Dr. Mahalingam College of Engineering and Technology

(An Autonomous Institution)

Pollachi - 642 003

Curriculum and Syllabus for

B.E. ELECTRICAL AND ELECTRONICS ENGINEERING

SEMESTER I to VIII

with effect from 2014-15

REGULATIONS 2014

Programme : B.E. – Electrical and Electronics Engineering
Curriculum and Syllabus : Semesters – I to VIII
Approved by Academic Council

Action	Responsibility	Signature of Authorized Signatory
Designed and Developed by	BoS Electrical and Electronics Engineering	
Compiled by	Office of the Controller of Examinations	
Approved by	Principal	

DEPARTMENT OF ELECTRICAL & ELECTRONICS AND ENGINEERING

Regulation – 2014 – Revision 0

Curriculum for B.E Electrical and Electronics Engineering

SEMESTER I

Course Code	Course Title	Hours/Week			Credits	Marks
		L	T	P		
THEORY						
140CO0101	Technical English	2	0	2	3	100
140CO0102	Engineering Mathematics - I	3	1	0	4	100
140CO0103	Engineering Physics	3	0	0	3	100
140CO0104	Engineering Chemistry	3	0	0	3	100
140CO0105	C Programming	3	0	0	3	100
140EE0106	Basics of Civil and Mechanical Engineering	3	0	0	3	100
PRACTICAL						
140EE0107	Engineering Practices Laboratory (Civil & Mechanical)	0	0	3	2	100
140CO0108	C Programming Laboratory	0	0	3	2	100
140CO0210	Engineering physics and chemistry laboratory (Annual Pattern)	0	0	3	-	-
	TOTAL	**17**	**1**	**11**	**23**	**800**

SEMESTER II

Course Code	Course Title	Hours/Week			Credits	Marks
		L	T	P		
THEORY						
140CO0201	Communication Skills	2	0	2	3	100
140CO0202	Engineering Mathematics -II	3	1	0	4	100
140CO0203	Material science	3	0	0	3	100
140CO0204	Environmental science	3	0	0	3	100
140EE0205	Object oriented Programming	3	0	0	3	100
140EE0206	Engineering Mechanics	3	0	0	4	100
PRACTICAL						
140EE0207	Engineering Practices Laboratory(Electrical and Electronics and PC hardware)	0	0	3	2	100
140EE0208	Object oriented programming laboratory	0	0	3	2	100
140CO0209	Engineering Graphics	2	0	3	3	100
140CO0210	Engineering physics and chemistry laboratory (Annual Pattern)	0	0	3	2	100
	TOTAL	**19**	**2**	**17**	**29**	**1000**

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SEMESTER III

Course Code	Course Title	Hours/Week L	T	P	Credits	Marks
THEORY						
140EE0301	Engineering Mathematics- III	3	1	0	4	100
140EE0302	Thermal Engineering and Fluid Mechanics	3	1	0	4	100
140EE0303	Circuit Theory	3	1	0	4	100
140EE0304	Electrical Machines – I	3	1	0	4	100
140EE0305	Data Structures and Algorithms using C++	3	1	0	4	100
140EE0306	Electronic Devices and Circuits	3	0	0	3	100
PRACTICAL						
140EE0307	Electrical Machines Laboratory-I	0	0	3	2	100
140EE0308	Data Structures and Algorithms Using C++ Laboratory	0	0	3	2	100
140EE0309	Circuits and Devices Laboratory	0	0	3	2	100
	One Credit Course	0	0	2	1	100
	TOTAL	**18**	**5**	**11**	**30**	**1000**

SEMESTER IV

Course Code	Course Title	Hours/Week L	T	P	Credits	Marks
THEORY						
140EE0401	Numerical Methods	3	1	0	4	100
140EE0402	Network Theory	3	1	0	4	100
140EE0403	Electrical Machines-II	3	1	0	4	100
140EE0404	Electromagnetic Theory	3	1	0	4	100
140EE0405	Measurements and Instrumentation	3	0	0	3	100
140EE0406	Digital Electronics	3	0	0	3	100
PRACTICAL						
140EE0407	Electrical Machines Laboratory – II	0	0	3	2	100
140EE0408	Measurements and Instrumentation Laboratory	0	0	3	2	100
140EE0409	Electronics Laboratory	0	0	3	2	100
	One Credit Course	0	0	2	1	100
	TOTAL	**18**	**4**	**11**	**29**	**1000**

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SEMESTER V

Course Code	Course Title	Hours/Week			Credits	Marks
		L	T	P		
THEORY						
140EE0501	Electrical Machine Design	3	1	0	4	100
140EE0502	Generation, Transmission and Distribution	3	1	0	4	100
140EE0503	Microprocessors and Microcontrollers	3	0	0	3	100
140EE0504	Control Systems	3	1	0	4	100
140EE0505	Communication Systems	3	0	0	3	100
140EE0506	Linear Integrated Circuits and Applications	3	0	0	3	100
PRACTICAL						
140EE0507	Microprocessors and Microcontrollers Laboratory	0	0	3	2	100
140EE0508	Digital and Integrated Circuits Laboratory	0	0	3	2	100
140EE0509	Control Systems Laboratory	0	0	3	2	100
	One Credit Course	0	0	2	1	100
	TOTAL	**18**	**3**	**11**	**28**	**1000**

SEMESTER VI

Course Code	Course Title	Hours/Week			Credits	Marks
		L	T	P		
THEORY						
140EE0601	Power System Analysis and Stability	3	1	0	4	100
140EE0602	Principles of Digital Signal Processing	3	1	0	4	100
140EE0603	Protection and Switchgear	3	0	0	3	100
140EE0604	Power Electronics	3	1	0	4	100
XXX	Elective – I	3	0	0	3	100
XXX	Elective – II	3	0	0	3	100
PRACTICAL						
140EE0607	Power Electronics Laboratory	0	0	3	2	100
140EE0608	Digital Signal Processing Laboratory	0	0	3	2	100
140EE0610	Mini Project	0	0	3	2	100
	One Credit Course	0	0	2	1	100
	TOTAL	**18**	**3**	**9**	**28**	**1000**

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SEMESTER VII

Course Code	Course Title	Hours/Week			Credits	Marks
		L	T	P		
THEORY						
140EE0701	Principles of Management	3	0	0	3	100
140EE0702	Solid State Drives	3	0	0	3	100
140EE0703	Electrical Energy Utilization	3	0	0	3	100
XXX	Elective – III	3	0	0	3	100
XXX	Elective – IV	3	0	0	3	100
PRACTICAL						
140EC0707	Electric Drives and Control Laboratory	0	0	3	2	100
140EE0708	Power System Simulation Laboratory	0	0	3	2	100
140EE0810	Project Work (Annual Pattern)	0	0	3	-	100
	TOTAL	**15**	**0**	**9**	**19**	**800**

SEMESTER VIII

Course Code	Course Title	Hours/Week			Credits	Marks
		L	T	P		
THEORY						
140EE0801	Engineering Economics and Financial Accounting	3	0	0	3	100
XXX	Elective – V	3	0	0	3	100
XXX	Elective – VI	3	0	0	3	100
PRACTICAL						
140EE0810	Project Work (Annual Pattern)	0	0	12	8	200
	TOTAL	**9**	**0**	**12**	**17**	**500**

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LIST OF ELECTIVES

Course Code	Course Name	L	T	P	C	M
140EE9111	Power System Quality	3	0	0	3	100
140EE9112	CAD Design of Electrical Apparatus	3	0	0	3	100
140EE9113	Flexible AC Transmission Systems	3	0	0	3	100
140EE9114	Special Electrical Machines	3	0	0	3	100
140EE9115	Power System Operation and Control	3	0	0	3	100
140EE9116	Power Electronics Applications to Power Systems	3	0	0	3	100
140EE9117	Electric and Hybrid vehicles	3	0	0	3	100
140EE9118	HVDC Transmission	3	0	0	3	100
140EE9119	High Voltage Engineering	3	0	0	3	100
140EE9120	Solid State Relays	3	0	0	3	100
140EE9121	Alternate Energy Sources	3	0	0	3	100
140EE9122	Advanced Microprocessors and Microcontrollers	3	0	0	3	100
140EE9123	Embedded System Design	3	0	0	3	100
140EE9124	VLSI Design	3	0	0	3	100
140EE9125	Nano Electronics	3	0	0	3	100
140EE9126	Digital Image Processing	3	0	0	3	100
140EE9127	Bio–Medical Engineering	3	0	0	3	100
140EE9128	Advanced Control Theory	3	0	0	3	100
140EE9129	Power Plant Instrumentation	3	0	0	3	100
140EE9130	Soft Computing Techniques	3	0	0	3	100
140EE9131	Virtual Instrumentation	3	0	0	3	100
140EE9132	Industrial Automation	3	0	0	3	100
140EE9133	Robotics and Automation	3	0	0	3	100
140EE9134	Micro Electro Mechanical systems	3	0	0	3	100
140EE9135	Professional Ethics and human values	3	0	0	3	100
140EE9136	Computer Networks	3	0	0	3	100

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SEMESTER I

Course Code: 140CO0101	**Course Title:** TECHNICAL ENGLISH
Core/Elective: Core	**Credits (L:T:P:C:M)** – 2 : 0 : 2 : 3 : 100
Type: Lecture	**Total Contact Hours:** 60

Pre-requisites:

Nil

Course Outcomes:

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

CO1. Employ appropriate vocabulary in different academic and professional contexts.
CO2. Comprehend lectures and technical oriented passages.
CO3. Apply suitable reading strategies to any science texts.
CO4. Speak effectively in real life and work related situations
CO5. Write grammatically correct sentences.

Course Content:

UNIT I FUNCTIONAL ENGLISHGRAMMAR 12

Mechanical and grammatical structures of written English-Errors in writing mechanics -Errors in spelling-Usage and punctuation–Cohesion and Discourse-Sequencing of jumbled sentences using connectives- Embedded questions-Incorrect English (Indian Scenario)

UNIT II LISTENING & SPEAKING - PHONETICS 12

Sounds of language -Sounds-phonemes -Organs of speech-Articulation-Consonants-vowels-International Phonetic Alphabets (IPA)-Stress and Tones Stress, pause & intonation-Transcription-Listening Comprehension

UNIT - III SPEAKING 12

Language for social purpose – Conversation-Making Introductions -Inviting questions and responses-Expressing Opinions-Individual Presentation-Extempore-Telephonic conversation

UNIT - IV GRAMMAR 12

Prepositions -Sentence Pattern-Concord –Tenses-Articles -Active & Passive Voice-Comparative adjectives-Nominal Compounds-Modal Verbs-Writing definitions -Expressions of use and purpose-Expressions for compare and contrast- Phrasal verbs

UNIT -V WRITING 12

Instructions –Recommendations -Sequencing of Sentences-Paragraph Writing- Transcoding data -Note Making

Text Books:

1. NiraKonar, "Communication Skills for Professionals" , PHI Learning Private Limited, New Delhi, 2009.
2. Peter Roach, "English Phonetics and Phonology", Cambridge University Press, United Kingdom, 2004
3. Raymond Murphy, "Murphy's English Grammar", Cambridge University Press, United Kingdom, 2004.

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Reference Books:

1. M.A.K.Halliday, "An introduction to Functional English Grammar", Edward Arnold Publishers Ltd. U.S.A, 1985
2. Walter.E.Oliu., "Writing That Works- How to Write Effectively on the Job", St.Martin's Press, New York,1980
3. Martin Hewings , "Advanced English Grammar", Cambridge University Press, 1999

Web references:

1. http://www.englishpage.com/grammar/index.html
2. UsingEnglish.com
3. http://www.perfect-english-grammar.com/
4. http://esl.fis.edu/grammar

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Course Code: 140CO0102	Course Title: ENGINEERING MATHEMATICS I
Core/Elective: Core	Credits (L:T:P:C:M) – 3 : 1 : 0 : 4 : 100
Type: Lecture	Total Contact Hours: 60

Pre-requisites:

Nil

Course Outcomes:

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

CO1. Use Eigen values and Eigen vectors of a real matrix to reduce quadratic form to canonical form

CO2. Write equations of sphere and cylinder under various geometrical conditions.

CO3. Use differential calculus concepts to derive equations of evolutes of curves.

CO4. Apply partial derivatives to calculate maxima and minima for functions of several variables

CO5. Apply multiple integrals to find area of plane curves and volume of solids.

Course Content:

UNIT I MATRICES 12

Rank of a matrix (Revision)-Solution of system of equations-Characteristic equations-Eigen values and Eigen vectors of a real matrix-Geometrical meaning-Significance- Diagonalization by orthogonal transformation-Quadratic forms and Canonical forms-Transformation of quadratic forms to canonical forms through orthogonal transformation

UNIT II THREE DIMENSIONAL ANALYTICAL GEOMETRY 12

Direction cosines- Direction ratios-The plane and the straight line (Revision) - Sphere-Plane section of a sphere- Equation of a sphere through a circle-Tangent plane- Orthogonal spheres - Cylinder-Right circular cylinder

UNIT - III DIFFERENTIAL CALCULUS 12

Curvature in Cartesian and polar co-ordinates-Centre and radius of curvature-Circle of curvature-Evolutes of some standard curves (Parabola, Ellipse, Hyperbola, Astroid, Cycloid) – Envelopes.

UNIT - IV FUNCTIONS OF SEVERAL VARIABLES 12

Partial derivatives (Revision)- Euler's theorem for homogenous functions-Total derivatives-Jacobians - Taylor's expansions- Maxima and minima for functions of two variables-Method of Lagrange's multipliers.

UNIT -V MULTIPLE INTEGRALS 12

Double integration-Cartesian and polar coordinates-Change of order of integration- Transformation from Cartesian to polar, spherical and cylindrical coordinates-Triple integration in Cartesian Coordinates-Applications: Evaluating area and volume using multiple integrals.

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Text Books:

1. Bali N. P and Manish Goyal, "Text book of Engineering Mathematics", ThirdEdition, Laxmi Publications (p) Ltd., (2008).
2. Grewal. B.S, "Higher Engineering Mathematics", 40th Edition, Khanna Publications, Delhi, (2007)

Reference Books:

1. Ramana B.V, "Higher Engineering Mathematics", Tata McGraw HillPublishing Company, New Delhi, (2007).
2. Glyn James, "Advanced Engineering Mathematics", 7th Edition, Wiley India, (2007).
3. Jain R.K and Iyengar S.R.K," Advanced Engineering Mathematics", 3rdEdition, Narosa Publishing House Pvt. Ltd., (2007).

Web references:

1. http://nptel.ac.in/
2. http://ocw.mit.edu/courses/mathematics
3. http://mathworld.wolfram.com/FourierSeries.html

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Course Code: 140CO0103	**Course Title:** ENGINEERING PHYSICS
Core/Elective: Core	**Credits (L:T:P:C:M)** – 3 : 0 : 0 : 3 : 100
Type: Lecture	**Total Contact Hours:** 45

Pre-requisites:

Nil

Course Outcomes:

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

- CO 1 Explain the properties, production and detection of ultrasonic.
- CO 2 Explain the working of laser and its applications
- CO 3 Explain the types of fibers, fabrication and its applications.
- CO 4 Explain the behavior of particle.
- CO 5 Calculate the miller indices and to recognize the crystal defects.

Course Content:

UNIT I ACOUSTICS AND ULTRASONICS 9

Acoustics: Sound intensity – Decibel - Reverberation - Sabines' formula. Factors affecting acoustics of buildings and remedies, Noise pollution and control, Noise control in machines. Ultrasonics: Magnetostriction and Piezoelectric generators. Detection and Properties of Ultrasonics – Cavitation - Industrial applications: Drilling, welding, soldering and cleaning – NDT: Pulse echo system, through transmission, resonance system - A, B and C scan displays with respect to flaw detection.

UNIT II LASERS 9

Laser principles: Stimulated and spontaneous emissions of radiations - Population inversion and pumping methods – Properties of lasers - Nd: YAG laser - He-Ne gas laser - CO_2 molecular laserand semiconductor lasers – Applications of Lasers: welding, drilling, cutting and heat treatment of materials. Holography: construction, reconstruction and applications - Medical applications of lasers (qualitative).

UNIT - III FIBER OPTICS 9

Principle of light propagation in optical fibres - Numerical aperture and acceptance angle -Types of fibres: based on material, refractive index, and mode of propagation. Fabrication of fibre using double crucible technique, splicing - Light sources: LD & LED. Detectors: PN, PIN & Avalanche photo diodes. Fibre optical communication systems and its advantages - Fibre optic sensors: temperature and displacement - Endoscope.

UNIT - IV QUANTUM PHYSICS 9

Schrodinger's wave equations: Time independent and time dependent - Physical significance of the wave function - Particle in a potential box - Electron microscopes: Scanning electron, transmission electron and Scanning transmission electron microscope.

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UNIT -V CRYSTAL STRUCTURE 9

Amorphous and Crystalline materials. Lattice - Unit cell - Bravais lattices. Crystal structures: SC, BCC, FCC and HCP – Calculation of number of atoms per unit cell, Coordination number, nearest neighbor distance, Atomic radius and packing factor - Diamond, NaCl structures. Miller indices – Interplanar distance Crystal defects: point, line and surface defects and their influence on the properties of materials (Qualitative).

Text Books:

1. R. K. Gaur and S.C. Gupta, 'Engineering Physics' DhanpatRai Publications, New Delhi (2003)
2. M.N. Avadhanulu and PG Kshirsagar, 'A Text book of Engineering Physics', S.Chand and company, Ltd., New Delhi, 2005.
3. Palanisamy, P.K., 'Engineering Physics' Scitech publications, Chennai, (2007).

Reference Books:

1. Serway and Jewett, 'Physics for Scientists and Engineers with Modern Physics', 6th Edition, Thomson Brooks/Cole, Indian reprint (2007)
2. Rajendran, V and Marikani A, 'Engineering Physics' Tata McGraw Hill Publications Ltd, III Edition, New Delhi, (2004).
3. Jayakumar. S, 'Engineering Physics', R.K. Publishers, Coimbatore, (2003).
4. Chitra Shadrach and SivakumarVadivelu, 'Engineering Physics', Pearson Education, New Delhi, (2007).

Web references:

1. http://www.physicsclassroom.com/
2. http://hyperphysics.phy-astr.gsu.edu/
3. http://www.tndte.com/TEXT%20BOOKS/Complete%20Books/Engineering%20Physics-I%20&%20II/Engineering%20Physics%20Sem%20-1%20&%202.pdf

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Course Code:140CO0104	**Course Title:** ENGINEERING CHEMISTRY
Core/Elective: Core	**Credits (L:T:P:C:M)** – 3 : 0 : 0 : 3 : 100
Type: Lecture	**Total Contact Hours:** 45

Pre-requisites:

Nil

Course Outcomes:

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

CO1. Explain the chemistry of water and specify the water treatment processes

CO2. Determine the rate of corrosion of a metal in a given environment and identify appropriate control techniques to avoid corrosion

CO3. Describe the efficiency of fuels in different states based on its composition and calorific value

CO4. Select a polymeric material for a specific engineering application

CO5. Select batteries based on the life cycle, working principle and their applications

Course Content:

UNIT I WATER TECHNOLOGY 9

Introduction- Impurities in water- Effect of impurities in natural water-hardness – estimation of hardness by EDTA method (problems). Boiler feed water – disadvantages of using hard water in boilers. Internal conditioning (phosphate, Calgon and carbonate conditioning methods).External conditioning – demineralization process – desalination (reverse osmosis).Domestic and waste water treatment.

UNIT II CORROSION AND IT'S CONTROL 9

Chemical Corrosion – Pilling-Bedworth rule – electrochemical corrosion – different types – galvanic corrosion – differential aeration corrosion – factors influencing corrosion. Corrosion control – sacrificial anode and impressed cathodic current methods – corrosion inhibitors – protective coating – metallic coatings – electroplating (Ni) plating. Paint – drying action of paint and its constituents.

UNIT - III SURFACE CHEMISTRY AND INSTRUMENTAL METHODS OF ANALYSIS 9

Surface chemistry

Adsorption – types – adsorption isotherm – Freundlich, Langmuir. Application of adsorption technology in industries (ion exchange adsorption and adsorption chromatography) **Instrumental methods of Analysis**

Beer-Lambert's Law – UV –VISIBLE , flame photometry, AAS, principle and instrumentation (Block diagram only).

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UNIT - IV FUELS AND LUBRICANTS **9**

Coal – classification – Calorific value –proximate and ultimate analysis of coal (method only) – metallurgical coke – manufacture by Otto-Hoffmann method – Ordinary, Premium, White and Speed petrol – Knocking- Octane number and Cetane number – Gaseous fuels – water gas, producer gas, CNG and LPG. Flue gas analysis – Orsat method. Lubricants – Classification and properties – (Viscosity, Viscosity index, flash and fire points, cloud and pour points.

UNIT -V ENGINEERING MATERIALS AND ENERGY STORAGE DEVICES **9**

Abrasives – natural and synthetic abrasives – diamond, Silicon carbide and boron carbide (properties and uses only) Engineering plastics – Classification – preparation and uses of PVC, Teflon, polycarbonate, polyurethane, nylon-66, PET- Biodegradable plastics. Energy storage devices- Dry cell – alkaline batteries – lead-acid, nickel-cadmium and lithium batteries. Fuel cells – (Hydrogen-Oxygen fuel cell).

Text Books:

1. Jain. P.C and Monica Jain, "Engineering Chemistry" DhanpatRai Pub, Co., New Delhi, 2002.
2. Sharma.B.K, "Engineering chemistry" Krishna Prakasan Media (P) Ltd., Meerut, 2001.
3. 2. Sivasankar.B, "Engineering Chemistry" Tata McGraw-Hill Pub.Co.Ltd, New Delhi, 2008.

Reference Books:

1. Roop Chand Bansal and Meenakshi Goyal, "Activated Carbon Adsorption", Taylor & Francis Group, LLC, 2005
2. Rajput.R.K, "Engineering Materials", S. Chand & Co. Pub. New Delhi, 2006
3. Samir Sarkar, "Fuels and Combustion", Orient Longman, India, 1996.

Web references:

1. www.nptel.ac.in/courses/122106028/
2. freevideolectures.com/Course/2263/Engineering-Chemistry-I
3. www.nith.ac.in/chem/chemistry.pdf

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Course Code: 140CO0105	Course Title: C PROGRAMMING
Core/Elective: Core	**Credits (L:T:P:C:M)** – 3 : 0 : 0 : 3 : 100
Type: Lecture	**Total Contact Hours:** 45

Pre-requisites:

Nil

Course Outcomes:

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

CO1. Enumerate the significant aspects of software development and problem solving techniques
CO2. Exhibit the various types of control flow in C language
CO3. Illustrate the effective usage of arrays, functions and structures in C.
CO4. Demonstrate the implementation of pointers in arrays, structures and functions.
CO5. Analyze file access methods and the features of preprocessor directives

Course Content:

UNIT I INTRODUCTION 9

Introduction to computers – Computer Software – Software development life cycle - Need for studying Computer Programming Languages - Problem Definition and Analysis -Flow Chart, Developing algorithm - Procedural Programming (modular and structural)- Compilers and Interpreters – Program compilation, execution, debugging, testing - C program development environment.

UNIT II C LANGUAGE BASICS 9

Overview of C – Constants, Variables and Data Types – Operators and Expressions – Managing Input and Output operators – Decision Making - Branching and Looping. Enumerated Data type, Renaming Data type with typedef – Type Casting

UNIT - III ARRAYS, FUNCTIONS AND STRUCTURES 9

ARRAYS: Definition- Declaration- Initialization- Assignment- Processing array- Passing array to a function-Two and multi dimensional array

FUNCTIONS: Defining a function- Accessing a function-Passing argument to functions- Function prototypes- Nested function call - Storage classes. Handling of character strings.

STRUCTURES: Definitions - processing structure-User defined data types- - Passing structure to functions –Self referential structures- Nested structures. Defining a Union- Processing union- Structures and union comparison- Bit fields

UNIT - IV POINTERS 9

Pointer variable declaration- Initialization and assignment- Pointers to a function- Pointers and one dimensional array and multi dimensional array- Operating a pointers- Array of pointers- Passing function to other functions. Structures and pointers – Linked Lists.

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UNIT -V FILES **9**

Introduction to files-File access-File organization-File operations (open, close, read, write, etc.)-Command line arguments. C Preprocessors – Features – Macro Expansion – File inclusion-Conditional compilation – Miscellaneous Directives – simple Header files functions.

Text Books:

1. Byron Gottfried, "Schaum's Outline of Programming with C", 2nd Edition, (Indian Adapted Edition), TMH publications, New Delhi, 2006.
2. YashwantKanetkar, "Let Us C", 5th Edition, BPB Publications, New Delhi ,2004.
3. Balagurusamy.E, "Programming in ANSI C" Tata McGRaw-Hill Publishing Company Limited, New Delhi 2007

Reference Books:

1. Herbert Schildt, "C – The Complete Reference", Fourth Edition, Tata McGraw Hill publishing Company, New Delhi, 2005.
2. Behrouz.A.Forouzan and Richard.F.Gilberg, "A Structured Programming Approach Using C", II Edition, Brooks-Cole Thomson Learning Publications,UK, 2007.
3. Ashok.N.Kamthane, "Computer Programming", Pearson Education (India),New Delhi, 2008.

Web references:

1. Introduction to programming in C. URL: http://nptel.ac.in/courses/106104128/
2. Practical Programming in C URL: http://ocw.mit.edu/courses/electrical-engineering-and-computer-science/6-087-practical-programming-in-c-january-iap-2010/lecture-notes/
3. www.iups.org/media/meeting_minutes/C.pdf

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Course Code:140EE0106	Course Title: BASICS OF CIVIL AND MECHANICAL ENGINEERING
Core/Elective: Core	Credits (L:T:P:C:M) – 3 : 0 : 0 : 3 : 100
Type: Lecture	Total Contact Hours: 45

Pre-requisites:

Nil

Course Outcomes:

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

CO 1: Outline the various Civil Engineering materials used in field and understand the importance of surveying

CO 2: Identify the principle behind architectural aspects involved in construction and Illustrate the techniques involved in construction of substructure and superstructure

CO 3: Recognize the various manufacturing process for making a product.

CO 4: Calculate various parameters in designing air conditioning and refrigeration systems.

CO 5: Explain the fundamentals of I.C Engine and its principle of working

Course Content:

CIVIL ENGINEERING

UNIT I CIVIL ENGINEERING MATERIALS & SURVEYING 8

Infrastructure projects- Role of civil Engineers, Basic areas in Civil Engineering and its scope - Civil Engineering Materials and classification - stones, bricks, sand, aggregate, cement & types of cement, mortar, concrete, concrete grades, types of concrete, Plain cement concrete (PCC) - Reinforcement cement concrete(RCC), surveying objectives and types, common methods and instruments for distance and angle measurements

UNIT II PRINCIPLES OF ARCHITECTURAL DESIGN 7

Aesthetic qualities in building to include, unity, proportion, scale, balance, symmetry and rhythm – study of examples, Factors in architectural design, such as: requirements, circulation, anthropometrics, site & landscape, climate, space standards, safety regulations, layout regulations, building rules , Basic services – basics of interior design and landscaping, Integration of building services.

UNIT - III BUILDING COMPONENTS 8

Sub structure: Nature of soil – problems with soil, selection of foundation based on soil condition – functions of foundation, Bearing capacity - requirement of good foundations. Super structure: types of masonry – brick masonry, stone masonry, Beams, columns, Lintels & floors.

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MECHANICAL ENGINEERING

UNIT - IV MANUFACTURING PROCESSES 8

Metal Forming - Forging, Rolling, Extrusion processes. Metal Casting - Foundry – Moulding and Casting Processes, Welding, Metal Machining – Turning, Milling, Grinding, Shaping, Planing.

UNIT - V REFRIGERATION AND AIR CONDITIONING 7

Refrigeration: Principle of vapor compression system – Layout of typical domestic refrigerator, Refrigerants – types and properties.
Air Conditioning: Air conditioning – Definition, working principle of Window and Split type room air conditioners.

UNIT -VI IC ENGINES 7

Internal combustion engines as automobile power plant – Working principle of Petrol and Diesel Engines – Two stroke and Four stroke cycles – Comparison of two stroke and four stroke engines

Text Books:

1. Jayagopal.L.S&Rudramoorthy.R, "Basic Civil and Mechanical Engineering", Vikas Publishing House, New Delhi, 2001.
2. Shanmugam.G and Palanichamy.M.S, "Basic Civil and Mechanical Engineering", Tata McGraw Hill Publishing Co., New Delhi, 1996.
3. Ramesh Babu.V, "Basic Civil and Mechanical Engineering", Anuradha Agencies, Kumbakonam 2001

Reference Books:

1. Bindra.S.P and Arora.S.P, "The text book of Building construction", DhanpatRai Publications (P) Ltd., New Delhi, 2011.
2. Francis.D.K.Ching, " Architecture: Form, Space and Order ", VNR, New York, 1999.
3. Ananthanarayanan.P, "Basic Refrigeration and Air Conditioning", Tata McGraw Hill Publishing Co., New Delhi, 2003.
4. Srinivasan. S, "Automotive engineering" Tata McGraw Hill Publishing Co., New Delhi, 2003

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Course Code:140EE0107	Course Title: ENGINEERING PRACTICES LABORATORY (CIVIL & MECHANICAL)
Core/Elective: Core	Credits (L:T:P:C:M) – 0 : 0 : 3 : 2 : 100
Type: Practical	Total Contact Hours: 45

Pre-requisites:

Nil

Course Outcomes:

At the end of the course students will be able to:
CO1. Identify the use of hand tools and equipments used in fabrication workshop.
CO2. Select the various tools and equipments used in the fabrication workshop.
CO3. Make various models in carpentry, fitting, sheet metal, welding and plumbing.
CO4. Demonstrate the working of domestic appliances.

List of Experiments:

I CIVIL ENGINEERING PRACTICE

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

(a) Plumbing Works:

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

(b) Carpentry works:

3. Study of the joints in roofs, doors, windows and furniture.
4. Hands-on-exercise: Wood work, joints by sawing, planning and cutting.
5. Demonstration on Carpentry using Power Tools only.

II MECHANICAL ENGINEERING PRACTICE

(a) Welding:

1. Study of welding processes, tools and safety aspects.
2. Hands on exercise for making butt joints, lap joints and tee joints using arc welding.
3. Hands on exercise on Gas welding practice.

