will be able to,

CO1	:	To understand the principles of measurement of impulse voltages and overvoltage protection.
CO2	:	To analyze the various breakdown mechanisms in solids, liquids and gases.
CO3	:	To understand the principle of generation of high voltage and high current
CO4	:	To analyze the transformer winding behavior under transient conditions.
CO5	:	To test the various power system apparatus.

CO and PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	S			S									S		
CO2	S														
CO3	S		S	S										S	
CO4	S		S	M									S		
CO5	S		S	S										S	

Unit 1: MEASUREMENT OF HIGH VOLTAGES AND HIGH CURRENTS

Measurement of high alternating and direct impulse voltages – digital recorders for impulsemeasurements – measurement of high currents- causes of overvoltages and its effect on power system-protection against overvoltages

Unit 2: ELECTRICAL BREAKDOWN IN GASES, SOLIDS AND LIQUIDS

Break down in gases – liquids and solids – partial discharges – dielectric breakdown.

Unit 3: GENERATION OF HIGH VOLTAGES AND HIGH CURRENTS

Generation of high alternating and direct voltages, impulse and switching voltages – generationof high impulse currents.

Unit 4: TRANSIENTS IN ELECTRICAL POWER SYSTEM

Basic concepts of transients – classification – lightning over voltage – switching over voltages –transformer winding unction under transient conditions – lightning discharge.

Unit 5: HIGH VOLTAGE TESTING AND INSULATION COORDINATION

High voltage testing – testing of circuit breakers, insulators, bushings and surge diverters,transformers, cables – standards and specifications – non-destructive high voltage test, tests on lightning arrestors – insulation coordination.

TEXT BOOKS

1. Wadhwa,C.L., High Voltage Engineering, New Age International (P) Limited, New Delhi, 2001.
2. Naidu,M.S., Kamaraju,V., High Voltage Engineering, Tata McGraw Hill Publishing Company, New Delhi, 2004.
3. A. Haddad,D.F. Warne, Advances in High Voltage Engineering Technology & Engineering, Institution of Engineering and Technology, 2004

REFERENCE BOOKS

1. Gallghar,P.J., Pearmain A.J., High Voltage measurement, Testing and Design,John Wiley and Sons,Newyork,1982.
2. Kuffel,E., Zaengl W.S., High Voltage Engineering Fundamentals , Pergamon press, Oxford, London, 2002.
3. An Introduction to High Voltage Engineering, Ray Subir , PHI; 2nd edition 2013
4. High Voltage Engineering Paperback, Simmi P. Burman, Nikita Gupta (Author) , S.K. Kataria & Sons; 2013 edition 2013.

EEE309	CONTROL SYSTEM DESIGN	L	T	P	C

Course Outcomes:

After Successful completion of course, the students will be able to,

CO1	:	Understand the fundamental control system design specifications.
CO2	:	Analyze the lead, lag, lead-lag compensators in frequency domain.
CO3	:	Use system observability and controllability concepts
CO4	:	Design classical controllers based on Bode plots and root locus techniques
CO5	:	Design the Kalman filter and use it in diverse engineering disciplines

CO and PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	S	S	S	S	S								S		
CO2	S	S	S	S	S									S	
CO3	S	S	M	S	S							M		M	
CO4	S	S	S	S	M								S		
CO5	S	S	S										S		

Unit 1: INTRODUCTION TO DESIGN

System performance and specification – P,PI, PD and PID controllers – characteristics – design – tuning – manual and automatic – robust control system design.

Unit 2: FREQUENCY DOMAIN DESIGN

Realization of compensators – design of lead, lag, lead-lag compensators – design using Bode plots – polar plots – Nichol‟s chart – MIMIO design – feedback compensation

Unit 3: STATE VARIABLE DESIGN

Design by state feedback – output feedback – MIMO pole assignment technique –design of state and output regulators – design of reduced and full order observer – parameter optimization – Hα control.

Unit 4: STATE ESTIMATION TECHNIQUES

Introduction – state observers, asymmetric observers, frequency domain interpretation – linear quadratic regulator (LQR) – statistical descriptions of noise, Kalman filter, stability margins.

Unit 5: CASE STUDIES

Inverted pendulum – robo arm control – RADAR tracking control – satellite attitude control – process control.

TEXT BOOKS

1. Friedland.B., Control System Design, Tata McGraw Hill 1986.
2. Anderson, B.D.O., Moore, J.B., Optimal Control – LQ Methods, Prentice Hall of India, New Delhi, 1991.
3. Doyle, J.C., Francis, B.A., Tannenbaum, A.R., Feedback Control Theory, Maxwell Macmilan International, 1992.

REFERENCE BOOKS

1. Gopal, M., Control system Principles and Design, Tata McGraw Hill, New Delhi, 2002.
2. Goodwin, G.C., et al., Control system Design, Pearson education, 2003.

EEE311	NETWORK ANALYSIS AND SYNTHESIS	L	T	P	C
		3	0	0	3

Course Outcomes:

After Successful completion of course, the students will be able to,

CO1	:	Understand and apply the concept of stability in active network
CO2	:	Analyze the frequency domain of RLC network
CO3	:	Analyze the two port network
CO4	:	Apply the concept of foster and cauer forms of realization in network synthesis
CO5	:	Design the various classifications of filter

CO and PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	S	S	S	S								L	S		
CO2	S	S	S	S								M	S	M	
CO3	S	S	S	S											
CO4	S	S	S	M	S								S		
CO5	S	S	S	S										S	

Unit 1: INTRODUCTION TO NETWORK ANALYSIS

Network elements – one port and two port networks – driving point immittance – transfer function – necessary conditions for driving point function and transfer function – poles and zeros – significance of poles and zeros – restriction and the location of pole and zeros – time domain behavior from pole zero plot – stability criterion for active network – solved problems.

Unit 2: FREQUENCY DOMAIN ANALYSIS

Admittance-Loci of RLC network-Frequency- RLC networks-Frequency response from pole –zero –Bode plots.

Unit 3: TWO–PORT NETWORKS

Two port network – open circuit impedance (Z)parameters – short circuit admittance(Y)

parameters – transmission (ABCD) parameters – inverse transmission (A'B'C'D')parameters – hybrid (h) parameters – inverse hybrid(g)parameters – inter relationship of different parameters – inter connection of two port networks– T and representation – terminated two port networks – lattice networks – image parameters.

Unit 4: NETWORK SYNTHESIS

Network reliability – Hurwitz polynomials – positive real functions – properties of RC, RL & LC networks – Foster and Cauer forms of realization (Synthesis of RL and RC Network) – transmission zeroes – synthesis of transfer functions.

Unit 5: FILTERS DEISGN

Filters-Classification of filters –Characteristics of ideal filters –Image impedance – constant K low pass, high pass and band pass filter-M derived low pass , high pass and band pass filter

TEXT BOOKS

1. Franklin F. Kuo., Network Analysis and Synthesis, John Wiley 1996.
2. Louis Weinberg., Network Analysis and Synthesis, Tata McGraw Hill Book Company Inc., 1962.
3. Vanvalkenburg., Network Analysis, Prentice Hall of India (P) Ltd., New Delhi,1989.
4. S.P Ghosh , A.K Chakrabarthy, Network analysis and synthesis, PHI learning education.
5. Ravish R. Singh, Network Analysis and Synthesis , McGraw Hill Education ,2013.

REFERENCE BOOKS

1. Someshwar C.Gupta., et. Al., Circuit Analysis with computer applications to problem– sovling, Wiley–Eastern Ltd., 2001.
2. Vasudev K. Aartre, Network Theory and Filter Design,Wiley–Eastern Ltd., 2nd edition, 1993.
3. Lawrence P. Huelsman, Active and Passive Analog Filter Design, McGraw Hill, 1993.
4. Electrical networks , Ravi R Singh , Tata McGraw-Hill, 2009.
5. K.M. Soni, Network Analysis and Synthesis, S K Kataria and Sons, 2013
6. B.R. Gupta , Network Analysis and Synthesis, S. Chand Publishing, 2010

EEE312	SPECIAL ELECTRICAL MACHINES	L	T	P	C
		3	0	0	3

Course Outcomes:

After Successful completion of course, the students will be able to,

CO1	:	Analyze the performance of synchronous reluctance motor & vernier motor.
CO2	:	Apply the knowledge of modes of operation of various stepper motor in practical applications and analyze its linear & non-linear performance.
CO3	:	Describe the performance of power semiconductor switching circuits for the different operating modes of switched reluctance motor.
CO4	:	Determine the EMF and torque productions of a PMBLDC motor based on its characteristics & driver circuits.
CO5	:	Analyze the performance of a permanent magnet synchronous motor based on its constructional features & open and closed loop control of it.

CO and PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	S	S											S	S	
CO2	S	S		S							S		S	S	
CO3	S	S		M											
CO4	S	S									S		M		
CO5	S	S											S	S	S

Unit 1: SYNCHRONOUS RELUCTANCE MOTORS

Constructional features – types – axial and radial air gap motors – operating principle – reluctance – phasor diagram – characteristics – Vernier motor – Applications

Unit 2: STEPPING MOTORS

Constructional features – principle of operation – variable reluctance motor – hybrid motor – single and multi stack configurations – theory of torque predictions – linear and non-linear analysis – characteristics – drive circuits – Applications

Unit 3: SWITCHED RELUCTANCE MOTORS

Constructional features – principle of operation – torque prediction – power controllers – non-linear analysis – microprocessor based control – characteristics – computer control – Applications

Unit 4: PERMANENT MAGNET BRUSHLESS DC MOTORS AND INDUCTION MACHINES

Principle of operation – types – magnetic circuit analysis – EMF and torque equations – power controllers – motor characteristics and control – induction voltage regulator – synchronous induction motor – power selsyn – position selsyn – linear motors – Applications

Unit 5: PERMANENT MAGNET SYNCHRONOUS MOTORS

Principle of operation – EMF and torque equations – reactance – phasor diagram – power controllers – converter – volt–ampere requirements – torque speed characteristics – microprocessor based control – Applications

TEXT BOOKS

1. Miller, T.J.E., Brushless Permanent Magnet and Reluctance Motor Drives, Clarendon Press, Oxford, 1989.
2. Aearnley P., Stepping Motors – A Guide to Motor Theory and Practice, Peter Perengrinus, London, 1982.
3. D Kothari, I Nagrath, Electrical Machines, McGraw Hill Education (India) Private Limited June 2006.

REFERENCE BOOKS

1. Kenjo, T., Stepping Motors and Their Microprocessor Controls, Clarendon Press London, 1984.
2. Kenjo,T., Nagamori,S., Permanent Magnet and Brushless DC Motors, Clarendon Press, London, 1988.
3. E.G. Janardanan , Special Electrical Machines , PHI , 2014
4. Theodore Wildi, Electrical Machines Drives, Pearson Education,2013

EEE313	ENERGY MANAGEMENT AND ENERGY AUDIT	L	T	P	C
		3	0	0	3

Course Outcomes:

After Successful completion of course, the students will be able to,

CO1	:	Understand the challenges in Energy Sector.
CO2	:	Apply Energy management, audit techniques and analyze the Energy flow in energy consuming systems.
CO3	:	Apply the concept of Energy Monitoring and Targeting System.
CO4	:	Understand the concept of Energy action planning, Project and Financial management in energy firms.
CO5	:	Describe the Global Environmental Issues.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	S						S								S
CO2	S	S	M	S		S			S	M		M		S	
CO3	S	M		M		M						S	S		
CO4	S	S			S									S	S
CO5	M		S	S		S	S	M					M		S

Unit 1: ENERGY SCENARIO AND ITS FORMS

Introduction – Primary and Secondary Energy – Commercial Energy and Non commercial Energy –Renewable and Non Renewable Energy – Global Primary Energy Reserves – Indian Energy Scenario –Energy Needs of Growing Economy –Long Term Energy Scenario for India – Energy Pricing in India – Energy Sector Reforms –Energy and Environment – Energy Security –Energy Conservation and its Importance – Energy Strategy for the Future – Energy Conservation Act, 2001 and its Features. Energy and its Various Forms: Definition – Various Forms of Energy – Electrical Energy Basics – Thermal Energy Basics –Units and Conversions.

Unit 2: ENERGY MANAGEMENT AND AUDIT

Definition & Objectives of Energy Management – Energy Audit: Types and Methodology – Energy Audit Reporting Format – Understanding Energy Costs – Benchmarking and Energy Performance – Matching Energy Usage to Requirement – Maximising System Efficiency – Fuel and Energy Substitution – Energy Audit Instruments – Basic Principles of Materialand Energy Balance – Sankey Diagram and its Use – Material Balances – Energy Balances – Method for Preparing Process Flow Chart – Facility as an Energy System – How to Carryout Material and Energy (M & E) Balance .

Unit 3: ENERGY MONITORING AND TARGETING

Definition – Elements of Monitoring & Targeting System – Rationale for Monitoring, Targeting and Reporting – Data and Information Analysis – Relating Energy Consumption and Production – CUSUM – Case Study.

Unit 4: ENERGY ACTION PLANNING, PROJECT AND FINANCIAL MANAGEMENT

Introduction – Energy Management System – Financial Management: Introduction – Investment Need, Appraisal and Criteria – Financial Analysis – Financial Analysis Techniques – Sensitivity and Risk Analysis – Financing Options. Project Management: Introduction – Steps in Project Management

Unit 5: GLOBAL ENVIRONMENTAL CONCERNS

Global Environmental Issues – Ozone Layer Depletion – Global Warming – Loss of Bio-Diversity – Climate Change Problem and Response – The Conference of the Parties (COP) – Prototype Carbon Fund (PCF) – 9.8 Sustainable Development.

TEXT BOOK

1. General Aspects of Energy Management and Energy Audit, Bureau of Energy Efficiency, New Delhi, India, 2nd edition 2005.
2. K. V. Sharma , P. Venkataseshaiah , Energy Management and Conservation, I K International Publishing House Pvt. Ltd, 2011

EEE314	SOLAR AND WIND ENERGY CONVERSIONS	L	T	P	C
		3	0	0	3

Course Outcomes:

After Successful completion of course, the students will be able to,

CO1	:	Apply the knowledge in solar spectrum and solar radiation.
CO2	:	Understand the basic concept of solar photovoltaic energy conversion and different types of solar PV plants.
CO3	:	Apply the solar power Conversion techniques in the field of solar cars, air craft and space satellites.
CO4	:	Understand the basic concept of wind energy conversion system.
CO5	:	Analyze the various aspects related to Wind turbine generators.