(b) Sheet Metal Work:

1. Study of sheet metal works, tools and measuring instruments.
2. Hands on exercise on:

(i) Forming & bending.
(ii) Model making – Trays, Funnels, Cones etc.

(c) Machine assembly practice:

1. Centrifugal Pump

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(d) Demonstration on:

1. Turning, milling and drilling practices.
2. Smithy operations, upsetting, swaging, setting down and bending. Example
3. Foundry operations like mould preparation for gear and step cone pulley.
4. Fitting – Preparation of square fitting and vee – fitting models.
5. Air-conditioner.
6. Working of IC Engine.

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HOD-Electrical and Electronics Engineering
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Course Code:140CO0108	**Course Title:** C PROGRAMMING LABORATORY
Core/Elective: Core	**Credits (L:T:P:C:M)** – 0 : 0 : 3 : 2 : 100
Type: Practical	**Total Contact Hours:** 45

Pre-requisites: The student should have undergone the course(s):

1. C PROGRAMMING

Course Outcomes:

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

CO1. Evaluate complex expressions using apt operators and data types.

CO2. Differentiate the types of control flow in a program using decision making and looping statements

CO3. Practice in handling complex data types and operations using structures, arrays and functions

CO4. Design applications using file operations and pointers

List of Experiments:

1. Program to process Data types, formatting inputs and outputs.
2. Program using operators and Expression Evaluation
3. Program using decision making
4. Program using looping Statements.
5. Program using Functions
6. Program using Arrays
7. Program for String Handling
8. Program using Structures
9. Program using Pointers
10. Program on basic File Operations
11. Develop a mini project implementing the concepts from 1 to 10.

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SEMESTER II

Course Code: 140CO0201	**Course Title:** COMMUNICATION SKILLS
Core/Elective: Core	**Credits (L:T:P:C:M)** – 2 : 0 : 2 : 3 : 100
Type: Lecture	**Total Contact Hours:** 60

Pre-requisites: The student should have undergone the course(s):

Technical English

Course Outcomes:

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

CO1 Practice listening skills for academic and professional purposes

CO2 Inculcate and develop the habit of reading.

CO3 Speak effectively in real life situations.

CO4 Write letters and reports effectively in formal & business situations.

CO5 Practice appropriate vocabulary in different business contexts

Course Content:

UNIT I LISTENING 12

Listening to fill up gapped texts -Listening to identify context and Speaker's opinion-Note Taking-Listening to Conversation

UNIT II READING 12

Exposure to different reading techniques-Skimming, identifying the topic sentence and its role in each paragraph-Scanning - Inferring and identifying the lexical and textual message-Comprehension & Note Making

UNIT - III SPEAKING 12

Verbal and Non-verbal Communication-Introducing Oneself-Describing objects and Situations-Expressing opinions - Agreement & Disagreement-Group Discussion- Mock interview-Power Point Presentation-Soft Skills-Behavioral attitude, Dress code, Dining etiquette

UNIT - IV TECHNICAL REPORT WRITING 12

Writing Business Messages (Advertisement), Caption, Slogan Writing- Documentation-Preparation of Brochure, Pamphlets, notices, agenda, minutes- Writing Business Letters- calling for quotations, placing orders, a letter of complaint regarding manufacturing defects, seeking permission to use certain facilities in a company-Preparation of comparative statements- Letter of application - content, format & Resume writing- E-Mail, Memos & Proposals-Process Description, Analytical Writing, Argumentative Writing-Writing Instructions-Proof Reading

UNIT -V VOCABULARY 12

Word formation-prefixes &suffixes - Abbreviations and Acronyms - Foreign Words and Phrases - British & American English - Idioms and phrases (computer- related) - Scientific and technical terms-jargons-Technical Register-Pairs of confused words

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Text Books:

1. Sangeetha Sharma &Binod Mishra, “Communication Skills for Engineers and Scientists”, PHI Learning Private Limited, New Delhi, 2009.
2.Raman Sharma, “Technical Communication”, Oxford University press, New Delhi,2015.
3.KavitaTyagi& Padma Misra , “Advanced Technical Communication”, PHI Learning Private Limited, New Delhi, 2011.

Reference Books:

1. M.A.K.Halliday, An introduction to Functional English Grammar, Edward Arnold Publishers Ltd.,U.S.A,1985
2. Walter.E.Oliu., Writing That Works- How to Write Effectively on the Job, St.Martin's Press, New York, 1980
3. Joe Ayres, Effective Public Speaking, Brown Company Publishers, 1983
4. Richard Huseman, Business Communication-Strategies and Skills, Alger Press, 1988
5. Herta. A. Murphy, Effective Business Communication, McGraw-Hill Ryerson, 1990
6. Martin Hewings, Advanced English Grammar, Cambridge University Press, 1999

Web references:

1. www.skillsyuneed.com/ips/nonverbal-communication.html
2. www.skillsyouneed.com/general/soft-skills.html
3. https://www.englishclub.com/vocabulary/british-american.html

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Course Code:140CO0202	Course Title: ENGINEERING MATHEMATICS II
Core/Elective: Core	Credits (L:T:P:C:M) – 3 : 1 : 0 : 4 : 100
Type: Lecture	Total Contact Hours: 60

Pre-requisites: The student should have undergone the course(s):

1. ENGINEERING MATHEMATICS I

Course Outcomes:

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

CO1. Solve second and higher order linear ordinary differential equations.
CO2. Explain the concepts of vector differentiation and integration.
CO3. Identify the functions of a complex variable and construct analytic functions.
CO4. Explain the concept of complex integration to solve contour integrals.
CO5. Apply Laplace transform techniques to solve differential equations.

Course Content:

UNIT I DIFFERENTIAL EQUATIONS **12**

Second and third order linear differential equations with constant coefficients -Method of variation Of parameters-Cauchy and Legendre's linear equations for variable coefficients-Simultaneous first order linear equations with constant coefficients.

UNIT II VECTOR CALCULUS **12**

Gradient, divergence and curl, irrotational and solenoidal vector fields- Directional derivatives-Green's theorem in a plane (without proof)-Gauss divergence theorem (without proof) - Stoke's theorem (without proof)-Verification and evaluation of integrals using Green's, Gauss's and Stoke's theorem.

UNIT - III ANALYTIC FUNCTIONS **12**

Function of a complex variable-Analytic function -Singular points –Cauchy Riemann equations-Sufficient conditions (without proof) – Properties-Construction of analytic functions-Conformal mapping: Bilinear transformation, Special mappings: $w = z + c$, $w = c z$, $w = 1/z$

UNIT - IV COMPLEXINTEGRATION **12**

Taylor and Laurent expansions- Types of singularity -Cauchy's fundamental theorem (without proof) – Residues-Cauchy Residue theorem-Evaluation of integrals –Applications: Evaluation of real integrals using Contour integration with no poles on the real axis.

UNIT -V LAPLACE TRANSFORM **12**

Laplace transform-Conditions for existence-Transform of elementary functions-PropertiesTransform of derivatives, integrals, unit step function and unit impulse function – Transformation of periodic functions-Inverse Laplace transform-Convolution theorem-Initial and final value theorems-Solution of linear ODE of second order with constant coefficients using Laplace transform .

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Text Books:

1. Veerarajan T, “Engineering Mathematics”, Updated 2nd Edition, Tata McGraw Hill, New Delhi, 2010.
2. Ramakrishna Prasad A, “Kreyszig’s Engineering Mathematics I”, 1st Edition, Wiley India Pvt. Ltd., India, 2011.
3. Venkatraman M K, “Engineering Mathematics-Volume I”, 4th edition, National publishing company, Chennai, 2008.

Reference Books:

1. Kandasamy P, “Engineering Mathematics”, Volume I (First semester), 6th Edition, S. Chand and Company Ltd., New Delhi, 2006.
2. Grewal B S, “Higher Engineering Mathematics”, 40th Edition, Khanna Publications, New Delhi, 2007.
3. Louis C Barrett, C Ray Wylie, “Advanced Engineering Mathematics”, 6th Edition, McGraw HillPublishing Company Ltd, New Delhi, 2003.

Web references:

1. http://nptel.ac.in/
2. http://ocw.mit.edu/courses/mathematics
3. http://mathworld.wolfram.com/laplace.html

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Course Code: 140CO0203	**COURSE TITLE:** MATERIAL SCIENCE
Core/Elective: Core	**Credits (L:T:P:C:M)** – 3 : 0 : 0 : 3 : 100
Type: Lecture	**Total Contact Hours:** 45

Pre-requisites:

Nil

Course Outcomes:

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

CO1. Explain the properties of conducting materials

CO2. Explain the properties and semiconducting materials.

CO3. Explain the properties and applications of magnetic and superconductors.

CO4. Identify the types of dielectric materials and its applications

CO5. Knowing the new engineering materials and its applications

Course Content:

UNIT I CONDUCTING MATERIALS 9

Formation of bands (qualitative) - Classification of solids based on bands – Classical free electron theory, Expression for electrical and thermal conductivity, Weidmann Franz law - Sources of resistivity - Mattheissen's rule. - Low and high resistivity materials and their applications.

UNIT II SEMICONDUCTING MATERIALS 9

Intrinsic and extrinsic semiconductors - Expression for carrier concentration - Variation of carrier concentration and Fermi level with temperature for n – type - Elemental and compound semiconductors - Hall effect : Hall coefficient in extrinsic semiconductors, experimental determination of Hall coefficient and applications of Hall effect, LDR, Solar Cells and strain gauges

UNIT - III MAGNETIC MATERIALS AND SUPERCONDUCTORS 9

Introduction to magnetic materials - Ferromagnetic materials - Properties - Domain theory of ferromagnetism - Hysteresis - Hard and soft magnetic materials - Ferrites: structure and applications. Magnetic storage devices: magnetic recording and magneto optical recording – Materials for permanent magnets. Superconductors – Properties - Types of superconductors - High Tc superconductors - Applications: SQUID - Cryotron – Magnetic levitation

UNIT - IV DIELECTRIC MATERIALS 9

Polarization – Polarizability – Polarization vector, Electrical susceptibility, Dielectric constant - Polarization mechanisms (Qualitative) –Internal Field- Clausius Mossotti relation-Frequency and temperature dependence of polarization - Dielectric loss - Dielectric breakdown mechanisms – Ferro electric materials, Classification and its Properties –Piezoelectric materials – classification of Insulating materials.

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UNIT -V **MODERN ENGINEERING MATERIALS** **9**

Shape Memory alloys (SMA): Characteristics, properties of NiTi alloy. Applications of SMA. Metallic glasses: Preparation, properties and applications. Nano Materials: Top down processes: Ball Milling - Bottom up processes: Physical vapor deposition, Nanomaterials, properties and applications (Qualitative). Carbon nanotubes: Fabrication - CVD, electric arc discharge method, Properties and applications.

Text Books:

1. William D CallisterJr,"Material Science and Engineering – An Introduction", John Wiley and Sons Inc., Sixth Edition, New York, 2007.
2. S. Jayakumar, "Materials science"', R.K. Publishers, Coimbatore, 2008.
3. PK Palanisamy, "Materials science", Scitech publications, Chennai, 2004.

Reference Books:

1. S.O. Kasap, "Principles of Electronics Materials and Devices", McGraw Hill Higher Education, New Delhi, 2002.
2. V Rajendran, "Engineering Physics", Tata McGraw-Hill Co, New Delhi, 2007.
3. M N Avadhanulu, "Engineering Physics", S. Chand, New Delhi, 2009.

Web references:

1. http://www.physicsclassroom.com/
2. http://hyperphysics.phy-astr.gsu.edu/
3. http://www.tndte.com/TEXT%20BOOKS/Complete%20Books/Engineering%20Physics-I%20&%20II/Engineering%20Physics%20Sem%20-1%20&%202.pdf

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HOD-Electrical and Electronics Engineering
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Course Code: 140CO0204	Course Title: ENVIRONMENTAL SCIENCE
Core/Elective: Core	Credits (L:T:P:C:M) – 3 : 0 : 0 : 3 : 100
Type: Lecture	Total Contact Hours: 45

Pre-requisites:

Nil

Course Outcomes:

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

CO1 Describe the ways to maintain ecological balance and preserve bio-diversity.
CO2 Explain the causes of pollution and the methods to reduce & recycle.
CO3 Describe the way from unsustainable to sustainable development through effective usage & conservation of energy.
CO4 Describe the global environmental issues and the laws passed to control it.
CO5 Describe the role of man & technology in environmental management

Course Content:

UNIT I ENVIRONMENTAL SCIENCE AND BIO SYSTEMS 9

Multidisciplinary nature of Environmental studies – Definition, Scope and Importance of Environmental studies – Natural resources– Over exploitation of resources and impacts Ecosystem – Structure and function of an ecosystem – concept, structure and function with relevant examples- Food chain, Food web and Ecological pyramids Biodiversity – Endemic, endangered and extinct species – Habitat – Hotspots – values of biodiversity -threats to biodiversity - conservation of biodiversity.

UNIT II ENVIRONMENTAL POLLUTION 9

Causes, effects and control of – Air pollution, Water pollution, Marine pollution, Thermal pollution, Noise pollution- solid waste management – types and sources of solid waste- 3R principles, advantages of recycling and waste utilization, E –waste, hazardous waste management.

UNIT - III ENERGY AND SUSTAINABILITY 9

Energy resources- types - the role of renewable sources of energy- Principle involved in energy conversion advantages and limitations of hydro energy, solar energy, wind energy, bio energy, geothermal energy, ocean energy. Sustainable development – equitable use of resources for sustainable development.

UNIT - IV GLOBAL ENVIRONMENTAL ISSUES AND LAWS 9

Facts and impacts of - Climate change, Global warming, ozone layer depletion, waste lands. Environmental disasters - disaster management approach. International Conventions, protocols for environmental protection.

Environmental ethics - Environmental protection act in India - Role of Pollution control boards.

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UNIT -V HUMAN POPULATION AND ENVIRONMENT 9

Population growth, population explosion, environment and human health, Role of technology in environmental management. Public awareness, Eco-labeling. Role of NGO's in environmental management. Case studies.

Text Books:

1. KaushikAnubha&Kaushik C P "Environmental Science and Engineering", New Age International Publishers, 3 rd edition, reprint 2010
2. William P. Cunningham – "Principles of Environmental Science", Tata McGraw Hill, New Delhi, 2007
3. Linda D. Williams – "Environmental Science Demystified", Tata McGraw Hill Publishing Company Limited , 2005

Reference Books:

1. Shyam Divan, Armin Rosencranz – Environmental Law and Policy in India – Cases,materials and Statutes, Oxford University Press, New Delhi, 2001.
2. Gilbert M. Masters, "Introduction to Environmental Engineering and Science", 'Prentice Hall of India private limited, New Delhi –second edition, 2004.
3. G. Tyler Miller, JR _ "Environmental Science ", Thomson, 2004.

Web references:

1. www.nptel.ac.in/courses/122106028/
2. freevideolectures.com/Course/2263/Engineering-Chemistry-I
3. www.nith.ac.in/chem/chemistry.pdf

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HOD-Electrical and Electronics Engineering
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Course Code: 140EE0205	Course Title: OBJECT ORIENTED PROGRAMMING CONCEPTS (Common to EEE,EIE,ICE & CSE)
Core/Elective: Core	**Credits (L:T:P:C:M)** – 3 : 0 : 0 : 3 : 100
Type: Lecture	**Total Contact Hours:** 45

Pre-requisites: The student should have undergone the course(s):

1. C PROGRAMMING

Course Outcomes:

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

CO 1 Describe Object-oriented paradigm with their fundamentals

CO 2 Implement OO concepts in C++

CO 3 Implements the concepts of basic exception handling mechanisms

CO 4 Outline the file organization and the usage of file systems

CO 5 Explain the fundamentals of Java programming.

Course Content:

UNIT I INTRODUCTION 9

Object-oriented paradigm, elements of object oriented programming – Merits and demerits of OOmethodology – C++ fundamentals – data types, operators and expressions- control flow-arrays- stringspointersand functions

UNIT II PROGRAMMING IN C++ 9

Classes and objects – Access Specifiers - Constructors and Destructors- Inheritance–Polymorphism-Operator overloading-Virtual functions.

UNIT - III TEMPLATES AND EXCEPTION HANDLING 9

Function and class templates - Exception handling – try-catch-throw paradigm – exception specification –terminate and unexpected functions – Uncaught exception.

UNIT - IV FILE HANDLING 9

C++ streams – console streams – console stream classes-formatted and unformatted console I/Ooperations, manipulators - File streams - classes file modes file pointers and manipulations file I/O.

UNIT -V JAVA FUNDAMENTALS 9

An overview of Java, data types, variables and arrays, operators, control statements, classes, objects,methods – Inheritance-Exception Handling.

Text Books:

1. Herbert Schildt, "The Complete Reference:C++", Fourth edition, Tata McGraw Hill, Noida, 2007.
2. Deitel.H.M, Deitel.P.J, "Java: How to program", Fifth edition, Prentice Hall of India private limited, New Delhi, 2009.
3. .Bjarne Stroustrup, "The C++ Programming Language ", Third Edition,Tata McGraw Hill, 1997.

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Reference Books:

1. Ira Pohl, "Object oriented programming using C++", Pearson Education Asia, 2007.
2. Malik.D.S, "C++ Programming from Problem Analysis to Program Design", 3rd Edition, Thomson course Technology, New Delhi, 2007.
3. John.R.Hubbard, "Programming with C++", Schaums outline series, Tata McGraw Hill, New Delhi ,2003.
4. Herbert Schildt, "The Complete Reference: Java2", Fifth edition, Tata McGraw Hill, Noida, 2007.

Web references:

1. Introduction to C++ URL : http://ocw.mit.edu/courses/electrical-engineering-and-computer-science/6-096-introduction-to-c-january-iap-2011/lecture-notes/,
2. Java lectures URL: http://www.cse.iitb.ac.in/~nlp-ai/java%20ppt/
3. Object-Oriented Programming with ANSI-CAxel-Tobias Schreiner , 1999http://www.cs.rit.edu/~ats/books/ooc.pdf

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HOD-Electrical and Electronics Engineering
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Course Code: 140EE0206	**Course Title:** ENGINEERING MECHANICS
Core/Elective: Core	**Credits (L:T:P:C:M)** – 3 : 1 : 0 : 4 : 100
Type: Practical	**Total Contact Hours:** 60

Pre-requisites:

Nil

Course Outcomes:

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

CO1 Explain the laws of motion the kinematics of motion and the interrelationship

CO2 Comprehend the effect of friction on equilibrium

CO3 Explain the properties of surfaces and solids

CO4 Explain the principle of work and energy

CO5 Write the dynamic equilibrium equation

Course Content:

UNIT I BASICS AND STATICS OF PARTICLES 9+3

Introduction – Units and Dimensions, Laws of Mechanics – Lamis theorem, Parallelogram and triangularLaw of forces, Vectors – Vectorial representation of forces and moments – Vector operations, CoplanarForces – Resolution and Composition of forces – Equilibrium of a particle, Forces in space – Equilibriumof a particle in space –Equivalent systems of forces, Principle of transmissibility – Single equivalent force.

UNIT II EQUILIBRIUM OF RIGID BODIES 9+3

Free body diagram – Types of supports and their reactions. Requirements of stable equilibrium, Momentsand Couples – Moment of a force about a point and about an axis, Vectorial representation of momentsand couples – Scalar components of a moment – Varignon's theorem, Equilibrium of Rigid bodies in twodimensions – Equilibrium of Rigid bodies in three dimensions – Examples

UNIT III PROPERTIES OF SURFACES AND SOLIDS 9+3

Determination of Areas and Volumes, First moment of area and the Centroid of simple and compositesections – Rectangle, circle, triangle by integration – T section, I section, - Angle section, Hollow sectionby using standard formula – second and product moments of plane area – Rectangle, triangle, circle byintegration – T section, I section, Angle section, Hollow section by using standard formula, Parallel axistheorem and perpendicular axis theorem, Polar moment of inertia, Principal moments of inertia of planeareas – Principal axes of inertia, Mass moment of inertia, Derivation of mass moment of inertia forrectangular section, prism, sphere from first principle, Relation to area moments of inertia.

UNIT IV DYNAMICS OF PARTICLES 9+3

Particle Dynamics, Energy Methods & Momentum Methods: Newton's law for rectangular coordinates &cylindrical coordinates, rectifier translation, central force motion, Newton's law for path variables, workenergy equations, work energy equations for a systems of particles, linear and angular momentumequations for a systems of particles. Problems (vector method.

UNIT V DYNAMICS OF RIGID BODIES 9+3

Kinematics of Particles and Rigid Bodies: Velocity and acceleration in path and cylindrical coordinates,motion of a particle relative to a pair of translating axes, translation and rotation of rigid bodies, Chaslestheorem, moving references, velocity and acceleration for different references, inertia and coriolisforces.Problems (vector method).

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Text Books:

1. Beer.F.P and Johnston Jr. E.R. "Vector Mechanics for Engineers", Vol.1 Statics and Vol. 2 Dynamics, McGraw-Hill International Edition, Maidenhead, 1997
2. Rajasekaran.S, Sankarasubramanian.G, "Fundamentals of Engineering Mechanics", Vikas Publishing House Pvt. Ltd., Uttar Pradesh, 2000.
3. Hibbeller.R.C, "Engineering Mechanics", Vol. 1 Statics, Vol. 2 Dynamics, Pearson Education Asia Pvt. Ltd. Chennai, 2000.

Reference Books:

1 Irving.H.Shames, "Engineering Mechanics – Statics and Dynamics", IV Edition – Pearson Education Asia Pvt. Ltd. Chennai, 2003.
2 Ashok Gupta, "Interactive Engineering Mechanics – Statics – A Virtual Tutor (CDROM)", Pearson Education Asia Pvt., Ltd. Chennai, 2002.

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HOD-Electrical and Electronics Engg.
Dr. Mahalingam College of Engineering and Technology
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Course Code: 140EE0207	Course Title: ENGINEERING PRACTICES LABORATORY (Electrical and Electronics and PC hardware)
Core/Elective: Core	Credits (L:T:P:C:M) – 0: 0 : 3 : 2 : 100
Type: Practical	Total Contact Hours: 45

Pre-requisites:

Nil

Course Outcomes:

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

CO1: Draw the basic circuit building components like resistor inductor, capacitor diode, transistor, transformers, sources logic gates and its symbols.

CO2: Explain the basic concepts of electrical wiring and its types, circuit concepts and earthing and instruments

CO3: Identifying simple faults and rectifying in domestic appliances.

CO4: Explain the concept of computer hardware components and its uses, and practise basic formatting and Partitioning HDD, Configuring CMOS-Setup, installation of Operating system

List of Experiments:

ELECTRICAL ENGINEERING PRACTICE

1. Electrical symbols, safety aspects of electrical wiring and earthing practices.
2. Introduction to the connection of voltmeter, ammeter and multimeter.
3. Stair case wiring, assembling and testing of a fluorescent lamp circuit & fault finding.
4. Domestic lighting circuits and use of megger.
5. Diagnosing simple faults in grinder, mixie, iron box, ceiling & table fans.
6. Introduction to types of fuses, MCB and types of wires and cables.

ELECTRONICS ENGINEERING PRACTICE

1. Symbols of basic electronic components and equipments.
2. Color coding of resistors and identification of capacitor values.
3. Study and method of using CRO, function generator, power supply units with fault identification and trouble shooting.
4. Study of AC signal parameters (amplitude, frequency, phase) using CRO.
5. Logic gates (AND, OR, NOT, NAND, NOR, EX-OR).
6. Soldering and testing a given simple electronic circuits using PCB.

COMPUTER PRACTICE

1. A).Study Of PC Hardware
   B)Assembling the Computer System
2. A). Formatting And Partitioning HDD
   B). Configuring Cmos-Setup
   C). Installation of OS

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Course Code:140EE0208	Course Title: OBJECT ORIENTED PROGRAMMING LABORATARY
Core/Elective: Core	**Credits (L:T:P:C:M)** – 0 : 0 : 3 : 2 : 100
Type: Practical	**Total Contact Hours:** 45

Pre-requisites: The student should have undergone the course(s):

1. C PROGRAMMING LABORATORY

Course Outcomes:

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

CO1. Implement the basic classes and functions using simple examples.
CO2. Implement OO concepts in C++ using Real time examples.
CO3. Practice file organization and the usage of file systems by file handling process.
CO4. Implement the fundamentals of Java programming with inheritance concepts

List of Experiments:

A. C++ Programming

1. Programs Using Functions
   Functions with default arguments
   Implementation of Call by Value, Call by Address and Call by Reference
2. Implementation of Classes for understanding objects, member functions and Constructors
   Classes with primitive data members
   Classes with arrays as data members
   Classes with pointers as data members – String Class
   Classes with constant data members
   Classes with static member functions
3. Compile time Polymorphism
   Operator Overloading including Unary and Binary Operators.
   Function Overloading
4. Runtime Polymorphism
   Virtual functions
   Virtual Base Classes
5. Templates
6. Exception Handling
7. File Handling
   Sequential Access
   Random access

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B. JAVA Programming

8. Java applications

    For understanding reference to an instance of a class (object), methods

    Handling Strings in Java

9. Inheritance
10. Exception Handling Mechanism in Java
11. Handling pre-defined exceptions
12. Handling user-defined exceptions

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Course Code: 140CO0209	**Course Title:** ENGINEERING GRAPHICS
Core/Elective: Core	**Credits (L:T:P:C:M)** – 2 : 0 : 3 : 3 : 100
Type: Lecture	**Total Contact Hours:** 75

Pre-requisites:

Nil

Course Outcomes:

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

CO1. Sketch different engineering curves

CO2. Generate multiple views of planes and solids using orthographic projection technique

CO3. Prepare development of lateral surfaces of objects

CO4. Draw three dimensional objects using CAD Package

Course Content:

UNIT I INTRODUCTION TO ENGINEERING GRAPHICS 15

Importance of graphics in engineering applications – General principles of engineering graphics – principles of orthographic projection – angles of projection - multiple views and their placement – layout of views. Use of conventional drafting instruments – BIS conventions and specifications – Size, layout and folding of drawing sheets – Lettering and dimensioning- Methods of Dimensioning. Geometric shapes of objects - Mathematical representation of geometrical shapes - their engineering applications –Construction of polygonal shapes, their importance and application. Conics sections – Construction of ellipse, Parabola and hyperbola by eccentricity method – construction of cycloid and involutes of square and circle – construction of spirals and helices – Meaning of tangents and normal to the above curves.

UNIT II PROJECTION OF LINES, PLANES AND SOLIDS 15

Projection of points and lines - Concept of polygonal surfaces and circular lamina inclined to both reference planes –Concept of true lengths and true inclinations. Projection of simple solids like prisms, pyramids, cylinder and cone when the axis is inclined to two reference plane.

UNIT - III DEVELOPMENT OF SURFACES AND SECTIONS OF SOILDS 15

Development of lateral surfaces of simple and truncated solids – Prisms, pyramids, cylinders and cones. Need for sectioning of solids – Sectioning of simple solids like prisms, pyramids, cylinder and cone when the axis is inclined to one reference plane by cutting planes inclined to one reference plane and perpendicular to the other. –Orthographic views of sections of simple solids.

UNIT - IV ORTHOGRAPHIC AND ISOMETRIC PROJECTION OF SOLIDS 15

Orthographic projection of solids – Practices on three view projection of solids. Isometric Projection of solids – practices on simple solids

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UNIT -V SOLID MODELING AND CIVIL DRAWINGS 15

Need and advantages of modeling software over conventional drawing methods - Representation of three Dimensional objects –3D modeling techniques – constructive solid geometry (CSG) and boundary representation(BRep) techniques - Boolean operations, extrude, revolve, mirror, array, etc. Modeling of isometric views of engineering components.

Introduction to perspective projection .Meaning of house plans-different types representation of different details meaning of area of a house and site.

Text Books:

1. Natrajan.K.V, "A text book of Engineering Graphics", Dhanalakshmi Publisher, Chennai, 2006
2. Dhananjay.A.Jolhe, "Engineering Drawing with an introduction to AutoCAD" Tata McGraw Hill Publishing Company Limited, New Delhi, 2008.
3. Bhatt.N.D, "Engineering Drawing "46th Edition, Charotar Publishing House , Gujarat, India, 2003

Reference Books:

1. Basant Agarwal and Agarwal.C.M, "Engineering Drawing", Tata McGraw Hill Publishing Company Limited, New Delhi, 2008.
2. Gopalakrishnan.K.R, "Engineering Drawing" (Vol. I&II), Subhas Publications, Chennai, 1998.
3. Manuals of 2D and 3D Modeling software packages

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Course Code:140CO0210	**Course Title:** ENGINEERING PHYSICS AND CHEMISTRY LABORATORY (Annual Pattern)
Core/Elective: Core	**Credits (L:T:P:C:M)** – 0 : 0 : 3 : 3 : 100
Type: Practical	**Total Contact Hours:** 45

Pre-requisites:

Nil

Course Outcomes:

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

CO1. Apply the concepts of physics to evaluate the engineering properties of materials through hands on experience acquired.
CO2: Determine the analytical testing methods for chemical substances
CO3. Identify the equipment required for analysis of different substances
CO4. Acquire the skills to use the analytical equipment

List of Experiments:

PHYSICS

1. Diode Laser-Determination of Wavelength and Particle size
2. Optical Fiber- Determination of Numerical aperture and acceptance angle
3. Lee's Disc Method – Determination of Thermal Conductivity of a bad conductor
4. Band gap of a semiconductor-Determination of Band gap of a semiconducting material
5. Characteristic of Light Dependent Resistor-Resistance –Illumination Characteristics
6. Carey Foster's Bridge-Determination of specific resistance of an alloy
7. Solar Cell- V-I Characteristics
8. Determination of Less viscous liquid by poiseuille's flow method
9. Determination of High viscous liquid by stoke's method
10. Determination of Young's' modulus by cantilever bending.
11. Determination of Rigidity modulus by Torsional Pendulum

CHEMISTRY

WEIGHING AND PREPARATION OF STANDARD SOLUTIONS

Preparation of molar and normal solutions of oxalic acid, sodium carbonate and standard hard water.

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WATER ANALYSIS

i) Determination of total, temporary and permanent hardness of water sample by EDTA method.

ii) Determination of Dissolved oxygen content by Winkler's method

iii) Determination of COD of waste water by dichromate method

iv) Determination of heavy metals in water by spectrophotometry (any one-Iron, Cr, Hg)

VISCOMETRY

v) Determination of molecular weight of a polymer

ELECTROCHEMISTRY

vi) To determine the strength of given acid – pH metrically

vii) To determine the amount of ferrous ions by potentiometry

viii) Determination of emf of electrochemical cell

ix) Determination of corrosion rate – weight loss method

x) Determination of inhibitor efficiency – corrosion

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SEMESTER III

Course Code: 140EE0301	**Course Title:** ENGINEERING MATHEMATICS III (Common to EEE,EIE,ICE & CSE)
Core/Elective: Core	**Credits (L:T:P:C:M)** – 3 : 1 : 0 : 4 : 100
Type: Lecture	**Total Contact Hours:** 60

Pre-requisites: The student should have undergone the course(s):

1. Engineering Mathematics I
2. Engineering Mathematics II

Course Outcomes:

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

CO1.Describe vector spaces and its properties.

CO2.Compute the Fourier series expansion for given periodic functions.

CO3.Calculate Fourier transform for aperiodic functions.

CO4.Determine the solution of first and second order PDE.

CO5. Solve one dimensional wave equation, one dimensional heat and two dimensional heat flow equations.

Course Content:

UNIT I LINEAR ALGEBRA 12

Vector spaces, subspaces, basis and dimension - Systems of linear equations, linear transformations - Kernel and Image - Geometric ideas - Inner product spaces - Orthogonality - Orthogonal basis - Reflections and Orthogonal maps of the plane - Orthogonal complements and Projections.

UNIT II FOURIER SERIES 12

Fourier series –Dirichlet's conditions - Half range Fourier cosine and sine series - Parseval's identity - Fourier series in complex form - Harmonic analysis.

UNIT - III FOURIER TRANSFORMS 12

Fourier transforms - Fourier cosine and sine transforms - inverse transforms - convolution theorem and Parseval's identity for Fourier transforms - Finite cosine and sine transforms.

UNIT - IV PARTIAL DIFFERENTIAL EQUATIONS 12

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

UNIT -V APPLICATIONS OF PARTIAL DIFFERENTIAL EQUATION 12

Solutions of one-dimensional wave equation - One-dimensional equation of heat conduction – Steady state solution of two dimensional equation of heat conduction (insulated edges excluded) - Fourier series solutions in Cartesian coordinates.

Text Books:

1. Venkataraman, M.K., 'Engineering Mathematics Vol.4', National publishing company, 2004.
2. Veerarajan, T., "Transforms and Partial Differential Equations", Tata McGraw Hill, 2012

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Reference Books:

1. Grewal. B. S. Higher Engineering Mathematics, Khanna Publishers,2000.
2. Ramana.B.V. 'Higher Engineering Mathematics' Tata Mc-Graw Hill Publishing Company Limited, New Delhi.
3. Erwinkreyszig 'Advanced Engineering Mathematics' Wiley India, 8th edition, 2007.

Web references:

1. elearning.vtu.ac.in/P5/enotes/MAT31/S1-ATE.pdf
2. www.tolani.edu/.../john_bird_engineering_mathematics_0750685557.pd...
3. julianoliver.com/share/free...books/essential-engineering-mathematics.pdf

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Course Code: 140EE0302	**Course Title:** THERMAL ENGINEERING AND FLUID MECHANICS (Common to EEE,EIE,ICE)
Core/Elective: Core	**Credits (L:T:P:C:M)** – 3 : 1 : 0 : 4 : 100
Type: Lecture	**Total Contact Hours:** 60

Pre-requisites: The student should have undergone the course(s):

1. Engineering Mechanics

Course Outcomes:

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

CO1: Explain the working principle and performance of IC engines for various power cycles.

CO 2: Explain the working principle and performance of Steam Turbines

CO 3: Estimate the power requirement of reciprocating air compressors and COP of refrigeration systems

CO 4: Explain the properties of fluids and classification of flows

CO 5: Explain the working of turbines and pumps and draw their performance curves

Course Content :

UNIT I BASIC CONCEPTS AND LAWS OF THERMODYNAMICS 11

Classical approach: Thermodynamic systems – Control volume – System and surroundings – Universe – Properties – State–Process – Cycle – Equilibrium – Work and heat transfer – Point and path functions – First law of thermodynamics for open and closed systems – First law applied to a control volume – SFEE equations [steady flow energy equation] – Second law of thermodynamics– Heat engines – Refrigerators and heat pumps – Carnot cycle – Carnot theorem (Qualitative).

UNIT II IC ENGINES & STEAM TURBINE 11

Air standard cycles: Otto, diesel and dual cycles and comparison of efficiency – Application of IC engines. Formation of steam – Properties of steam – Use of steam tables and charts – Steam power cycle (Rankine) – Steam turbines: Impulse and reaction principle.

UNIT - III COMPRESSORS, REFRIGERATION AND AIR CONDITIONING 13

Positive displacement compressors – Reciprocating compressors – Indicated power – Clearance volume – Various efficiencies – Clearance ratio – Volume rate – Conditions for perfect and imperfect inter cooling – Multi stage with inter cooling (Qualitative) – Construction and working principle of centrifugal and axial flow compressors.

Refrigeration – Various methods of producing refrigerating effects (RE) – Vapour compression cycle: P–H and T–S diagram – Saturation cycles – Air–conditioning systems, Types of air conditioning systems – Selection criteria for a particular application

UNIT - IV FLUID PROPERTIES & FLOW THROUGH PIPES 13

Dimensions. Properties of fluids – Specific gravity, specific weight, viscosity, compressibility, vapour pressure and gas laws – capillarity and surface tension. Flow characteristics – concepts of system and control volume. Application of control volume to continuity equation, Momentum Equation, Darcy – Weisbach equation. Friction factor. Minor losses. Flow through pipes in series and in parallel.

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UNIT -V TURBINE & PUMPS **12**

Homologous units – Specific speed. Theory of turbo machines. Euler"s equation. Hydraulic efficiency. Velocity components at the entry and exit of the rotor – Velocity triangle for single stage radial flow and axial flow machines – Centrifugal pumps, turbines, performance curves for pumps and turbines. Reciprocating pumps – Indicator diagrams, Work saved by air vessels – Rotary pumps – Classification. Working and performance curves.

Text Books:

1.Khurmi. R.S.& Gupta. J.K., "Thermal Engineering", S.Chand& Co. Ltd., 2006.

2. Bansal, R.K., "Fluid Mechanics and Hydraulics Machines", Laxmi Publications (P) Ltd., New Delhi.

3. Nag. P.K., "Engineering Thermodynamics" Tata McGraw Hill, 2003

Reference Books:

1. Rogers and Mayhew, "Engineering Thermodynamics – Work and Heat Transfer", Pearson Education Pvt. Ltd., 2006.

2. Eastop and McConkey, "Applied Thermodynamics", Pearson Education Pvt. Ltd, 2002.

3. Rajput, B.K. Sankaar, "Thermal Engineering", S.Chand& Co. Ltd., 2003.

4. Kumar. K.L., "Engineering Fluid Mechanics" Eurasia Publishing House (P) Ltd., 7th edition, 1995

Web references:

1.www.accessengineeringlibrary.com

2. www. nptel.ac.in

3.www.engineeringtoolbox.com

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Course Code: 140EE0303	**Course Title:** CIRCUIT THEORY
Core/Elective: Core	**Credits (L:T:P:C:M)** – 3 : 1 : 0 : 4 : 100
Type: Lecture	**Total Contact Hours:** 60

Pre-requisites: The student should have undergone the course(s):

1.Basics of Electrical Engineering
2.Basics of Engineering Physics
3.Engineering Mathematics

Course Outcomes:

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

CO 1: Illustrate the fundamental principles and analyze the circuits using Kirchoff's laws
CO 2: Determine the response of DC circuits using network reduction techniques
CO 3: Determine the response of AC circuits
CO 4: Calculate the magnetic circuit quantities
CO 5: Formulate and solve differential equations of circuits containing energy storage elements under steady state and transient conditions

Course Content:

UNIT I INTRODUCTION 12

Types of Sources – relation between voltage and current in network elements – concept of active, passive, linear, nonlinear, unilateral, bilateral, lumped, distributed elements – Kirchoff's laws and their application to node and mesh analysis of networks – Tellegen's theorem (statement only) – concept of tree, branch, co–tree, link, loop and cutset. Problems involving DC circuits only.

UNIT II NETWORK REDUCTION TECHNIQUES 12

Series parallel circuits – star delta and reverse transformation – superposition, reciprocity, compensation, Thevenin's, Norton's, Millman's and Maximum power transfer theorems – principle of duality. Problems involving dc circuits only.

UNIT - III AC CIRCUITS 12

Basic definitions – phasors and complex representation – solution of RLC networks, power and energy relations – applications of Kirchoff's laws, Thevenin's, Norton's, Maximum power transfer theorems to ac circuits – series and parallel resonance – Q factor and bandwidth – locus diagrams.

UNIT - IV MAGNETIC CIRCUITS 12

Ampere's law – magnetic circuit concept and laws, magnetization curve of ferromagnetic materials, calculation of magnetic circuit quantities – series and parallel circuits – circuits with short air gaps – fringing with long air gaps – energy of magnetic field, magnetic pull, hysteresis and eddy current losses with ac excitation, mutual inductance and coefficient of coupling.

UNIT -V TIME DOMAIN ANALYSIS 12

Unit functions – step, impulse, ramp and parabolic – solution of network problems using Laplace transform – transient and steady state response of RLC networks with different types of forcing functions – Complex frequency, poles and zeros of network functions (introductory concept only).

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Text Books:

1. Soni M.L, Gupta.J.G "A course in Electrical Circuits Analysis" Dhanpat and sons, 4th edition, 2003.
2. Charles K. Alexander, Mathew N.O. Sadiku, "Fundamentals of Electric Circuits", Tata McGraw Hill, 3rd Edition, 2008.
3. Joseph.A. Edminister and M Nahvi, "Theory and problems of Electric circuits", Tata McGraw Hill Publishing company, 4th Edition, Reprint 2007.

Reference Books:

1. Sudhakar.A, Shyam Mohan S.P. "Circuits and Networks Analysis & Synthesis", Tata McGraw Hill, 4th edition, 2011.
2. Gupta.B.R, Vandana Singhal, "Fundamentals of Electrical Networks", S.Chand& company ltd, 2nd edition, 2009.
3. Dr. Arumugam. M and Premkumaran. N, "Electric Circuit Theory", Khanna publishers, 5th edition, 2010.
4. Paranjothi S.R. "Electric Circuit Analysis" New Age Publishers, 2nd edition, 2003.

Web references:

1. http://nptel.ac.in/courses/108102042/
2. http://www.allaboutcircuits.com/
3. http://ocw.mit.edu/courses/electrical-engineering-and-computer-science/6-002-circuits-and-electronics-spring-2007/index.htm

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Course Code: 140EE0304	Course Title: ELECTRICAL MACHINES – I
Core/Elective: Core	**Credits (L:T:P:C:M)** – 3 : 1 : 0 : 4 : 100
Type: Lecture	**Total Contact Hours:** 60

Pre-requisites: The student should have undergone the course(s):

1. Engineering Physics
2. Basic electrical and Electronics Engineering
3. Electromagnetism

Course Outcomes:

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

CO 1: Explain the basic concepts of EMF and MMF by electric and magnetic fields Concepts

CO 2: Apply terminology, principles and theory relative to the operation of DC Generators.

CO 3: Explain the principles and theory relative to the operation of DC Motors

CO 4: Discuss transformer terminology, principles and theory, types relative to Industrial / Commercial power transformers.

CO 5: Conduct various testing and experimental procedures on different types of transformers

Course Content:

UNIT I BASIC CONCEPTS OF ROTATING MACHINES 12

Principles of electromechanical energy conversion – Single and multiple excited systems – MMF of distributed A.C. windings – Rotating magnetic field – Generated EMF – Torque in round rotor machine.

UNIT II DC GENERATORS 8

Constructional features of a DC machine – Principle of operation – EMF equation – Methods of excitation: Self and separately excited generators, Characteristics of series, shunt and compound generators, applications – Armature reaction and commutation – Parallel operation of DC shunt and compound generators.

UNIT - III DC MOTORS 12

Principle of operation of DC motor – Back EMF and torque equation – Characteristics of series, shunt and compound motors – applications – Starting of DC motors – Types of starters – Speed control of DC series and shunt motors – Losses and efficiency –Testing of DC Motors – Brake Test, Swinburne's test, Hopkinson's test.

UNIT - IV TRANSFORMERS 15

Constructional details of core and shell type transformers – Types of windings – Principle of operation – EMF equation – Transformation ratio – Transformer on no load – Equivalent circuit – Transformer on load – Regulation – Parallel operation of single phase transformers – Auto transformer – Comparison with two winding transformers. Three phase transformer constructional features – Three phase transformer connections.

UNIT -V TESTING OF TRANSFORMERS 9

Losses and efficiency in transformers – All day efficiency – Condition for maximum efficiency – Testing of transformers: Polarity and voltage ratio tests, Load test, Open circuit and short circuit tests, Sumpner's test.

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Text Books:

1. Nagrath I.J Kothari D.P, "Electric Machines", Tata McGraw Hill publishing company Ltd, 2002.
2. Theraja. B.L., Theraja. A.K. "A Textbook of Electrical Technology, Volume II (AC & DC Machines)", S.Chand& Company Ltd, 2008.
3. Fitzgerald. A. E., Charles Kingsley, Stephen D. Umans, "Electrical Machinery"Tata McGraw Hill publishing company Ltd, 2003.

Reference Books:

1. Bimbhra. P.S., "Electrical Machinery", Khanna Publishers, 2003.
2. Gupta. J.B., "Theory and Performance of Electrical Machines",S. K. Kataria and Sons, 2002.
3. Murugesh Kumar. K, "DC Machines and Transformers",Vikas publishing house Pvt. Ltd,1999.

Web references:

1. http://vlab.co.in/
2. http://ocw.mit.edu/courses/electrical-engineering-and-computer-science/6-685-electric-machines-fall-2013/
3. https://www.google.co.in/webhp?sourceid=chromeinstant&ion=1&espv=2&ie=UTF-8#

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Course Code: 140EE0305	**Course Title:** DATA STRUCTURES AND ALGORITHMS USING C++ (Common to EEE,EIE,ICE)
Core/Elective: Core	**Credits (L:T:P:C:M)** – 3 : 1 : 0 : 4 : 100
Type: Lecture	**Total Contact Hours:** 60

Pre-requisites: The student should have undergone the course(s):

1. Programming in C++

Course Outcomes:

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

CO 1:Illustrate the concept of Data Structures and its applications

CO 2: Apply Data structure concepts into Data bases, Banking system etc.

CO 3:Comprehend on various Types of trees and its applications in real world

CO 4:Demonstrate suitable data structures for the applications

CO 5:Explain how to practice the graph concepts in real world applications

Course Content:

UNIT I INTRODUCTION TO OBJECT ORIENTED PROGRAMMING & LINEAR DATA STRUCTURES 9

Introduction – concepts of object oriented programming – ADTs – The List ADT (Array & Linked List Implementation) – The Stack ADT – Applications of Stack - The Queue ADT - Applications of Queue

UNIT II HASHING & PRIORITY QUEUES 8

Hashing – Separate chaining – Open addressing – Rehashing and Extendible hashing - Heap – Binary Heap – Applications of Priority Queues (The Selection Problem & Event Simulations) – d-heaps – Binomial Queues

UNIT - III NON LINEAR DATA STRUCTURES 10

Trees - Binary trees – Binary Search Trees - AVL Trees. Graph - Definitions - Topological Sort – Shortest path algorithms (Dijktra's Algorithm) - Minimum Spanning Trees (Prim's &Kruskal's Algorithm) – Introduction to NP Completeness.

UNIT - IV SEARCHING & SORTING 9

Searching – Linear Search – Binary Search – Sorting - Insertion sort, Bubble sort, Shell sort, Heap sort, Merge sort, Quick sort and Bucket sort – External Sorting – running time analysis.

UNIT -V ALGORITHM DESIGN TECHNIQUES 9

Greedy Algorithm (Knapsack Problem) – Divide and Conquer (Euclidean algorithm) – Dynamic programming (Traveling salesman problem) – Backtracking (Eight queen Problem) – Branch and Bound (Job Scheduling).

Text Books:

1. Mark Allen Weiss, "Data Structures and Algorithm Analysis in C++", 3rd Ed, Pearson Education Asia, 2007.
2. Michael T. Goodrich, "Data Structures and Algorithm Analysis in C++", Wiley student edition, 2007.
3. Sahni, "Data Structures Using C++", The McGraw-Hill, 2006.

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Reference Books:

1. Jean – Paul Tremblay & Paul G.Sorenson, An Introduction to data structures with applications, Tata McGraw Hill edition, II Edition, 2002.
2. John R.Hubbard, Schaum's outline of theory and problem of data structure with C++, McGraw-Hill, New Delhi, 2000.
3. BjarneStroustrup, the C++ Programming Language, Addison Wesley, 2000.

Web references:

1. http://www.cse.unr.edu/~bebis/CS308/
2. https://ece.uwaterloo.ca/~dwharder/aads/Lecture_materials/
3. http://nptel.ac.in/courses/106102064/

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Course Code: 140EE0306	Course Title: ELECTRONIC DEVICES AND CIRCUITS
Core/Elective: Core	Credits (L:T:P:C:M) – 3 : 0 : 0 : 3 : 100
Type: Lecture	Total Contact Hours: 45

Pre-requisites: The student should have undergone the course(s):

- Basic knowledge of semiconductor physics.

Course Outcomes:

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

CO.1 Outline the basic structure of diodes and transistors and differentiate the characteristics of various special diodes from pn junction diode.
CO.2 Compare and contrast the types of Field effect transistors and power devices.
CO.3 Analyze the design aspects of power amplifiers.
CO.4 Explain the operation of feedback amplifiers and oscillators.
CO.5 Discuss about the various applications of electronic devices.

Course Content:

UNIT I SEMICONDUCTOR DIODE AND BJT 9

PN Junction – Current components in a PN diode – Junction capacitance– Junction diode switching times – Zener diode – Varactor diode – Schotkky diode – Transistor Structure – Basic Transistor operation – Transistor characteristics and parameters – The transistor as a switch, as an amplifier – Transistor bias circuits : Voltage divider bias, base bias circuits, emitter bias circuits, collector feedback bias circuits – DC load line – AC load line – Bias stabilization, thermal runaway and thermal stability.

UNIT II FET, UJT AND SCR 9

JFET characteristics and parameters – JFET biasing: Self bias, Voltage divider bias – Q point, stability over temperature – MOSFET D-MOSFET, E-MOSFET – MOSFET characteristics and parameters – MOSFET biasing, zero bias, voltage divider bias method, drain feedback bias – Characteristics and applications of UJT, SCR, DIAC, TRIAC.

UNIT - III AMPLIFIERS 9

CE, CC and CB amplifiers – Small signal low frequency transistor amplifier circuits – h parameter representation of a transistor – Analysis of single stage transistor amplifier using parameters voltage gain, current gain, input impedance and output impedance – Frequency response – RC coupled amplifier. Classification of power amplifiers:- Class A, B, AB and C Power amplifiers – Push-Pull and Complementary Symmetry Push-Pull amplifiers – Design of power output, efficiency and cross- over distortion.

UNIT - IV AMPLIFIERS AND OSCILLATORS 9

Advantages of negative feedback – Voltage/Current, Series/Shunt feedback – Positive feedback – Condition for oscillators – Phase shift –Wein Bridge – Hartley –Colpitts and crystal oscillators.

UNIT -V RC CIRCUITS AND POWER SUPPLIES 9

RC wave shaping circuits – Diode clampers and clippers –Multivibrators– Schmitt triggers – UJT – Saw tooth oscillators – Single and polyphase rectifiers and analysis of filter circuits – Design of zener and transistor series voltage regulators – Switched mode power supplies.

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Text Books:

1. Millman and Halkias, "Electronic Devices and Circuits", Tata McGraw Hill, New Delhi, 2007.
2. Boylsted and Nashelsky, "Electronic Devices and Circuit Theory", 6th Edition, Prentice Hall of India, New Delhi, 1999.
3. Floyd.T.L, "Electronic Devices" 6th Edition, Pearson Education, India 2003.

Reference Books:

1. Mottershead. A, "Electronic Devices and Circuits an Introduction", Prentice Hall of India, New Delhi, 2003.
2. Streetman. B and Sanjay.B, "Solid State Electronic Devices", 5th Edition, Prentice Hall of India, NewDelhi, 2005.
3. Bell.D.A, "Electronic Devices and Circuits", 4th Edition, Prentice Hall of India, New Delhi, 1999.
4. Millman. J, PrakashRao. M. S and Taub. H, "Pulse Digital and Switching Wave Forms", Mc-Graw Hill, New Delhi, 2007.

Web references:

1. http://www.electronics-tutorials.ws/
2. http://www.learnabout-electronics.org/
3. http://www.nptel.ac.in/

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Course Code: 140EE0307	Course Title: ELECTRICAL MACHINES LABORATORY-I
Core/Elective: Core	Credits (L:T:P:C:M) – 0 : 0 : 3 : 2 : 100
Type: Practical	Total Contact Hours: 45

Pre-requisites: The student should have undergone the course(s):

1. Basics of Electromagnetism
2. Basics of Engineering Physics

Course Outcomes:

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

CO1 Compare the characteristics and performance of DC Machines and transformer by load tests.

CO2 Compare the types of starters used in DC machines.

CO3 Analyze the characteristics of dc machines and transformers.

CO4 Demonstrate the speed control techniques of DC machines.

List of Experiments:

1. Open circuit and load characteristics of separately excited dc shunt generator.
2. Open circuit and load characteristics of self–excited dc shunt generator.
3. Load characteristics of dc compound generator with differential and cumulative connection.
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. Hopkinson's test on dc motor – generator set.
9. Load test on single–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.

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Course Code: 140EE0308	Course Title: DATA STRUCTURES AND ALGORITHMS USING C++ LABORATORY
Core/Elective: Core	**Credits (L:T:P:C:M)** – 0 : 0 : 3 : 2 : 100
Type: Practical	**Total Contact Hours:** 45

Pre-requisites: The student should have undergone the course(s):

1. Knowledge on C & C++ Programming

Course Outcomes:

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

CO 1: Explain the concepts of arrays, lists, stacks and queues.
CO 2: Practice various sorting and searching techniques.
CO 3: Implement AVL, minimum spanning and binary trees.
CO 4: Develop programs for sorting and searching techniques.

List of Experiments:

1. Array implementation of List Abstract Data Type (ADT).
2. Linked list implementation of List ADT.
3. Stack ADT – Array and linked list implementations.
4. Queue ADT – Array and linked list implementations.
5. Implementation of Heap sort.
6. Implementation of AVL Tree.
7. Implementation of Minimum Spanning Tree (Prim's Algorithm).
8. Implementation of Binary tree.
9. Implementation of Linear search.
10. Implementation of Binary search.
11. Implementation of Merge sort.
12. Implementation of Quick sort

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Course Code: 140EE0309	**Course Title:** CIRCUITS AND DEVICES LABORATORY
Core/Elective: Core	**Credits (L:T:P:C:M)** – 0 : 0 : 3 : 2 : 100
Type: Practical	**Total Contact Hours:** 45

Pre-requisites:

Nil

Course Outcomes:

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

CO1 Compute the voltage and current of a given circuit by verifying experimentally through theorems

CO2 Verify the characteristics of various electronic devices such as diodes and transistors

CO3 Plot the frequency response of series and parallel resonance circuits

CO4 Verify the characteristics of special electronic devices such as Photodiodes, Phototransistors, DIAC,TRIAC

List of Experiments:

1. Verification of KVL and KCL
2. Verification of Thevenin and Superposition Theorem.
3. Verification of Maximum power transfer and reciprocity theorems.
4. Frequency response of series and parallel resonance circuits.
5. Characteristics of PN and Zener diode
6. Characteristics of CE and CB configuration of a Transistor.
7. Characteristics of UJT and SCR
8. Characteristics of JFET
9. Characteristics of Diac and Triac.
10. Characteristics of Photo diode and Photo transistor.

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SEMESTER IV

Course Code:140EE0401	Course Title: NUMERICAL METHODS (Common to EEE,EIE,ICE,CSE,IT)
Core/Elective: Core	Credits (L : T : P : C : M) – 3 : 1 : 0 : 4 : 100
Type: Lecture	Total Contact Hours: 60

Pre-requisites: The student should have undergone the course(s):

1. System of linear equations and non linear equations
2. Ordinary differential equations
3. Partial differential equations

Course Outcomes:

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

CO1: Calculate dominant eigen values of a matrix and solve the equation of linear system.

CO2: Determine the solution for a nonlinear equation and Fit a curve for the given numerical data.

CO3: Choose numerical techniques to interpolate , differentiate and integrate for the given numerical data

CO4: Solve the first and second order initial value problems

CO5: Solve the first and second order boundary value problems.

Course Content:

UNIT I SOLUTION OF SYSTEM OF LINEAR EQUATIONS 9+3

Solution of linear system - Gaussian elimination and Gauss-Jordan methods - LU - decomposition methods - Crout's method - Jacobi and Gauss-Seidel iterative methods - sufficient conditions for convergence - Power method to find the dominant eigen value and eigen vector.

UNIT II SOLUTION OF NON LINEAR EQUATIONS & CURVE FITTING 9+3

Solution of nonlinear equation - Bisection method - Regulafalsi method - Newton- Raphson method -Order of convergence of these methods- Curve fitting - Method of least squares and group averages.

UNIT - III INTERPOLATION & NUMERICAL DIFFERENTIATION AND INTEGRATION 9+3

Newton's forward, backward and divided difference interpolation – Lagrange's interpolation – Numerical Differentiation and Integration – Trapezoidal rule – Simpson's 1/3 and 3/8 rules – Double integration-Trapezoidal rule.

UNIT - IV SOLUTION OF ORDINARY DIFFERENTIAL EQUATIONS 9+3

Numerical Solution of Ordinary Differential Equations- Euler's method - Euler's modified method - Taylor's method and Runge-Kutta method of fourth order to solve first order differential equations- and second order equations – Multi step methods - Milne's and Adams' methods.

UNIT -V SOLUTION OF PARTIAL DIFFERENTIAL EQUATIONS 9+3

Numerical solution of Laplace equation and Poisson equation by Liebmann's method - solution of one dimensional heat flow equation - Bender - Schmidt recurrence relation - Crank - Nicolson method - Solution of one dimensional wave equation.

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Text Books:

1. Sastry S.S. Introductory methods of Numerical Analysis, Third edition, PHI, 2003,
2. Grewal, B.S. and Grewal, J. S., Numerical methods in Engineering and Science, Sixth Edition, Khanna Publishers, New Delhi, 2004.
3. SankaraRao, K. Numerical methods for Scientists and Engineers, Third Edition Prentice Hall of India Private Ltd., New Delhi, 2007

Reference Books:

1. Gerald, C. F. and Wheatley, P. O., Applied Numerical Analysis, Sixth Edition, Pearson Education Asia, New Delhi, 2006.
2. Jain M. K., Iyengar, S. R. and Jain, R. K, Numerical Methods for Scientific and Engineering Computation", Wiley Eastern Company

Web references:

1. https://www.math.ust.hk/~machas/numerical-methods.pdf
2. www.techmat.vgtu.lt/~inga/Files/Quarteroni-SkaitMetod.pdf
3. ns.sjtu.edu.cn/people/mtang/textbook.pdf

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Course Code:140EE0402	Course Title: NETWORK THEORY
Core/Elective: Core	Credits (L : T : P : C : M) – 3 : 1 : 0 : 4 : 100
Type: Lecture	Total Contact Hours:60

Pre-requisites: The student should have undergone the course(s):

1 Basic Knowledge of Electrical learnt in 11th and 12th Std. The knowledge acquired during the course in Circuit Theory.

Course Outcomes:

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

CO1: Compute the parameters for three phase balanced and unbalanced circuits.

CO2: Express the given Electrical Circuit in terms of A,B,C,D and Z,Y Parameter Model and solve the circuits.

CO3: Synthesis the given LC, RC and RL circuits using Foster and Cauer method.

CO4: Synthesize one port networks

CO5: Design different types of filters.

Course Content:

UNIT I THREE PHASE CIRCUITS 12

Three phase sources– analysis of three phase wire and four wire circuits with balanced and unbalanced loads–Power relations.

UNIT II TWO PORT NETWORK 12

Network functions – Poles and zeros of network functions – Complex frequency –Two port parameters Z,X,HandABCD–Scalingnetworkfunctions–Tand=equivalent circuits–Bridge networks –Analysisofladderandlatticenetworks–Coupledcircuitsastwoportnetwork–Tuned circuits.

UNIT - III RELIABILITY AND IMMITANCE FUNCTIONS 12

Casuality, stability, Hurwitzpolynomial–Positiverealfunctions–PropertiesofLC,RCandRLdrivingpointfunctions–Basicsynthesis procedure ofdrivingpointfunctions–SynthesisofdrivingpointLC,RCandRLfunctions–FosterandCauerform.

UNIT - IV TRANSFER FUNCTION SYNTHESIS 12

Properties of transfer function–Zeros of transmission–Synthesis of transfer admittance, transfer impedance with a one ohm termination–Synthesis of constant–resistance network.

UNIT -V FILTERS 12

Design of filters: Specification of filter characteristics–frequency transformation techniques–Design of constant K,M derived and composite filters. Introduction to Butterworth and Chebyeshev filters.

Text Books:

1. SudhakarAandShayamMohanSP,"CircuitsandNetworks-Analysis&Synthesis",Tata McGrawHill,2010.
2. RFrankilnF.Kuo,"NetworkAnalysisandSynthesis(Secondedition)"WileyIndia,Students Edition 2009
3. Soni,Gupta,"Acoursein ElectricalCircuitAnalysis"DhanpatRaiandsons2003.

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Reference Books:
1. M.E.VanValkenberg,"IntroductiontoModernNetworkSynthesis"WileyEastern;1986.
2. D. Ganesh Rao, R.V. Srinivasa Murthy, Network Analysis, A Simplified Approach, 1st ed., Sanguine Technical Publishers, 2009
3. SamarajitGhosh, Network Theory, Analysis and Synthesis, PHI 2005
4. Gopal G Bhise, Network analysis and filter design, Umesh publishers.