CO and PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	S												M		
CO2			S				S					S	M		S
CO3	S		S	S	M	S	S					S	S	S	S
CO4	M	S				S	M						S		S
CO5	S		M	M	S	S	S					M	S	S	S

Unit 1: SOLAR SPECTRUM AND SOLAR RADIATION

World energy resources – Indian energy scenario – environmental aspects of energy utilization – renewable energy resources and their importance – global solar resources – solar spectrum – electromagnetic spectrum – basic laws of radiation – physics of the sun – energy balance of the earth – energy flux – solar constant for earth – green house effect.Solar radiation on the earth surface – extraterrestrial radiation characteristics – terrestrial radiation – solar isolation – spectral energy distribution of solar radiation-depletion of solar radiation – absorption – scattering – beam radiation – diffuse and global radiation – measurement of solar radiation

Unit 2: SOLAR ELECTRICAL ENERGY CONVERSION

Solar photovoltaic energy conversion – principles – physics and operation of solar cells – classification of solar PV systems – solar cell energy conversion efficiency – I-V

characteristics – effect of variation of solar insulation and temperature – losses – solar PV power plants.

Unit 3: PV SYSTEM APPLICATIONS

Integrated photovoltaic units – grid interacting central power stations – stand alone devices for distributed power supply in remote and rural areas – solar cars – aircraft – space solar power satellites – socio-economic and environmental merits of photovoltaic systems

Unit 4: INTRODUCTION OF WIND ENERGY

Basics & power analysis – wind resource assessment – power conversion technologies and applications – wind power estimation techniques – principles of aerodynamics of wind turbine blade – various aspects of wind turbine design

Unit 5: WIND TURBINE GENERATORS

Induction machines – synchronous machine – constant V & F and variable V & F generations – reactive power compensation – site selection – concept of wind form & project cycle – cost economics & viability of wind farm.

TEXT BOOKS

1. Duffy and Buckman., Solar energy thermal process, John wiley and sons,2002.
2. CulpA.W., Principles of Energy Conversion, Tata McGraw Hill Publication, New Delhi,2001.
3. Solar Energy: Principles Of Thermal Collection And Storage S. Sukhatme (Author), J Nayak (Author), Mcgraw Hill Education 2008.

REFERENCE BOOKS

1. Rai, G.D., Non–conventional Energy Sources, Khanna Publishers, New Delhi, 2003.
2. Sathyajith Mathew, Wind energy–Fundamentals, Resource Analysis and Economics, Springer, 2006.
3. S. Sumathi (Author), L. Ashok Kumar (Author), P. Surekha (Author), Solar PV and Wind Energy Conversion Systems, Springer; 2015 edition (14 April 2015).
4. Energy Harvesting: Solar, Wind, and Ocean Energy Conversion Systems (Energy, Power Electronics, and Machines), Alireza Khaligh (Author), Omer C. Onar (Author) CRC Press 2009.

EEE366	EMBEDDED SYSTEMS	L	T	P	C
		3	0	0	3

Course Outcomes:

After Successful completion of course, the students will be able to,

CO1	:	Design the embedded process for simple application
CO2	:	Describe the processor and component interfacing
CO3	:	Understand the network protocols
CO4	:	Analyze the different scheduling algorithm
CO5	:	Design simple product using system design technology

CO and PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	S		S										S	S	
CO2	S		S	S									M		
CO3	S			S									M		
CO4	S		S	S	S			S					S	S	
CO5	S		S										S	S	

Unit 1: EMBEDDED ARCHITECTURE

Embedded computers, characteristics of embedded computing applications – challenges in embedded computing system design – embedded system design process – requirements – specification – architectural design – designing hardware and software components – system integration – formalism for system design – structural description – behavioral description – design example: model train controller.

Unit 2: EMBEDDED PROCESSOR AND COMPUTING PLATFORM

ARM processor – processor and memory organization – data operations – flow of control – memory devices – input/output devices – component interfacing – designing with microprocessor development and debugging – design example: alarm clock – component interfacing using LPC1768 controller.

Unit 3: NETWORKS

Distributed embedded architecture – hardware and software architectures – networks for embedded systems – I2C, CAN Bus – SHARC link p ports – unction, myrinet, internet, network – based design – communication analysis – system performance analysis – hardware platform design – allocation and scheduling – design example: elevator Controller – I2C and CAN bus interfacing using LPC1768 controller.

Unit 4: REAL-TIME CHARACTERISTICS

Clock driven approach – weighted round robin approach – priority driven approach – dynamic versus static systems – effective release times and deadlines – optimality of the earliest deadline first (EDF) algorithm – challenges in validating timing constraints in priority driven systems – off-line versus on-line scheduling – Task Scheduling by using Keil IDE. =

Unit 5: SYSTEM DESIGN TECHNIQUES

Design methodologies – requirement analysis – specification – system analysis and architecture design – quality assurance – design example: telephone pbx – system architecture – ink jet printer – hardware design and software design – personal digital assistants – set-top boxes.

TEXT BOOKS

1. Wayne Wolf, Computers as Components: Principles of Embedded Computing System Design, Morgan Kaufman Publishers, 2012.
2. Jane.W.S. Liu Real–Time systems, Pearson Education Asia, 2004.

REFERENCE BOOKS

1. C. M. Krishna and K. G. Shin , Real–Time Systems, ,McGraw–Hill, 2011.
2. Frank Vahid and Tony Givargi, Embedded System Design: A Unified Hardware/Software Introduction, s, John Wiley & Sons, 2011.

EEE402	ELECTRICAL DRIVES	L	T	P	C
		3	1	0	4

Course Outcomes:
After Successful completion of course, the students will be able to,

CO1	:	Observe the Characteristics of various loads and drive motors.
CO2	:	Understand the basic principles of DC motor drives.
CO3	:	Classify and analyze the types and operation of induction motor drives.
CO4	:	Analyze the operation and performance of synchronous motor drives.
CO5	:	Apply digital control techniques in speed control of electric drives

CO and PO mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	S												S		
CO2	S	S	L										S		
CO3	S	S	S										S		
CO4	S	S	S										S		
CO5	S	M		M									S	M	

Unit 1: CHARACTERISTICS OF ELECTRIC DRIVES
Speed – torque characteristics of various types of loads and drive motors – joint speed – torque characteristics – selection of power rating for drive motors with regard to thermal overloading and load variation factors – load equalization – starting, braking and reversing operations.

Unit 2: DC DRIVES
Speed control of dc motors – Ward – Leonard scheme – drawbacks – thyristor converter fed dc drives – single, two and four quadrant operations – SRM drive – micro motor drive – chopper fed DC Drives – time ratio control and current limit control – single, two and four quadrant operations – effect of ripples on the dc motor performance.

Unit 3: THREE PHASE INDUCTION MOTOR DRIVES
Speed control of three phase induction motors – stator control – stator voltage and frequency control – AC chopper, inverter and cycloconverter fed induction motor drives, rotor control – rotor resistance control and slip power recovery schemes – static control of rotor resistance using dc chopper – static Kramer, Scherbius drives.

Unit 4: THREE PHASE SYNCHRONOUS MOTOR DRIVES
Speed control of three phase synchronous motors – voltage source and current source inverter fed synchronous motors – commutator less DC motors – cycloconverter fed synchronous motors– effects of harmonics on the performance of AC motors – closed loop control of drive motors.

Unit 5: DIGITAL CONTROL AND DRIVE APPLICATIONS
Digital techniques in speed control – advantages and limitations – microprocessor based control of drives – selection of drives and control schemes for steel rolling mills, paper mills, lifts and cranes.

TEXT BOOKS
1. Pillai, S.K., A First Course on Electrical Drives, New Age International Publishers,

2nd Edition, 2002.
2. Subhramanyam,V., Thyristor control of Electrical Drives, Tata McGraw Hill Publishing company Ltd, NewDelhi, 2002.
3. Gopal K. Dubey ,Fundamentals of Electrical Drives, Narosa Book Distributors ,2010.
4. U.A.Bakshi , V.U.Bakshi, Basic Electrical Drives And Controls For NMU, Technical Publications (2014)
4. Electrical Drives: Principles, Planning, Applications, Solutions Hardcover , Jens Weidauer , Richard Messer, Wiley VCH, 2014

REFERENCE BOOKS

1. Sen, P.C., Thyristor drives, John wiley & sons, New unc, 1993.
2. Ramamoorthy, M., An Introduction to Thyristor and their Application, Affiliated East West Press (P) Ltd, 2nd Edition, 1991.
3. Electrical Drive: Performance, Design and Control, Vodovozov Valery , LAP Lambert Academic Publishing, 2014
4. Theodore Wildi, Electrical Machines Drives, Pearson Education, 2013

EEE404	HVDC AND FACTS	L	T	P	C
		3	0	0	3

Course Outcomes:

After Successful completion of course, the students will be able to,

CO1	:	To describe the DC transmission system planning for HVDC transmission
CO2	:	To analyze the principles of operation of current and extinction angle control in HVDC converters.
CO3	:	To understand the working principles of FACTS devices.
CO4	:	To design the thyristor based devices such as switched capacitor (TSC), saturated reactor (SR) etc for power transmission.
CO5	:	To understand and design the VSC based FACTS devices.

CO and PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	S												M		
CO2	M	S		S									S	S	
CO3													M	L	
CO4	S	S	S	M				M					S	S	
CO5	S	M	S	S				M					S	S	

Unit 1: DC POWER TRANSMISSION TECHNOLOGY

Introduction – comparison of HVAC and HVDC –application of DC transmission – description of DC transmission system planning for HVDC transmission – modern trends in DC transmission – limitations

Unit 2: ANALYSIS OF CONVERTERS AND HVDC SYSTEM CONTROL

Thyristor converter circuits – choice of converter configurations – control characteristics – simplified analysis of Grates circuit – system control hierarchy –firing angle control – current and extinction angle control

Unit 3: BASIC CONCEPTS OF FACTS

Lack of control on active reactive power flow – conventional control mechanisms – Need for FACTS Devices – Advances in power semiconductor devices – types of FACTS controllers –importance of facts controllers – operating principles.

Unit 4: THRISTOR BASED FACTS DEVICES

Classification – thyristor controlled reactor (TCR), thyristors switched reactor (TSR), thyristor switched capacitor (TSC), saturated reactor (SR), and fixed capacitor (FC) thyristor controlled series capacitor (TCSC), static var compensator (SVC).

Unit 5: VSC BASED FACTS DEVICES

Basic concepts of VSC – STATCOM – principle of operation – V-I characteristics – static synchronous series capacitor (SSSC) – unified power flow controller (UPFC) – principle of operation – applications – modeling of UPFC for power flow.

TEXT BOOKS

1. Padiyar,K.R., HVDC Power Transmission System, Wiley Eastern Limited,New Delhi,1st edition,1990.
2. Mohan Mathur, R., & Rajiv k. Varma., Thyristor based FACTS controllers for Electrical transmission systems, IEEE press, wiley Inter Science, 2002.
3. Vijay K. Sood , HVDC and FACTS Controllers: Applications of Static Converters in Power Systems , Springer; Softcover reprint of the original 1st ed. 2004 edition

REFERENCE BOOKS

1. Arrilaga,J., High Voltage Direct Current Transmission, Peter Pregrinus,London,1983.
2. Edward Wilson Kimbark, Direct Current Transmission, Wiley inerscience,NewYork,London,Sydney, 1971.
3. Narin G.Hingorani, Flexible AC Transmission, IEEE Spectrum, April 1993.
4. S Kamakshaiah (Author), V. Kamaraju (Author), HVDC Transmission , McGraw Hill Education (India) Private Limited (23 March 2011).
4. Jos Arrillaga (Author), Y. H. Liu (Author), Neville R. Watson (Author), Flexible

EEE405	POWER SYSTEM DYNAMICS	L	T	P	C
		3	1	0	4

Course Outcomes:

After Successful completion of course, the students will be able,

CO1	:	To develop the dynamic model of a synchronous machine.
CO2	:	To describe the working of various excitation systems.
CO3	:	To understand the small signal stability problem of SMIB systems.
CO4	:	To perform transient stability analysis using Euler and Range Kutta methods
CO5	:	To understand voltage stability problems in power systems.

CO and PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	S		S	S					S					S	S
CO2		S		L									S		
CO3	M	M		S	S				S					M	S
CO4	S			S	S				M						M

CO5	S	S		S	S								S	S	

Unit 1: MODELING OF SYNCHRONOUS MACHINE

Mathematical description of synchronous machine –dqo transformation – per unit representation – equivalent circuit for d and q axis – steady state analysis – magnetic saturation – Simplified model with amortisseurs neglected – classical model – constant flux linkage model including the effect of sub transient circuits – reactive capability limits.

Unit 2: MODELING OF EXCITATION SYSTEM

Exciter and voltage regulators, function of excitation systems, types of excitation systems, typical excitation system configuration, block diagram and state space representation of IEEE type1 excitation system, saturation function, stabilizing circuit.

Unit 3: SMALL SIGNAL STABILITY ANALYSIS

Basic concepts and definitions-Principle behind small signal stability improvement methods – classification of stability – stability of dynamic system – state-space representation – eigen properties of state matrix – participation factor – SMIB configuration – effects of field circuit dynamics – effect of field flux variation on system stability – analysis with numeric examples.

Unit 4: TRANSIENT STABILITY ANALYSIS

Factors influencing transient stability – numerical integration method – Euler and Runge Kutta method – simulation of power system dynamic response – structure of power system model – synchronous machine representation – transmission network and load representation – overall system equation and their solution – simplified transient stability simulation using simultaneous implicit method – principle behind transient stability enhancement method – regulated shunt compensation – dynamic braking – reactive switching – high speed excitation system.

Unit 5: VOLTAGE STABILITY

Basic concepts related to voltage stability – voltage collapse – classification of voltage stability – voltage stability analysis – – prevention of voltage collapse – system design & measures – system
operating measures.

Text Books

1. Padiyar,K.R., Power system dynamics, Wiley Eastern Limited, New Delhi. 2002.
2. Kundur, P., Power system stability and control, Tata McGraw Hill, 2006.
3. Power System Dynamics: Analysis and Simulation, Ramanujam R. (Author), PHI; 1 edition 2009..

Reference Books

1. Pai, M.A., Computer techniques in power system analysis, Tata McGraw Hill, New Delhi 1979.
2. Power System Dynamics Stability And Control, Padiyar K R (Author), BS Publications (2003).