Web references:
1. Prof. N. K De IIT Kharagpur, Prof T.K Bhattacharya IIT Kharagpur, Prof. G D Roy IIT Kharagpur,(July 2012) Basic Electrical Technology www.nptel.com Retrieved August 03 2013 from URL :http://nptel.iitm.ac.in/courses/Webcoursecontents/IIT%20Kharagpur/Basic%20Electrical%20Technology/ Newindex1.html
2. www.indiabix.com › Electronics and Communication Engineering
3. (2012) TheScilab Website. [Online]. Available: http://www.scilab.org.

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Course Code:140EE0403	Course Title: ELECTRICAL MACHINES-II
Core/Elective: Core	Credits (L:T:P:C:M) – 3 : 1 : 0 : 4 : 100
Type: Lecture	Total Contact Hours:60

Pre-requisites: The student should have undergone the course(s):

1. Electrical Machines – I
2. Basics Electrical and Electronics Engineering

Course Outcomes:

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

CO1 Describe the working principle, construction, performance characteristics of Synchronous Generator

CO2 Explain the working principle, construction, performance characteristics of Synchronous Motor

CO3 Describe the working principle, construction, performance characteristics of three phase induction motor

CO4 Classify the different types of starter and various speed control techniques used for three phase induction motor

CO5 Explain the working principle, construction, performance characteristics ofsingle phase induction motor and special machines.

Course Content:

UNIT I SYNCHRONOUS GENERATOR 9+3

Constructional details – Types of rotors – EMF equation – Synchronous reactance – Armature reaction – Voltage regulation: EMF, MMF, ZPF and ASA methods – Synchronizing and parallel operation – Synchronizing torque – Change of excitation and mechanical input – Two reaction theory – Determination of direct and quadrature axis synchronous reactance using slip test – Operating characteristics – Capability curves.

UNIT II SYNCHRONOUS MOTOR 9+3

Principle of operation – Torque equation – Synchronizing to infinite bus bars – Operating characteristics – Methods of Starting – Phasor diagrams – V curves and Inverted V curves – Power angle characteristics – Synchronous condensers – Hunting, damper windings, applications – brushless DC motors.

UNIT - III THREE PHASE INDUCTION MOTOR 9+3

Constructional details – Types of rotors – Principle of operation – Slip – Equivalent circuit – Slip – torque characteristics – Condition for maximum torque – Losses and efficiency – Load test – No load and blocked rotor tests – Circle diagram – Separation of no load losses – crawling – cogging – Double cage motor – Induction generator.

UNIT - IV STARTING AND SPEED CONTROL OF THREE PHASE INDUCTION MOTOR 9+3

Methods of starting: DOL starter, Stator resistance starter, Auto Transformer starter, rotor resistance starter and star–delta starter – Methods of Speed control: speed control by change of frequency, speed control by number of poles and speed control by change of slip.

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UNIT -V SINGLE PHASE INDUCTION MOTORS AND SPECIAL MACHINES **9+3**

Constructional details of single phase induction motor – Double field revolving theory – Equivalent circuit – types of single phase Induction motor – Special machines: Reluctance motor, Switched Reluctance motor, Repulsion motor, hysteresis motor, stepper motor, DC Servo motor, AC servomotor and Universal motor.

Text Books:

1. Theraja. B.L., Theraja.A.K. "A Textbook of Electrical Technology, Volume II (AC & DC Machines)", S.Chand& Company Ltd.,2008.
2. Murugesh Kumar, K, "Induction & Synchronous Machines", Vikas publishing house Pvt.Ltd., 2000.
3. Say. M. G., " Alternating Current Machines", ELBS &Piman, London, 5th

Reference Books:

1. Gupta. J.B., "Theory and Performance of Electrical Machines", S.K. Kataria and Sons, 2002.
2. Kothari. D.P. and Nagrath. I.J., "Electric Machines", Tata McGraw Hill Publishing Company Ltd, 2002.
3. Fitzgerald. A.E., Charles Kingsley, Stephen.D.Umans, "Electric Machinery", Tata McGraw Hill publishing Company Ltd, 2003.

Web references:

1. http://www.electrical4u.com/alternator-or-synchronous-generator/
2. http://www.learnengineering.org/2014/04/Synchronous-motor-working-principle.html
3. http://www.electricaleasy.com/2014/02/starting-of-three-phase-induction-motors.html
4. http://www.nptel.ac.in/courses/IIT-MADRAS/Electrical_Machines_II/pdf/1_8.pdf

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Course Code:140EE0404	Course Title: ELECTROMAGNETIC THEORY
Core/Elective: Core	Credits (L:T:P:C:M) – 3 : 1 : 0 : 4 : 100
Type: Lecture	Total Contact Hours: 60

Pre-requisites: The student should have undergone the course(s):

1. Engineering Physics-I
2. Material Science
3. Circuit Theory
4. Electrical Machines-I

Course Outcomes:

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

CO 1 Solve the basics of vector problems and application of vector calculus for different co-ordinate systems.

CO 2 Outline the concepts of electric field and its boundary conditions, Electric potential using Coulombs law and Electric Gauss law.

CO 3 Describe the knowledge on magnetic field, Magnetic flux and its boundary conditions, Magnetic potential using Biot- Savart law and Magnetic Gauss Law

CO 4 Explain about time varying Electric and magnetic fields.

CO 5 Understand the concepts of electromagnetic waves and Pointing vector

Course Content:

UNIT I VECTOR ANALYSIS 11

Vector analysis –Definition of scalar and vector, example Area expressed as a vector, scalar product of vectors ,cross product of vectors ,Time and Space derivatives of scalar and vector functions , definition of gradient of a scalar function, illustrative examples Co–ordinate systems – Different types of co–ordinate systems, Line integral , surface integral and volume integral, examples , Basic definition of divergence and curl of vector functions, illustrative examples – Stokes theorem and Divergence theorem – Examples of application of these theorems.

UNIT II ELECTROSTATICS 13

Definition of electric charge, Coulomb's Law – Electric field intensity – Field due to point and continuous charges – Gauss's law and application – Electric potential – Electric field and equipotential plots, Poisson's and Laplace's equations – Electric field in free space, conductors, dielectric, Dielectric polarization – dipole moment, Dielectric strength – Electric field in multiple dielectrics – Boundary conditions, Capacitance – Definition of Capacitance , Loss angle of a capacitor, capacitance of parallel plate system with single and multiple dielectric, Capacitance of coaxial cable with single and multiple dielectric Spherical capacitor, capacitance of isolated sphere, capacitance of two conductor transmission line, Energy stored in electrostatic field, Energy density. Conduction current, convection current, displacement current, Equation of continuity.

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UNIT - III MAGNETOSTATICS 12

Magnetic circuits – permanent magnets, definition of magnetic flux, magnetic field intensity, Lorentz Law of force, Biot–savart Law , Ampere's Law , Magnetic field due to straight conductors, circular loop, infinite sheet of current – Magnetic flux density (B) – B in free space, conductor, magnetic materials – Magnetic field in multiple media, Boundary conditions – Lifting force of a magnet –. Magnetization – Magnetic dipole – the phenomena of magnetization of ferromagnetic materials – Scalar and vector potential – Magnetic force, Torque , Inductance – Definition of self inductance, mutual inductance, examples – L of a solenoid, L of a toroidal system, M of coupled coils, energy in terms of L and M, L of two conductor transmission system – M between power line and telephone line – Energy density.

UNIT - IV ELECTRODYNAMIC FIELDS 12

Faraday's laws –Types of induced emf, Transformer and motional EMF, Faradays Disc generator – Forces and Energy in quasi–stationary Electromagnetic Fields – Maxwell's equations (differential and integral forms) – Relation between field theory and circuit theory.

UNIT -V ELECTROMAGNETIC WAVES 9+3

Generation – Electro Magnetic Wave equations– Wave parameters, velocity, intrinsic impedance, propagation constant – Waves in free space, lossy and lossless dielectrics, conductors, skin depth, Poynting vector and poynting theorem – Plane wave reflection and refraction – Transmission lines – Line equations – Input impedances – Standing wave ratio and power.

Text Books:

1. Gangadhar. K.A., Ramanathan. P.M. "Electromagnetic Field Theory" Khanna publishers, Delhi, 2009.
2. AshutoshPramanik, "Electromagnetism – Theory and Applications", Prentice Hall of India Private Limited, 2006.
3. Mathew N. O. Sadiku, "Principles of Electromagnetics", Oxford University press Inc., 1st edition, 2007.

Reference Books:

1. Sathaiah .D and Anitha M. "Electromagnetic Fields" Scitech Publications (India) Private Ltd. Chennai, 2007.
2. Kraus and Fleish, "Electromagnetics with Applications", McGraw Hill International Editions, 5th edition, 1999.
3. Joseph. A .Edminister, "Theory and Problems of Electromagnetics", 2nd edition, Schaum Series, Tata McGraw Hill, 1993.

Web references:

1. www.myopencourses.com
2. http://ocw.mit.edu
3. nptel.ac.in/courses/115101005/

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Course Code:140EE0405	Course Title: MEASUREMENTS AND INSTRUMENTATION
Core/Elective: Core	Credits (L : T : P : C : M) – 3 : 0 : 0 : 3 : 100
Type: Lecture	Total Contact Hours: 45

Pre-requisites: The student should have undergone the course(s):

1. Basics of Electrical and Electronics engineering
2. Material Science

Course Outcomes:

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

CO1: Illustrate the concepts of indicating instruments for voltage and current measurements.

CO2: Describe the working principle involved in the Wattmeter, Energy meter and Maximum demand meter, KVAR meter, power factor meter.

CO3: Discuss the working principle involved in the bridges and potentiometers.

CO4: Summarize the concepts used in magnetic measurements and Instrument transformers.

CO5: Select appropriate passive or active transducers for measurement of physical phenomenon and explain the concept of modern electronic instruments like CRO, plotters etc.

Course Content:

UNIT I UNITS AND STANDARDS 9

Functional elements of an instrument – Dimensional Analysis -D'Arsonval Galvanometer- Errors inmeasurement – Principle of operation and constructional details of moving coil,movingiron,dynamometertype,rectifiertype,thermal type instruments- errors and compensations - Extension of range using shunt,multiplier.

UNIT II MEASUREMENT OF POWERAND ENERGY 9

Measurement of power in single and three phase circuits : dynamometer type wattmeter-LPF wattmeter-Errors and compensation.Measurement of energy in single and three phase circuits : Induction type energy meter : Errors and compensation,Calibration, Maximum demand meter,KVARmeter,powerfactormeter

UNIT - III BRIDGES & POTENTIOMETERS 9

Measurement of low, medium and high resistances :Wheatstone bridge , Kelvin's double bridge, series & shunt type ohmmeter, Megger.

General principle of AC bridges – Bridge sensitivity and bridge balance, screening and earthling devices, Measurements of self and mutual inductance and capacitance: Maxwell, Hay's, Anderson, Wien and schering bridges – Impedance bridges.

DC potentiometers : Crompton's type, vernier type - AC potentiometers :drysdale polar potentiometers

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UNIT - IV MAGNETIC MEASUREMENTS & INSTRUMENT TRANSFORMERS **9**

Introduction : Types of tests, ballistic tests-measurement of flux density, magnetizing force, magnetic potentiometer, testing of ring specimens, determination of B-H curve, hysteresis loop, testing of ring specimens – flux meter - Measurements of iron loss.

Introduction to Instrument transformers – Construction and principle of operation of current transformers, potential transformers- calibration

UNIT -V TRANSDUCERS AND ELECTRONIC INSTRUMENTS **9**

Classification of transducers – Selection of transducers – Resistive, capacitive &inductive transducers –digital transducers. Constructional details of CRO – typical measurements using CRO – digital storage oscilloscope – X-Y Recorders, strip chart recorders - digital plotters.

Text Books:

1. E.O. Doebelin, 'Measurement Systems – Application and Design', Tata McGrawHill publishing company, 2003.
2. A.K. Sawhney, 'A Course in Electrical & Electronic Measurements &Instrumentation', DhanpatRai and Co, 2004
3. J. B. Gupta, 'A Course in Electronic and Electrical Measurements', S. K. Kataria&Sons, Delhi, 2003.

Reference Books:

1. A.J. Bouwens, 'Digital Instrumentation', Tata McGraw Hill, 1997.
2. D.V.S. Moorthy, 'Transducers and Instrumentation', Prentice Hall of India Pvt Ltd,2007.
3. H.S. Kalsi, 'Electronic Instrumentation', Tata McGraw Hill, II Edition 2004.
4. Martin Reissland, 'Electrical Measurements', New Age International (P) Ltd., Delhi,2001.

Web references:

1. www. nptel.ac.in
2. www.nptel.iitg.ernit.in
3. www.sciencedirect.com

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Course Code:140EE0406	**Course Title:** DIGITAL ELECTRONICS
Core/Elective: Core	**Credits (L : T : P : C : M)** - 3 : 0 : 0 : 3 : 100
Type: Lab	**Total Contact Hours:** 45

Pre-requisites: The student should have undergone the course(s):

1. Electronic devices and circuits

Course Outcomes:

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

CO 1 Simplify the Boolean functions by employing Boolean algebra, K-map method and Tabulation method

CO 2 Construct simple combinational circuits using gates

CO 3 Design synchronous sequential logic circuits, counters and registers using flip-flops

CO 4 Design asynchronous sequential logic circuits

CO 5 Describe the principles of memory devices, programmable logic devices and digital logic families

Course Content:

UNIT I NUMBER SYSTEMS AND BOOLEAN ALGEBRA 9

Number System – Conversion– Binary Codes – Types –Signed binary Numbers – Boolean Algebra – Basic Theorems, Properties and Boolean functions – Canonical and standard forms – Complements – r"s and r–1"s – Digital Logic Gates – K map Method – Don't care condition ,NAND and NOR Implementation – Tabulation Method.

UNIT II COMBINATIONAL LOGIC 9

Design Procedure – Adder, Subtractor, Comparators, Code converters, Encoders, Decoders, Multiplexers and demultiplexers – Function realization using gates, multiplexers and decoders.

UNIT - III SYNCHRONOUS SEQUENTIAL LOGIC 9

Flip flops – SR, JK, T, D and Master slave – Characteristic and excitation tables and equations – Level and Edge Triggering – Realization of one flip flop using other flip flops – Analysis and design of sequential circuits with state diagram, state table, state reduction and state assignment – Registers – shift registers – Ripple counters – Synchronous counters.

UNIT - IV ASYNCHRONOUS SEQUENTIAL LOGIC 9

Analysis of Asynchronous Sequential Circuits – primitive flow table – Reduction of primitive flow table – state assignment – Excitation table – Races and Cycles –Hazards – Static, Dynamic, Essential –Hazards elimination.

UNIT -V PROGRAMMABLE LOGIC DEVICES AND MEMORY DEVICES 9

PLD – ROM, Programmable logic Arrays (PLA), Programmable array logic(PAL) and FPGA – Realization of logic function using ROM, PLA and PAL – Classification of Memories – RAM organization – Static RAM – Dynamic RAM cell – ROM organization – PROM, EPROM and EEPROM – Digital Logic Families – TTL, ECL and CMOS.

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Text Books:

1. Morris Mano. M., "Digital Design", 3rd edition, Prentice Hall of India Pvt. Ltd., Pearson Education Pvt. Ltd., 2003.
2. Anil.K.Maini, "Digital Electronics", 1st edition, Wiley India Pvt, Ltd., 2011.
3. Donald D. Givone, "Digital Principles and Design", TMH, 2003.

Reference Books:

1. Charles H. Roth. "Fundamentals of Logic Design", Thomson Learning, 2003.
2. Salivahanan. S. andArivazhagan. S.,"Digital Circuits and Design", 2nd edition, Vikas Publishing House Pvt. Ltd, New Delhi, 2004.
3. John .M Yarbrough, "Digital Logic Applications and Design", Thomson – Vikas Publishing house, 2002.
4. Donald P.Leach and Albert Paul Malvino, "Digital Principles and Applications", 6th edition, TMH, 2003.

Web References:

1. http://web.iitd.ac.in/~shouri/eel201/lectures.php
2. http://www.learnabout-electronics.org//Digital/dig10.php
3. http://nptel.ac.in/courses/117103064/

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Course Code: 140EE0407	**Course Title:** ELECTRICAL MACHINES LABORATORY – II
Core/Elective: Core	**Credits (L:T:P:C:M)** – 0 : 0 : 3 : 2 : 100
Type: Practical	**Total Contact Hours:** 45

Pre-requisites: The student should have undergone the course(s):

1. Engineering Practices Laboratory
2. Electrical Machines Laboratory-I

Course Outcomes:

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

CO 1: Explain the constructional details, principle of operation, performance of Alternators and AC Motors

CO 2: Demonstrate the working of starters and speed control techniques of AC machines

CO 3: Compare the performance characteristics of single phase and three phase AC machines by conducting different tests

CO 4: Select the various types of AC machines for different applications based on the evaluation of their performance

List of Experiments:

1. Regulation of three phase alternator by EMF method.
2. Regulation of three phase alternator by MMF method.
3. Regulation of three phase salient pole alternator by slip test.
4. Parallel operation of three phase alternators using Synchronoscope.
5. Load test on three phase alternator.
6. V and Inverted V curves of Three Phase Synchronous Motor.
7. Load test on three phase induction motor.
8. Speed control of three phase Induction Motor by pole changing method.
9. Construction of Circle Diagram of three phase induction motor.
10. Separation of No – load losses of three phase induction motor.
11. Load test on single phase induction motor.
12. No load and blocked rotor test on single phase induction motor.

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Course Code: 140EE0408	**Course Title:** MEASUREMENTS AND INSTRUMENTATION LABORATORY
Core/Elective: Core	**Credits (L:T:P:C:M)** – 0 : 0 : 3 : 2 : 100
Type: Practical	**Total Contact Hours:** 45

Pre-requisites: The student should have undergone the course(s):

1. Basic circuit connections.
2. Theoretical knowledge on AC and DC bridges.
3. Knowledge on the working principle of various transducers.

Course Outcomes:

At the end of the course students will be able to:
CO1: Analyze the accuracy of measuring devices.
CO2: Calculate the power, powerfactor and ironloss.
CO3: Measure Resistance, Inductance and Capacitance using Bridges.
CO4: Analyze the working principle of transducers.

List of Experiments:

1. Calibration of Voltmeter, Ammeter and Wattmeter.
2. Measurement of three phase power and power factor.
3. Calibration of single – phase energy meter.
4. Calibration of current transformer.
5. Calibration of three – phase energy meter.
6. Measurement of resistance using Kelvin's Bridge and Wheatstone Bridge.
7. Measurement of inductance using Hays and Andeson Bridge.
8. Measurement of capacitance using Maxwell's and Schering Bridge.
9. Measurement of unknown voltage using dc potentiometer (Crompton's type).
10. Measurement of iron loss.
11. Measurement of Temperature using Thermistor / RTD's.
12. Study of displacement and pressure transducers (LVDT &Bourden tube).

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Course Code: 140EE0409	Course Title: ELECTRONICS LABORATORY
Core/Elective: Core	Credits (L:T:P:C:M) – 0 : 0 : 3 : 2 : 100
Type: Practical	Total Contact Hours: 45

Pre-requisites: The student should have undergone the course(s):

1. Basic knowledge of semiconductor devices like diodes, transistors, resistors, capacitors, inductors is essential.
2. Circuits and devices laboratory.

Course Outcomes:

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

CO 1 Design and analyse basic electronic circuits, particularly with application to diodes, Junction field-effect transistors and bipolar junction transistors.

CO 2 Use basic circuit building blocks to create more advanced circuits such as amplifiers, oscillators and multivibrators.

CO 3 Acquire experience in designing electronic circuits to perform realistic tasks.

CO 4 Apply troubleshooting techniques to test the electronic circuits.

List of Experiments:

1. Darlington Amplifier using BJT.
2. Differential amplifier using BJT.
3. Series feedback amplifiers.
4. Shunt feedback amplifiers.
5. Frequency response of common emitter amplifiers.
6. Design of Fixed Bias and voltage divider bias amplifier circuits using BJT.
7. Colpitt's Oscillator.
8. Wein–Bridge Oscillator.
9. Hartley Oscillator.
10. RC Phase shift Oscillator.
11. Design of Astable and Monostablemultivibrators.
12. Design of Bistablemultivibrator.

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SEMESTER V

Course Code:140EE0501	**Course Title:** ELECTRICAL MACHINE DESIGN
Core/Elective: Core	**Credits (L : T : P : C : M)** – 3 : 1 : 0 : 4 : 100
Type: Lecture	**Total Contact Hours:**60

Pre-requisites: The student should have undergone the course(s):

1. Electrical Machines I & II
2. Basics of Circuit Theory

Course Outcomes:

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

CO1: Analyze MMF and leakage reactance of various types of electrical machines.

CO2: Carryout optimal design of armature and field systems for D.C. machines

CO3: Apply knowledge to design core, yoke, windings and cooling systems of transformers

CO4: Calculate the design of main dimensions, stator and rotor of induction machines

CO5: Select the optimal design of stator and rotor of synchronous machines

Course Content:

UNIT I INTRODUCTION **9+3**

Considerations and limitations in design - 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 II D.C. MACHINES **9+3**

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.

UNIT - III TRANSFORMERS **9+3**

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 – design of tanks and cooling tubes of transformers.

UNIT - IV THREE PHASE INDUCTION MOTORS **9+3**

Constructional details of squirrel cage and slip ring motors- Output equation – main dimensions – choice of specific loadings -design of stator – design of squirrel cage and slip ring rotor – performance calculation from designed data.

UNIT -V SYNCHRONOUS MACHINES **9+3**

Output equation – main dimensions – choice of specific loadings- short circuit ratio – design of stator and rotor of cylindrical pole and salient pole machines –- design of field coil – cooling of turbo alternators- introduction to computer aided design.

Text Books:

1. A.K. Sawhney, 'A Course in Electrical Machine Design', DhanpatRai and Sons, New Delhi, 2011.
2. R.K. Agarwal, 'Principles of Electrical Machine Design', S.K.Kataria and Sons, Delhi, 2002.
3. Rajput R K, 'Electrical Machines: D.C. Machines, A.C. Machines andPolyphase Circuits', Laxmi Publications,2002

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Reference Books:

1. Shanmugasundaram, A., Gangadharan G. and Palani R., "Electrical Machine Design Data Book", New Age International., New Delhi, 1999.
2. S.K. Sen, 'Principles of Electrical Machine Design with Computer Programmes', Oxfordand IBH Publishing Co.Pvt Ltd., New Delhi, 2010
3. V.N. Mittle and A. Mittle, 'Design of Electrical Machines', Standard Publications Distributors, Delhi, 2002

Web References:

1. http://nptel.iitm.ac.in
2. http://www.motor-engineer.net/
3. http://electrical4u.com.

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Course Code:140EE0502	**Course Title:**GENERATION, TRANSMISSION AND DISTRIBUTION
Core/Elective: Core	**Credits (L : T : P : C : M)** – 3 : 1 : 0 : 4 : 100
Type: Lecture	**Total Contact Hours:**60

Pre-requisites: The student should have undergone the course(s):

1.Circuit Theory
2.Electromagnetic Field Theory
3.Basics of Electrical Engineering

Course Outcomes:

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

CO1: Describe the structure of power system and sources of electrical energy.

CO2: Calculate the transmission line parameters like resistance, inductance, and capacitance.

CO3: Analyze the various type of transmission lines based on the length.

CO4:Analyze the voltage distribution in insulator strings and cables and methods to improve the same.

CO5: Distinguish the radial, ring main distributors & interconnector in AC & DC distributors.

Course Content:

UNIT I POWER GENERATION 11

Generation, Transmission & Distribution Scenario of India - Types of generation: Conventional and Non-conventional, Thermal Power Plant, Hydro Power Plant, Gas Power Plant, Nuclear Power Plant, Non-conventional Energy Sources - Load capacity factor - Connected load factor - Load duration curve - Selection of units.

UNIT II TRANSMISSION LINE PARAMETERS 12

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 transposition; application of self and mutual GMD; skin and proximity effects; interference with neighboring communication circuits.

UNIT - III ANALYSIS OF TRANSMISSION LINES 14

Classification of lines: Short line, medium line and long line; equivalent circuits, attenuation Constant, phase constant, surge impedance; transmission efficiency and voltage regulation; Surge-impedance loading, load ability limits based on thermal loading, angle and voltage stability considerations; shunt and series compensation; Ferranti effect and corona loss -Calculation of sag and tension.

UNIT - IV INSULATORS AND CABLES 11

Insulators: Types, voltage distribution in insulator string and grading, improvement of string Efficiency. Underground cables: Constructional features of LT and HT cables, capacitance, Dielectric stress and grading, thermal characteristics.

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UNIT -V DISTRIBUTION SYSTEM **12**

Feeders, Distributors and Service mains - Radial and ring main systems - Calculation of voltage in distributors with concentrated and distributed loads, A.C. single phase and three phase distribution systems.

Text Books:

1. V.K.Mehta, Rohit Mehta," Principles of Power System", Fourth Edition,S Chand & Co Ltd, 2011.
2. M.L. Soni, Gupta, Bhatnagar, Chakrabarthy, "A Text book on Power Systems Engineering", DanpatRai& Sons, 2010.
3. Wadhwa, C.L., "Electrical Power Systems", Sixth Edition, Wiley Eastern Limited India, 2009.

Reference Books:

1. S.N. Singh, "Electric Power Generation, Transmission and Distribution", Second Edition, Prentice Hall of India Pvt. Ltd, 2010.
2. B.R. Gupta, "Generation of Electrical Energy", Eurasia Publishing House (Pvt.)Ltd., Ramnagar, New Delhi, 2009.
3. Leonard L. Grigsby, "Electric Power Generation, Transmission and Distribution", Third Edition, CRC Press, 2012.
4. HaadiSaadat, "Power System Analysis" TATA MC GRAW Hill Edition 2002.

Web References:

1. nptel.ac.in/courses/108102047
2. www.tangedco.gov.in
3. www.ilo.org
4. www.siemens.com/about/.../en/...transmission-distribution
5. http://www.enernoc.com

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Course Code: 140EE0503	Course Title: MICROPROCESSORS AND MICROCONTROLLERS (Common to EEE,EIE,ICE)
Core/Elective: Core	Credits (L:T:P:C:M) – 3 : 0 : 0 : 3 : 100
Type: Lecture	Total Contact Hours: 45

Pre-requisites: The student should have undergone the course(s):

A fundamental understanding of Analog and Digital Electronics.

Course Outcomes:

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

CO 1: Explain the architecture of 8085 and 8086 processors
CO 2: Explain the addressing modes and programming
CO 3: Interface various circuits necessary for the various applications.
CO 4: Acquire the basic knowledge of microcontroller.
CO 5: Develop skill in advanced processor and applications of 8051microcontroller.

Course Content:

UNIT I INTRODUCTION 9

8085: Architecture - Signals– Memory interfacing – I/O Devices Interfacing – Timing Diagram – Interrupt structure, 8086 Architecture.

UNIT II PROGRAMMING OF 8085 PROCESSOR 9

Addressing modes and Instruction sets – Assembly language format – Data transfer, data Manipulation & control instructions – Programming: Loop structure with counting & Indexing - Subroutine instructions stack-Code Conversions.

UNIT - III PERIPHERAL INTERFACING 9

Study of Architecture and programming of ICs: 8255 PPI, 8259 PIC, 8251 USART, 8279 Key board display controller and 8253 Timer/ Counter – Interfacing with 8085 - A/D and D/A converter interfacing.

UNIT - IV MICRO CONTROLLER 8051 9

Architecture - Addressing modes and Instruction Sets – Interrupt structure – Timer –I/O ports – Serial communication, Simple programming.

UNIT -V INTRODUCTION TO ADVANCED PROCESSORS & APPLICATIONS OF 8051 9

Interfacing: LCD, ADC, DAC, Sensors, Stepper Motor, Keyboard and DC motor speedcontrol. PIC microcontroller-CPU Architecture and instruction set.

Text Books:

1 R.S. Gaonkar, 'Microprocessor Architecture Programming and Application', Wiley Eastern Ltd., New Delhi.

2. Kenneth J Ayala, 'The 8051 Micro controller', Thomson Delmer Learning, 2004

3. Microcontrollers, Principles and Applications – Ajit pal – PHI Ltd., - 2011.

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Reference Books:

1. A.K. Ray and K.M. Bhurchandi, 'Advanced Microprocessors and peripherals', 2nd Edition, Tata McGraw-Hill, 2006.
2. Muhammad Ali Mazidi& Janice GilliMazidi, 'The 8051 Micro Controller and Embedded Systems', Pearson Education, 2007.
3. John B.Peatman, 'Design with PIC microcontrollers', Pearson Education, New delhi.

Web References:

1. http://www.nptel.ac.in/downloads/106108100/
2. http://www.ustudy.in/ece/mpmc/u1

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Course Code: 140EE0504	**Course Title:** CONTROL SYSTEMS (Common to EEE,ICE)
Core/Elective: Core	**Credits (L:T:P:C:M)** – 3 : 1 : 0 : 4 : 100
Type: Lecture	**Total Contact Hours:**60

Pre-requisites: The student should have undergone the course(s):

1. Basics of Laplace transform, its inverse and partial fraction expansions
2. Differentiation and Integration

Course Outcomes:

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

CO1: Explain the concept of open loop and closed loop (feedback) systems

CO2: Represent different control systems like electrical, mechanical and thermal systems with their transfer functions.

CO3: Illustrate the time domain and frequency domain characteristics of systems.

CO4: Identify the systems for stability.

CO5: Model a compensator in designing a control system based on specification.

Course Content:

UNIT I SYSTEMS AND THEIR REPRESENTATION 12

Basic elements in control systems – Open and closed loop systems – Electrical analogy of mechanical and thermal systems – Transfer function – Synchros – AC and DC servomotors – Block diagram reduction techniques – Signal flow graphs.

UNIT II TIME RESPONSE 12

Time response – Time domain specifications – Types of test input – I and II order system response – Error coefficients – Generalized error series – Steady state error – P, PI, PID modes of feedback control.