EEE406	POWER SYSTEM OPTIMIZATION	L	T	P	C
		3	1	0	4

Course Outcomes:

After Successful completion of course, the students will be able,

CO1	:	To apply well-known optimization techniques to power system problem.
CO2	:	To solve the economic dispatch and unit commitment problem using optimization techniques.
CO3	:	To analyze the hydro thermal scheduling problems
CO4	:	To solve the optimal power flow problem of electrical power systems
CO5	:	To understand the knowledge of maintenance scheduling of thermal plants

CO and PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	S	S											S		
CO2	S	S	S	M	S	S							S	S	S
CO3	S	M	S	S	S	M							S	S	
CO4	S	S	S	S	M								S	S	S
CO5	S					S	S					S	S	M	S

Unit 1: OPTIMIZATION TECHNIQUES

Introduction, Statement of an optimization problem, design vector, design constraints, constraint surface, objective function, classification of optimization problem. Classical optimization Techniques, single variable optimization, multivariable optimization with equality constraints, Direct substitution method, constrained variation method, Lagrange Multiplier method, formulation of multivariable optimization, Kunh-Tucker conditions.

Unit 2: ECONOMIC DISPATCH AND UNIT COMMITMENT

Incremental cost curve – co-ordination equations with loss and without loss– solution by direct method and Iteration method – base point and participation factors method – two generator system, coordination equations, incremental losses and penalty factors-Constraints in unit commitment – spinning reserve, thermal unit constraints, other constraints – solution using priority list method, dynamic programming method – forward DP approach – Lagrangian relaxation method, adjusting

Unit 3: GENERATION SCHEDULING–THERMAL AND HYDROTHERMAL SYSTEM

Long range hydro scheduling – short range hydro scheduling – hydro electric plant models – scheduling problems – short term hydrothermal scheduling problem – solution using lamda iteration method – dynamic programming, pumped storage schemes.

Unit 4: OPTIMAL POWER FLOW

Solution of optimal power flow (OPF) – Gradient method, Newton‟s method, linear sensitivity analysis – LP methods with real power variables only – LP method with AC power flow variables and detailed cost functions – security constrained optimal power flow – interior point algorithm – bus incremental costs.

Unit 5: MAINTENANCE SCHEDULING

Factors considered in maintenance scheduling – generator units, turbines, boilers–

maintenance scheduling using mathematical programming.

Text Books

1. Dhillon.J., Kothari.D.P., Power System Optimization, Prentice Hall India,2004.
2. Power System Optimization, Kothari D. P. (Author), Dhillon J. S. (Author), PHI; 2 edition (2010).

Reference Books

1. Allen J.Wood., Bruce F Wollenberg, Power Generation, Operation and control, John Wiley and sons, Newyork, 2004.
2. Mahalanabis. A.K., et.al., Computer Aided Power System Analysis and Control, Tata McGraw Hill Publishing Co. Ltd., NewDelhi 1988.
3. Power System Engineering, D Kothari (Author), I Nagrath (Author), Mcgraw Hill Education (India) Private Limited; 2 Edition (9 July 2007).

EEE407	ELECTRIC ENERGY GENERATION, UTILISATION AND CONSERVATION	L	T	P	C
		3	0	0	3

Course Outcomes:

After Successful completion of course, the students will be able to,

CO1	:	Describe the basic principles & technologies of various renewable and non-renewable energy resource based power generation.
CO2	:	Apply the energy management and energy audit techniques for a given system and measure the cost analysis.
CO3	:	Design the lighting, heating, and welding system for domestic, commercial and industrial application standards.
CO4	:	Analyze the behavior & control of electric traction system.
CO5	:	Describe the selection of electrical drives based on the industrial applications.

CO and PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	S	M											S		S
CO2	S	S					S					L	S		
CO3	S	S	S			S		S				S	S	S	
CO4	S	S	S	S			M						S	S	
CO5	S	M	S	S		S		S					S		

Unit 1: GENERATION

Generation of electrical power by conventional methods – brief review – generation from tidal, wind, MHD, geothermal and solar sources – concept of distributed generation – effect on system operation.

Unit 2: CONSERVATION

Economics of generation – definitions – load curves – number and size of units – cost of electrical energy – tariff – need for electrical energy conservation – methods – energy efficient equipment – energy management – energy auditing – economics of power factor improvement – design for improvement of power factor using power capacitors – power quality – effect on conservation.

Unit 3: ILLUMINATION, HEATING AND WELDING

Nature of radiation – definition – laws of photometry – lighting calculations – design of illumination systems – residential, industrial, commercial, health care, sports and administrative complexes, street lighting – types of lamps – energy efficient lamps – Methods of heating, requirement of heating material – design of heating element – furnaces – welding generator – welding transformer and its characteristics

Unit 4: ELECTRIC TRACTION

Requirements of an ideal traction system – supply systems – mechanics of train movement – traction motors and control – multiple units – braking – current collection systems – recent trends in electric traction.

Unit 5: DRIVES AND THEIR INDUSTRIAL APPLICATIONS

Motor selection and related factors – loads – types – characteristics – steady state and transient characteristics – load equalization – Industrial applications – modern methods of speed control of industrial drives.

TEXT BOOKS

1. Openshaw Taylor, E., Utilization of Electrical Energy, Orient Longman (P) Ltd, 2003.
2. Wadhwa, C.L., Generation,Utilisation and Distribution, New age International, 2003.
3. Modern Power System analysis by D.P. Kothari (Author), I Nagrath (AuthorMcGraw Hill Education (India) Private Limited; 4 edition (29 June 2011)

REFERENCE BOOKS

1. Partab, H., Art and Science of Utilisation of Electrical Energy, Dhanpat Rai and Co, New Delhi, 2004.
2. Gupta, B.R., Generation of Electrical Energy, Eurasia Publishing House (P) Ltd, New Delhi, 2003.
3. Gupta, J.B., Utilization of Electric Power and Electric Traction, S.K.Kataria and Sons, 2002.

EEE409	INDUSTRIAL AUTOMATION	L	T	P	C
		3	0	0	3

Course Outcomes:

After Successful completion of course, the students will be able to,

CO1	:	Understand the functioning of PLC, DCS and SCADA etc.
CO2	:	know about various process control techniques adopted in industrial PLC environment
CO3	:	Make use of SCADA in power system automation.
CO4	:	enable the students to learn about the various technologies used in process automation
CO5	:	Summarize Distributed control system and SCADA system.

CO and PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1			M												
CO2	S		S		S	S				S	S		S	S	
CO3	S		S		S		M			S		S	S		
CO4			S		S	S							S	S	
CO5	S		L		S		S				S		S	S	

UNIT I INTRODUCTION

Evolution of control strategy, Role of automation in industries, Benefits of automation, Introduction to automation tools PLC, DCS, SCADA, Hybrid DCS/PLC, Automation strategy evolution, performance and safety systems.

UNIT II PROGRAMMABLE LOGIC CONTROLLERS (PLC)

Introduction, architecture, definition of discrete state process control, PLC versus PC, PLC versus DCS, relay diagram, ladder diagram, relay sequencers, timers/counters, PLC design, study of at least one industrial PLC.

UNIT III SUPERVISORY CONTROL AND DATA ACQUISITION (SCADA)

Introduction to Supervisory Control and Data Acquisition –SCADA Functional requirements and Components – General features and functions – Configurations of SCADA, RTU (Remote Terminal Units) and MTU (Master Terminal Units) Connections – SCADA Communication requirements – SCADA Communication protocols – Structure of a SCADA Communications Protocol – SCADA in Power System Automation

UNIT IV APPLICATIONS OF PLC AND SCADA

PLC programming methods, Analog control using PLC, PLC interface to SCADA using communication links and protocols (Modbus ASCII / RTU) – Automation in power, cement and waste water treatment industries.

UNIT V DISTRIBUTED CONTROL SYSTEMS (DCS)

Introduction – Functions – DCS as an automation tool to support Enterprise Resources Planning – DCS Architecture of different makes – Enhanced functions viz. Advance process control, historical data management – Security and Access Control.

TEXT BOOK

1. Stuart A. Boyer, "SCADA: Supervisory Control and Data Acquisition", ISA; 4th Revised edition, 2009.

REFERENCE BOOKS

1. Robert Radvanovsky, Jacob Brodsky, "Handbook of SCADA/Control Systems Security", CRC Press.
2. David Bailey, Edwin Wright, "Practical SCADA for Industry", Newnes is an imprint of Elesvier

EEE410	NEURAL NETWORK AND FUZZY LOGIC	L	T	P	C
		3	0	0	3

Course Outcomes:

After Successful completion of course, the students will be able to,

CO1	:	To understand the principles of neural networks and fuzzy logic
CO2	:	To study and design the feed forward architecture
CO3	:	To analyze and working of feedback network
CO4	:	To develop Neural fuzzy system using MATLAB tool box.
CO5	:	To apply fuzzy logic and artificial neural network to engineering problems

CO and PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	S												S		
CO2	S	M	S										S	S	
CO3	S			S								M	S	S	
CO4	S	S	S		S				S	S			S	S	
CO5	S	S	S		S				S	L		S	S	S	

Unit 1: INTRODUCTION TO NEURAL NETWORKS

Overview of biological neuro-system – mathematical models of neurons – learning rules –learning paradigms – supervised – unsupervised and reinforcement learning

Unit 2: FEEDFORWARD AND FEEDBACK NETWORKS

Perceptron networks – training rules – multilayer perceptron – back propagation algorithm –associative memories – Hopfield networks – Boltzman machine – self organizing map. Implement back propagation learning algorithm using Matlab Toolbox. Design of multilayer feed forward network using MATLAB Toolbox.

Unit 3: FUZZY LOGIC

Overview of classical sets – introduction to fuzzy logic – membership function – fuzzy rule generation – operations on fuzzy sets – compliment – intersections – unions – combinations of operations – fuzzy if-then rule – fuzzy inferencing –Mamdani, TSK – defuzzification. Implementation of fuzzy logic controller using Matlab Fuzzy Logic Toolbox

Unit 4: NEURO FUZZY SYSTEM

Adaptive neuro fuzzy inference systems (ANFIS) – architecture – hybrid learning algorithm – parameter identification – rule base structure identification – input selection – input space partitioning – neuro-fuzzy control. Development of Neuro fuzzy system using MATLAB tool box.

Unit 5: APPLICATIONS OF NEURAL NETWORK AND FUZZY LOGIC

Applications of neural network – pattern recognition – fuzzy logic control – inverted pendulum –image processing – home heating system – biomedical applications – applications of neuro fuzzy system – character recognition – channel equalization – noise cancellation. .

Text Books

4. Jang,J.S.R., Sun.C.T., E.Mizutani., Neuro-Fuzzy and Soft Computing , Prentice Hall of India (P) Ltd,New Delhi,2005.
5. Timothy J. Ross., Fuzzy Logic with Engineering Applications, Tata McGraw Hill, 1997.
6. Sivanandam S, Sumathi S, Deepa, Introduction To Neural Networks Using Matlab 6.0 , Tata Mgraw Hill, 2009.

Reference Books

3. Laurance Fausett, Englewood cliffs, N.J., Fundamentals of Neural Networks, Pearson Education, 1992.
4. Zimmermann, H.J., Fuzzy Set Theory & its Applications, Allied Publication Ltd., 1996.

5. John Yen & Reza Langari., Fuzzy Logic – Intelligence Control & Information, Pearson Education, New Delhi, 2003.
6. Timothy Ross, Fuzzy Logic with Engineering Applications, Second Edition, John Wiley& Sons, Ltd, 2004.
7. B.Yegnanarayana, Artificial neural networks, Prentice-hall Of India Pvt Ltd, 2008.

EEE411	DIGITAL PROTECTION	L	T	P	C
		3	0	0	3

Course Outcomes:

After Successful completion of course, the students will be able,

CO1	:	To Describe the Construction and Working Principle of Numerical Protection
CO2	:	To discuss the different types of protection methods for transmission lines.
CO3	:	To describe the different types of faults and protection methods for synchronous generators and power transformer
CO4	:	To understand the concept of relay setting and relay Coordination
CO5	:	To design the various relaying scheme for short circuit protection

CO and PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	M	M	S										M		
CO2	S				S								S	S	
CO3															
CO4					S									S	
CO5	S			S	S								S	S	

Unit 1: NUMERICAL PROTECTION

Introduction – block diagram of numerical relay– sampling theorem, correlation with a reference wave–least error squared (LES) technique–digital filtering, numerical over current protection.

Unit 2: DIGITAL PROTECTION OF TRANSMISSION LINE

Introduction–protection scheme of transmission line–distance relays, traveling wave relays–digital protection scheme based upon fundamental signal, hardware design, software design–digital protection of EHV/UHV transmission line based upon travelling wave phenomenon, new relaying scheme using amplitude comparison.

Unit 3: DIGITAL PROTECTION OF SYNCHRONOUS GENERATOR AND POWER TRANSFORMER

Introduction–faults in synchronous generator, protection schemes for synchronous generator, digital protection of synchronous generator. – Faults in a transformer, schemes used for transformer protection–digital protection of transformer.

Unit 4: DISTANCE AND OVER CURRENT RELAY SETTING AND CO-ORDINATION

Directional instantaneous IDMT over current relay, directional multizone distance relay–distance relay setting–co-ordination of distance relays, co-ordination of over current relays, computer graphics display–man-machine interface subsystem, integrated operation of national power system, application of computer graphics.

Unit 5: PC APPLICATIONS IN SHORT CIRCUIT STUDIES FOR DESIGNING RELAYING SCHEME

Types of faults– assumptions, development of algorithm for S.C. studies–PC based integrated software for S.C. studies, transformation to component quantities, S.C. studies of multiphase systems. Ultra high speed protective relays for high voltage long transmission line.

Text Books

1. Digital Protection, L. P. Singh, New Age International PvtLimited Publishers, New Delhi, 2nd Edition.
2. Digital Relay / Numerical relays – T.S.M. Rao, Tata Mc Graw Hill, New Delhi.

Reference Books

1. Fundamentals of Power System Protection, Paithankar & Bhide Prentice Hall of India Pvt. Ltd., New Delhi.
2. Protective Relaying for Power System II, Stanley Horowitz IEEE press , New York Transmission Network Protection, Paithankar (Marcel & Dekker, New York).

EEE412	VIRTUAL INSTRUMENTATION	L	T	P	C
		3	0	0	3

Course Outcomes:

After Successful completion of course, the students will be able,

CO1	:	Understand the basics concepts and programming in virtual instrumentation.
CO2	:	Apply virtual instrumentation tool set for a given problem.
CO3	:	Apply virtual instrumentation concept for a given application.
CO4	:	Virtual instrument interface with hardware component.
CO5	:	Design and analysis the given applications using virtual instrumentation

CO and PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	S	S			S								M	L	
CO2	S	S		S	S										
CO3	S	S	S	M	S							M		M	
CO4	S	M	S	L	S					S		S			
CO5	S	M	S	L	S					S		S	M		

Unit 1: REVIEW OF VIRTUAL INSTRUMENTATION

Historical perspective– advantages–block diagram–architecture of a virtual instrument.

Unit 2: DATA FLOW TECHNIQUES

Graphical programming in data flow– comparison with conventional programming.

Unit 3: PROGRAMMING TECHNIQUES

Vis– sub-Vis – loops–charts–arrays–clusters–graphs–case–sequence structures–formula nodes– local –global variables–string–file I/O.

Unit 4: DATA ACQUISITION AND INSTRUMENT INTERFACE

ADC–DAC–DIO–counters–timers–PC hardware structure–timing–interrupts–DMA–software– hardware installation–current loop–RS232/RS485–GPIB-USB-PCMCIA.

Unit 5: ANALYSIS TOOLS AND APPLICATION

Some tools from the advanced analysis tools relevant to the discipline may be included e.g. Fourier transform-power spectrum-correlation methods–windowing–filtering-VI applications in various fields–visa and ivi–image acquisition–processing.

TEXT BOOKS

1. Gary Johnson, Lab View graphical programming Mc Graw Hill, New unc, 2nd Edition, 1997.
2. Lisa K .Wells and Jeffrey travels, Lab View for everyone, Prentice Hall, New Jersey, 1997.

REFERENCE BOOKS

1. Gupta S. and Gupta J.P., PC interfacing for Data Acquisition & Process Control, Instrument Society of America, 2nd Edition, 1994.
2. Kevin James, PC Interfacing And Data Acquisition Techniques for Measurement, Instrumentation And Control, New Nes , 2000.

EEE420	POWER PLANT ENGINEERING	L	T	P	C
		3	0	0	3

Course Outcomes:

After Successful completion of course, the students will be able,

CO1	:	To understand the various power plants and boilers used in power generation
CO2	:	To describe the principles of combustion equipment for burning coal
CO3	:	To understand the detailed principles and operation of Nuclear And Hydel Power Plants
CO4	:	To describe the working principles and operation of Diesel And Gas Turbine Power Plants
CO5	:	To estimate the Economics of load sharing and comparison of various power plants.

CO and PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1						L									
CO2	S										M				
CO3						S	S				M		S		S
CO4	S						S				M		S		S
CO5	S	S		M	S		M				M			S	

Unit 1: INTRODUCTION TO POWER PLANTS AND BOILERS

Layout of Steam , Hydel , Diesel , MHD, Nuclear and Gas turbine Power Plants Combined Power cycles – comparison and selection , Load duration Curves Steam boilers and cycles – High pressure and Super Critical Boilers – Fluidised Bed Boilers.

Unit 2: STEAM POWER PLANT

Fuel and ash handling, Combustion Equipment for burning coal, Mechanical Stokers. Pulveriser, Electrostatic Precipitator, Draught- Different Types, Surface condenser types, cooling Towers

Unit 3: NUCLEAR AND HYDEL POWER PLANTS

Nuclear Energy-Fission , Fusion Reaction, Types of Reactors, Pressurized water reactor ,Boiling water reactor, Waste disposal and safety Hydel Power plant- Essential elements, Selection of turbines, governing of Turbines- Micro hydel developments.

Unit 4: DIESEL AND GAS TURBINE POWER PLANT

Types of diesel plants, components, Selection of Engine type, applications-Gas turbine power plant- Fuels- Gas turbine material – open and closed cycles- reheating Regeneration and intercooling – combines cycle.

Unit 5: OTHER POWER PLANTS AND ECONOMICS OF POWER PLANTS

Geo thermal- OTEC- tidal- Pumped storage –Solar central receiver system Cost of electric Energy- Fixed and operating costs-Energy rates- Types tariffs- Economics of load sharing, comparison of various power plants.

Text Books

1. Arora S.C and Domkundwar S, "A Course in Power Plant Engineering", Dhanpat Rai, 2001.
2. Nag P.K ,"Power Plant Engineering". Third edition Tata McGraw- Hill ,2007

Reference Books

1. EI-Wakil M.M ,Power "Plant Technology," Tata McGraw-Hill 1984.
2. K.K.Ramalingam, "Power Plant Engineering ", Scitech Publications, 2002.
3. G.R,Nagpal , "Power Plant Engineering", Khanna Publishers 1998.
4. G.D.Rai, "Introduction to Power Plant technology" Khanna Publishers, 1995

EEE421	SMART GRID TECHNOLOGY	L	T	P	C
		3	0	0	3

Course Outcomes:

After Successful completion of course, the students will be able,

CO1	:	To know the importance of smart grid and to design the smart grid architecture.
CO2	:	To understand the basic concepts of the power flow model ling through power grid and measurement technologies for wide area monitoring systems.
CO3	:	To understand the working principle of smart meter and to design the policy and economic drives of the smart grid
CO4	:	To learn and analyze the power quality conditioners for smart grid
CO5	:	To understand the concepts of of web service and CLOUD computing to make smart grids smarter

CO and PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	S		M				M						S	S	
CO2	S						M							M	

CO3	S		S										S	S	
CO4	S			S		M	S						M		S
CO5							S						M		

Unit 1: SMART GRID ARCHITECTURA DESIGNS

Introduction – Comparison of Power grid with Smart grid – power system enhancement – communication and standards – General View of the Smart Grid Market Drivers Stakeholder Roles and Function – Measures – Representative Architecture – Functions of Smart Grid Components-Wholesale energy market in smart grid-smart vehicles in smart grid.

Unit 2: SMART GRID COMMUNICATIONS AND EASUREMENT TECHNOLOGY

Communication and Measurement - Monitoring, Phasor Measurement Unit (PMU), Smart Meters, Wide area monitoring systems (WAMS) – Elements of the power grid and measurement technologies: generation, transmission, distribution, and enduser – Basic concepts of power – load models – load flow analysis - wide area monitoring system (WAMS) – advanced metering infrastructure (AMI) and phasor measurement units (PMU).

Unit 3: SMART METERS AND ADVANCED METERING INFRASTRUCTURE

Introduction to Smart Meters – Advanced Metering Infrastructure (AMI) drivers and benefits –AMI protocols – standards and initiatives – AMI needs in the smart grid – Policy and economic drives of the smart grid; environmental implications; sustainability issues; state of smart grid implementation.

Unit 4: POWER QUALITY MANAGEMENT IN SMART GRID

Power quality & EMC in Smart Grid – power quality issues of grid connected renewable energysources – power quality conditioners for smart grid – web based power quality monitoring – power quality audit.

Unit 5: HIGH PERFORMANCE COMPUTING FOR SMART GRID APPLICATIONS

ISDN – overview – interfaces and functions – layers and services – signaling System 7 –broadband ISDN architecture and protocols-load flow state of the art: classical, extended formulations, and algorithms –load flow for smart grid design – contingencies studies for smart grid- basics of web service and CLOUD computing to make smart grids smarter – cyber security for smart grid.

Text Books

2. James Momoh, “Smart Grid: Fundamentals of design and analysis”, John Wiley & sonsInc, IEEE press 2012.
3. Janaka Ekanayake, Nick Jenkins, Kithsiri Liyanage, Jianzhong Wu, Akihiko okoyam“Smart Grid: Technology and Applications”, John Wiley & sons inc, 2012

Reference Books

1. Fereidoon P. Sioshansi, “Smart Grid: Integrating Renewable, Distributed & EfficientEnergy”,Academic Press, 2012.

EEE422	SOFT COMPUTING TECHNIQUES	L	T	P	C
		3	0	0	3

Course Outcomes:

After Successful completion of course, the students will be able,

CO1	:	To understand the basic concepts of soft computing techniques
CO2	:	To solve real world problems using neural network
CO3	:	To analyze the functioning of recurrent neural network
CO4	:	To apply genetic algorithm to solve the optimization problem
CO5	:	To develop fuzzy logic controller for the given system

CO and PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	M			M	S								M	M	
CO2		S	M	S	S				S				S	S	
CO3	S	S		S	S										
CO4	S		S	S	S				S			M		S	
CO5	S		S	S	S				S			M	L		

Unit 1: INTRODUCTION AND FEEDFORWARD NEURAL NETWORKS

Introduction to soft computing –soft computing vs. hard computing-various types of soft computing techniques-applications of soft computing-Neuron-Nerve structure and synapse- Artificial Neuron and its model-activation functions-Neural network architecture-single layer and multilayer feed forward networks-McCullochPitts neuron model-perceptron model –Adaline and Madaline-multilayer perception model-back propogation learning algorithm- Implement back propagation learning algorithm using Matlab Toolbox.

Unit 2: RECURRENT NEURAL NETWORKS

Counter propagation network-architecture-functioning & characteristics of counter-Propagation network-Hopfield/ Recurrent network-configuration-stability constraints-associative memory- and characteristics-limitations and applications-Hopfield v/s Boltzman machine-Adaptive Resonance Theory-Architecture-classifications-Implementation and training-Associative Memory- Design of multilayer feed forward network using MATLAB Toolbox.

Unit 3: FUZZY LOGIC SYSTEM

Introduction to crisp sets and fuzzy sets-basic fuzzy set operation and approximate reasoning. Introduction to fuzzy logic modeling and control-Fuzzification-inferencing and defuzzification- Fuzzy knowledge and rule bases-Fuzzy modeling and control schemes for nonlinear systems. Self organizing fuzzy logic control-Fuzzy logic control for nonlinear time delay system- Development of Neuro fuzzy system using MATLAB tool box.

Unit 4: GENETIC ALGORITHM

Basic concept of Genetic algorithm and detail algorithmic steps-adjustment of free Parameters-Solution of typical control problems using genetic algorithm-Concept on some other search techniques like tabu search and ant colony search techniques for solving

optimization problems- Implementation of optimization problem using MATLAB Toolbox.

Unit 5: APPLICATIONS

GA application to power system optimization problem-Case studies: Identification and control of linear and nonlinear dynamic systems using Matlab-Neural Network toolbox. Stability analysis of Neural Network interconnection systems-Implementation of fuzzy logic controller using Matlab fuzzy logic toolbox-Stability analysis of fuzzy control systems.

Text Books

3. S.N. Sivanandam, S.N. Deepa, "Principles of Soft Computing" 2nd Edition, Wiley, 2011.
4. Fakhreddine O. Karray and Clarence De Silva, "Soft Computing & Intelligent System: Theory, Tools and Applications", First edition, Pearson Education, 2009.

Reference Books

7. Laurene V. Fausett, Fundamentals of Neural Networks: Architectures, Algorithms And Applications, Pearson Education.
8. Timothy J. Ross, "Fuzzy Logic with Engineering Applications" Wiley India.
9. W.T.Miller, R.S.Sutton and P.J.Webrose, "Neural Networks for Control", MIT Press, 1996.

MINOR ELECTIVES

CSE207	OPERATING SYSTEMS	L	T	P	C
		3	0	0	3

Course Outcomes:

After Successful completion of course, the students will be able to,

CO1	:	Understand Operating System Structure, Operations and Services
CO2	:	Understand the Process Concept, Multithreaded Programming, Process Scheduling and Synchronization
CO3	:	Apply the Concepts of Virtual Memory Management and File Systems
CO4	:	Analyze the Secondary Storage and I/O Systems
CO5	:	Evaluate the different Protection and Security Mechanisms for Operating System

CO and PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	S				S										
CO2		S			S				S						
CO3	M	S	S	S	S				M						
CO4	S		S												
CO5	S	M	S	M	S										

UNIT I

Introduction-OS Concepts – Evolution of OS, OS Structures- Kernel, Shell, General Structure of MSDOS, Windows 2000, Linux. Introduction- UNIX and ANSI Standards: The ANSI C Standard, The ANSI/ISO C++ Standards, Difference between ANSI C and C++, The POSIX Standards.

UNIT II

Process Management-Process & Threads – Process States – Process Control Block – Process Scheduling – Operations on Processes, Threads, CPU Scheduler – Preemptive and Non-Preemptive; Dispatcher, Scheduling Criteria, Scheduling Algorithms – Process Management in UNIX.

UNIT III

UNIX Processes: The Environment of a UNIX Process: Introduction, main function, Process Termination, Command-Line Arguments, Environment List, Memory Layout of a C Program, Shared Libraries, Memory Allocation, Environment Variables, setjmp and longjmp Functions, getrlimit, setrlimit Functions, UNIX Kernel Support for Processes. Process Control

UNIT IV

Process Synchronization & Inter process Communication-Concurrent Processes, Co-operating Processes, Precedence Graph, Hierarchy of Processes, Critical Section Problem – Two process solution, Synchronization Hardware, Semaphores – Deadlock- detection, handling, prevention, avoidance, recovery, Starvation, Critical Regions, Monitors, Inter process communication.

UNIT V

Memory Management-Objectives and functions, Simple Resident Monitor Program (No design), Overlays – Swapping; Schemes – Paging – Simple, Multi-level Paging; Internal and External Fragmentation; Virtual Memory Concept, Demand Paging - Page Interrupt Fault, Page Replacement Algorithms; Segmentation – Simple, Multi-level, Segmentation with Paging, Memor Management in UNIX.

TEXT BOOKS

1. Operating Systems Concepts – Silberschatz, Galvin, Wiley Publications (2008)
2. Modern Operating Systems – Andrew S. Tenenbaum, Pearson Education Asia / PHI (2005)
3. UNIX System Programming Using C++,by Terrence Chan: Prentice Hall India, 1999.
4. Advanced Programming in UNIX Environment, by W. Richard Stevens: 2nd Ed, Pearson Education, 2005.

REFERENCE BOOKS

1. Operating Systems – William Stallings, Pearson Education Asia (2002)

CSE210	COMPUTER ARCHITECTURE AND ORGANIZATION	L	T	P	C
		3	0	0	3

Course Outcomes:

After Successful completion of course, the students will be able to,

CO1	:	Understand the functional units of a computers, bus structures and addressing modes
CO2	:	Apply the knowledge of algorithms to solve arithmetic problems.
CO3	:	Learn about single bus, multiple bus organization and pipelining concepts
CO4	:	Analyze RAM, ROM, Cache memory and virtual memory concepts
CO5	:	Evaluate the various I/O interfaces

CO and PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	M	M													
CO2	S	S	S	S					S						
CO3	S	M													
CO4	M			S	S										
CO5	M	M		M											

UNIT I BASIC STRUCTURE OF COMPUTERS

Functional units – Basic operational concepts – Bus structures – Software performance – Memory locations and addresses – Memory operations – Instruction and instruction sequencing – Addressing modes – Assembly language – Basic I/O operations – Stacks and queues.