UNIT - III FREQUENCY RESPONSE 12

Frequency response – Bode plot – Polar plot – Determination of closed loop response from open loop response – Correlation between frequency domain and time domain specifications

UNIT - IV STABILITY OF CONTROL SYSTEM 12

Characteristics equation – Location of roots in S plane for stability – Routh Hurwitz criterion – Root locus construction – Effect of pole, zero addition – Gain margin and phase margin – Nyquist stability criterion

UNIT -V COMPENSATOR DESIGN 12

Performance criteria – Lag, lead and lag-lead networks – Compensator design using bode plots.

Text Books:

I.J. Nagrath and M. Gopal, 'Control Systems Engineering', New Age International Publishers, 2003.

2. Benjamin C. Kuo, 'Automatic Control systems', Pearson Education, New Delhi, 2003.

3. K. Ogata, 'Modern Control Engineering', 4 th edition, PHI, New Delhi, 2002

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Reference Books:

1. Norman S. Nise, 'Control Systems Engineering', 4th Edition, John Wiley, New Delhi, 2007.
2. SamarajitGhosh, 'Control systems', Pearson Education, New Delhi, 2004.
3. M. Gopal, 'Control Systems, Principles and Design', Tata McGraw Hill, New Delhi, 2002.

Web references:

1. www. nptel.ac.in
2. http://sunzi.lib.hku.hk/ER/subject/hkul/6213/co/1
3. www.mathworks.com
4. http://www.microchip.com/

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Course Code: 140EE0505	**Course Title:** COMMUNICATION SYSTEMS
Core/Elective: Core	**Credits (L:T:P:C:M)** – 3 : 0 : 0 : 3 : 100
Type: Lecture	**Total Contact Hours:** 45

Pre-requisites: The student should have undergone the course(s):

1. Electronic Devices and Circuits

Course Outcomes:

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

CO 1: Explain the basic concepts of AM, FM transmission and reception.

CO 2: Describe the different types of transmission lines and explain the basic idea of radio propagation.

CO 3:Identify and describe different digital modulation schemes and understand the concept of Multiplexing.

CO 4:Acquire knowledge about different data communication codes and networks

CO 5: Explain the fundamentals of satellite and optical communication.

Course Content:

UNIT I MODULATION SYSTEMS 9

Representation of Signals –Modulation – Need for Modulation – Types – Analog Modulation – AM – Modulation and Demodulation – FM–Modulation and Demodulation –Comparison – AM and FM Transmitters and Receivers – TRF – Super heterodyne receiver – FM Receivers.

UNIT II TRANSMISSION MEDIUM 9

Transmission lines – Types, equivalent circuit, losses, standing waves, impedance matching, bandwidth; radio propagation – Ground wave and space wave propagation, critical frequency, maximum usable frequency, path loss, white Gaussian noise.

UNIT - III DIGITAL COMMUNICATION 9

Time Division Multiplexing, Digital T-carrier System – Pulse code modulation – Digital modulation: Frequency and phase shift keying – Modulator and demodulator, bit error rate calculation.

UNIT - IV DATA COMMUNICATION AND NETWORK PROTOCOL 9

Data Communication codes, error control. Serial and parallel interface, telephone network, data modem, ISDN, LAN, ISO-OSI seven layer architecture for WAN.

UNIT -V SATELLITE AND OPTICAL FIBRE COMMUNICATIONS 9

Orbital satellites, geostationary satellites, look angles, satellite system link models, satellite system link equations; advantages of optical fibre communication – Light propagation through fibre, fibre loss, light sources and detectors.

Text Books:

1. Louis E. Frenzel, "Principles of Electronics Communication Systems", Tata McGraw Hill, 3rd Edition, 2008.

2. Wayne Tomasi, "Electronic Communication Systems", Pearson Education, Third Edition, 2001.

3. Kennedy, „Electronic Communication Systems", 4th edition, McGraw Hill,2002.

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Reference Books:

1. Anokh Singh, "Principles of Communication Engineering" S.Chand& Co., 1999.
2. Miller, „Modern Electronic Communication", Prentice Hall of India, 2003.
3. Roy Blake, "Electronic Communication Systems", 2nd Edition, Thomson Delmar, 2002 4.

Web References:

1. http://www.nptel.ac.in/courses/117102059/8
2. http://www.nptel.ac.in/courses/117101051/18
3. http://www.nptel.ac.in/courses/117101054/

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Course Code:140EE0506	Course Title: LINEAR INTEGRATED CIRCUITS AND APPLICATIONS (Common to EEE,EIE,ICE)
Core/Elective: Core	Credits (L : T : P : C : M) – 3 : 0 : 0 : 3 : 100
Type: Lecture	Total Contact Hours: 45

Pre-requisites: The student should have undergone the course(s):

1. Electronic Devices and Circuits
2. Circuit Theory

Course Outcomes:

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

CO1. Classify the manufacturing process of IC

CO2. Illustrate linear and nonlinear application of op amp

CO3. Outline design of ADC and DAC using op amp

CO4. Design power supplies based on requirement.

CO5. Develop OPAMP for industrial applications

Course Content:

UNIT I IC FABRICATION **9**

IC classification, Fundamental of Monolithic IC technology, Basic Planar process: Epitaxial growth, Masking and Etching, Diffusion of impurities, Isolation techniques, Assembly processing and Packaging, Fabrication of IC based components: Active and Passive components, BJT, FET, MOSFET and CMOS – Fabrication of a typical circuit

UNIT II CHARACTERISTICS AND BASIC APPLICATIONS OF OPAMP **9**

Ideal OP-AMP characteristics, DC characteristics, AC characteristics, offset voltage and current, CMRR, Slew rate - Frequency response of OP-AMP - IC 741 - Inverting amplifier, Non Inverting amplifier, Summer, Differential amplifier, Average amplifier, Differentiator, Integrator and Log/Antilog amplifier

UNIT - III SPECIAL APPLICATIONS OF OPAMP **10**

Instrumentation amplifier, First and Second order active filters, V/I & I/V converters, Comparators, Multivibrators, Waveform generators, Clippers, Clampers, Peak detector, Precision rectifier - S/H circuit, D/A converter: R-2R ladder and Weighted resistor types - A/D converter : Dual slope, Successive approximation and Flash types

UNIT - IV SPECIAL FUNCTION ICs **9**

555 Timer circuit – Functional block, characteristics & applications – 566 voltage controlled oscillator circuit – 565 Phase lock loop circuit functioning and applications, Analog multiplier ICs– IC voltage regulators: Fixed and Variable regulators – 78XX, 79XX, 317, 723 regulators, Switching regulator, Opto-Coupler ICs.

UNIT - V CASE STUDIES – OPAMP BASED DESIGNS **8**

Design of Signal Conditioning circuits for Thermocouple, RTD, Strain gauge and LDR – Water level control - DC motor speed control.

Text Books:

1. Ramakant A. Gayakward,"Op-amps and Linear Integrated Circuits", IV edition, Pearson Education, 2003
2. Roy Choudhary.D., Sheil B. Jani, "Linear Integrated Circuits", II edition, New Age, 2003
3. David A. Bell, "Op-amp & Linear ICs", 2nd edition, Prentice Hall of India, 2005

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Reference Books:

1. Jacob Millman, Christos C.Halkias, "Integrated Electronics - Analog and Digital circuits system", Tata McGraw Hill, 2003
2. Robert F.Coughlin, Fredrick F.Driscoll, "Op-amp and Linear ICs", 4th edition, PearsonEducation, 2002
3. S. Franco, "Design with Operational Amplifiers and Analog Integrated Circuits", (3/e) TMH, 2003

Web References:

1. http://www.nptel.ac.in/courses/Webcourse-contents/IIT ROORKEE/Analog%20circuits /index.htm
2. http://www.555-timer-circuits.com
3. http://www.technologystudent.com
4. http://freevideolectures.com/Course/2915/Linear-Integrated-Circuits#

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HOD-Electrical and Electronics E
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Course Code: 140EE0507	**Course Title:** MICROPROCESSORS AND MICROCONTROLLERS LABORATORY
Core/Elective: Core	**Credits (L:T:P:C:M)** – 0 : 0 : 3 : 2 : 100
Type: Practical	**Total Contact Hours:** 45

Pre-requisites: The student should have undergone the course(s):

1. Digital Electronics
2. Microprocessors And Microcontrollers

Course Outcomes:

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

CO1: Apply the fundamentals of assembly level programming of basic microprocessors and microcontrollers

CO2: Employ the knowledge of the 8085/8086/8051 instruction set in programming.

CO3: Interface with standard microprocessor interfaces including serial ports, digital-to-analog converters and analog-to-digital converters.

CO4: Analyze problems and apply a combination of hardware and software to address problem by programming.

List of Experiments:

1. Programming for 8/16 bit Arithmetic operations Using 8085
   Addition / subtraction / multiplication / division.
2. Programming with control instructions Using 8085
   Ascending / Descending order.
   Maximum / Minimum of numbers.
   ASCII / BCD code conversions.
3. Programming for Arithmetic operations Using 8086
   Addition / subtraction / multiplication / division.
4. A/D Interfacing.
5. D/A Interfacing.
6. Traffic light controller using 8085/8051.
7. Interfacing experiments using 8251, 8254.
8. Programming for 8/16 bit Arithmetic operations Using 8051
   Addition / subtraction / multiplication / division.
9. Interfacing and Programming of Servo Motor Speed control using 8051.
10. Interfacing and Programming of Stepper Motor control using 8085/8051.
11. Interfacing and Programming of LCD Using 8051.
12. Keyboard / Display Interface using 8279.

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Course Code: 140EE0508	**Course Title:**DIGITAL AND INTEGRATED CIRCUITS LABORATORY
Core/Elective: Core	**Credits (L:T:P:C:M)** – 0 : 0 : 3 : 2 : 100
Type: Practical	**Total Contact Hours:** 45

Pre-requisites: The student should have undergone the course(s):

1. Digital Electronics
2. Linear integrated and circuits applications

Course Outcomes:

At the end of the course the learner can able to

CO1. Analyze the digital circuits and design the circuit with the help of K-map and truth table.

CO2. Verify the functions of basic gates and flip-flops.

CO3. Design and implement the digital circuits such as encoders,decoders, MUX DEMUX, counters, adders &Subtractors.

CO4. Design and implement the integrated circuits with OPAMP such as inverting Noninverting amplifiers,comparators,differentiators,integrators,VCO,multivibrators, Frequency multipliers.

List of Experiments:

1. Verification of truth table for NOR, NAND, JK FF, RS FF, D FF.
2. **Implementation of Adder/ Subtractor circuits**.
Half adder, Full adder, Half subtractor and Full subtractor using logic gates.
3. **Code converters**.
4. **Encoders and Decoders:**
8x3 encoder and 3x8 decoder.
5. **Counters**:
a)Design and implementation of modulo N counter.
b) Design and implementation of 4-bit shift registers.
6. **Multiplex/ De-multiplex**:
4:1 multiplexer and 1:4demultiplexer
7.Inverting and non-inverting amplifier,Adder, comparator using **Op-Amp**
8.Integrator and Differentiator using **Op-Amp**
9.Precision Rectifier using Op -Amp.
10. **Timer IC application**:
NE/SE 555 timer in Astable, Monostable operation.
11.Design and Verification of Voltage Comparator using OP AMP.
12.**VCO and PLL ICs**:
a) Voltage to frequency characteristics of NE/ SE 566 IC.
b) Frequency multiplication using NE/SE 565 PLL IC.

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Course Code: 140EE0509	**Course Title:**CONTROL SYSTEMS LABORATORY
Core/Elective: Core	**Credits (L:T:P:C:M)** – 0 : 0 : 3 : 2 : 100
Type: Practical	**Total Contact Hours:** 45

Pre-requisites: The student should have undergone the course(s):

1. Electrical Machines lab

Course Outcomes:

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

CO1: Demonstrate an experiment to find the transfer function of a DC and AC motor.

CO2: Analyze the transient behavior of closed control system using DC and AC motor position controller

CO3: Design P,PI, PID controllers ,Lag-lead compensators based on specifications

CO4: Simulate the response characteristics and stability of linear first order and second order system.

List of Experiments:

1. Determination of transfer function of DC Servomotor
2. Determination of transfer function of AC Servomotor.
3. Determination of transfer function of Field Controlled DC Motor.
4. DC position control systems.
5. AC position control systems.
6. Synchro Transmitter and Receiver.
7. Determination of transfer function of Armature Controlled DC Motor.
8. Design of P, PI, PID Controller.
9. Frequency response of Lag lead and Lead lag Network.
10. a) Simulation of first order and second order systems.
    b) Simulation of Stability analysis of LinearSystems.
11. Determination of transfer function of Separately Excited DC Generator.
12.. Determination of transfer function of Self Excited DC Generator

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SEMESTER VI

Course Code:140EE0601	**Course Title:** POWER SYSTEM ANALYSIS AND STABILITY
Core/Elective: Core	**Credits (L : T : P : C : M)** – 3 : 1: 0 : 4 : 100
Type: Lecture	**Total Contact Hours:**60

Pre-requisites: The student should have undergone the course(s):

1. Circuit Theory
2. Generation, Transmission & Distribution

Course Outcomes:

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

CO 1: Explain the structure of Power System.

CO 2: Develop model for various components in power system.

CO 3: Analyze the power flow problems using different methods.

CO 4: Analyze the system faults such as symmetrical and unsymmetrical faults.

CO 5: Examine the concept of stability in the power system.

Course Content:

UNIT I INTRODUCTION 13

Structure of Power System. Overview of the Power System Analysis. Need for system analysis in planning and operation of power system – distinction between steady state and transient state – per phase analysis of symmetrical single phase & three-phase system. General aspects relating to power flow, short circuit and stability analysis - per unit representation. Steps to draw per unit impedance and reactance diagram.

UNIT II MODELING OF VARIOUS COMPONENTS / ACCESSORIES 11

Primitive network and its matrices – bus admittance (Y-bus) and bus impedance matrix (Z-bus) formation. Formation of bus impedance by two-rule method or Inspection method – Z-bus building algorithm - π-equivalent circuit of transformer with off-nominal-tap ratio. Introduction to Matlab-Simulink and its applications to Power System Analysis..

UNIT - III POWER FLOW ANALYSIS 10

Power Flow Equation. Bus classification with its known and unknown parameters—Problem definition -Solution by Gauss–Seidel and Newton–Raphson methods - P-V bus adjustments for both methods – Comparison of both the buses with its advantages and disadvantages. Computation of slack bus power, line flow and line losses. Introduction to Power factory digisilient software and its applications to Power System Analysis

UNIT - IV SHORT CIRCUIT ANALYSIS 13

Need for short circuit study- Approximations in modeling – Fault MVA- Symmetrical short circuit analysis – Thevenin's equivalent representation - Unsymmetrical Fault Analysis - Symmetrical component transformation – sequence impedances – sequence networks – Types of

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unsymmetrical fault - unsymmetrical fault analysis on an unloaded generator- unsymmetrical analysis on power system. Introduction to ETAP tools and its applications to Power System Analysis.

UNIT -V STABILITY ANALYSIS 10

Concept of stability in power system - Swing equation - stability limits - methods of improving stability limits- Solution of swing equation by Euler's method and Runge-Kutta method – power angle equations - Equal area criterion - critical clearing angle and time. Introduction to PS-CAD tools its applications to Power System Analysis.

Text Books:

1. P.Kundur,'PowerSystem Stability and Control, TataMcGraw-Hill Publishing Company Ltd.,NewDelhi, 2012.
2. I.J.NagrathandD.P.Kothari,'ModernPowerSystem Analysis',TataMcGraw-Hill Publishing Company Ltd.NewDelhi,2012.
3. Allen. J. Wood and Bruce F. Wollenberg, 'Power Generation, Operation and Control', John Wiley & Sons, Inc., 2003. 37

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1. John J. Grainger and Stevenson Jr. W.D., 'Power System Analysis', 1st Edition, Tata McGraw Hill, 2003.
2. C.L. Wadhwa-Electrical Power systems, Second edition, Wiley Eastern Limited, 2012.
3. Olle.I.Elgerd,'ElectricEnergySystems Theory–An Introduction', Second Edition, TataMcGrawHill Publishing company Limited, New Delhi,2011.

Web References:

1. http://nptel.ac.in/syllabus/108101004
2. http://electrical4u.com
3. https://www.vidyarthiplus.com/vp/thread-28545.html

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HOD-Electrical and Electronics Engineering
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Course Code:140EE0602	Course Title:PRINCIPLES OF DIGITAL SIGNAL PROCESSING (Common to EEE,EIE,ICE)
Core/Elective:Core	Credits (L : T : P : C : M) – 3 : 1: 0 : 4 : 100
Type: Lecture	Total Contact Hours:60

Pre-requisites: The student should have undergone the course(s):

Digital Electronics

Course Outcomes:

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

CO 1: Classify signals and systems & perform basic signal processing operations.

CO 2: Analyze the discrete time systems using Z and Fourier transforms.

CO 3: Compute DFT and IDFT by DIT & DIF techniques and compare the results.

CO 4: Design digital filter for the given specification by various methods.

CO 5: Explain the importance of real-time DSP for digital signal processing applications.

Course Content:

UNIT I DISCRETE TIME SIGNALS AND SYSTEMS 12

Need and benefits of Digital Signal Processing - Classification of systems: Continuous, discrete, linear, causal, stable, dynamic, recursive, time variance - classification of signals: continuous and discrete, energy and power - mathematical representation of signals - Typical signal processing operations: convolution, correlation and transformation - Analog to Digital conversion of signals - sampling, signal reconstruction, signal quantization and encoding.

UNIT II DISCRETE TIME SYSTEM ANALYSIS 12

Z-transform and its properties, inverse z-transforms; difference equation – Solution by z transform - application to discrete systems - Stability analysis, frequency response – Fourier transform of discrete sequence – Discrete Fourier series– Convolution using Z-transform and Fourier transform.

UNIT - III DISCRETE TRANSFORMS 12

DFT – Definition - properties, Computation of DFT using FFT algorithm – DIT & DIF -FFT using radix 2 – Butterfly structure; Computation of IDFT using DFT.

UNIT - IV DESIGN OF DIGITAL FILTERS 12

IIR design: Approximation of analog filter design - Butterworth and Chebyshev; digital design using impulse invariant and bilinear transformation - Warping, prewarping - Frequency transformation.

FIR design: Windowing Techniques – Need and choice of windows – Linear phase characteristics. FIR & IIR filter realization – Parallel & cascade forms.

UNIT -V PROGRAMMABLE DIGITAL SIGNAL PROCESSORS 12

Introduction to programmable DSP's – An overview of TMS320F281X – TMS320F281X Assembly Language Instructions – Application programs in TMS320F281X.

Text Books:

BoS Chairman

HOD-Electrical and Electronics Engineering
Dr. Mahalingam College of Engineering and Technology
Pollachi - 642 003.

Text Books:

1. J.G. Proakis and D.G. Manolakis, 'Digital Signal Processing Principles, Algorithms and Applications', Pearson Education, New Delhi, 4th Edition,2007.
2. B. Venkataramani, M. Bhaskar, 'Digital Signal Processors, Architecture,Programming and Applications', Tata McGraw Hill, New Delhi, 2002.
3. A.V. Oppenheim and R.W. Schafer, 'Discrete Time Signal Processing', Prentice Hall, Third Edition.2013.

Reference Books:

1. S.K. Mitra, 'Digital Signal Processing – A Computer Based Approach', Tata McGraw Hill, New Delhi, Third Edition,2008.
2. S. Salivahanan, A. Vallavaraj, C. Gnanapriya, 'Digital Signal Processing', Tata McGraw Hill, New Delhi, Second Edition,2010.
3. Steve Smith, 'The Scientist and Engineer's Guide to Digital Signal Processing', California Technical Publishing, 19972013

Web References:

1. http://www.dspguide.com/pdfbook.htm (free on-line text in pdf format).
2. www.ti.com/ TMS320F281X data sheet
3. www.dspguru.com

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HOD-Electrical and Electronics Engineering
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Pollachi - 642 003.

Course Code:140EE0603	Course Title: PROTECTION AND SWITCH GEAR
Core/Elective:Core	Credits (L : T : P : C : M) – 3 : 0 : 0 : 3 : 100
Type: Lecture	Total Contact Hours:45

Pre-requisites: The student should have undergone the course(s):

1. Basics of power system
2. Basics of Electromagnetism

Course Outcomes:

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

CO1: Explain about various faults and protections in power system.

CO2: Select the type of relay used in different equipment in power system.

CO3:Classify the different types of protection for motor, bus bar, alternator and feeders

CO4: Classify and explain the different types of circuit breakers.

CO5: Choose the insulation level for the several components in power system.

Course Content:

UNIT I INTRODUCTION TO PROTECTIVE SCHEMES AND OVER VOLTAGES 9

Principles and need for protective schemes - Nature and cause of faults - Types of fault - Power system earthing: grounded and ungrounded - Zones of protection and essential qualities of protection - Current limiting reactors - CTs and PTs and their applications in protection schemes. **Surge**: Switching surges - Lightning phenomenon - Protections against lightning - Lightning arresters – Types - Surge absorbers.

UNIT II PROTECTIVE RELAYS 9

Definition - Requirement of relays - Universal relay torque equation - Non directional and directional over current relays - Earth fault relays - Distance relays: Impedance, Mho and Reactance relays - Differential relays - Negative sequence relays - Under frequency relays - Introduction to static relays - Microprocessor and computer based protective relaying.

UNIT - III APPARATUS AND LINE PROTECTION 9

Alternator, Transformer, Bus bar and Motor protection using relays - Feeder Protection: Pilot (Translay) relay, Power line carrier communication, Carrier and Microwave pilot relays.

UNIT - IV CIRCUIT BREAKERS AND ARC INTERRUPTION 9

Functions of switchgear - Elementary principles of arc extinction - Arc control devices - Recovery voltage and restriking voltage - Current chopping and capacitance current breaking - Bulk oil, Low oil, Air break, Air blast, and Sulphur hexafluoride and Vacuum circuit breakers - HVDC breakers – Rating - Testing of circuit breakers.

UNIT -V INSULATION CO-ORDINATION AND IE STANDARDS 9

Definition - Determination of line insulation - Insulation levels of sub-station equipment – insulation levels at sub stations with protective zones-insulation coordination-BIL-statistical methods for insulation coordination- Introduction to Indian Electricity rules.

Text Books:

1. Soni M L, Gupta P V, Bhatnagar U S and Chakrabarti A, "A Text Book on Power Systems Engineering", DhanpatRai& Co Ltd., Delhi, 2010.
2. Ravindranath B and Chander M, "Power System Protection and Switchgear", New Age International Ltd., New Delhi, 2011.
3. Badri Ram, Vishwakarma D N, "Power System Protection and Switch Gear", Tata McGraw Hill Education Private Limited, New Delhi, 2011.

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Reference Books:

1. Sunil S Rao, "Switchgear Protection and Power Systems", 13th Edition, Khanna Publishers, Delhi, 2008.
2. Paithankar Y G, Bhide S R, "Fundamentals of Power System Protection" Prentice - Hall of India Ltd, New Delhi – 2003.
3. Wadhwa C L, "Electrical Power Systems", Fourth Edition, New Age International Publishers, Reprint: Aug, 2007.

Web References:

1. http://www.accessengineeringlibrary.com/
2. http://www.electrical4u.com/
3. https://en.wikipedia.org/

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HOD-Electrical and Electronics Engineering
Dr. Mahalingam College of Engineering and Technology
Pollachi - 642 003.

Course Code: 140EE0604	Course Title: POWER ELECTRONICS (Common to EEE,EIE,ICE)
Core/Elective: Core	Credits (L : T : P : C : M) – 3 : 1 : 0 : 4 : 100
Type: Lecture	Total Contact Hours: 60

Pre-requisites: The student should have undergone the course(s):
Electron Devices & Circuits

Course Outcomes:

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

CO 1: Classify the characteristics of various power semiconductor devices.
CO 2: Analyze and design the AC/DC rectifier circuits.
CO 3: Illustrate the different topologies of DC/DC converter circuits.
CO 4: Compare and contrast the different PWM techniques of Inverter circuits
CO 5: Demonstrate the basic concepts in AC/AC converter circuits.

Course Content:

UNIT I — POWER SEMI-CONDUCTOR DEVICES — 12

Introduction -Power Diode:V-I characteristics, reverse recovery characteristics and types – Thyristor family (SCR, TRIAC and GTO): Basic structure, static and dynamic characteristics, device specifications and ratings, methods of turn-on and turn-off - gate triggering circuit using UJT, commutation circuits, series and parallel connections and protection circuits – Power Transistors: Basic structure, static and dynamic characteristics of Power MOSFET and Power IGBT.

UNIT II — AC-DC CONVERTERS — 15

Single Phase: Principle of phase angle control, Half wave rectifier with R and RL loads, function of freewheeling diode, semi-converter (Asymmetrical and Symmetrical configurations), Fully controlled converter with R and RL loads, Estimation of average load voltage and rms load voltage, Performance parameters, single-phase dual converter and effect of source inductance, Simple Problems.Three Phase: Operation of half wave converter, half controlled and fully controlled converters with R and RL loads, Estimation of average load voltage, Simple Problems.

UNIT - III — DC-DC CONVERTERS — 12

Choppers: Step-down and step-up chopper, Forced commutation techniques, Time ratio control and current limit control - Simple Problems.

Switching regulators: Principle of operation of Buck regulator, Boost regulator and Buck-boost regulators, SMPS - Simple Problems.

UNIT - IV — DC-AC CONVERTER — 12

Types – Single phase and three phase bridge inverters: basic circuit and operation, Voltage control of single-phase inverters – Control of AC output voltage - Harmonic reduction. – HVDC SYSTEMS – UPS.

UNIT -V — AC-AC CONVERTER — 9

Single phase and three phase AC voltage controllers: Basic circuit operation, sequence control and multi stage sequence control – Cycloconverter: single phase and three phase cycloconverters – Matrix converters – Applications: Tap changing transformers, AC circuit breakers.

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Dr. Mahalingam College of Engineering and Technology
Pollachi - 642 003.

Text Books:

1. Muhammad H. Rashid, "Power Electronics: Circuits, Devices and Applications", Pearson Education, 3rd Edition, 2011.
2. *M.D.Singh and K.B.Khanchandani, "Power Electronics", Tata McGraw-Hill, New Delhi,* 2006.
3. Bimal K Bose, "MODERN POWER ELECTRONICS & AC DRIVES",PHI LEARNING PVT. LTD-NEW DELHI, 2002.

Reference Books:

1. Ned Mohan, T.M.Undeland, W.P.Robbins, "Power Electronics: Converters, applications and design", 3rd Edition, John wiley and Sons, 2006.
2. Joseph Vithayathil, "Power Electronics: Principles and applications", *Tata McGraw-Hill, New Delhi,*2010.
3. Lander : Power Electronics, 3rd Edition, T*ata McGraw Hills Publishing Company Limited, New Delhi* 1994.

Web references:

1. http://www.nptel.ac.in/courses
2. https://www.rose-hulman.edu
3. http://ocw.mit.edu/courses/electrical-engineering-and-computer-science/6-334-power-electronics-spring-2007/download-course-materials/

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HOD-Electrical and Electronics Engine
Dr. Mahalingam College of Engineering and Technology
Pollachi - 642 003.

Course Code: 140EE0607	**Course Title:** POWER ELECTRONICS LABORATORY
Core/Elective: Core	**Credits (L : T : P : C : M)** – 0 : 0 : 3 : 2 : 100
Type: Lab	**Total Contact Hours:** 45

Pre-requisites: The student should have undergone the course(s):

1. Electronic Devices & Circuits

Course Outcomes:

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

CO 1 Classify the characteristics of SCR, MOSFET, and IGBT.
CO 2 Analyze the performance parameters of ac-dc, dc-dc, dc-ac and ac-ac converters
CO 3 Compare the characteristics of various switching technique on inverters
CO 4 Design and simulate UPS and SMPS using MATLAB

List of Experiments:

1. VI & Switching Characteristics of MOSFET.
2. VI & Switching Characteristics of SCR
3. VI & Switching Characteristics of IGBT
4. Single phase half and fully controlled bridge rectifiers
5. Three phase half and fully controlled bridge rectifiers
6. Step up & step down chopper
7. Single-phase series inverter.
8. Three phase PWM inverter(120° & 180° conduction)
9. Single phase Cycloconverter.
10. Three Phase AC voltage controller
11. Simulation of UPS.
12. Simulation of SMPS.

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HOD-Electrical and Electronics Engineering
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Pollachi - 642 003.

Course Code: 140EE0608	**Course Title**: DIGITAL SIGNAL PROCESSING LABORATORY
Core/Elective: Core	**Credits (L : T : P : C : M)** – 0 : 0 : 3 : 2 : 100
Type: Lab	**Total Contact Hours:** 45

Pre-requisites:

The student should have minimal programming knowledge

Course Outcomes:

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

CO 1: Write programs to implement Convolution, Correlation in MATLAB.

CO 2: Verify sampling theorem and analyse aliasing and folding using MATLAB.

CO 3: Determine the frequency response of FIR and IIR filters using MATLAB.

CO 4: Program a DSP chip to perform basic signal processing concepts.

List of Experiments:

PART-A: LIST OF EXPERIMENTS USINGSIMULATION SOFTWARE.

1. Generation of signals.
2. Verification of sampling theorem.
3. Linear & Circular convolution of two given sequences.
4. Autocorrelation & Cross correlation of given sequence.
5. Z Transform & inverse Z Transform of a given Transfer function.
6. Computation of DFT of a given sequence.
7. Design of Chebyshev filters.
8. Design of Butterworth filters.
9. Design and analysis of FIR filter using windows.

PART-B : LIST OF EXPERIMENTS USING DSP PROCESSOR.

1. Generation of signals.
2. Linear & Circular convolution of two given sequences.
3. Computation of N-point DFT of a given sequence.

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Course Code: 140EE0610	**Course Title:** Mini Project
Core/Elective: Core	**Credits (L : T : P : C : M)** – 0 : 0 : 3 : 2 : 100
Type: Lab	**Total Contact Hours:** 45

Course Outcomes:

At the end of the course the learner can able to

CO 1: Develop a small circuit / a computer based analysis / an algorithm /a data collection / a survey and analysis /an application of theoretical concepts

CO 2 :Identify the methodology to solve the problem which is to be used for their major Project

CO 3: Practice a clear cut time line of execution of the project

CO 4: Summarise their work by making presentations and preparing reports with their group

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Pollachi - 642 003.

SEMESTER VII

Course Code:140EE0701	Course Title: PRINCIPLES OF MANAGEMENT (Common to EEE,EIE,ICE,ECE)
Core/Elective: Core	Credits (L : T : P : C : M) – 3 : 0 : 0 : 3 : 100
Type: Lecture	Total Contact Hours: 45

Pre-requisites:

It is intended for those who presently hold, or desire to hold, management responsibilities in any organization or enterprise. Specific topics include planning, decision making, organizing, leading, controlling, and innovating

Course Outcomes:

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

CO 1 :. Explain the concepts to improve the practice of management.

CO 2 : Develop a global vision and management skills at both a strategic level and interpersonal level.

CO 3 :Function effectively in multidisciplinary teams to accomplish a common goal of organizations

CO4 : Appreciate the management challenges associated with high levels of change in the organizations.

CO 5 : Exercise discernment in implementing managerial decisions for ethical, safe, and controlling operations of the business operations.

Course Content:

UNIT I INTRODUCTION 9

Historical developments –approaches to management– Management and Administration – Development of Management Thought – Contribution of Taylor and Fayol – Functions of Management – Types of Business Organization

UNIT II MANAGERS AND ENVIRONMENT 9

Social responsibility–Planning – Objectives – Setting Objectives – Process of Managing through Objectives – Strategies- Policies & Planning Premises- Forecasting Techniques – Decision-making

UNIT - III FUNCTIONAL AREA OF ORGANISATION 9

Formal and informal organization – Organization Chart – Structure and Process – Departmentation by difference strategies – Line and Staff authority – Benefits and Limitations – De-Centralization and Delegation of Authority – Staffing – Selection Process – Techniques

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UNIT - IV MOTIVATION AND DIRECTIONS 9

Objectives– Human Factors – Creativity and Innovation – Harmonizing Objectives – Leadership – Types of Leadership Motivation – Hierarchy of needs – Motivation theories – Motivational Techniques – Job Enrichment – Communication-Types

UNIT -V CONTROLLING STRATEGIES 9

System and process of Controlling – Requirements for effective control – The Budget as Control Technique – Information Technology– Computers in handling the information – Productivity – Problems and Management – Control of Overall Performance – Direct and Preventive Control – Reporting – The Global Environment – Globalization and Liberalization – International Management and Global theory of Management

Text Books:

1. Harold Koontz & Heinz Weihrich 'Essentials of Management', Tata McGraw- Hill-7th Edition-2007.
2. Tripathy PC And Reddy PN, 'Principles of Management', Tata McGraw-Hill 1999
3. Robbins, 'Principles of Management', Pearson education -2005

Reference Books:

1. Joseph L Massie, 'Essentials of Management', Prentice Hall of India- (Pearson) 4th Edition- 2003.
2. Decenzo David- Robbin Stephen. A, 'Personnel and Human Reasons Management', Prentice Hall of India- 1996.
3. V.S.Bagad, 'Principles of Management' ,Technical publications,3rd edition-2009.

Web References:

1. http://www.lib.latrobe.edu.au/
2. www.mftrou.com
3. www.findarticles.com

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HOD-Electrical and Electronics Engineering
Dr. Mahalingam College of Engineering and Technology
Pollachi - 642 003.

Course Code:140EE0702	Course Title: Solid State and Drives
Core/Elective: Core	Credits (L : T : P : C : M) – 3 : 0 : 0 :3 : 100
Type: Lecture	Total Contact Hours: 45

Pre-requisites: The student should have undergone the course(s):

1. Basics of power Electronics and Drives
2. Basics of machines –I and II

Course Outcomes:

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

CO1: Explain about steady state and dynamic operation of motor load system

CO2:Analyse the effect of ripples and motor performance

CO3:Describe the operation and performance of Ac motor Drives

CO4: Classify and explain the different types of speed control methods

CO5: Interpret the digital techniques used in speed control

Course Content:

UNIT I ELECTRIC DRIVES **9**

Introduction-Parts Of Electrical Drives –Torque Equation-Components and Classification Of load torques_-Selection of motor power Rating with regard to thermal model and load variation factors-Load Equalization- Multi Quadrant operation

UNIT II DC DRIVES **9**

DC Motor and their performance- ward leonard drives- single and three phase controlled rectifier fed DC drives-chopper fed DC drives-time ratio control and current ratio control-Four Quadrant operation- Effect of ripples on the DC motor Performance-l. Applications DC traction using Chopper control, mines

UNIT - III INDUCTION MOTOR DRIVES **9**

Speed control methods-stator control: Stator voltage and frequency control, AC Chopper, Inverter and Cycloconverter fed induction motor drives-Rotor control: rotor resistance control-slip recovery schemes- vector control-Applications: paper mills, cranes Doubly fed induction motor in wind mills

UNIT - IV SYNCHRONOUS MOTOR DRIVES **9**

Synchronous motor types-open loop and closed loop speed control of synchronous machine using VSI-power factor control- self-controlled synchronous motor using load commutated inverter and cyclo converter-PMAC drives – BLDC Motor drives

UNIT -V DIGITAL CONTROL OF DRIVES **9**

Closed loop control of electric drives-digital control in drive applications- digital technique in speed control- Advantages and limitations-Microprocessor/PLC based control of drives

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HOD-Electrical and Electronics Engineering
Dr. Mahalingam College of Engineering and Technology
Pollachi - 642 003.

Text Books:

1. Dubey G K, "Fundamentals of drives", Narosa publishing house, new delhi 2013
2. Bimbal K Bose"Modern power electronics and AC drives",Pearson Education,2002.
3. Muhammed h Rashid, "PowerElectronics handbook Devices and applications", Tata McGraw Hill Education Private Limited, New Delhi, 2011.

Reference Books:

1. VedhamSubramanyam-,"Thyristor control of electrical drives", Tata McGraw Hill Education Private Limited, New Delhi, 2002.
2. Ramakant A Gayakward, "Analog and digital control system" Prentice - Hall of India Ltd, New Delhi – 1998.
3. S K Pillay, "A first course on Electric Drives", Fourth Edition, New Age International Publishers, 2002.

Web References:

1. http://www.accessengineeringlibrary.com/
2. http://www.electrical4u.com/
3. https://en.wikipedia.org/

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HOD-Electrical and Electronics Engineering
Dr. Mahalingam College of Engineering and Technology
Pollachi - 642 003.

Course Code:140EE0703	Course Title: ELECTRICAL ENERGY UTILIZATION
Core/Elective: Core	Credits (L : T : P : C : M) – 3 : 0 : 0 : 3 : 100
Type: Lecture	Total Contact Hours: 45

Pre-requisites: The student should have undergone the course(s):

1. Circuit Theory
2. Electrical Machines- I
3. Electrical Machines-II

Course Outcomes:

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

CO 1: Classify the different types of Electric Heating and Illumination & discuss about electric Welding.

CO 2: Describe Electric Traction.

CO3: Discuss mechanics of Train movement & specifies energy consumption

CO 4: Categorize the working of Electric Drives

CO 5: Explain the concept of electrolysis & classify the different types of batteries

CO6: Explain the calculation of Load curves and Number and size of units,& Explain the Economics of generation and Energy auditing

Course Content:

UNIT I ILLUMINATION AND HEATING 9

Nature of radiation – Definition – Laws photometry – Polar curves – Lighting calculations - Design of illumination systems (for residential, industrial, commercial and street lightings) - Types of lamps - Energy efficiency lamps. Methods of heating requirement of heating material - Design of heating element-furnaces – Welding generator-welding transformer and its characteristics.

UNIT II ELECTRIC TRACTION 9

Introduction – Requirements of an ideal traction system – Supply systems – Mechanics of train movement – Tractive effort – Specific energy consumption – Traction motors and control – Multiple units – Braking methods - Current collection systems - Recent trends in electric traction.

UNIT - III DRIVES AND THEIR INDUSTRIAL APPLICATIONS 9

Introduction – Motor selection and related factors – Types of loads – Characteristics – Load equalization – Industrial applications – Modern methods of speed control of industrial drives.

UNIT - IV ELECTROLYTICPROCESSANDSTORAGE OF ELECTRICITY 9

Electrolysis – Polarization factor – Preparation of work for electroplating – Tanks and other equipment – Method of charging and maintenance – Nickel – iron and Nickel – Cadmium batteries – Components and materials – Capacity rating of batteries – Battery chargers.

UNIT -V ENERGY CONSERVATION AND AUDITING 9

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

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HOD-Electrical and Electronics Engineering
Dr. Mahalingam College of Engineering and Technology
Pollachi - 642 003.

Text Books:

1. J.B. Gupta, "Utilization of Electric Power and Electric Traction", Kataria& Sons publishers, Delhi, IX Edtion, 2004. (Units 1-5)
2. C.L. Wadhwa, "Generation, Distribution and Utilization of electrical Energy", New Age International (P) Limited Publishers, 3rd Edition, 2010. (Units 1-5)
3. M.L. Soni, P.V. Gupta, V.S. Bhatnagar, A. Chakrabarti, "A Text Book on Power System Engineering", DhanpatRai& Co., 1998

Reference Books:

1. N.V. Suryanarayana, "Utilization of Electrical Power including Electric drives and Electric traction", New Age International (P) Limited Publishers, 1st Edition,1994.
2. E. Open Shaw Taylor, "Utilization of Electric Energy", Orient Longman,1st Edition,1937.
3. B.R. Gupta, "Generation of Electrical Energy", Eurasia Publishing House Private Limited, New Delhi, 2003.
4. Albert Thumann, William J. Younger, "HandBook of Energy Audits", the Fairmont Press, Inc., 2003

Web References:

1. www.ncbi.nlm.nih.gov/pubmed
2. https://en.wikipedia.org/wiki/Railway_electric_traction
3. www.electrical4u.com/electrical-drives/

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HOD-Electrical and Electronics Engineering
Dr. Mahalingam College of Engineering and Technology
Pollachi - 642 003.

Course Code: 140EE0707	**Course Title:** ELECTRIC DRIVES AND CONTROL LABORATORY
Core/Elective: Core	**Credits (L : T : P : C : M)** – 0 : 0 : 3 : 2 : 100
Type: Lab	**Total Contact Hours:** 45

Pre-requisites: The student should have undergone the course(s):

1. Electrical Machines
2. Power Electronics

Course Outcomes:

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

CO 1: Design and simulate converters for the speed control of dc motors and ac motors

CO 2: Analyze the performance of ac motors using various controllers

CO 3: Analyze the performance of permanent magnet synchronous machines

CO 4: Design the converter for various drive applications

List of Experiments:

1. Simulation of closed loop control of converter fed DC motor.
2. Simulation of closed loop control of chopper fed DC motor.
3. Simulation of VSI fed 3 Phase induction motor.
4. Simulation of 3 Phase synchronous motor drive.
5. Simulation of AC voltage controller fed 3 phase induction motor.
6. Speed control of DC motor using 3 Phase Controlled Rectifier.
7. Speed control of 3 Phase induction motor using PWM inverter.
8. DSP based closed loop drive for induction motor.
9. Induction motor speed control using FPGA.
10. Speed control of 3 Phase induction motor using V/F drives.
11. Induction motor control using PLC drives.
12. Speed control of Permanent Magnet Synchronous Motor drives.

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HOD-Electrical and Electronics Engineering
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Course Code: 140EE0708	**Course Title:** POWER SYSTEM SIMULATION LABORATORY
Core/Elective: Core	**Credits (L : T : P : C : M)** – 0 : 0 : 3 : 2 : 100
Type: Practical	**Total Contact Hours:** 45

Pre-requisites: The student should have undergone the course(s):

1. Generation, Transmission and Distribution
2. Power System Analysis & Stability

Course Outcomes:

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

CO1: Acquire the fundamental knowledge of power system parameters and components
CO2: Form bus admittance and impedance matrices of power system
CO3: Determine the fault in power system
CO4: Simulate power system transients

List of Experiments:

1. Computation of parameters and modeling of transmission lines
2. Formation of bus admittance and impedance matrices.
3. Solution of power flow using Gauss-Seidel method.
4. Solution of power flow using Newton-Raphson method.
5. Load flow analysis by fast decoupled method
6. Short circuit analysis.
7. Load – frequency dynamics of single area power systems.
8. Load – frequency dynamics of two area power systems.
9. Transient and small signal stability analysis – single machine infinite bus system.
10. Transient stability analysis – multi machine infinite bus system.
11. Economic dispatch in power systems.
12. Transient analysis in transmission system.

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SEMESTER VIII

Course Code:140EE0801	**Course Title:** ENGINEERING ECONOMICS AND FINANCIAL ACCOUNTING (Common to ECE,CSE EEE,EIE,ICE)
Core/Elective: Core	**Credits (L : T : P : C : M)** – 3 : 0 : 0 : 3 : 100
Type: Lecture	**Total Contact Hours:** 45

Pre-requisites: The student should have undergone the course(s):

1. Principle of Management

Course Outcomes:

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

CO 1: Discuss about managerial economics and different elements of cost
CO 2: Describe about different market structures
CO 3: Identify the suitable cost estimation procedure
CO 4: Explain the types of costing methods
CO 5: Explain the concepts of cost accounting

Course Content:

UNIT I — INTRODUCTION — 9

Objectives of Managerial Economics, Firm, Cost Estimation, Costing, Cost Accounting, Factors Influencing Managerial Decisions & Theoretical Concepts, Classification and Elements of cost

UNIT II — PRODUCTION ANALYSIS AND PRICING — 9

Production Function-Least Cost Combination of Inputs-Factor Productivities & Return to Scale-Determinants of Price-Pricing under different objectives and Market Structures-Price Discrimination & Pricing methods in practice

UNIT III — ESTIMATION — 9

Estimation of Material, Labor and Overhead Cost, Allocation of Overheads. Estimation for different types of jobs

UNIT IV — COSTING — 9

Job Costing - Operating Costing - Process Costing - Standard Costing (Variance Analysis)GDP

UNIT V — ACCOUNTING — 9

Balance Sheet - Profit & Loss Statement - Evaluation of Investment decisions – Average Rate of Return-Payback Period-Net Present Value & IRR

Text Books:

1. V.L.Mote, Samuel Paul &G.S.Gupta, Managerial Economics-Concepts & Cases, TMH, Co, NewDelhi, 1989
2. T.P.Banga&S.C.Sharma, Mechancial Estimating and Costing, Khanna Publishers, 1984
3. Jawaharlal, Cost Accounting, Tata McGraw-Hill company, 1996

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HOD-Electrical and Electronics Engineering
Dr. Mahalingam College of Engineering and Technology
Pollachi - 642 003.

Reference Books:

1. James.C.Van Home, "Fundamentals of fincancial Management", PHI, NewDelhi, 2004.
2. RamachandranAryasry&VV.Ramana Murthy, Engg Economics & Financial Accounting, Tata McGraw-Hill company, NewDelhi, 2004
3. Craig H.Petersen, W.Cris Lewis &Sudhir K. Jain, " Managerial Economics", Pearson Education, 4th Edition, 2009

Web References:

1. http://www.managementstudyguide.com/managerial-economics.htm
2. http://nptel.ac.in/courses/110101003/1
3. http://nptel.ac.in/courses/110101004/17

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HOD-Electrical and Electronics Engineering
Dr. Mahalingam College of Engineering and Technology
Pollachi - 642 003.

Course Code: 140EE0810	**Course Title:** Project
Core/Elective: Core	**Credits (L : T : P : C : M)** – 0 : 0 : 12 : 8 : 200
Type: Lab	**Total Contact Hours:** - 45

Course Outcomes:

At the end of the course the learner can able to

CO 1: Create a circuit / a computer based analysis / an algorithm /a data collection / a survey and analysis /an application of theoretical concepts

CO 2:Develop a solution for an industrial problem by designing a prototype

CO 3: Practice a clear cut time line of execution of the project

CO 4: Summarise their work by making presentations and preparing reports with their group

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ELECTIVES

Course Code:140EE9111	**Course Title: POWER SYSTEM QUALITY**
Core/Elective: Elective	**Credits (L : T : P : C : M)** – 3 : 0 : 0 : 3 : 100
Type: Lecture	**Total Contact Hours:** 45

Pre-requisites: The student should have undergone the course(s):

1.Power Electronics
2.Power System Analysis & Stability

Course Outcomes:

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

CO1:Explain the concepts of basic power quality problems & its characteristics
CO2:Analyse the different sources of creating PQ problems.
CO3:Explain the voltage sag mitigation techniques.
CO4: Explain the different types of wave form distortion.
CO5:Outline the power quality survey and power quality monitoring and Create awareness in operation of harmonic controlling devices

Course Content:

UNIT I INTRODUCTION 6

Definitions: Power quality, Voltage quality – Power quality issues: Short duration voltage variations, Long duration voltage variations, Transients, Waveform distortion, Voltage imbalance, Voltage fluctuation and Power frequency variations – Sources and Effects of power quality problems – Power quality terms – CBEMA and ITI curves – IEEE and IEC Standards

UNIT II VOLTAGE SAGS AND INTERRUPTIONS 9

Sources of sags and Interruptions – Estimating Voltage Sag Performance – Motor Starting sag – Voltage Sag Mitigation – Economic Evaluation of Different ride-through Alternatives.

UNIT - III TRANSIENT OVERVOLTAGES 10

Sources of Transient Overvoltage: Capacitor Switching, Lightning, Ferroresonance – Principle of Overvoltage Protection – Devices for Overvoltage Protection – Utility capacitor-switching Transients – Lightning Protection – Switching transients with load – Computer analysis tools for Transients: PSCAD, EMTP

UNIT - IV WAVEFORM DISTORTION 10

Harmonics: Types, Harmonic Distortion, Harmonics indices, Voltage Vs Current distortion, Harmonics Vs Transients, Harmonics Evaluation – Sources and Effects of harmonic distortion – System response characteristics – Principles of controlling harmonics –Harmonic Standards– Devices for Controlling harmonics: Passive Filter and Active Power filter.

UNIT -V POWER QUALITY MONITORING 10

Power quality monitoring: Need for power quality monitoring, Monitoring considerations – Power quality measurement tools – Assessment of PQ measurement data – Expert system for PQ monitoring - Planning, Conducting and Analyzing power quality survey

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Text Books:

1.Roger C. Dugan, Mark, F. McGranaghan and H.WayneBeaty, "Electrical Power Systems Quality", 3rd Edition, McGraw-Hill, New York, 2009

2. Barry W. Kennedy, “Power Quality Primer”, McGraw-Hill, New York, 2000.

3.Jos Arrillaga, Neville R. Watson”Power System Harmonics”, 2nd EditionWiley-Blackwell 2003

Reference Books:

1. Math H. J. Bollen, "Understanding Power Quality Problems: Voltage Sags and Interruptions", IEEE Press, New York, 2000.
2. Sankaran. C, "Power Quality", CRC Press, Washington, D.C., 2002
3. AravindamGhosh, "Power Quality enhancement using custom power devices" Kluwer Academic Publishers, 2002.

Web references:

1. https://www.bchydro.com/.../power_quality_application_guide_adjustabl...
2. www.gentec.ca/stock/eng/power-quality-technical-application-guide.pdf
3. http://samples.sainsburysebooks.co.uk/9780470754238_sample_390210.pdf

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Course Code: 140EE9112	**Course Title:** CAD DESIGN OF ELECTRICAL APPARATUS
Core/Elective: Elective	**Credits (L : T : P : C : M)** – 3 : 0 : 0 : 3 : 100
Type: Lecture	**Total Contact Hours:** 45

Pre-requisites: The student should have undergone the course(s):

1. Electrical Machines- I
2. Electrical Machines-II
3. Electrical Machine Design

Course Outcomes:

At the end of this course the student will be able to
CO1: Describe the importance of computer aided design method.
CO2: Explain the basic electromagnetic field equations and the problem formulation for CAD applications.
CO3: Explain Finite Element Method as applicable for Electrical Engineering.
CO4: Explain the organization of a typical CAD package.
CO5: Apply Finite Element Method for the design of different Electrical apparatus.

Course Content:

UNIT I INTRODUCTION 8

Conventional design procedures – Limitations – Need for field analysis based design – Review of Basic principles of energy conversion – Development of Torque/Force.

UNIT II MATHEMATICAL FORMULATION OF FIELD PROBLEMS 9

Electromagnetic Field Equations – Magnetic Vector/Scalar potential – Electrical vector /Scalar potential – Stored energy in Electric and Magnetic fields – Capacitance - Inductance- Laplace and Poisson's Equations – Energy functional.

UNIT III PHILOSOPHY OF FEM 10

Mathematical models – Differential/Integral equations – Finite Difference method – Finite element method – Energy minimization – Variational method- 2D field problems – Discretisation – Shape functions – Stiffness matrix – Solution techniques.

UNIT IV CAD PACKAGES 9

Elements of a CAD System –Pre-processing – Modelling – Meshing – Material properties-Boundary Conditions – Setting up solution – Post processing.

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Text Books:

1.Roger C. Dugan, Mark, F. McGranaghan and H.WayneBeaty, "Electrical Power Systems Quality", 3rd Edition, McGraw-Hill, New York, 2009

2. Barry W. Kennedy, "Power Quality Primer", McGraw-Hill, New York, 2000.

3.Jos Arrillaga, Neville R. Watson"Power System Harmonics", 2nd EditionWiley-Blackwell 2003

Reference Books:

1. Math H. J. Bollen, "Understanding Power Quality Problems: Voltage Sags and Interruptions", IEEE Press, New York, 2000.
2. Sankaran. C, "Power Quality", CRC Press, Washington, D.C., 2002
3. AravindamGhosh, "Power Quality enhancement using custom power devices" Kluwer Academic Publishers, 2002.

Web references:

1. https://www.bchydro.com/.../power_quality_application_guide_adjustabl...
2. www.gentec.ca/stock/eng/power-quality-technical-application-guide.pdf
3. http://samples.sainsburysebooks.co.uk/9780470754238_sample_390210.pdf

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Course Code: 140EE9113	Course Title: FLEXIBLE AC TRANSMISSION SYSTEMS
Core/Elective: Elective	**Credits (L : T : P : C : M)** – 3 : 0 : 0 : 3 : 100
Type: Lecture	**Total Contact Hours:**45

Pre-requisites: The student should have undergone the course(s):

1. Generation,Transmission & Distribution
2. Power Electronics

Course Outcomes:

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

CO1: Explain the principles of Reactive power compensators.

CO2: Discuss the operation of Thyristor controlled Shunt Compensator.

CO3: Discuss the operation of Thyristor controlled Series Compensator

CO4: Illustrate the static devices for Shunt and Series Compensation.

CO5: Describe the operation of controllers for enhancing the transmission capability.

Course Content:

UNIT I COMPENSATORS 9

Introduction to FACTS controllers – Reactive power control: Reactive power, uncompensated transmission line, reactive power compensation – Principles of conventional reactive power compensators: Synchronous condensers, saturated reactor, phase angle regulator and other controllers.

UNIT II THYRISTOR CONTROLLED SHUNT COMPENSATOR 9

Objective of shunt compensation – Principle and operating characteristics of Thyristor Controlled Reactor(TCR) – Thyristor Switched Capacitor(TSC) – Static VAR Compensators (SVC) – SVC control system – SVC voltage regulator model – Transfer function and dynamic performance of SVC – Transient stability enhancement and power oscillation damping, mitigation of sub-synchronous resonance.

UNIT – III THYRISTOR CONTROLLED SERIES COMPENSATOR (TCSC) 9

Series compensation – Principles of operation of TCSC – Capability characteristics of TCSC – Modeling of TCSC – TCSC control system – enhancement of system damping – mitigation of sub-synchronous resonance.

UNIT – IV VSC BASED SHUNT AND SERIES COMPENSATOR 9

Static Synchronous Compensator (STATCOM): Principle of operation, VI Characteristics, Harmonic performance – Steady state model – SSR mitigation.

Static Synchronous Series Compensator (SSSC): Principle of operation and characteristics of SSSC – control range and VA rating – capability to provide real power compensation –Immunity to sub-synchronous resonance – control scheme for SSSC.

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UNIT –V UNIFIED POWER FLOW CONTROLLER **9**

Basic operating principles – conventional transmission control capability of UPFC –Independent real and reactive power flow control – control scheme for UPFC – Basic control system for P and Q control – dynamic performance.

Text Books:

1. Narain G. Hingorani and Laszlo Gyugyi, "Understanding FACTS concepts and technology of flexible AC transmission systems" IEEE power Engineering society Sponsor, IEEE press, 2001.
2. R. Mohan Mathur and Rajiv K. Varma, "Thyristor-Based FACTS Controllers for Electrical Transmission Systems", Edition February 2002, IEEE press-John Wiley and Sons publications, 2002

Reference Books:

1. Vijay K. Sood, "HVDC and FACTS Controller: Application of Static Converters in power systems", IEEE Power Electronics and Power Systems series, Kluwer Academic publishers, Boston, First edition January 2004.
2. Timothy John Eastham Miller, "Reactive power control in Electric systems", John Wiley and sons, New York, 1982.
3. Yong Hua Song and Allan T Johns, "Flexible AC Transmission System (FACTS)",IEEE Power Engineering Series-IEEE press, 1999.
4. K. R. Padiyar, "HVDC Power Transmission Systems Technology and System Interactions", New Age International (p) Limited, New Delhi, 2003.
5. Einar V. Larsen, Jaun J. Sanchez-Gasca and Joe H. Chow, "Concepts of design of FACTS Controllers to damp power swings", IEEE Transaction on Power Systems,Vol. 10, no. 2, May 1995.
6. Gyugyi L, "Unified Power flow control concept for flexible AC transmission", IEEE Proceedings, vol. 139, no. 4, July 1992

Web References:

1. http://nptel.ac.in/courses/108104052/
2. http://nptel.ac.in/syllabus/syllabus.php?subjectId=108101003
3. http://ocw.mit.edu/index.htm
4. http://eeekits.blogspot.in/2011/09/flexible-ac-transmission-system-by-pal.html
5. http://www.energy.siemens.com/hq/en/power-transmission/facts/
6. http://www.abb.com/facts

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Course Code:140EE9114	**Course Title:**SPECIAL ELECTRICAL MACHINES
Core/Elective: Elective	**Credits (L : T : P : C : M)** – 3 : 0 : 0 : 3 : 100
Type: Lecture	**Total Contact Hours:** 45

Pre-requisites: The student should have undergone the course(s):

1. Electrical Machines- I
2. Electrical Machines-II

Course Outcomes:

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

CO 1: Analyze the construction, principle of operation and performance of synchronous reluctance motors.

CO 2: Describe the construction, principle of operation, control and performance of stepping motors.

CO 3: Explain the construction, principle of operation, control and performance of switched reluctance motors.

CO 4: Illustrate the construction, principle of operation, control and performance of permanent magnet brushless D.C.

CO 5: Explain the construction, principle of operation and performance of permanent magnet synchronous motors

Course Content:

UNIT I SYNCHRONOUS RELUCTANCE MOTORS 9

Constructional features–Types–Axial and Radial flux motors – Operating principles–Variable ReluctanceandHybridMotors–SYNRELMotors–VoltageandTorqueEquations- Phasor diagram – Characteristics.

UNIT II STEPPING MOTORS 9

Constructional features – Principle of operation–Variable reluctance motor – Hybrid motor – Single and multi stack configurations–Torque equations – Modes of excitations – Characteristics–Drive circuits–Microprocessor control of stepping motors–Closed loop control.

UNIT - III SWITCHED RELUCTANCEMOTORS 9

Constructionalfeatures–RotaryandLinearSRMs-Principleofoperation–Torqueproduction–Steadystateperformanceprediction-Analyticalmethod-PowerConvertersandtheircontrollers–MethodsofRotorpositionsensing–Sensorlessoperation–ClosedloopcontrolofSRM - Characteristics.

UNIT - IV PERMANENT MAGNET BRUSHLESS D.C. MOTORS 9

Permanent Magnet materials – Magnetic Characteristics – Permeance coefficient-Principle of operation–Types–Magnetic circuit analysis – EMF and torque equations – Commutation- Power controllers–Motor characteristics and control.

UNIT -V PERMANENT MAGNET SYNCHRONOUSMOTORS 9

Principleofoperation–Ideal PMSM –EMFandTorqueequations–ArmaturereactionMMF– Synchronous Reactance – Sinewave motor with practical windings - Phasor diagram – Torque/speedcharacteristics- Power controllers- ConverterVolt-ampere requirements.

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Text Books:

1. T.J.E.Miller,'BrushlessPermanentMagnetandReluctanceMotorDrives',ClarendonPress, Oxford, 1989.
2. T. Kenjo,'SteppingMotorsandTheirMicroprocessorControls',ClarendonPressLondon, 1984.
3. S Bhattacharya 'ELECTRICAL MACHINES' McGraw Hill Education (India) Private Limited; 3 edition (27 August 2008)

Reference Books:

1. R.Krishnan,'SwitchedReluctanceMotorDrivesModeling,Simulation,Analysis,DesignandApplication' ,CRCPress,NewYork,2001.
2. P.P.Aearnley,'SteppingMotorsAGuidetoMotorTheoryandPractice',PeterPerengrinusLondon,1982.
3. T.KenjoandS.Nagamori,'PermanentMagnetandBrushlessDCMotors',ClarendonPress, London, 1988

Web references:

1.www.academia.edu/.../SPECIAL_ELECTRICAL_MACHINES_NPTEL

2.https://www.vidyarthiplus.com/vp/thread-28545.html

3.www.nct-tech.edu.lk/Download/.../Stepping%20Motors.pdf

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Course Code:140EE9115	Course Title: POWER SYSTEM OPERATION AND CONTROL
Core/Elective: Elective	Credits (L : T : P : C : M) – 3 : 0 : 0 : 3 : 100
Type: Lecture	Total Contact Hours: 45

Pre-requisites: The student should have undergone the course(s):

1. Power Systems analysis and stability
2. Generation, Transmission & Distribution

Course Outcomes:

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

CO1:Analyze the overview of power system operation and control

CO2: Develop generation scheduling scheme for steam generating units.

CO3:Analyze the system control based on Real power & Frequency control

CO4:Analyze the system control based on Reactive power & Voltage control

CO5:Explain the concepts of operating states of power systems and system security

Course Content:

UNIT I INTRODUCTION 9

Structure of Power System, Load and load duration curves; Load forecasting, components of system load, classification of base load, load factor, diversity factor & important terms for deciding the type and rating of the generating plant with related problems. Reserve requirements: Installed reserves, spinning reserves, cold reserves, hot reserves.