UNIT II ARITHMETIC UNIT

Addition and subtraction of signed numbers – Design of fast adders – Multiplication of positive numbers – Signed operand multiplication and fast multiplication – Integer division – Floating point numbers and operations.

UNIT III BASIC PROCESSING UNIT

Fundamental concepts – Execution of a complete instruction – Multiple bus organization – Hardwired control – Micro programmed control – Pipelining – Basic concepts – Data hazards – Instruction hazards – Influence on Instruction sets – Data path and control consideration – Superscalar operation.

UNIT IV MEMORY SYSTEM

Basic concepts – Semiconductor RAMs – ROMs – Speed – size and cost – Cache memories – Performance consideration – Virtual memory – Memory Management requirements – Secondary storage.

UNIT V I/O ORGANIZATION

Accessing I/O devices – Interrupts – Direct Memory Access – Buses – Interface circuits – Standard I/O Interfaces (PCI, SCSI, USB).

TEXT BOOK

1. Carl Hamacher, Zvonko Vranesic and Safwat Zaky, Computer Organization, McGraw-Hill, 2008, 5th Edition.

REFERENCE BOOKS

1. William Stallings, Computer Organization and Architecture – Designing for Performance, Pearson Education, 8th Edition, 2009.
2. David A.Patterson and John L.Hennessy, Computer Organization and Design: The hardware software interface, Morgan Kaufmann, 3rd Edition, , 2007.
3. John P.Hayes, Computer Architecture and Organization, McGraw Hill, 3rd Edition, 1998.

CSE306	DATA COMMUNICATION AND NETWORKS	L	T	P	C
		3	0	0	3

Course Outcomes:

After Successful completion of course, the students will be able to,

CO1	:	Understand the data communication
CO2	:	Analyze the different communication technique
CO3	:	Knowledge about LAN and WAN
CO4	:	Understand the different network application

CO and PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	M														
CO2		S						M							
CO3	S							S							
CO4	M														
CO5	S														

UNIT I DATA COMMUNICATION OVERVIEW

Data Communications, - Data Networking – the Internet – Protocol Architecture – TCP/IP – Internet based Application.

UNIT II DATA COMMUNICATION

Data Transmission – Guided and Wireless Transmission – Digital Data Communication Techniques – Data Link Control – Multiplexing.

UNIT III WIDE AREA NETWORK

Circuit Switching – Packet Switching – Routing in Switched Networks – Congestion Control in Switched Data Networks – Cellular Wireless Networks.

UNIT IV LOCAL AREA NETWORKS AND TRANSPORT PROTOCOLS

Local Area Network Overview – High-Speed LANs – Wireless LANs – Internetwork Protocols – Internetwork Operation – Transport Protocols

UNIT V INTERNETWORK APPLICATIONS

Internet Applications – Electronic Mail and Network Management – Internet Applications – Internet Directory Service and World Wide Web – Voice over IP – Session Initiation Protocol – Real Time Transport Protocol.

TEXT BOOK

2 Behrouz Forouzan., Data Communications and Networking (SIE), McGraw Hill Education (India) Private Limited; 4th Edition, 2006

3 William Stallings., Data and Computer Communication, 8th Edition, 2005.

REFERENCE BOOKS

1. Tanenbaum A. S., Computer Networks, Prentice Hall, 4th Edition, 2003.

2. Leon-Garcia A., and Widjaja I., Communication Networks: Fundamental Concepts and Key Architectures, McGraw-Hill, 2nd Edition, 2004.

CIV416	DISASTER MANAGEMENT AND THERMO DYNAMICS	L	T	P	C
		3	0	0	3

Course Outcomes:

After Successful completion of course, the students will be able to,

CO1	:	Improve the knowledge and understanding of the disaster phenomenon and, its factors.
CO2	:	Understand the relationship of hazard, risk and vulnerability
CO3	:	obtain the skills in role of education and training in disaster prevention
CO4	:	ensure skills in post disaster management activities
CO5	:	knowledge in understanding various prone zones in India

CO and PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	S					S	S	M	S						
CO2	M					S		M	S						
CO3						S	M	M	S						

CO4															
CO5	S						S								

UNIT I ESSENTIAL COMPONENTS AND CO-ORDINATION IN DISASTER RESPONSE

Disaster Response Plan – Communication, Participation and Activation of Emergency – Preparedness Plans – Search, Rescue, Evacuation and other logistic management – Needs and Damage Assessment; Types and Technique – Disaster Response: Central, State, District and Local Administration – Armed Forces in Disaster Response: Role and Responsibility – Disaster Response: Police and Other organizations – Role of Multiple stakeholders in Disaster Response

UNIT II HUMAN BEHAVIOR AND RESPONSE MANAGEMENT

Psychological Response and Psychological Rehabilitation - · Trauma and Stress Management – Rumour and Panic Management – Medical and Health Response to Different Disasters – Role of Information and Communication Technology in Response Management

UNIT III RELIEF MEASURES

Minimum Standard of Relief - · Relief Management- essential components - · Funding Relief – short term and long term - · Disaster Site Management – Recovery

UNIT IV ENERGY AND IRREVERSIBILITY

Review of fundamental concepts and definitions – Review of first and thermodynamics – entropy – properties of substances – quality of energy, maximum work in a reversible process – reversible work by an open system exchanging heat only with surroundings – useful work – dead state – availability – irreversibility and Gouy-Stodala Theorem – Mathematical conditions for exact differential – Maxwell's equation – Tds equation – Thompson coefficient and Inversion curve – coefficient of volume expansion

UNIT V GAS POWER CYCLES AND GAS COMPRESSORS

Gas power cycles: Carnot cycle – Stirling cycle – Ericsson cycle – Air standard cycles – Otto cycle – Diesel cycle – Limited pressure cycle or Dual cycle – comparison of Otto, Diesel and Dual cycles – Brayton cycle – Aircraft propulsion – Brayton-Rankine combined cycle

Gas compressors: Compression processes – work of compression – single stage reciprocating air compressor – volumetric efficiency – multi stage compression – air motors – rotary compressors – blowers and fans

TEXT BOOKS

1. Jagbir Singh, Disaster Management: Future Challenges and Opportunities, I K International Publishing House Pvt. Ltd, 2007.
2. Kapoor Mukesh, Disaster Management Paperback, Saurabh Publishing House, 2010
3. Tushar Bhattacharya, Disaster Science and Management Paperback, McGraw Hill Education (India) Private Limited, 2012
4. Engineering thermodynamics by Jones and Dugans, PHI Learning Pvt. Ltd.
5. Gas turbine Theory & Practice, by Cohen & Rogers, Addison Weslay Longman Ltd.

REFERENCE BOOKS

1. Taori, K (2005) Disaster Management through Panchayati Raj, Concept Publishing Company, New Delhi.
2. Fundamentals of thermodynamics by Sonntag, Wiley India
3. Fundamentals of Classical Thermodynamics by Van Wylen, John Wiley and Sons.

ECE301	DIGITAL SIGNAL PROCESSING	L	T	P	C
		3	0	0	3

Course Outcomes:

After Successful completion of course, the students will be able to,

CO1	:	Understand the different time and frequency algorithm.
CO2	:	Design the IIR filters
CO3	:	Design FIR filters
CO4	:	Understand the different number system
CO5	:	Understand Sampling rate conversion

CO and PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	S														
CO2		S	S												
CO3		S	S												
CO4		M													
CO5	M														

UNIT I INTRODUCTION

Basic elements of a digital signal processing system – advantages of digital over analog signal processing, applications of DSP, FFT algorithms – radix-2 FFT algorithms – decimation in time – decimation in frequency algorithms – applications of FFT algorithms.

UNIT II IIR FILTERS

Design of Butterworth filters, Chebyshev Type I and Type II filters, IIR filter design using bilinear transformation, impulse invariant transformation – frequency transformation in analog and digital domain

UNIT III FIR FILTERS

Design of linear phase FIR filters using rectangular, hamming, Kaiser Windows – design of linear phase FIR filters using frequency sampling techniques.

UNIT IV FINITE WORD LENGTH EFFECTS

Number representations – fixed point and floating point numbers, quantization of fixed and floating point numbers, coefficient quantization, over flow error – truncation error – co-efficient quantization error, limit cycle oscillation – signal scaling.

UNIT V MULTIRATE DSP

Decimation by a factor D, interpolation by a factor I, filter design and implementation for sampling rate conversion, multistage implementation of sampling rate conversion – sampling rate conversion by an arbitrary factor – applications of multirate signal processing.

TEXT BOOK:

1. Monson Hayes., Digital Signal Processing, McGraw Hill Education (India) Private Limited; 2nd Edition, 2009.
2. John G Proakis., Dimtris Manolakis, G., Digital Signal Processing Principles, Algorithms and Application, Prentice Hall of India, 3rd Edition, 2000.

REFERENCE BOOKS:

1. Tan., Digital Signal Processing: Fundamentals and Applications, Elsevier, 2008
2. Oppenheim., Schafer., Discrete Time Signal Processing, Prentice Hall of India, 1992.
3. S.K.Mitra., Digital Signal Processing – A Computer based approach, Tata McGraw Hill, 1998.

ECE356	COMMUNICATION ENGINEERING	L	T	P	C
		3	0	0	3

Course Outcomes:

After Successful completion of course, the students will be able to,

CO1	:	Understand the different modulation techniques.
CO2	:	Understand the different angle modulation technique
CO3	:	Analyze the DSB and SSB receiver in communication
CO4	:	Analyze the AM and FM receiver in communication
CO5	:	Understand the channel parameter in commnication

CO and PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	S														
CO2	S														
CO3		S		S	M										
CO4		S		M	S										
CO5	M														

UNIT I AMPLITUDE MODULATIONS

Generation and demodulation of AM, DSB–SC, SSB–SC, VSB signals, filtering of sidebands, comparison of amplitude modulation systems, frequency translation, frequency division multiplexing, AM transmitters –super unctional receiver, AM receiver.

UNIT II ANGLE MODULATION

Angle modulation, frequency modulation, narrowband and wideband FM, transmission bandwidth of FM signals, generation of FM signal – direct FM – indirect FM, demodulation of FM signals, FM stereo multiplexing, PLL – non-linear model and linear model of PLL, non-linear effects in FM systems, FM broadcast receivers, FM stereo receives.

UNIT III NOISE PERFORMANCE OF DSB, SSB RECEIVERS

Noise – shot noise, thermal noise, white noise, noise equivalent bandwidth, narrowband noise, representation of narrowband noise in terms of envelope and phase components, sinewave plus narrowband noise, receiver model, noise in DSB-SC receiver, noise in SSB receiver.

UNIT IV NOISE PERFORMANCE OF AM AND FM RECEIVERS

Noise in AM receivers threshold effect, noise in FM receivers capture effect, FM threshold effect, FM threshold reduction, pre-emphasis and de-emphasis in FM, comparison of performance of AM and FM systems.

UNIT V INFORMATION THEORY

Uncertainty, information and entropy, source coding theorem, data compaction, discrete memory less channels, mutual information, channel capacity, channel coding theorem, differential entropy, and mutual information for continuous ensembles, information capacity theorem, implication of the information capacity theorem, rate distortion theory, dompression of information.

TEXT BOOK

1. Sanjay Sharma., Communication Engineering, SK Kataria and Sons 2012.
2. Simon Haykin., Communication Systems, John wiley & sons, New York, 4th Edition, 2001.

REFERENCE BOOKS

1. Roddy., Coolen., Electronic communication, Prentice Hall of India, New Delhi, 4th edition, 2003.
2. Bruce Carlson et al, Communication systems, Tata McGraw Hill International, 4th edition, 2002.
3. Taub, Schilling, Principles of communication systems, Tata McGraw Hill Publishing company, New Delhi, 1995.

CSE404	DATA MINING AND DATA WAREHOUSING	L	T	P	C
		3	0	0	3

Course Outcomes:

After Successful completion of course, the students will be able to,

CO1	:	Understand the basic concepts of data warehouse and functionality of the various data warehousing components and how it differs from traditional data base systems and how it is helpful for data mining
CO2	:	Understand the pre-processing methods on datasets and various functionality of the data mining system.
CO3	:	Apply classification and prediction methods for data mining.
CO4	:	Use various clustering algorithm for grouping data items of interest
CO5	:	Understand various fields in which data mining can be applied and related tools used for mining process.

CO and PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	S														
CO2	S														
CO3	S	S		S											
CO4		S													
CO5	M														

UNIT I INTRODUCTION

Relation To Statistics, Databases- Data Mining Functionalities-Steps In Data Mining rocess-Architecture Of A Typical Data Mining Systems- Classification Of Data Mining Systems – Overview Of Data Mining Techniques.

UNIT II DATA PREPROCESSING AND ASSOCIATION RULES

Data Preprocessing-Data Cleaning, Integration, Transformation, Reduction, Discretization Concept Hierarchies-Concept Description: Data Generalization And Summarization Based Characterization- Mining Association Rules In Large Databases.

UNIT III PREDICTIVE MODELING

Classification And Prediction: Issues Regarding Classification And Prediction-Classification By Decision Tree Induction-Bayesian Classification-Other Classification Methods-rediction-Clusters

Analysis: Types Of Data In Cluster Analysis- Categorization Of Major Clustering Methods: Partitioning Methods –Hierarchical Methods

UNIT IV DATA WAREHOUSING

Data Warehousing Components –Multi Dimensional Data Model- Data Warehouse Architecture-Data Warehouse Implementation- Mapping The Data Warehouse To Multiprocessor Architecture OLAP-Need- Categorization Of OLAP Tools.

UNIT V APPLICATIONS

Applications of Data Mining-Social Impacts Of Data Mining-Tools-An Introduction To DB Miner-Case Studies-Mining WWW-Mining – Text Database-Mining Spatial Databases.

TEXT BOOKS

1. Veeraswamy Ammisetty., Introduction to Data Mining & Data Warehousing Paperback – Import, LAP Lambert Academic Publishing, 2014
2. Jiawei Han, Micheline Kamber., Data Mining: Concepts and Techniques, Morgan Kaufmann Publishers, 2002.