UNIT II THE ECONOMIC DISPATCH & UNIT COMMITMENT 9

Economic dispatch – Incremental cost curve, co-ordination equations without loss and with loss, solution by direct method and λ-iteration method. (No derivation of loss coefficients.).Base point and participation factors. Introduction to unit commitments constraints on unit commitment, unit commitment using priority ordering load dispatching and dynamic programming method.

UNIT - III ACTIVE POWER & FREQUENCY CONTROL 9

Speed governing system – Transfer function model, load frequency control of single area system – static response & dynamic response. AGC in isolated power systems - AGC in interconnected power systems – Two area system –modeling of tie line – representation of two area system – static and dynamic response – tie line bias control - Frequency bias tie line control - Basis for selection of bias factor

UNIT - IV REACTIVE POWER & VOLTAGE CONTROL 9

Fundamental characteristics of excitation system; Block diagram model of exciter system; Generation and absorption of reactive power; Methods of voltage control; static shunt capacitor/inductor VAR compensator; tap changing transformer; comparisons of different types of compensating equipment for transmission systems. Excitation Systems Requirements - Elements of an excitation system - Modeling of excitation system. Types of excitation systems - DC, AC.

UNIT -V STATE ESTIMATION & SECURITY ANALYSIS 9

Power system security; Factors affecting system security; Different operating states of power systems; Energy Control Centers& EMS functions; Necessity for regulation of system frequency and voltage; Power systems control problems; SCADA systems

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Text Books:

1. Olle.I.Elgerd, ‘Electric Energy Systems theory - An introduction’, Tata McGraw Hill Education Pvt. Ltd., New Delhi, 34th reprint, 2010.
2. Allen. J. Wood and Bruce F. Wollenberg, ‘Power Generation, Operation and Control’, John Wiley& Sons, Inc., 2003. 37
3. AbhijitChakrabarti, SunitaHalder, ‘Power System Analysis Operation and Control’, PHI learning Pvt. Ltd., New Delhi, Third Edition, 2010.

Reference Books:

1. Kundur P., ‘Power System Stability and Control, Tata McGraw Hill Education Pvt. Ltd., New Delhi, 10th reprint, 2010.
2. Nagrath&Kothari,"Power System Engineering”, Tata MCGraw Hill Publication, 2012.
3. N.V.Ramana, “Power System Operation and Control,” Pearson, 2011

Web References:

1. http://nptel.ac.in/syllabus/108101004
2. http://elearning.vtu.ac.in/12/enotes/psoc/Unit1&6-BVS.pdf
3. http://www.uptu.ac.in/pdf/sub_eee_031_30sep14.pdf

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HOD-Electrical and Electronics Engineering
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Course Code:140EE9116	Course Title: POWER ELECTRONICS APPLICATIONS TO POWER SYSTEMS
Core/Elective: Elective	**Credits (L : T : P : C : M)** – 3 : 0 : 0 : 3 : 100
Type: Lecture	**Total Contact Hours:** 45

PREREQUISITES: The student should have undergone the course(s):

1. Power Systems analysis and stability

Course Outcomes:

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

CO1: Analyze the performance of power devices & converters for high power applications.
CO2: Analyze the system control
CO3: Design the power converters for wind& solar energy.
CO4: Design the converters for HVDC transmission
CO5: Design the converters for FACTS

UNIT I : INTRODUCTION **9**

High power devices for power system controllers - characteristics - converters configurations for large power control-Single and three phase converters: Properties - current and voltage harmonics - effects of source and load impedance - choice of best circuit for power systems.

UNIT II : CONVERTER CONTROL **9**

Gate control - Basic means of control - Control characteristics - Stability of control - Reactive power control - Power flow analysis: Component models - Converter model -analysis of converter - Transient and dynamic stability analysis – protection.

UNIT III : WIND ENERGY CONVERSION SYSTEM **9**

Basic components - Generator control - Harmonics - Power factor improvement.PV CONVERSION SYSTEMS: Different schemes - DC and AC power conditioners -Synchronized operation with grid supply.

UNIT IV : HVDC SYSTEMS **9**

Application of converters in HVDC systems - Static VAR control - sources of reactive power - Harmonics and filters

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UNIT V : FACTS **9**

Concept of flexible AC Transmission system - Static VAR compensators – Thyristor controlled reactor - Thyristor switched capacitor - Static condenser - Controllable series compensation.

L: 45, T: 0, Total: 45

TEXT BOOKS:

1. Padiyar, K.R.,"HVDC Power Transmission Systems", New Age International , New Delhi, 2012.

REFERENCES

1. Kimbark, E.X., "Direct Current Transmission", Wiley Interscience, New York, 1971.
2. Rao, S.,"EHVAC and HVDC Transmission", Khanna Publishers, 1991.
3. Rakesh Das Bagamudre, "Extra High Voltage AC Transmission Engineering", Wiley Eastern Ltd., New Delhi, Second Edition, 1990.
4. Daniel, Hunt, V.,"Wind Power - A hand book of WECS", Van Nostrand Co., NewYork, 1981.

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Course Code:140EE9117	Course Title: ELECTRIC AND HYBRID VEHICLES
Core/Elective: Elective	**Credits (L : T : P : C : M)** – 3 : 1 : 0 : 3 : 100
Type: Lecture	**Total Contact Hours:** 45

Pre-requisites: The student should have undergone the course(s):

1. Electrical Machines-I
2. Electrical Machines- II

Course Outcomes:

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

CO1: Discuss the performance and characteristics of electric vehicle

CO2: Describe the different architecture in Hybrid vehicles.

CO3: Select different DC motors, induction motors and reluctance motor for Hybrid Electric vehicles.

CO4: Choose the different types of energy storage and generators

CO5: Describe the construction and working of fuel cells and photovoltaic cell

Course Content:

UNIT I ELECTRIC VEHICLES **9**

Layout of an Electric Vehicle, performance of electric vehicles – traction motor characteristics, tractive effort, transmission requirements, vehicle performance, energy consumption, advantage and limitations, specifications, system components, electronic control system.

UNIT II HYBRID VEHICLES **9**

Concepts of hybrid electric drive train, architecture of series and parallel hybrid electric drive train, merits and demerits, series and parallel hybrid electric drive train design.

UNIT - III ELECTRIC PROPULSION SYSTEM AND MOTOR CONTROL SYSTEM **9**

DC Motors, AC Motors, Permanent Magnet Motors, Brushless DC and Reluctance Motors, Characteristics, Regenerative Braking, Control System Principles, speed and torque control – DC motors and AC Motors.

UNIT - IV ENERGY STORAGES & GENERATORS **9**

Electromechanical batteries – types of batteries – lead acid batteries, nickel based batteries, lithium based batteries, electrochemical reactions, thermodynamic voltage, specific energy, specific power, energy efficiency, ultra capacitors – DC Generators, AC Generators, Voltage and Frequency regulations.

UNIT -V FUEL CELLS & SOLAR CARS **9**

Fuel Cell, Construction, Working, Equations, possible fuel sources, fuel reformer, design, solar cars, photovoltaic cells, tracking, efficiency and cost comparison, Plug In Vehicles(PIV).

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Text Books:

1. 1. Mehrdad Ehsani, Yimin Gao, Sebatien Gay and Ali Emadi, " Modern Electric, Hybrid Electric and Fuel cell vehicles: Fundamentals, Theory and Design", CRC press, 2004.
2. James Larminie and John Loury, " Electric Vehicle Technology – Explained", John Wiley & Sons Ltd, 2003.

Reference Books:

1. 1. Sandeep Dhameja, "Electric Vehicle Battery Systems", Butterworth – Heinemann, 2002.
2. Ronald K Jurgen, "Electric and Hybrid – Electric Vehicles", SAE, 2002.
3. Ron Hodkinson and John Fenton, "Light Weight Electric/Hybrid Vehicle Design", Butterworth – Heinemann, 2001.

Web References:

1. nptel.ac.in/courses/108103009
2. http://www.ieahev.org
3. http://www.fueleconomy.gov
4. http://www.ucsusa.org
5. http://www.caranddriver.com

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Course Code: 140EE9118	Course Title: HVDC TRANSMISSION
Core/Elective: Core	Credits (L : T : P : C : M) – 3 : 0 : 0 : 3 : 100
Type: Lecture	Total Contact Hours:45

Pre-requisites: The student should have undergone the course(s):

1.Generation Transmission and Distribution
2. Power Systems analysis and stability
3. Power Electronics

Course Outcomes:

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

CO1: Identify significance of DC over AC transmission system, types and application of HVDC links in practical power systems.

CO2: Analyze different converters viz.3,6 and 12 pulse converter.

CO3: Analyze AC/DC system interactions and know the operation and control of various MTDC systems.

CO4: Model AC/DC system and apply protection for HVDC system against transient overvoltage and over currents

CO5: Explain the concepts of MTDC Systems

Course Content:

UNIT I: INTRODUCTION TO HIGH VOLTAGE TRANSMISSION SYSTEMS 9

Introduction - Historical sketch - Comparison between AC and DC transmission - kinds of DC links – Planning and modern.

UNIT II: HVDC CONVERTERS 9

Three phase bridge converter - Simplified analysis, waveforms with and without overlap -Current and voltage relations - Input power factor - principles of control – Control characteristics – Constant ignition angle control – Constant current and extinction angle control.

HVDC converters – twelve - higher pulse operation - introduction to modern convertrs.

UNIT III: HVDC FAULTS AND PROTECTION 9

Converter faults, commutation failure, axis fire – Disturbance caused by over current and over voltage – Protection against over current and over voltage – Surge arrestors smoothing reactors –

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Corona effects of DC line – Transient over voltages for DC line – Protection of DC links.

UNIT IV: REACTIVE POWER AND HARMONICS IN HVDC 9

Sources of reactive power - static VAR system – Reactive power control during transients – Generation of harmonics – Types and design of various AC filters, DC filters – interferencetelephone - RI noise

UNIT V: MULTI TERMINAL HVDC SYSTEMS 9

Types of MTDC system – Comparison of series and parallel MTDC system – HVDC insulation – DC line insulators – DC breakers – Characteristics and types of DC breakers.

L: 45, T: 0, Total: 45

TEXT BOOKS:

1. K. R. Padiyar, "HVDC Power Transmission Systems Technology and System Interactions", New Age International (p) Limited, New Delhi, 2003.
2. Edward Wilson Kimbark, "Direct current Transmission", Wiley Interscience, Vol. I,New York, 1971.
3. K R Padiyar "HVDC Power Transmission Systems"New Acadamic Science,2015

REFERENCES:

1. Vijay K. Sood, "HVDC and FACTS Controller: Application of Static Converters in power systems", IEEE Power Electronics and Power Systems series, Kluwer Academic publishers, Boston, First edition January 2004.
2. C. Adamson and N.G. Hingorani, "High voltage DC power Transmission", Garraway Limited, England, 1960.
3. Mohan, Undeland and Robbins, "Power Electronics Converters, Applications and Design, John Wiley & Son, Inc., 2003.
4. J. Arrialga, "HVDC Transmission", Peter Peregrinus Ltd., London, 1983.

WEBSITE:

1. www.cleanlineenergy.com/technology/hvdc
2. electrical-engineering-portal.com › Technical Articles › High Voltage
3. www.energy.siemens.com/hq/en/power-transmission/hvdc
4. www.siemens.co.in

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Course Code:140EE9119	**Course Title: HIGH VOLTAGE ENGINEERING**
Core/Elective: Elective	**Credits (L : T : P : C : M)** – 3 : 0 : 0 : 3 : 100
Type: Lecture	**Total Contact Hours:**45

Pre-requisites: The student should have undergone the course(s):

1. Generation, Transmission & Distribution
2. Protection & Switchgear
3. Basics of Electrical Engineering

Course Outcomes:

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

CO1: Describe the transient overvoltage in electric power systems.

CO2: Distinguish the various types of breakdown in gases, solids and liquids.

CO3: Discuss the various high voltage and high current generating techniques.

CO4: Apply the different measuring techniques for measurement of high voltage and high current

. CO5: Analyze the high voltage testing methods of electrical power apparatus and standards

Course Content:

UNIT – I TRANSIENT OVERVOLATGES IN ELECTRIC POWER SYSTEMS 9

Natural causes of over voltages - Lightning phenomena - Over voltages due to switching Surges-temporary over voltages - System faults and other abnormal conditions –Traveling waves on transmission lines (lines terminated with open end, short circuited end, apparatus and cables)

UNIT - II ELECTRICAL BREAKDOWN IN GASES,SOLIDS AND LIQUIDS 9

Classical gas laws - Ionization processes – Townsend's Criterion - Paschen's law – Streamer theory - Breakdown in non-uniform fields and corona discharges – Practical considerations in using gases for insulation purposes - Vacuum insulation. Conduction and breakdown in pure and commercial liquids. Intrinsic breakdown in solids - Electromechanical breakdown - Thermal breakdown - Breakdown in composite dielectrics.

UNIT - III GENERATION OF HIGH VOLTAGES AND HIGH CURRENTS 9

Generation of high DC voltage, alternating voltages, impulse voltages and impulse currents – Tripping and control of Impulse Generators

UNIT - IV MEASUREMENT OF HIGH VOLTAGE AND HIGH CURRENTS 9

Measurement of high DC voltages, high AC voltages and impulse voltages - Measurement of high DC currents, high AC currents and impulse currents - CRO for impulse voltage and current measurement - Digital techniques in high voltage measurement.

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UNIT - V HIGH VOLTAGE TESTING OF ELECTRICAL POWER APPARATUS 9

Testing of Insulator, Bushings, Isolators, Circuit breakers, Cables, Transformers, Surge Arresters – Non-Destructive Insulation Test Techniques, Measurement of dielectric constant and dissipation factor, Partial Discharge measurement, Radio interference measurement – Principles of Insulation Co-Ordination- International and Indian Standards.

L: 45, T: 0, Total: 45

TEXT BOOK

1. M.S. Naidu and V.Kamaraju, 'High Voltage Engineering', McGraw Hill, 2nd Edition,2012.

REFERENCES:

1. Kuffel, E and Zaengl, W.S, 'High Voltage Engineering Fundamentals', Pergamon Press, Oxford, London, Second Edition,2000.
2. Wadhwa C.L 'High Voltage Engineering' New Age International.Second Edition 2007.
3. Dieter Kind, Kurt Feser, 'High Voltage Test Techniques', SBA Electrical Engineering Series, New Delhi,Second Edition 2001.

Web References

1. http://nptel.ac.in/courses/108104048/ui/TOC.htm

BoS Chairman

HOD-Electrical and Electronics Engineering
Dr. Mahalingam College of Engineering and Technology
Pollachi - 642 003.

Course Code: 140EE9120	Course Title: SOLID STATE RELAYS
Core/Elective: Elective	Credits (L : T : P : C : M) – 3 : 0 : 0 : 3 : 100
Type: Lecture	Total Contact Hours: 45

Pre-requisites: The student should have undergone the course(s):

1. Electronic Devices & Circuits
2. Protection & Switchgear
3. Microprocessor

Course Outcomes:

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

CO1: Explain the concepts of relays, CT's and PT's.

CO2: Describe the characteristics of static relays

CO3: Explain the concept of static relays for power system.

CO4: Analyze the performance of static relays

CO5: Apply microprocessor based relays for measurement of different electrical parameters.

Course Content:

UNIT I INTRODUCTION 09

Advantages of static relays – generalized characteristics and operational equations of relays – Steady state and transient performance of signal driving elements – signal mixing techniques and measuring techniques – CT's and PT's in relaying schemes – saturation effects.

UNIT II STATIC RELAYS 09

Static relay circuits (using analog and digital IC's) for over current, inverse time characteristics, Differential relay and directional relay

UNIT - III STATIC RELAYS FOR POWER SYSTEM 09

Static relay circuits for generator loss of field, under frequency distance relays, impedance, reactance, mho, reverse power relays

UNIT - IV PROTECTION AND PERFORMANCE OF STATIC RELAYS 09

Static relay circuits for carrier current protection – steady state and transient behavior of Static relays – testing and maintenance – tripping circuits using thyristor.

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UNIT -V MICROPROCESSOR BASED RELAYS 09

Microprocessor based relays – hardware and software for the measurement of voltage, current, frequency, phase angle – Microprocessor implementation of over current relays – inverse time characteristics – impedance relay – directional relay – mho relay.

Text Books:

1. Badri ram and Vishwakarma D.N., Power System Protection and Switchgear, 2nd Edition, Tata McGraw Hill, 2011.
2. Rao T.S.M., Power System Protection: Static Relays, 2nd Edition, Tata McGraw Hill, 2004

Reference Books:

1. Van C.Warrington, Protection Relays – Their Theory and Practice, third edition, Chapman and Hall. 1977.
2. Ravindranath.B.and Chander M., Power System Protection and Switchgear, Wiley Eastern, reprint 2005.
3. Russel .C.Mason, The Art and Science of Protective relays. Power Systems Engineering Course material by the General Electric Company.
4. Van C.Warrington Digital Protection: Protective Relaying from Electromechanical to Microprocessor ,New age international(P) limited publishers, reprint 2004

Web References:

1. http://www.electronics-tutorials.ws/io/io_5.html
2. http://www.learnabout-electronics.org/ssr_01.php
3. https://en.wikipedia.org/wiki/Solid-state_relay
4. http://www.omega.com/temperature/Z/pdf/z124-127.pdf
5. http://www.phidgets.com/docs/Solid_State_Relay_Primer

BoS Chairman

HOD-Electrical and Electronics Engineering
Dr. Mahalingam College of Engineering and Technology
Pollachi - 642 003.

Course Code:140EE9121	Course Title: ALTERNATE ENERGY SOURCES
Core/Elective: Elective	**Credits (L : T : P : C : M)** – 3 : 0 : 0 : 3 : 100
Type: Lecture	**Total Contact Hours:** 45

Pre-requisites: The student should have undergone the course(s):

1. Electrical Machines-I
2. Electrical machines II
3. Power Electronics

Course Outcomes:

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

CO1: Explain the various types of Renewable energy sources and its concepts.

CO2: Outline the concepts of Renewable energy sources and its performance, site characteristics.

CO3:Acquire a knowledge about Solar Energy, Wind Energy, Bio-Energy, otec, tidal, geothermal and hydel energy

CO4:Acquire knowledge about New Energy Sources like Hydrogen Fuel cells, Piezo Electric power generation

CO5:Apply the knowledge on applications of various forms of new and alternate energy sources and its environmental impacts.

Course Content:

UNIT I SOLAR ENERGY 9

Solar radiation - its measurements and prediction - solar thermal flat plate collectors, concentrating collectors – applications - heating, cooling, desalination, power generation, drying, cooking - principle of photovoltaic conversion of solar energy- types of solar cells and fabrication- Photovoltaic applications: battery charger, domestic lighting, street lighting, satellite solar power systems and water pumping-power generation schemes

UNIT II WIND ENERGY 9

Principles of wind power - Aerodynamics of wind turbine rotor- Wind Energy Conversion Systems – Wind Energy generators and its performance, site characteristics, horizontal and vertical axis types - Wind Energy Storage – Applications – Hybrid systems-safety and environmental aspects.

UNIT - III BIO-ENERGY 9

Concepts and systems, biomass production, energy plantation, short rotation species, forestry system, biomass resource agro forestry wastes, municipal solid wastes and agro processing industrial residues - Thermo chemical conversion: direct combustion, gasification, pyrolysis and liquefaction - biochemical conversion: anaerobic digestion, alcohol production from biomass - chemical conversion process: hydrolysis and hydrogenation. Biogas - generation - types of biogas Plants- applications

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UNIT - IV OTEC, TIDAL, GEOTHERMAL AND HYDEL ENERGY 9

Ocean energy resources - principles of ocean thermal energy conversion systems - ocean thermal power plants Tidal energy – Wave energy – Data, Technology options –Geothermal energy sources, power plant and environmental issues - Small hydro turbines –site selection – construction.

UNIT -V NEW ENERGY SOURCES 9

Hydrogen, generation, storage, transport and utilization- Applications: power generation, transport – Fuel cells – technologies, types – applications - economics and the power generation. -Piezo Electric power generation.

Text Books:

1. G.D. Rai, "Non-Conventional Energy Sources", 4th Edition, Khanna Publishers,2012.
2. B.H.Khan,"NonconventionalEkergy Resources", Tata McGraw Hill, 1st Edition 2006.
3. Hart, A.B., and Womack, G. J., "Fuel Cells: Theory & Applications", Prentice Hall, 1997

Reference Books:

1. Kreith, F and Kreider, J. F., "Principles of Solar Engineering", McGraw-Hill, 1978.
2. Godfrey Boyle, "Renewable Energy, Power for a Sustainable Future", Oxford University Press, U.K, 1996.
3. Sukhatme, S.P., "Solar Energy", Tata McGraw Hill, 1984

Web references:

1) www.mnre.gov.in
2) https://en.wikipedia.org/wiki/Solar_power
3) https://en.wikipedia.org/wiki/Wind_power
4) http://nptel.ac.in/downloads/108108078/

BoS Chairman

HOD-Electrical and Electronics Engineering
Dr. Mahalingam College of Engineering and Technology
Pollachi - 642 003.

Course Code: 140EE9122	Course Title: ADVANCED MICROPROCESSORS AND MICROCONTROLLERS
Core/Elective: Elective	**Credits (L : T : P : C : M)** – 3 : 0 : 0 : 3 : 100
Type: Lecture	**Total Contact Hours:**45

Pre-requisites: The student should have undergone the course(s):

1.Digital Electronics

2.Electronic Devices

Course Outcomes:

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

CO1: Explain the Advance of microprocessor.

CO2: Describe the Pentium processors and its programming.

CO3: Discuss the programmer's model of ARM processor and its instruction sets.

CO4: Describe the architecture and instruction sets of PIC microcontroller

CO5: Demonstrate the interfacing of the PIC Microcontroller.

Course Content:

UNIT I MICROPROCESSOR ARCHITECTURE 9

Instruction Set – Data formats –Addressing modes – Memory hierarchy –register file –Cache memory and paging – Segmentation- pipelining –the instruction pipeline– pipeline hazards – i level parallelism –RISC versus CISC.

UNIT II HIGH PERFORMANCE CISC ARCHITECTURE – PENTIUM

Introduction to Pentium microprocessor: Real and Protected mode operation-Software model of Pe CPU Architecture- Bus Operations – Pipelining – Branch predication-

Addressing modes – Instruction types-Instruction set -floating point unit- Paging – Multitasking –

Exception and Interrupts

UNIT III HIGH PERFORMANCE RISC ARCHITECTURE – ARM 9

ARM Programmer's Model– Registers –Processor Modes –ARM Pipelines (3 and 5 stage) –AR point and MMU architecture-ARM Addressing Modes-ARM and Thumb instruction set overview.

UNIT IV PIC MICROCONTROLLER 9

CPU Architecture – Instruction set –Loop time subroutine and Interrupts-Interrupt Timing –Externa interrupts and Timers-I/O port Expansion.

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UNIT V INTERFACING OF PIC MICROCONTROLLER **9**

I2C Bus for peripheral chip access –UART- A/D Converter –PWM-Special features: Serial programming, parallel slave port.

Text Books:

1. Daniel Tabak,' Advanced Microprocessors" McGraw Hill.Inc., 2008.
2. James L. Antonakos, "The Pentium Microprocessor '' Pearson Education , Fourth Indian Reprint 200
3. Steve Furber, "ARM System-on-Chip Architecture", Pearson Education, 2005.
4. John .B.Peatman " Design with PIC Microcontroller , Prentice hall, 1997.

Reference Books:

1. Badri Ram, "Advance Microprocessors and Interfacing", Tata McGraw Hill Publishing Company lin
2. Valvano "Embedded Microcomputer Systems" Thomson Asia PVT LTD first reprint 2001.
3. Barry.B.Breg," The Intel Microprocessors Architecture , Programming and Interfacing " , PHI,2002.

Web References:

1. nptel.ac.in/courses/108102047
2. http://www.microchip.com/
3. http://www.arm.com/

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HOD-Electrical and Electronics Engineering
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Pollachi - 642 003.

Course Code: 140EE9123	Course Title: EMBEDDED SYSTEM DESIGN (Common to EEE,EIE,ICE)
Core/Elective: Elective	Credits (L : T : P : C : M) – 3 : 0 : 0 : 3 : 100
Type: Lecture	Total Contact Hours: 45

Pre-requisites: The student should have undergone the course(s):

1. Microprocessor & Microcontroller
2. C-Program

Course Outcomes:

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

CO 1: Analyse the basic concepts in the structure of embedded systems.

CO 2: Design the microcontroller's architecture available in embedded systems with their programs.

CO 3: Apply the knowledge of embedded systems in real time application models.

CO 4: Design RTOS and develop the real time program models.

CO 5: Explain the concepts of embedded system in real time case studies.

Course Content:

UNIT I INTRODUCTION 9

Embedded System – Classification of Embedded System – Processors in the embedded system – Processor and Memory organization – DMA – Timer and Counting devices – Device drivers and interrupt service mechanism

UNIT II PIC CONTROLLER 9

PIC 16F8XX – Pin diagram – Registers – Program and Data Memory– I/O Ports – Serial Port expansion – SPI and I2C – Timers – ADC – Interrupts

UNIT - III REAL TIME MODELS 9

State Machine and Concurrent Process model: Types of models – FSM – HCFSM and State chart Language – Program state machine model – Concurrent Process – communication among process – Synchronization among process – Data flow model

UNIT - IV REAL TIME OPERATING SYSTEMS 9

RTOS - Real time kernel, OS tasks, task states, task scheduling, interrupt processing, Clocking, communication and synchronization, control blocks, memory requirements and control, kernel services

UNIT -V CASE STUDIES 9

Case Studies of Embedded System Design – Automatic Chocolate Vending machine – Digital Camera – Adaptive Cruise Control System in a Car – Smart Card

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Dr. Mahalingam College of Engineering and Technology
Pollachi - 642 003.

Text Books:

1. RajKamal, 'Embedded Systems Architecture, Programming and Design', Tata McGraw hill Publishing Company Ltd, Second Edition, 2008
2. John.B.Peatman, 'Design with Microcontrollers', Pearson Education, 2002.
3. . Ajay V. Deshmukh, 'Microcontrollers Theory and Applications', Tata McGraw hill Publishing Company Ltd, 2008.

Reference Books:

1. Frank Vahid, Tony Givargis, 'Embedded Systems Design', Wiley India, 2006
2. Tammy Noergaard, 'Embedded Systems Architecture', Elsevier, 2005.
3. Tim Wilhurst, 'An Introduction to the Design of Small Scale Embedded Systems', Palgrave, 2004

Web references:

1. Embedded.com – Under the Hood: Robot Guitar embeds autotuning
2. "Micro controller.com – Embedded Systems supersite".
3. Embedded Systems Dell OEM Solutions | Dell.

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HOD-Electrical and Electronics Engineering
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Pollachi - 642 003.

Course Code:140EE9124	Course Title: VLSI DESIGN (Common to EEE,EIE,ICE)
Core/Elective:Elective	Credits (L : T : P : C : M) – 3 : 0 : 0 : 3 : 100
Type: Lecture	Total Contact Hours: 45

Pre-requisites: The student should have undergone the course(s):

1. Digital Electronics
2. Digital circuit design.
3. Computer Architecture

Course Outcomes:

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

CO 1: Describe the MOS transistors and circuit layout in static CMOS logic style.

CO 2: Identify the characteristics of MOS inverters and estimate power consumption of a VLSI chip.

CO 3: Construct layouts for the logic circuit incorporating technology-specific layout rules.

CO 4: Extract analog parasitic elements from the layout and explain the chip technology scaling process.

CO5: Design elementary data paths for microprocessors viz., moderate-speed adders, subtractors and multipliers.

Course Content:

UNIT I MOS TRANSISTOR THEORY **9**

VLSI Design Flow- Basic MOS Transistors – NMOS, CMOS Fabrication- MOS Transistor Operation- Threshold Voltage-Derivation of Drain Current - Channel length modulation - Body Effect –Transconductance - DC model of MOS transistor

UNIT II INVERTERS **9**

NMOS Inverter - Resistive Load Inverter Circuit - NMOS Inverter with Depletion NMOS as a Load - CMOS Inverter - Latch-up in CMOS Circuit - CMOS Transmission Gate - Tristate Inverter - Power Dissipation in CMOS Circuits

UNIT - III LOGIC DESIGN WITH MOSFETS **9**

MOSFETS as Switches - Basic Logic Gates in CMOS: NOT- NOR - NAND and other Complex gates - MOS Layers - Stick diagram - Design Rules and Layout Diagram - Physical design of Simple Logic Gates

UNIT - IV BASIC CIRCUIT CONCEPTS **9**

Sheet Resistance - 0Capacitance Calculation- Delay Unit τ - Driving Large Capacitive Loads- Propagation Delays - Wiring Capacitances- Scaling of MOS circuits

UNIT -V SUBSYSTEM DESIGN **9**

Introduction - Design of ALU – Design of Adders: Parallel Adder - Manchester Carry Chain Adder - Carry Skip Adder - Carry Select Adder - Carry Look Ahead adder - Design of Multipliers: array Multiplier - Serial Parallel Multiplier - Baugh wooly multiplier - Booth Multiplier - FPGA: Architecture and Programming Technologies.

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HOD-Electrical and Electronics Engineering
Dr. Mahalingam College of Engineering and Technology
Pollachi - 642 003.

Text Books:

1. Kiran Kumar VG and Nagesh, "Fundamentals of CMOS VLSI Design", Pearson Education, 2nd Edition, 2012.
2. Neil Weste and David Harris, CMOS VLSI Design: A Circuits and Systems Perspective, third edition, Addison Wesley, 2005
3. Weste& Harris, CMOS VLSI Design: A Circuits and Systems Perspective, 3rd ed, Addison Wesley, 2005

Reference Books:

1. M. Bushnell and V. Agrawal, Essentials of Electronic Testing for Digital, Memory and Mixed-Signal VLSI Circuits, Springer, 2000.
2. aker, R.J., Lee, H. W. and Boyce, D. E., CMOS Circuit Design, Layout and Simulation, Wiley – IEEE Press (2004) 2nd ed.
3. Rabaey, J.M., Chandrakasen, A.P. and Nikolic, B., Digital Integrated Circuits – A Design Perspective, Pearson Education (2007) 2nd ed.