REFERENCE BOOKS

1. Jiawei Han and Micheline Kamber., Data Mining: Concepts and Techniques (The Morgan Kaufmann Series in Data Management Systems) Hardcover – Import, Morgan Kaufmann; 1st Edition 2000.
2. Soman K. P. and Diwakar Shyam., Insight Into Data Mining: Theory and Practice, PHI 2006
3. Alex Berson and Stephen J. Smith., Data Warehousing, Data Mining,& OLAP, Tata Mcgraw- Hill, 2004.
4. Ralph Kimball, The Data Warehouse Life Cycle Toolkit, John Wiley & Sons Inc., 1998.

CSE414	ADVANCED JAVA PROGRAMMING	L	T	P	C
		3	0	0	3

Course Outcomes:

After Successful completion of course, the students will be able to,

CO1	:	Understand Java programming concepts and utilize Java Graphical User Interface program writing.
CO2	:	Write, compile, execute and troubleshoot Java programming for networking concepts.
CO3	:	Build Java Application for distributed environment
CO4	:	Design and Develop multi-tier applications.
CO5	:	Identify and Analyze Enterprise applications.

CO and PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	S														
CO2		S													
CO3		S													
CO4		M	S		L										
CO5				S	S										

UNIT I JAVA BASICS-REVIEW

Java Streaming – Components and events handling – Threading concepts – Networking features– Byte code interpretation – Media Techniques.

UNIT II JAVA DATA STRUCTURES

Lists – Linear Structures – Ordered Structures – Sorting – Trees.

UNIT III ADVANCED NETWORKING AND BEANS

Client-Sever computing – Sockets – Content and Protocols handlers – Developing distributed applications – RMI – Remote objects – Object serialization – Bean Concepts – Events in Bean Box – Bean customization and persistence.

UNIT IV JAVA DATABASE PROGRAMMING

Connecting to Databases – JDBC principles – Databases access – Interacting – Database search – Accessing Multimedia databases – Database support in Web applications.

UNIT V RELATED JAVA TECHNIQUES

3D graphics – JAR file format and creation – Internationalization – Swing Programming – Advanced Java Scripting Techniques.

TEXT BOOK

1. Jame Jaworski, “Java Unleashed”, SAMS Techmedia Publications, 1999.

REFERENCE BOOKS

1. Campione, Walrath and Huml, “The Java Tutorial”, Addison Wesley, 1999.
2. Duane A.Bailey, “Java Structures”, McGraw-Hill Publications, 1999.
3. Jeff Frentzen and Sobotka, „Java Script”, Tata Mcw-Hill, 1999.

ECE431	WIRELESS COMMUNICATION	L	T	P	C
		3	0	0	3

Course Outcomes:

After Successful completion of course, the students will be able to,

CO1	:	Understand the basic concept cellular system.
CO2	:	Analyze the different propagation and fading types
CO3	:	Analyze the different mobile access technique
CO4	:	Understand the different coding in communication
CO5	:	Apply the different mobile standards

CO and PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1				L											
CO2				M						S					
CO3				M											
CO4				S						S		M			
CO5				S						S		M			

UNIT I CELLULAR CONCEPT

Frequency reuse – channel assignment strategies – hand off strategies – interference and system capacity – Trunking and grade of Service – improving coverage and capacity in cellular systems.

UNIT II RADIO PROPAGATION

Free Space Propagation Model – propagation Mechanisms – reflection, diffraction and scattering– models for path loss – small scale, multipath propagation – parameters of mobile multipath channels – small scale fading types.

UNIT III MULTIPLE ACCESS TECHNIQUES

FDMA – TDMA – CDMA – spread spectrum multiple access – multiplexing and OFDM – Packet Radio protocols – capture effect – capacity of cellular systems.

UNIT IV EQUALIZATION, DIVERSITY AND CODING

Linear and nonlinear equalization – adaptive equalization – diversity techniques – RAKE Receiver – fundamentals of channel coding – Block codes and finite fields – convolutional codes– coding gain – Trellis coded Modulation – Turbo Codes.

UNIT IV WIRELESS STANDARDS

GSM – IS-95 –UMTS – IMT-2000 – signaling – call control – mobility management and location tracing.

TEXT BOOKS

1. T.S.Rappaport., Wireless Communications: Principles and Practice, 2nd Edition, Pearson Education, 2010.
2. Sunilkumar S. Manvi., Wireless and Mobile Networks: Concepts and Protocols, Wiley 2010

REFERENCE BOOKS

1. P. Nicopolitidis and M.S. Obaidat., Wireless Networks, Wiley India Private Limited, 2009.
2. W.C.Y.Lee, Mobile Communications Engineering: Theory and applications, 2nd Edition, McGraw-Hill International, 1998.
3. R. Blake, Wireless Communication Technology, Thomson Delmar, 2003.

EIE409	BIO–MEDICAL INSTRUMENTATION	L	T	P	C
		3	0	0	3

Course Outcomes:

After Successful completion of course, the students will be able to,

CO1	:	Knowledge about human physiology system.
CO2	:	Knowledge of the principle operation and design and the background of biomedical instruments and specific applications of biomedical engineering.
CO3	:	Understand the different electrical safety codes and standards
CO4	:	Measurement of flow and volume of blood
CO5	:	Describe situations when CT imaging is preferred to MRI imaging.

CO and PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1															
CO2	M		S			L								S	
CO3						S							M	L	
CO4	S		S			S							M		
CO5			S			S						S			

UNIT I ANATOMY, PHYSIOLOGY AND TRANSDUCERS

Brief review of human physiology – anatomy – cell structures – electrical activities – mechanical activities – chemical activities – action potential – resting potential – different types of electrodes– sensors used in biomedicine – selection criteria for transducers – electrodes – necessity for low noise pre-amplifiers – difference amplifiers – difference amplifiers – chopper amplifiers – electrical safety – grounding – isolation.

UNIT II MEASUREMENT OF BIOPOTENTIAL AND PHYSIOLOGICAL PARAMETERS

ECG – Phonocardiography – Neurophysiology – Central nervous system – EEG – Respiratory system – Muscular system – EMG, - Eye – ERG, Physiological Transducers – Measurement of Blood pressure – Blood flow – Cardiac output measurement – heart rate – respiration rate – measurement of lung volume – Oximeters – Audiometer.

UNIT III THERAPEUTIC AND SURGICAL EQUIPMENTS

Electro Surgical unit – short wave – microwave diathermy – Laser surgical unit – Anesthesia machine – Pacemakers – Total artificial heart (TAH) – Dialyser – Heart lung machine – Defibrillators – Ventilators – Nerve stimulators – centralized and Bedside patient monitoring system.

UNIT IV BIOMEDICAL EQUIPMENTS AND ELECTRICAL SAFETY

Flame photometer – spectrophotometer – chromatography – Ph, Pco2, analysis – sterilizers – Electrical safety hazards in hospitals.

UNIT V IMAGING SYSTEMS AND TELEMETRY

Computerized Tomography (CT) – MRI instrumentation – Ultrasound scanner – X-ray machine– Fluroscopic techniques – angiography – Cardiac catherisation lab – Echo cardiograph – vector cardiograph – Biotelemetry.

TEXT BOOKS

1. G S Sawhney., Biomedical Electronics and Instrumentation Made Easy, .K.International Publishing House; 1st Edition 2011
2. Kandpur, R.S., Handbook of Biomedical Instrumentation, TMH, 2003
3. Richard Aston, Principles of Biomedical Instrumentation and Measurement, Merrill publishing company, 1990.

REFERENCE BOOKS

1. Arumugam, M., Biomedical Instrumentation, Anuradha Agencies, Publishers, Kumbakonam, 1992.
2. Geddes, L.A. and Baker, L.E., Principles of Applied Biomedical Instrumentation, John wiley and Sons, 1989.

EIE412	OPTIMAL AND ADAPTIVE CONTROL	L	T	P	C
		3	0	0	3

Course Outcomes:

After Successful completion of course, the students will be able to,

CO1	:	Apply optimal control concepts to systems.
CO2	:	Use dynamic optimization techniques to controllers.
CO3	:	Design optimal control algorithms for real time systems.
CO4	:	Understand the adaptive controller strategy

CO and PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	S	M	S												
CO2	S	M													
CO3		M										M			
CO4	M	M				S									
CO5	M	M				M						M			

UNIT I PROBLEM FORMULATION

Mathematical model – physical constraints- performance measure – optimal control problem – performance measures for optimal control problem – selection a performance measure.

UNIT II DYNAMIC PROGRAMMING

Optimal control law – principle of optimality-an optimal control system – a recurrence relation of dynamic programming – computational procedure characteristics of dynamic

programming solution unction – uncti – bellman equation continuous linear regulator problems.

UNIT III CALCULUS OF VARIATIONS

Fundamental concepts – unctional – piecewise – smooth externals constrained extrema.

UNIT IV ARIATIONAL APPROACH TO OPTIMAL CONTROL PROBLEMS

Necessary conditions for optimal control – linear regulator problems-linear tracking problems – pontryagin‟s minimum principle and state inequality constraints.

UNIT V ADAPTIVE CONTROL

Classification – MRAC systems – different configuration, classification, mathematical description – direct and indirect MRAC – self tuning regulator – different approach to self tuning, recursive parameter estimation, implicit and explicit STR.

TEXT BOOKS

1. Karl J. Astrom and Bjorn Wittenmark ., Adaptive Control: Second Edition (Dover Books on Electrical Engineering), over Publications; Second Edition, 2008.
2. Petros Ioannou and Jing Sun., Robust Adaptive Control (Dover Books on Electrical Engineering), Dover Publications, 2012
3. Anderson B.D.O., and Moore, J. B., Optimal control Linear Quadratic methods, Prentice Hall of India, New Delhi, 1991.

REFERENCE BOOKS

1. Lavretsky., Eugene., Wise and Kevin., Robust and Adaptive Control, Springer, 2013
2. Gang Feng and Rogelio Lozano., Adaptive Control Systems, Elsevier.
3. Astrom, K.J. and Wittenamrk, B., Adaptive control, Addison Wesley Publishing Co. USA, 1989.
4. Sastry S. and Bodson M. Adaptive control Stability, Convergence and Robustness, Prentice Hall, New Jersey, 1989.

EIE415	MICRO–CONTROLLER BASED SYSTEM DESIGN	L	T	P	C
		3	0	0	3

Course Outcomes:

After Successful completion of course, the students will be able to,

CO1	:	understand the role of micro controller in industrial applications
CO2	:	Understand the basic resources needed for microcontroller.
CO3	:	Design and implement microcontroller based systems.
CO4	:	Understand the Hardware and software interaction and integration
CO5	:	Development of software tools for microcontroller

CO and PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1															
CO2	M														
CO3	S		S					S					S	S	
CO4	M												L		
CO5	S		S					S				S	S	S	

UINTI ROLE OF MICRO-CONTROLLERS

Types and selection – Application example.

UNITII MICRO-CONTROLLER RESOURCES

Family members - bus width program - data memory parallel ports - D/A - A/D converters - reset circuitry - watchdog timers - power – down considerations.

UNITIII REAL-TIME CONTROL

Interrupt structures programmable timers - real-time clock – latency – interrupt - density - interval constraints.

UNITIV PROGRAMMING FRAMEWORK

CPU register – Structure - addressing modes - instruction sets - assembly languages – assemblers.

UNITV SOFTWARE BUILDING BLOCKS

Queues, tables and strings - program organization - micro controller expansion methods - I/O hardware alternatives - development tools - motorola - Intel micro controller details.

TEXT BOOKS

1. Manish K Patel., The 8051 Microcontroller Based Embedded Systems, McGraw Hill Education (India) Private Limited; First Edition, 2014
2. Yeralan, S. and Ahluwalia.A., Programming and Interfacing the 8051 Micro controller, Addison Wesley, 1995.
3. John B. Peatman, Design with Micro-controllers, McGraw Hill International Ltd.,1989

REFERENCE BOOKS

1. Huang., Embedded System Design Using C8051, Cengage Learning India Pvt Ltd; 1st Edition, 2009.
2. Steven Barrett and Daniel Pack., Microcontroller Programming and Interfacing: Texas Instruments MSP430 (Synthesis Lectures on Digital Circuits and Systems, Morgan & Claypool Publishers, 2011
3. Mathivanan. N., Microprocessors, PC hardware and interfacing, Prentice-Hall of India Private Ltd., 2003.
4. Intel Manual on 16 bit – embedded controllers, 1991.

EIE420	VLSI DESIGN	L	T	P	C
		3	0	0	3

Course Outcomes:

After Successful completion of course, the students will be able to,

CO1	:	Understand the fundamentals of CMOS VLSI and associated technologies.
CO2	:	create models of moderately sized CMOS circuits that realizes specified digital functions.
CO3	:	solve problems in the design of CMOS logic circuits, with particular reference to speed and power consumption
CO4	:	explain basic operation principles of diodes and MOS transistors and their circuits level models
CO5	:	design the fundamental blocks of a VLSI circuits, both by circuit schematic and physical layout

CO and PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	M														
CO2	S		S												
CO3	S		S												
CO4	L				S										
CO5	S		S		S										

UNITI BASIC DEVICE CHARACTERISTICS

NMOS - PMOS - CMOS devices characteristics - linear, saturation modes - bulk effect capacitance - device models for simulation - CMOS device fabrication principles.

UINTII BASIC CIRCUITS DIGITAL SYSTEMS

CMOS inverter - design principles – design layout rules - construction of multiplexers - transmission gates – latches - flip flops - timing - fan-out considerations.

UINTIII BUILDING BLOCKS OF DIGITAL SYSTEMS

Combinational logic - sequential logic circuits - data path circuits - adder multiplier architecture– accumulators.

UNITIV PROGRAMMABLE LOGIC DEVICES AND FPGAs

Programmable logic interconnect principles – types - programmable logic elements - AND-OR arrays - routing procedures in FPGAs and CPLD - programming methods for FPGAs and CPLDs - Comparison of ACTEL, Altera AND Xilinx FPGAs

UNITV PRINCIPLES OF HDL

Introduction to VHDL – sequential - concurrent descriptions - signal, port and variable statements - wait, case - other sequential statements - block, process component and generate descriptions - test branch creation - principles of operation of VHDL simulator – verilog - brief comparison with VHDL.

TEXT BOOK

1. Partha Pratim Sahu., VLSI Design, McGraw Hill Education (India) Private Limited, 2013.

MEC403	MECHATRONICS	L	T	P	C
		3	0	0	3

Course Outcomes:

After Successful completion of course, the students will be able to,

CO1	:	Know the fundamentals of mechatronics systems.
CO2	:	describe about the types of sensors.
CO3	:	apply 8085 microprocessor to real life scenario
CO4	:	Interpret the PLC programming.
CO5	:	Design various mechatronic systems with respect to applications.

CO and PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	S		S	M										M	
CO2	S		S	S		M									
CO3	S			S								S	S	S	
CO4	S					M							S	S	
CO5	S		L										S	S	

UNIT I INTRODUCTION TO MECHATRONICS

Introduction to mechatronics systems - measurement systems-control systems.

UNITII SENSORS AND TRANSDUCERS

Introduction-performance terminology-displacement, position and proximity-velocity and motion-fluid pressure-temperature sensors-light sensors-selection of sensors-signal processing.

UNITIII 8085 MICROPROCESSOR

Introduction – architecture - pin configuration - instruction set - programming of microprocessors using 8085instructions-interfacing input and output devices-interfacing D/A converters and A/D converters-applications-temperature control-stepper motor control-traffic light controller.

UNITIV PROGRAMMING LOGIC CONTROLLERS

Introduction-basic structure-input / output processing-programming - mnemonics-timers, internal relays and counters-data handling-analog input/output-selection of a PLC.

UNIT V DESIGN OF MECHATRONIC SYSTEMS

Stages in designing mechatronic systems - traditional and mechatronic design -possible design solutions-case studies of mechatronic systems - pick and place robot - automatic car park system -engine management system.

TEXT BOOK

1. Singh M. D. and Joshi J. G., Mechatronics, PHI, 2006
2. David Alciatore., Introduction to Mechatronics and Measurement Systems, McGraw Hill Education (India) Private Limited; 4th Edition 2014
3. Bolton, W., Mechatronics, Longman, Second Edition, 1999.

REFERENCE BOOKS

1. Nitaigour Mahalik., Mechatronics: Principles, Concepts and Applications, McGraw Hill Education (India) Private Limited 2003
2. Michael, B.H., and David, G.A., Introduction to Mechatronics and measurement systems, McGraw Hill International Editions, 1999.
3. Ram, K., Fundamentals of Microprocessors and Microcomputers, Dhanpat Rai Publications, Fourth Revised Edition, 1999.

HSS001	TOTAL QUALITY MANAGEMENT	L	T	P	C
		3	0	0	3

Course Outcomes:

After Successful completion of course, the students will be able to,

CO1	:	Determine the impact of quality on profitability and to learn the basic principles and practices of TQM.
CO2	:	Develop an understanding on quality management philosophies and frame work.
CO3	:	Develop in-depth knowledge in various tools and techniques of quality management
CO4	:	Communicate the importance of customer focused in TQM.
CO5	:	Learn how to achieve world –class status in manufacturing and service through TQM and bench marking.

CO and PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1								L		M	M	S			
CO2							M		S		S				
CO3												S			
CO4								S	M	S		S			
CO5							L					S			

UNIT I INTRODUCTION TO QUALITY MANAGEMENT

Definitions – TOM framework, benefits, awareness and obstacles - Quality – vision, mission and policy statements - Customer Focus – customer perception of quality, Translating needs into requirements, customer retention. Dimensions of product and service quality. Cost of quality.

UNIT II PRINCIPLES AND PHILOSOPHIES OF QUALITY MANAGEMENT

Overview of the contributions of Deming, Juran Crosby, Masaaki Imai, Feigenbaum, Ishikawa, Taguchi, Shingeo and Walter Shewhart - Concepts of Quality circle, Japanese 5S principles and 8D methodology.

UNIT III STATISTICAL PROCESS CONTROL AND PROCESS CAPABILITY

Meaning and significance of statistical process control (SPC) – construction of control charts for variables and attributed - Process capability – meaning, significance and measurement – Six sigma concepts of process capability - Reliability concepts – definitions, reliability in series and parallel, product life characteristics curve - Business process re-engineering (BPR) – principles, applications, reengineering process, benefits and limitations.

UNIT IV TOOLS AND TECHNIQUES FOR QUALITY MANAGEMENT

Quality functions development (QFD) – Benefits, Voice of customer, information organization, House of quality (HOQ), building a HOQ, QFD process. Failure mode effect analysis (FMEA) – requirements of reliability, failure rate, FMEA stages, design, process and documentation.

UNIT V TAGUCHI TECHNIQUES

Taguchi techniques – introduction, loss function, parameter and tolerance design, signal to noise ratio - Seven old (statistical) tools - Seven new management tools - Bench marking and POKA YOKE.

REFERENCE BOOKS

1. Dale H.Besterfield et al, Total Quality Management, Perarson Education, Thrid edition, (First Indian Reprints 2004).
2. Shridhara Bhat K, Total Quality Management – Text and Cases, Himalaya Publishing House, First Edition, 2002.
3. William J.Kolarii, Creating quality, Mcgraw Hill, 1995
4. Poornima M.Charantimath., Total quality management, Pearson Education, First Indian Reprint, 2003.

HSS002	ENGINEERING MANAGEMENT	L	T	P	C
		3	0	0	3

Course Outcomes:

After Successful completion of course, the students will be able to,

CO1	:	Develop a framework for understanding the system by identifying the key physical principles
CO2	:	Design,develop, implement and improve a component, process, or integrated system of people, materials
CO3	:	Translate the conceptual framework into an appropriate mathematical format.
CO4	:	Understand the impact of engineering solutions in a global, economic, environmental, and societal context.
CO5	:	Integrate systems using appropriate analytical, computational and experimental practices then Analyze and assess the reasonableness of the answers obtained and Communicate their findings either verbally and/or via written expression.

CO and PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1						S				L		S			
CO2								S							
CO3						M		S	S	S		S			
CO4						S		S		S	S				
CO5						S	S	S		M					

UNIT I INTRODUCTION

Demand and Revenue Analysis - Demand Forecasting - Production Analysis - Cost and Supply Analysis, Price and output Determination - Investment Analysis - Plant Location - Economic Optimization.

UNIT II FORMS OF BUSINESS AND FUNCTIONS

Types of Business Organisation, Forms - Planning - Organizing - Designing effective organisations - Coordination

UNIT III HUMAN RESOURCE DEVELOPMENT

Motivating individuals and workgroups - Leadership for Managerial Effectiveness -Team working and Creativity -Managerial Communication - Personal Management – Time Management - Stores Management - Career Planning.

UNIT IV FINANCIAL MANAGEMENT

Product development -Management techniques in product development - Nature of controlling - Operations Management -Just-in-Time.

UNIT V GLOBAL ENVIRONMENT

Managing World Economic Change - The global environment - Multinational Strategies - Economic Cycles and Director Investment - Change and Organisation Development - Managerial Ethics and Social responsibilities.

REFERENCE BOOKS

1. Harold Koontz& Heinz Weihrich, Essentials of Management, Tata McGraw Hill publishing company Ltd.
2. Koontz, Weihrich& Aryasri, Principles of Management, Tata McGraw Hill publishing company Ltd.
3. Tripathi, Reddy, Principles of Management, Tata McGraw Hill publishing company Ltd.
4. Hampton, Management, Tata McGraw Hill publishing company Ltd. L.M.Prasad, Principles of Management.

HSS004	INDUSTRIAL PSYCHOLOGY	L	T	P	C
		3	0	0	3

Course Outcomes:

After Successful completion of course, the students will be able to,

CO1	:	Understanding of key concepts, theoretical perspectives, and trends in industrial psychology.
CO2	:	Evaluate thorough and systematic competency model
CO3	:	Analyse the environment and design a job
CO4	:	Create a better work environment for better performance
CO5	:	Design a performance appraisal process and form

CO and PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1						L									
CO2						S	S								
CO3							S	S		S		S			
CO4										M		S			
CO5						S					S				

UNIT I INTRODUCTION

The role of the psychologist in industry, the field of occupational Psychology - Study of behavior in work situation and applications of Psychological principles to problems of selection, Placement, Counseling and training

UNIT II DESIGN OF WORK ENVIRONMENTS

Human engineering and physical environment techniques of job analysis, Social environment- Group dynamics in Industry Personal psychology - Selection, training, placement, promotion, counseling, job motivations, job satisfaction .Special Study of problem of fatigue, boredom and accidents.

UNIT III UNDERSTANDING CONSUMER BEHAVIOUR

Consumer behaviour; study of consumer preference, effects of advertising, Industrial morale - the nature and scope of engineering psychology, its application to industry

UNIT IV WORK METHODS

Efficiency at work, the concept of efficiency, the work curve, its characteristics - The work methods; hours of work, nature of work, fatigue and boredom, rest pauses. The personal factors; age abilities, interest, job satisfaction The working environment - noise, illumination, atmospheric conditions - Increasing efficiency at work; improving the work methods, Time and motion study, its contribution and failure resistance to time and motion studies, need for allowances in time and motion study.

UNIT V WORK AND EQUIPMENT DESIGN

Criteria in evaluation of job-related factor, job design, human factors, Engineering information, input processes, mediation processes, action processes, methods design, work space and its arrangement, human factors in job design. Accident and Safety -The human and economic costs of accidents, accident record and statistics, the causes of accidents situational and individual factors related to accident reduction

REFERENCE BOOKS

1. Tiffin,J and McCormic E.J., Industrial Psychology, Prentice Hall, 6th Edn., 1975.
2. McCormic E.J., Human Factors engineering and design, McGraw Hill, 4th Edn.,1976.
3. Mair, N.R.F., Principles of Human relations
4. Gilmer, Industrial Psychology
5. Ghiselli & Brown, Personnel and Industrial Psychology.
6. Myer, Industrial Psychology.
7. Dunnete, M.D., Handbook of Industrial and Organizational Psychology.
8. Blum & Taylor, Industrial Psychology.

HSS006	PROFESSIONAL ETHICS	L	T	P	C
		3	0	0	3

Course Outcomes:

After Successful completion of course, the students will be able to,

CO1	:	Understand the engineering code of ethics and be able to apply them as necessary.
CO2	:	Understand moral complexities in many engineering activities and decision-making processes
CO3	:	Understand some of the contemporary issues in the engineering professions
CO4	:	Effectively communicate their knowledge and understanding of engineering ethics
CO5	:	Students learnt the moral issues and moral problems in engineering and how to find the solution to those problems.

CO and PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1												S			
CO2								S							
CO3						S		S							
CO4										S	L				
CO5						M	S	S				S			

UNIT I ENGINEERING ETHICS

Functions of Being a Manager – Stock holder and stakeholder management - Ethical treatment of employees - ethical treatment of customers- supply chain management and other issues.

UNIT II ENGINEERING AS SOCIAL EXPERIMENTATION

Senses of Ethics – Variety of moral issues – Types of inquiry – Moral dilemmas – Moral Autonomy – Kohlberg's theory – Gilligan's theory – Consensus and Controversy – Professions and Professionalism – Professional ideals and virtues – Theories about right action – Self-interest – Customs and religion – Use of Ethical Theories.

UNIT III ENGINEER RESPONSIBILTY FOR SAFETY

Corporate social responsibility - Collegiality and loyalty – Respect for Authority – Collective Bargaining – Confidentiality – Conflicts of Interest – Occupational Crime – Professional Rights – Employee Rights – Discrimination.

UNIT IV RESPONSIBILITY AND RIGHTS

Moral imagination, stake holder theory and systems thinking - One approach to management Decision – making Leadership.

UNIT V GLOBAL ISSUES

Multinational Corporations – Environmental Ethics – Computer Ethics – Weapons Development – Engineers as Managers – Consulting Engineers – Engineers as Expert Witnesses and Advisors – Moral Leadership – Sample code of conduct.

REFERENCE BOOKS

1. Mike Martin and Roland Schinzinger, Ethics in Engineering, McGraw Hill, New York, 1996.
2. Charles D Fledderman, Engineering Ethics, Prentice Hall, New Mexico, 1999.
3. Laura Schlesinger, How Could You Do That: The Abdication of Character, Courage, and Conscience, Harper Collins, New York, 1996.
4. Stephen Carter, Integrity, Basic Books, New York, 1996.

5. Tom Rusk, The Power of Ethical Persuasion: From Conflict to Partnership at Work and in Private Life, Viking, New York, 1993.

HSS014	MARKETING MANAGEMENT	L	T	P	C
		3	0	0	3

Course Outcomes:

After Successful completion of course, the students will be able to,

CO1	:	Understanding of the theoretical foundations of marketing alongside current and emerging practitioner applications in the applications in marketing management, the analysis of marketing decisions, consumer behaviour and marketing research methods.
CO2	:	The competence and creativity to address marketing and issues through flexible, adaptable and innovative approaches
CO3	:	Understanding of how to undertake qualitative and quantitative research and apply this knowledge in the context of a major study such as a dissertation
CO4	:	An opportunity to interact and study with a range of students and to practice multiple management skills, including communication, independent action and teamwork.
CO5	:	Develop transferable intellectual and study skills which will encourage a positive attitude to continuing personal development and lifelong learning.

CO and PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1						L	S								
CO2															
CO3								S		S					
CO4										S					
CO5									M			S			

UNIT I MARKETING

Meaning -concept -functions -marketing Planning & implementation marketing Programmes - Marketing environment – Market Segmentation and consumer behaviour – Influencing factors, Decision process – Marketing mix – Marketing department.

UNIT II PRODUCT

Meaning - Product planning - policies - positioning - New product development Product life cycle – BCG Matrix-branding. Packing, labeling.

UNIT III PRICING

Pricing objectives – Setting and modifying the price – Different pricing method Product line pricing and new product pricing

UNIT IV DISTRIBUTION

Nature of Marketing channels - Types of Channel flows - Channel functions - Channel co-operation, conflict and competition - Direct Marketing Telemarketing, Internet shopping.

UNIT V PROMOTION

Promotion Mix - Advertisement - Message - copy writing – Advertisement budgeting - Measuring advertisement effectiveness - Media strategy - sales promotion - Personal selling, publicity and direct marketing

REFERENCE BOOKS

1. Philip Kotler, Marketing Management- Analysis Planning and Control, Prentice Hall of India, New Delhi.
2. Cundiff, Still & Govoni, Fundamentals of Modern Marketing, Prentice Hall of India, New Delhi.
3. Ramaswamy. V S & Namakumari. S, Marketing Management-Planning Implementation and Control, Macmillan Business Books, 2002.
4. Jobber, Principles and Practice of Marketing, McGraw-Hill.

HSS015	MANAGEMENT CONCEPTS AND TECHNIQUES	L	T	P	C
		3	0	0	3

Course Outcomes:

After Successful completion of course, the students will be able to,

CO1	:	Develop a framework for understanding the system by identifying the key physical principles
CO2	:	Design, develop, implement and improve a component, process, or integrated system of people, materials
CO3	:	Translate the conceptual framework into an appropriate mathematical format.
CO4	:	Understand the impact of engineering solutions in a global, economic, environmental, and societal context.
CO5	:	Integrate systems using appropriate analytical, computational and experimental practices then Analyze and assess the reasonableness of the answers obtained and Communicate their findings either verbally and/or via written expression.

CO and PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1						M					S				
CO2										M		S			
CO3									S						
CO4						S									
CO5								S		M	S	S			

UNIT I DEVELOPMENT OF MANAGEMENT THOUGHT

Scientific Management Movement, Administrative Movement, Human- Relations Movement, Decision-Science Movement, Behavioral Movement, Systems Movement, Contingency Movement

UNIT II ESSENTIALS OF PLANNING

Objectives, goals, Programmed Decisions and Un programmed Decisions; Decision-Making, Creativity in Decision-Making, Forecasting and Strategy to Formulation.

UNIT III EFFECTIVE ORGANIZING

Span of Control, Departmentation, Authority; Responsibility, Bureaucracy and Adhocracy; Group Dynamics

UNIT IV REALITIES OF ORGANIZATIONAL LIFE

Organizational Politics, Organizational Power, Organizational Conflict

UNIT V COMMUNICATION & CONTROL

Communication Process Evaluation, Control Process, Qualities of a Good Control System, Management Audit, Human – Offset Accounting, Cost Benefit Analysis.

REFERENCE BOOKS

1. Harold Koontz & Heinz Weihrich, Essentials of Management, Tata McGraw Hill publishing company Ltd.
2. Koontz, Weihrich & Aryasri, Principles of Management, Tata McGraw Hill publishing company Ltd.
3. Tripathi & Reddy, Principles of Management, Tata McGraw Hill publishing company Ltd.
4. Hampton, Management, Tata McGraw Hill publishing company Ltd.
5. L.M.Prasad, Principles of Management.

HSS016	ORGANIZATIONAL PSYCHOLOGY	L	T	P	C
		3	0	0	3

Course Outcomes:

After Successful completion of course, the students will be able to,

CO1	:	Understanding of personnel assessment and selection, training effectiveness and how organizational identity and culture can affect employee and organizational functioning.
CO2	:	Analyze some of the main theories of Organizational Behavior
CO3	:	Analyze how these theories and empirical evidence can help to understand contemporary organizational issues
CO4	:	Apply theories to practical problems in organizations in a critical manner
CO5	:	Understand the various factors for affecting the Organizational effectiveness.

CO and PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1															
CO2						M	S	S	S						
CO3								S	S	S		L			
CO4								S							
CO5							S		S		M	M			

UNIT I FOCUS AND PURPOSE

Definition, need and importance of organizational Behaviour – nature and scope – frame work.

UNIT II INDIVIDUAL BEHAVIOUR

Personality – types – factors influencing personality – theories – learning – types of learners – learning theories – organizational Behaviour modification. Attitudes – characteristics –

components – formation – measurement. Perceptions – importance – factors influencing perception – interpersonal perception.

UNIT III GROUP BEHAVIOUR

Organization structure – formation – groups in organizations – influence – group dynamics – emergence of informal leaders and working norms – group decision making techniques – interpersonal relations – communication – control.

UNIT IV POWER

Leadership styles – theories – leaders Vs managers – sources of power – power centers – power and politics.

UNIT V DYNAMICS OF ORGANIZATIONAL BEHAVIOURS

Organizational climate – factors affecting organizational climate – importance. Job satisfaction – determinants – measurements – influence on behavior. Organizational change – importance – stability Vs change – proactive Vs reaction change – the change process – resistance to change – managing change. Organizational development – characteristics – objectives – team building. Organizational effectiveness – perspective – effectiveness Vs efficiency – approaches – the time dimension – achieving organizational effectiveness.

REFERENCE BOOKS

1. Stephen P.Robins, Organisational Behavior, Prentice Hall of India, 9th edition, 2001.
2. Hellriegel, Slocum and Woodman, Organisational Behavior, South-Western, Thomson Learning, 9th edition, 2001.
3. Schermerhorn, hunt and Osborn, Organisational behavior, John Wiley, 7th edition, 2001.
4. Jit S.Chand, Organisational Behavior, Vikas publishing House Pvt. Ltd. 2nd edition, 2001.
5. Fred Luthans, Organisational Behavior, McGraw Hill Book Co., 1998.
6. New Strom & Davis, Organisational behaviour, McGraw Hill, 2001.
7. Jaffa Harris and Sandra Hartman, Organisational Behaviour, Jaico, 2002.

HSS017	INTERNATIONAL ECONOMICS	L	T	P	C
		3	0	0	3

Course Outcomes:

After Successful completion of course, the students will be able to,

CO1	:	Understand trade laws, and the national and international institutions central to trade.
CO2	:	Evaluate economic integration and conflicts across countries.
CO3	:	Evaluate strategic trade policies from the perspective of nations and companies.
CO4	:	Explain how exchange rate is determined in the long run and the short run.
CO5	:	Analyze interpret a nation's balance of payments and related accounts and Explain the effectiveness of national macroeconomic policy in an interdependent global economy

CO and PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1															
CO2						S		S							
CO3						L		S	S						

CO4						M		S				S			
CO5								S							

UNIT I INTRODUCTION

The Traditional Theory of International Trade, The Basic Trade Model, Heckscher-Ohlin-Samuelson Model, Effects of Tariffs & Quotas, Theory of Factor Movements - New Theories of International Trade and Industrial Policies.

UNIT II EXCHANGE RATE & BALANCE OF PAYMENT

The Balance of Payments and National Accounts, Determinants of Exchange Rates The Exchange-Rate Regime Choice and a Common Currency Area, International Debt and Currency Crises.

UNIT III INTERNATIONAL REGULATORY AUTHORITY

Political Economy of Trade Disputes, the FTA and the WTO -The role of the IMF and other International Financial Organizations. Reasons for Protection World Trade, International Movements of Capital - The Balance of Trade and Other Measures of International Transactions. Export and import policies.

UNIT IV INTERNATIONAL MACROECONOMICS

European Monetary Unification and the Euro - Preferential Trading Arrangements and the NAFTA International Policies for Economic Development, Trade Outsourcing and Off shoring

REFERENCE BOOKS

1. N. Bhagwati, A. Panagariya and T. N. Srinivasan, Lectures on International Trade, MIT Press, 2nd edition, 1998.
2. M. Obstfeld and K. Rogoff, Foundation of International Macroeconomics, McGraw-Hill, 1996.
3. Romer, D., Advanced Macroeconomics, McGraw Hill, 1996.

HSS018	**COMMUNICATION SKILLS**	**L**	**T**	**P**	**C**
		3	**0**	**0**	**3**

Course Outcomes:

After Successful completion of course, the students will be able to,

CO1	:	Demonstrate ability to apply communication concepts and theories to address everyday dilemmas within dimensions (ethical, social, legal, technological, relational, and cultural) central to the student's major focus.
CO2	:	Demonstrate oral and written communication skills expected of a future professional in the field.
CO3	:	Demonstrate communication research skills expected of a future professional in the field.
CO4	:	Demonstrate understanding of ethical values central to the communication discipline.
CO5	:	Demonstrate the ability to integrate communication and business scholarship for application in work settings.

CO and PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1								M		S		S			
CO2								M	S			S			
CO3						S		S			L	S			
CO4								S		S	S	M			
CO5							S	S			S	M			

UNIT I COMMUNICATION IN BUSINESS

Systems approach, forms of business communication, management and communication, factors facilitating communication.

UNIT II COMMUNICATION PROCESS

Interpersonal perception, selective attention, feedback, variables, listening barriers to listening, persuasion, attending and conducting interviews, participating in discussions, debates and conferences, presentation skills, paralinguistic features, oral fluency development.

UNIT III BUSINESS CORRESPONDENCE

Business letter. Memos, minutes, agendas, enquiries, orders, sales letters, notice, tenders, letters of application, letter of complaints.

UNIT IV TECHNICAL REPORTS

Format, Choice of vocabulary, coherence and cohesion, paragraph writing, organization.

UNIT V PROJECT REPORTS

Project proposal, project reports, and appraisal reports.

REFERENCE BOOKS

1. Sharan J.Genrson and Steven M.Gerson, Technical Writing - Process and Product, Pearson Education, 2000.
2. Raymond V.Lesikar, John D. Pettit and Mary E.Flatley, Lesikass Basic Communication, Tata McGraw Will, 8th Edition, 1999.
3. Stevel. E. Pauley, Daniel G.Riordan, Technical Report Writing Today, AITBS Publishing & Distributors, India 5th edition, 2000.
4. Robert L.Shurter, Effective letters in business, Third Ed., 1983.
5. McGraith, Basic Managerial Skills for all Prentice Hall of India, 6th Edition, 2002.
6. Halliday, M.A.Ky R.Hasan, Cohesion in English, Longman, London, 1976.

HSS020	HUMAN RESOURCE MANAGEMENT	L	T	P	C
		3	0	0	3

Course Outcomes:

After Successful completion of course, the students will be able to,

CO1	:	Synthesize the role of human resources management as it supports the success of the Organization including the effective development of human capital as an agent for Organizational change
CO2	:	Applying the knowledge of laws that impact behavior in relationships between employers and employees that ultimately impact the goals and strategies of the organization.
CO3	:	Understand the role of employee benefits and compensation as a critical component of Employee performance, productivity and organizational effectiveness.
CO4	:	Show evidence of the ability to analyze, manage and problem solve to deal with the challenges and complexities of the practice of collective bargaining
CO5	:	Demonstrate knowledge of practical application of training and employee Development as it impacts organizational strategy and competitive advantage.

CO and PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1									M						
CO2						S						M			
CO3												S			
CO4							S	S	S	S					
CO5						S		S		M		S			

UNIT I INTRODUCTION

Functions of a human resources manager - recruitment and selection processes interview methods.

UNIT II HR- EVALUATION AND DEVELOPMENT

Performance appraisal, Training and development, disciplinary procedures, collective bargaining and employee welfare.

UNIT III TRENDS IN HRM

The recent methods and trends in HRM with a few case studies in the context of globalization.

UNIT IV STRATEGIC ROLE OF HUMAN RESOURCE MANAGEMENT

Job analysis Personnel planning and recruiting Employee testing and selection, interviewing candidates, Appraising performance.

UNIT V CAREER AND COMPENSATION

Managing careers Compensation Benefits and services Labor relations and collective bargaining Employee safety and health

REFERENCE BOOKS

1. Decenzo and Robbins, Human Resource Management, Wiley, 6th edition, 2001.
2. Biswajeet Pattanayak, Human Resource Management, Prentice Hall of India, 2001.
3. Eugene McKenna and Nic Beach, Human Resource Management, Pearson Education.
4. Dessler, Human Resource Management, Pearson Education Limited, 2002.
5. Mamoria C.B and Mamoria S., Personnel Management, Himalaya Publishing.
6. Wayne Cascio, Managing Human Resources, McGraw-Hill, 1998.
7. Ivancevich, Human Resource Management, McGraw-Hill, 2002.

HSS023	ENTREPRENEURSHIP DEVELOPMENT	L	T	P	C
		3	0	0	3

Course Outcomes:

After Successful completion of course, the students will be able to,

CO1	:	Understand the concept of entrepreneurship and its close relationship with Enterprise and owner-management.
CO2	:	Understand the Business environment, Central and State Government Industrial Policies and Regulations of International Business.
CO3	:	Understand the concepts of innovation and creativity and the roles that both Play in entrepreneurship and business development.
CO4	:	Evaluate the Effective management of Business Units.
CO5	:	Understand the concept of entrepreneurship and its close relationship with Enterprise and owner-management.

CO and PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1															
CO2						S	S					S			
CO3								S		S					
CO4								S	S			S			
CO5						M		S							

UNIT I ENTREPRENEURIAL COMPETENCE

Entrepreneurship concept – Entrepreneurship as a Career – Entrepreneur – Personality Characteristics of Successful. Entrepreneur – Knowledge and Skills Required for an Entrepreneur.

UNIT II ENTREPRENEURIAL ENVIRONMENT

Business Environment - Role of Family and Society - Entrepreneurship Development Training and Other Support Organisational Services - Central and State Government Industrial Policies and Regulations - International Business.

UNIT III BUSINESS PLAN PREPARATION

Sources of Product for Business - Prefeasibility Study - Criteria for Selection of Product - Ownership - Capital - Budgeting Project Profile Preparation - Matching Entrepreneur with the Project - Feasibility Report Preparation and Evaluation Criteria.

UNITIV LAUNCHING OF SMALL BUSINESS

Finance and Human Resource Mobilization Operations Planning - Market and Channel Selection - Growth Strategies - Product Launching.

UNIT V MANAGEMENT OF SMALL BUSINESS

Monitoring and Evaluation of Business - Preventing Sickness and Rehabilitation of Business Units.Effective Management of small Business.

REFERENCE BOOKS

1. Hisrich, 'Entrepreneurship', Tata McGraw Hill, New Delhi, 2001.
2. P. Saravanavel, 'Entrepreneurial Development', Ess Pee kay Publishing House, Chennai -1997.
3. S.S.Khanka, 'Entrepreneurial Development', S.Chand and Company Limited, New Delhi, 2001.
4. Prasama Chandra, Projects – 'Planning, Analysis, Selection, Implementation and Reviews', Tata McGraw-Hill Publishing Company Limited 1996.
5. P.C.Jain (ed.), 'Handbook for New Entrepreneurs', EDII, Oxford University Press, New Delhi, 1999.
6. Staff College for Technical Education, Manila and Centre for Research and Industrial Staff Performance, Bhopal, 'Entrepreneurship Development', Tata McGraw-Hill Publishing Company Ltd., New

		L	T	P	C
EEE390 /	**COMMUNITY SERVICE PROJECT**	**0**	**0**	**2**	**1**
EEE391		**0**	**0**	**2**	**2**

COURSE OUTCOME FOR COMMUNITY SERVICE PROJECTS:

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

CO1	:	Acquire experience the worth of helping public and giving back to the society
CO2	:	Develop Strong ties between students and society so as to give it a sustainable nature.
CO3	:	Gain skill to equip themselves with diverse and rich leadership experience and Design the experiments and make power point presentation with results and challenges

CO and PO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1				S		S	S		S					S	S
CO2	S			S	M	S	S	M	S	S		S	S	S	S
CO3				S	S	S	S	S	S	S		M		S	S