Web references:

1. www.ee.ncu.edu.tw
2. citeseerx.ist.psu.edu
3. emicroelectronics.free.fr/onlinecourses/VLSI/ch03.html

BoS Chairman

HOD-Electrical and Electronics Engineering
Dr. Mahalingam College of Engineering and Technology
Pollachi - 642 003.

Course Code: 140EE9125	**Course Title:** NANO ELECTRONICS
Core/Elective: Elective	**Credits (L : T : P : C : M)** – 3 : 0 : 0 : 3 : 100
Type: Lecture	**Total Contact Hours:45**

PREREQUISITES:

1. Circuit Theory
2. Electronic Devices & circuits

OBJECTIVES:

After successful completion of the course, the learner can able to

CO 1: Summarize about the evolution of nanostructured materials and their fabrication techniques.

CO 2: Describe the basics of scaling effects at nano level and its breakthrough in electronic devices.

CO 3: Describe the basics of quantum Electronics

CO 4: Identify the different applications of nano semiconductor devices in different areas.

CO 5: Interpret the applications of nanoelectronic devices as memory and sensor elements in various fields.

UNIT I: INTRODUCTION **9**

The development of micro electronics- The region of nanostructures- Complexity problem. The challenge initiated by nanoelectronics. Methods and limits of microminiaturization in silicon.

UNIT II : BASICS OF NANOELECRONICS **9**

Physical fundamentals- Electromagnetic fields and photons, Electrons behaving as waves, Electrons in potential wells, Nanosystems as information processing machines- Nanosystems as functional blocks, Information processing as information modification.

UNIT III: QUNATUM ELECTRONICS **9**

Quantum electronic devices(QED)- Electrons in mesoscopic structures. Examples of quantum electronic devices- short channel MOS transistor, Split- gate transistor, Electron – wave transistor.

UNIT IV: SINGLE ELECTRON TRANSISTOR(SET) **9**

Principle of single electron transistor- The coulomb blockade, Performance of SET. SET – Circuit design, Wiring and drivers, Logic and memory devices, SET adder circuit.

UNIT V: NANOELECTRONICS WITH SUPERCONDUCTING DEVICES **9**

Superconducting switching devices- Cryotron, The Josephson tunneling device. Applications of superconducting devices- Integrated and Field effect transistor electronics. Carbon nanotubes- Properties and Applications.

L: 45, T: 0, Total: 45

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Pollachi - 642 003.

Text Books:

1. Kiran Kumar VG and Nagesh, "Fundamentals of CMOS VLSI Design", Pearson Education, 2nd Edition, 2012.
2. Neil Weste and David Harris, CMOS VLSI Design: A Circuits and Systems Perspective, third edition, Addison Wesley, 2005
3. Weste& Harris, CMOS VLSI Design: A Circuits and Systems Perspective, 3rd ed, Addison Wesley, 2005

Reference Books:

1. M. Bushnell and V. Agrawal, Essentials of Electronic Testing for Digital, Memory and Mixed-Signal VLSI Circuits, Springer, 2000.
2. aker, R.J., Lee, H. W. and Boyce, D. E., CMOS Circuit Design, Layout and Simulation, Wiley – IEEE Press (2004) 2nd ed.
3. Rabaey, J.M., Chandrakasen, A.P. and Nikolic, B., Digital Integrated Circuits – A Design Perspective, Pearson Education (2007) 2nd ed.

Web references:

1. www.ee.ncu.edu.tw
2. citeseerx.ist.psu.edu
3. emicroelectronics.free.fr/onlinecourses/VLSI/ch03.html

BoS Chairman

HOD-Electrical and Electronics Engineering
Dr. Mahalingam College of Engineering and Technology
Pollachi - 642 003.

Course Code:140EE9126	Course Title: DIGITAL IMAGE PROCESSING (Common to EEE,EIE,ICE,ECE)
Core/Elective:Elective	Credits (L : T : P : C : M) – 3 : 0 : 0 : 3 : 100
Type: Lecture	Total Contact Hours: 45

Pre-requisites: The student should have undergone the course(s):

1. Digital Signal Processing
2. Digital Electronics

Course Outcomes:

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

CO1: Understand the basic digital image fundamentals

CO2: Perform the various image transformation techniques

CO3: Perform the image enhancement and restoration techniques

CO4: Explain about image segmentation and representation

CO5: Describe about image compression techniques

OBJECTIVES:

After successful completion of this course, the learner will be able to

- Understand and apply image transforms.
- Gain knowledge on concepts of image enhancement and restoration.
- Describe basics of image segmentation, representation and compression.

UNIT I DIGITAL IMAGE FUNDAMENTALS 9

Elements of digital image processing systems- Elements of visual perception- psycho visual model- brightness- contrast- hue- saturation- mach band effect- Color image fundamentals - RGB-HSI models- Image sampling- Quantization-Two dimensional mathematical preliminaries.

UNIT II IMAGE TRANSFORMS 9

1D DFT- 2D transforms – DFT- DCT- Discrete Sine, Walsh- Hadamard- KL transforms and their properties - Haar Wavelet Transform.

UNIT III IMAGE ENHANCEMENT AND RESTORATION 9

Spatial domain enhancement: gray level transformations - histogram modification and specification techniques- Image averaging- Directional Smoothing- Median- Geometric mean- Harmonic mean-Contra harmonic and Yp mean filters. Image Restoration: degradation model- Unconstrained and Constrained restoration-Wiener filtering- Geometric transformations: spatial transformations-Gray-Level interpolation

UNIT IV IMAGE SEGMENTATION AND REPRESENTATION 9

Point- line and edge detection- Edge linking- Region based segmentation: Region splitting and merging. Image representation: chain codes – polygonal approximations – signatures –boundary segments – skeletons.

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UNIT V IMAGE COMPRESSION **9**

Need for data compression-Error free compression: variable length coding, bit plane coding, LZW coding. Lossy compression: Transform coding, wavelet coding. Overview of Compression standards: binary image compression standard, still image compression standards.

L: 45, T: 0, Total: 45

TEXT BOOKS:

1. Rafael C. Gonzalez and Richard E. Woods, "Digital Image Processing", 2nd Edition, Pearson Education, 2002.
2. Anil K. Jain, "Fundamentals of Digital Image Processing", Prentice Hall of India, 2001.

REFERENCES:

1. Dr. Jayaraman, S., Essakirajan, S., and Veerakumar, T., "Digital Image Processing", Tata Mc Graw Hill, New Delhi, 2009.
2. David Salomon, "Data Compression – The Complete Reference", 3rd edition, Springer Verlag
   Newyork, 2004.
3. William K-Pratt, "Digital Image Processing", 4th edition, John Wiley and Sons, 2007.
4. Kenneth R. Castleman, "Digital Image Processing", Pearson Education, 1996.

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HOD-Electrical and Electronics Engineering
Dr. Mahalingam College of Engineering and Technology
Pollachi - 642 003.

Course Code:140EE9127	Course Title: BIOMEDICAL ENGINEERING (Common to EEE,EIE)
Core/Elective: Elective	Credits (L : T : P : C : M) – 3 : 0 : 0 : 3 : 100
Type: Lecture	Total Contact Hours: 45

Pre-requisites: The student should have undergone the course(s):

1. Basic knowledge on human body and its systems
2. Linear Integrated Circuits

Course Outcomes:

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

CO1: Explain human physiology like working of heart and lungs.

CO2: Elucidate the various amplifier like instrumentation amplifier, bio amplifier and sensors Used in biomedical applications

CO3: Measure the biological parameters like blood pressure, cardiac output, lung volume capacity.

CO4: Explain the concepts of medical Imaging and bio-telemetry systems

CO5: Visualize the need of assist devices to aid in therapy.

Course Content:

UNIT I PHYSIOLOGY AND TRANSDUCERS 9

Cell and its structure – Action and resting – Potential propagation of action potential – Sodium pump – Nervous system – CNS – PNS – Nerve cell –Synapse – Cardio pulmonary system – Physiology of heart and lungs –Circulation and respiration – Transducers – Different types – Piezo–electric,ultrasonic, resistive, capacitive, inductive transducers – selection criteria

UNIT II ELECTRO – PHYSIOLOGICAL MEASUREMENTS 9

Basic components of a biomedical system – Electrodes – Micro, needle and surface electrodes – Amplifiers – Preamplifiers, differential amplifiers, chopper amplifiers – Isolation amplifier.ECG - PCG– EEG – EMG – ERG – Lead systems and recording methods – Typical Waveforms

UNIT - III NON-ELECTRICAL PARAMETER MEASUREMENTS 9

Measurement of blood pressure – Cardiac output – Cardiac rate – Heart sound –Respiratory rate – Gas volume –- pH of blood, ESR, GSR measurements – Plethysmography.

UNIT - IV MEDICAL IMAGING AND PMS 9

X-ray machine _ Computer tomography – MRI – Ultrasonography – Endoscopy – Thermography – Different types of biotelemetry systems and patient monitoring – Electrical safety

UNIT -V ASSISTING AND THERAPEUTIC EQUIPMENTS 9

Pacemakers – Defibrillators – Ventilators – Nerve and muscle stimulators –Diathermy – Heart – Lung machine – Audio meters – Dialyzers.

Text Books:

1. R.S.Khandpur, 'Hand Book of Bio-Medical instrumentation', Tata McGraw HillPublishing Co Ltd., 2003.
2. Leslie Cromwell, Fred J.Weibell, Erich A. Pfeiffer, 'Bio-Medical Instrumentationand Measurements', II edition, Pearson Education, 2002 / PHI.
3. M.Arumugam, 'Bio-Medical Instrumentation', Anuradha Agencies, 2003

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HOD-Electrical and Electronics Engineering
Dr. Mahalingam College of Engineering and Technology
Pollachi - 642 003.

<u>**Reference Books:**</u>

1. L.A. Geddes and L.E.Baker, 'Principles of Applied Bio-Medical Instrumentation', John Wiley & Sons, 1975.
2. J.Webster, 'Medical Instrumentation', John Wiley & Sons, 1995.
3. C.Rajarao and S.K. Guha, 'Principles of Medical Electronics and Bio-Medical Instrumentation', Universities press (India) Ltd, Orient Longman ltd, 2000

<u>**Web references:**</u>

1. http://www.bci2000.org/wiki/index.php/User_Tutorial:EEG_Measurement_Setup
2. https://www.medicalradiation.com/types-of-medical-imaging/
3. http://www.nhlbi.nih.gov/health/health-topics/topics/pace

BoS Chairman

HOD-Electrical and Electronics Engg.
Dr. Mahalingam College of Engineering and Technology
Pollachi - 642 003.

Course Code:140EE9128	Course Title: ADVANCED CONTROL THEORY
Core/Elective: Elective	Credits (L : T : P : C : M) – 3 : 0 : 0 : 3 : 100
Type: Lecture	Total Contact Hours: 45

PREREQUISITES

1. Control systems
2. Engineering Mathematics-III

Course Outcomes:

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

CO1: summarize the concepts of controllers and their design

CO2: Summarize the concepts of state variable and output feedback for LTI systems.

CO3:Summarize the concepts of digital control systems

CO4: Explain the concepts of optimization in providing control solutions for LTIsystems concepts of medical Imaging and bio-telemetry systems

CO5: Explain the concepts of system identification and parameter estimation

UNIT I CONVENTIONAL DESIGN OF CONTROLLERS 9

System performance and specifications – Proportional, Integral and Derivative controllers – Structure – Empirical tuning – Ziegler Nichols – Cohen coon – Root Locus method –Tuning using ISE, IAE and ITAE and other performance indices – Design of Lead-lag compensators –Design using Bode plots – polar plots- Nichols charts – Root locus and Routh Hurwitz criterion.

UNIT II DESIGN USING STATE SPACE METHODS 9

Control Law design – State feedback and pole placement- Estimator design – Regulator design - Combined control law and estimator – Introduction of the Reference input – Integral control and disturbance estimation – Effect of delays.

UNIT III OPTIMAL CONTROL 9

Decoupling - Time varying optimal control – LQR steady state optimal control – Optimal estimation – Multivariable control design – Optimal observers.

UNIT IV DIGITAL CONTROL 9

Digitization – Effect of sampling – PID control – Discrete system analysis and design using Z transform – Sampled –data analysis –Discrete equivalents – State space design methods – Sample rate selection.

UNIT V SYSTEM IDENTIFICATION 9

Defining the model set for linear system – Identification of Nonparametric models – Models and Criteria for parametric identification – Deterministic estimation – Stochastic Least Squares – Maximum Likelihood algorithm – Numerical search for Maximum Likelihood Estimate –Subspace Identification methods.

L: 45, T: 0, Total: 45

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HOD-Electrical and Electronics Eng
Dr. Mahalingam College of Engineering and Technology
Pollachi - 642 003.

TEXT BOOKS:

1. Gene F. Franklin, J. David Powell, and Michael Workman, " Digital Control ofDynamic Systems", Prentice Hall of India (Pearson Education, Inc.), New Delhi2002.
2. Benjamin C.Kuo, "Digital Control Systems", Oxford University Press, SecondEdition, 2006.

REFERENCES:

1. Gene F. Franklin, J. David Powell and Abbasemami-Naeini, "Feedback Control ofDynamic Systems", Fifth edition, Prentice Hall of India (Pearson Education,Inc.)2008.
2. K.J. Astrom, "Adaptive control", second edition,Pearson Education, Inc. 2009.
3. Graham C. Goodwin, Stefan F. Graebe and Mario E. Salgado, "Control SystemDesign", Prentice Hall of India (Pearson Education, Inc.), New Delhi 2003.

Web References

1. nptel.ac.in/courses/108103007/

BoS Chairman

HOD-Electrical and Electronics Engineering
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Pollachi - 642 003.

Course Code: 140EE9129	**Course Title**: POWER PLANT INSTRUMENTATION\ (Common to EEE,EIE,ICE)
Core/Elective: Elective	**Credits (L : T : P : C : M)** – 3 : 0 : 0 : 3 : 100
Type: Lecture	**Total Contact Hours:45**

Pre-requisites: The student should have undergone the course(s):

1. Measurements and Instrumentation

Course Outcomes:

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

CO1: Describe the methods of power generation.

CO2: Calculate the flow, level, temperature and pressure measurements of power plants.

CO3: Discuss the various types of analysers in power plants.

CO4: Discuss various control loops for boiler operations

CO5: Apply different methods of pressure and temperature control for turbine and condenser.

Course Content:

UNIT I OVERVIEW OF POWER GENERATION 9

Brief survey of methods of power generation – Hydro, Thermal, Nuclear, Solar and Wind power plants – Thermal power plants – Block diagram – Details of boiler accessories – P & I diagram of boiler – Cogeneration - Importance of instrumentation in power generation

UNIT II MEASUREMENTS IN POWER PLANTS 9

Flow measurement of feed water, fuel, air and steam with correction factor for temperature – Measurement of steam temperature – Drum level measurement – Steam pressure measurement – Radiation measurement – Smoke and Dust Monitoring.

UNIT - III ANALYSERS IN POWER PLANTS 9

Flue gas oxygen analyser – Analysis of impurities in feed water and steam – Dissolved oxygen analyser – Chromatography for gas analysis – pH meter – Fuel analyser – Pollution monitoring instruments.

UNIT - IV CONTROL LOOPS IN BOILER 9

Combustion control – Air/Fuel ratio control – Furnace draft control – Drum level control – Main steam and reheat steam temperature control – Super heater control - attemperator - Air temperature control - Deaerator control - Distributed control system in power plants - Interlocks in boiler operation.

UNIT -V TURBINE AND CONDENSER – MONITORING AND CONTROL 9

Speed, Vibration, Shell temperature Monitoring and Control – Steam pressure control – Lubricant oil temperature control – Cooling system. Condenser – Temperature monitoring – Reuse water control.

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Pollachi - 642 003.

Text Books:

1. Arora.S.C, Domkundwar.S, Domkundwar.A.V, A course in Power Plant Engineering, Dhanpat Rai & Co. (P) Ltd, Fifth revised and enlarged edition, 2006.
2. Sam G. Dukelow, 'The Control of Boilers', Instrument Society of America, 1991.

Reference Books:

1. S.M. Elonka and A.L. Kohal, 'Standard Boiler Operations', Tata McGraw Hill, New Delhi, 1994.
2. R.K.Jain, 'Mechanical and Industrial Measurements', Khanna Publishers, New Delhi, 1995.
3. E.Al. Wakil, 'Power Plant Engineering', Tata McGraw Hill, 1985.

Web References:

1. www.nptel.ac.in/courses/108106074
2. www.nptelvideos.in/2012/11
3. fullreport.in/tags/nptel-powerplant-engineering-notes
4. www.slideshare.net

BoS Chairman

HOD-Electrical and Electronics Engine...
Dr. Mahalingam College of Engineering and Technol...
Pollachi - 642 003.

Course Code: 140EE9130	**Course Title:** SOFT COMPUTING TECHNIQUES
Core/Elective: Elective	**Credits (L : T : P : C : M)** – 3 : 0 : 0 : 3 : 100
Type: Lecture	**Total Contact Hours:**45

Pre-requisites: The student should have undergone the course(s):

1. Digital Electronics

Course Outcomes:

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

CO1: Explain the ideas of soft computational techniques based on human experience.

CO2: Conceptualize fuzzy logic and its implementation for various real world applications.

CO3: Generate an ability to design, analyze and perform experiments on real life problems using various Neural Learning Algorithms..

CO4: Apply the process of approximate reasoning using Neuro-Fuzzy Modeling..

CO5: Describe the concepts of Genetic algorithm and its applications to soft computing using some applications..

Course Content:

UNIT I INTRODUCTION 9

Evolution of Computing- Soft Computing Constituents – Conventional AI to Computational Intelligence - Machine Learning Basics.

UNIT II FUZZY LOGIC 9

The Concept of uncertainty and associated solutions - Fuzzy sets - Basic properties and Characteristics of Fuzzy sets - Fuzzy Relations – Membership Functions- Fuzzy Rules - Fuzzy reasoning - Applications of Fuzzy logic.

UNIT III ARTIFICIAL NEURAL NETWORKS 9

Basics of artificial neural networks (ANN) – characteristics of ANN - models of neuron – topology - Adaptive Networks - Supervised and Unsupervised learning networks- Types Applications of ANN to engineering problems.

UNIT IV NEURO – FUZZY MODELLING 9

Adaptive networks based Fuzzy interfaces-Classification and Representation trees- Data clustering algorithm-Rule base structure identification- Neuro - Fuzzy Controls. – Coactive Neuro-Fuzzy Modelling – Classification and Regression Trees.

UNIT V GENETIC ALGORITHM 9

Fundamentals- Basic concepts-Creation of off springs-Working principle-Encoding Techniques-Fitness function and Reproduction.

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Pollachi - 642 003.

Text Books:

1. S.N. Sivanandan and S.N. Deepa, Principles of Soft Computing, Wiley India, 2007.
2. N.K.Bose, Ping Liang, Neural Network fundamental with Graph, Algorithms & Applications, TMH, 1st Edition, 1998.
3. Bart Kosko, Neural Network & Fuzzy System, PHI Publication, 1st Edition, 2009

Reference Books:

1 S. Rajasekaran and G.A.V.Pai, Neural Networks, Fuzzy Logic and Genetic Algorithms, PHI, 2003.

2. Timothy J.Ross, Fuzzy Logic with Engineering Applications, McGraw-Hill, 1997.
3. J.S.R.Jang, C.T.Sun and E.Mizutani, Neuro-Fuzzy and Soft Computing, PHI, 2004, Pearson Education.
4. Martin T Hagen, Neural Network Design, Nelson Candad, 2nd Edition, 2008.

Web References:

1. http://www.myreaders.info/html/soft_computing.html
2. http://www.sau.ac.in/~vivek/softcomp/softcomp.htm
3. http://ycce.edu/pdf/soft_computing.pdf

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Electrical and Electronics ...
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Course Code:140EE9131	Course Title: VIRTUAL INSTRUMENTATION (Common to ECE,EEE,EIE,ICE)
Core/Elective: Elective	Credits (L : T : P : C : M) – 3 : 0 : 0 : 3 : 100
Type: Lecture	Total Contact Hours: 45

Pre-requisites: The student should have undergone the course(s):

1. Basic knowledge on computer programming

Course Outcomes:

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

CO 1 Explain concept of Graphical system and its functional blocks
CO 2 Develop virtual instruments with LabVIEW graphical programming tools
CO 3 Apply the concept of Arrays, Strings and File I/O tasks in Data acquisition
CO 4 Choose Data acquisition system interfaces based on the requirement
CO 5 Apply DAQ hardware's and LabVIEW in real time environment

Course Content:

UNIT I GRAPHICAL SYSTEM DESIGN 8

Graphical System Design Model – Virtual Instrumentation – Virtual Instrument and Traditional Instrument – Hardware and software in virtual instrumentation – Virtual instrumentation for test, control and Design – Conventional and Graphical programming

UNIT II LabVIEW BASICS I 10

Front Panel and Block Diagram – Tools, Controls and Functions palette. Modular programming – SubVI. Structures – FOR, WHILE Loops, Case, Sequence, event structures, Formula node

UNIT - III LabVIEW BASICS II 9

Arrays, Clusters, Strings, File I/O, Time and Dialog controls, Waveform chart, Graph, XY Graph and operations.Report generation, Web Publishing tool

UNIT - IV DATA ACQUISITION SYSTEM 9

Instrument control: GPIB – VISA – Instrument drivers – Serial Port communication. Data Acquisition: Review of Transducers and signal conditioning, DAQ hardware – AI, AO, DIO. DAQ Assistant and configuration

UNIT -V LabVIEW APPLICATIONS 9

LabVIEW RT, Process control applications, Physical applications, Speed control, Data visualization, Imaging and Sound. Level,flow,temperature process, BioMedical application - Pulse rate.

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Text Books:

1. Jovitha Jerome, 'Virtual Instrumentation using LabVIEW' PHI Learning Private Limited, New Delhi, Second Printing, 2011
2. Gary W Johnson, Richard Jennings, 'LabVIEW Graphical Programming' Fourth Edition, McGraw Hill, 2006.

Reference Books:

1. Sanjay Gupta, Joseph John, 'Virtual Instrumentation using LabVIEW' Tata McGraw Hill, 5^{th} Reprint, 2010
2. Robert H Bishop. 'Learning with LabVIEW 2009' Pearson Education, 2010.

Web references:

1. http://www.ni.com/academic/students/learn-labview/
2. http://www.ni.com/academic/students/learn-daq/

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Course Code:140EE9132	Course Title: INDUSTRIAL AUTOMATION
Core/Elective:Elective	Credits (L : T : P : C : M) – 3 : 0 : 0 : 3 : 100
Type: Lecture	Total Contact Hours: 45

Pre-requisites: The student should have undergone the course(s):

1. Measurements& Instrumentation
2. Digital Electronics

Course Outcomes:

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

CO 1 Explain the PLC Architecture and its functional blocks
CO 2 Explain the PLC Programming and its instructions
CO 3 Explain the Architecture of Distributed Control System And HART
CO 4 Explain the working of Field Bus And SCADA
CO 5 Explain the applications of PLC and DCS

UNIT I PLC ARCHITECTURE **9**

PLC Programming: PLC: Evolution – Components of PLC – Advantages over relay logic - PLC programming languages – Ladder diagram – Programming timers and counters –PLC Specifications –Selection of PLC- Digital and Analog I/O Modules

UNIT II PLC PROGRAMMING **9**

Timer Functions: Types, programming - Counter Functions: Types, programming. Advanced functions – Arithmetic functions – Logic functions – Comparison functions - Program control instructions, math instructions, and sequencer instructions. Advanced Instructions in PLC – Program control instructions, math instructions, sequencer instructions.

UNIT III DISTRIBUTED CONTROL SYSTEM AND HART **9**

DCS: Evolution – Different architectures – local control unit – Operator interface – Displays – Engineering interface. HART: HART: Introduction – Evolution of signal standards – HART communication protocol – communication modes – HART networks – Control system interface – HART commands – HART field controller implementation – HART and ISO-OSI model.

UNIT IV FIELD BUS AND SCADA **9**

Field Bus: Field bus: Introduction –Architecture – Basic requirements of field bus standard – Field bus topology – interoperability – interchangeability.

SCADA: Supervisory Control and Data Acquisition (SCADA) – overview – Developer and runtime packages – architecture – Tools – Tag – Internal & External graphics, Alarm logging – Tag logging – structured tags – Trends – history – Report generation

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UNIT V APPLICATIONS OF PLC AND DCS **9**

Applications of PLC: Bottle filling system – Material handling system – Spray Painting System – Pneumatic Stamping System.

Applications of DCS: Applications of DCS in Power plants, Iron and Steel plants, Chemical plants, Cement plants and Pulp and Paper plants.

L: 45, T: 0, Total: 45

TEXT BOOKS:

1. Webb John W. and Reis Ronald A., "Programmable Logic Controllers", Prentice Hall Publications, New Delhi, 2005.
2. Lukas, Michael P., "Distributed Control Systems", Van Nostrand Reinfold Company, 2002.

REFERENCES:

1. Petrezeulla, "Programmable Controllers", McGraw Hill, New York, 1989.
2. Popovic D. and Bhatkar V.P., "Distributed Computer Control for Industrial Automation, Marcel Dekkar Inc., New York, 1990.
3. Cimplicity Scada Packages Manual Fanuc India Ltd, 2004.

Web References:

1. www.nptel.ac.in/downloads/108105063/
2. http://nptel.ac.in/courses/108105062/18

BoS Chairman

HOD-Electrical and Electronics Engineering
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Course Code: 140EE9133	**Course Title:** ROBOTICS AND AUTOMATION (Common to EEE,EIE,ICE)
Core/Elective: Elective	**Credits (L : T : P : C : M)** – 3 : 0 : 0 : 3 : 100
Type: Lecture	**Total Contact Hours:**60

Pre-requisites: The student should have undergone the course(s):

1. Electrical machines I
2. Electrical machines II
3. Measurements & instrumentation

Course Outcomes:

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

CO1: Explain the basic structure of Robotics and Automation.

CO2: Describe the power sources, sensors and drive system.

CO3: Develop student's skills in perform kinematics and dynamics analysis of robot systems.

CO4: Explain the concepts basic methods of Robot programming.

CO5: Examine the Case Studies and applications of robotics.

Course Content:

UNIT I BASIC CONCEPTS **9**

Automation and Robotics – Asimov's laws of robotics - Robot Anatomy – basic Components of Robots system - classification of Robots by configuration – Robot Motion – Precision of movements - end effectors

UNIT II POWER SOURCES, SENSORS AND DRIVE SYSTEM **9**

Actuators - Hydraulic, pneumatic and electric drives – Mechanical power transmission System: Bearings, Gears, Belt and chains – Sensors: Position, Velocity, tactile sensors, Proximity and range sensor – Machine vision: Sensing and digitizing, Image processing and applications

UNIT - III KINEMATICS AND DYNAMICS **10**

Solution of direct and inverse kinematics problem – Manipulator path control – Robot dynamics - Robot trajectories - Jacobian work envelope - Robot cycle time analysis.

UNIT - IV ROBOT PROGRAMMING **8**

Methods of Robot programming – lead through programming methods – robot program as a path in space – motion interpolation – weight, signal and delay commands – Branching capabilities – Robot programming examples for pick and place application using VAL.

UNIT -V CASE STUDIES **9**

Robots in manufacturing and non-manufacturing application – Robot cell design – selection of robot - factory automation – FMS and CIM. Applications - material handling, processing operations, assembly and inspection – future applications of robots

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UNIT V APPLICATIONS OF PLC AND DCS **9**

Applications of PLC: Bottle filling system – Material handling system – Spray Painting System – Pneumatic Stamping System.

Applications of DCS: Applications of DCS in Power plants, Iron and Steel plants, Chemical plants, Cement plants and Pulp and Paper plants.

L: 45, T: 0, Total: 45

TEXT BOOKS:

1. Webb John W. and Reis Ronald A., "Programmable Logic Controllers", Prentice Hall Publications, New Delhi, 2005.
2. Lukas, Michael P., "Distributed Control Systems", Van Nostrand Reinfold Company, 2002.

REFERENCES:

1. Petrezeulla, "Programmable Controllers", McGraw Hill, New York, 1989.
2. Popovic D. and Bhatkar V.P., "Distributed Computer Control for Industrial Automation, Marcel Dekkar Inc., New York, 1990.
3. Cimplicity Scada Packages Manual Fanuc India Ltd, 2004.

Web References:

1. www.nptel.ac.in/downloads/108105063/
2. http://nptel.ac.in/courses/108105062/18

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HOD-Electrical and Electronics Engineering
Dr. Mahalingam College of Engineering and Technology
Pollachi - 642 003.

Course Code: 140EE9134	Course Title: MICRO ELECTRO MECHANICAL SYSTEMS (Common to EEE,EIE,ICE)
Core/Elective: Elective	Credits (L : T : P : C : M) – 3 : 0 : 0 : 3 : 100
Type: Lecture	Total Contact Hours: 45

Pre-requisites: The student should have undergone the course(s):

1. Linear Integrated Circuits and Applications
2. Engineering Mechanics

Course Outcomes:

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

CO 1 Identify the various sensors and actutators

CO 2 Define the knowledge of semiconductors and solid mechanics to fabricate MEMS devices.

CO 3 Describe the mechanical structures

CO 4 Describe the micromachining process

CO 5 Explain the applications of MEMS in Various fields

Course Content:

UNIT I MEMS DESIGN 9

Overview - Microsystems and microelectronics - Working principle of Microsystems - micro actuation techniques- microsensors- types- microactuators- types- micropump- micromotors- microvalves- microgrippers- scaling laws-scaling in geometry-scaling in rigid body dynamics- scaling in electrostatic forces- scaling in electricity- scaling in fluid mechanics- scaling in heat transfer.

UNIT II MATERIALS AND FABRICATION PROCESS 9

Substrates and wafer-single crystal silicon wafer formation-ideal substrates-mechanical properties- silicon compounds - Sio2, SiC, Si3N4 and polycrystalline silicon - Silicon piezoresistors - Gallium arsenide, Quartz-piezoelectric crystals-polymers for MEMS-conductive polymers- Photolithography - Ion implantation - Diffusion– Oxidation –CVD - Physical vapor deposition Deposition by epitaxy - etching process

UNIT - III MICROMECHANIC 9

Introduction-static bending of thin plates-circular plates with edge fixed - rectangular plate with all edges fixed and square plate with all edges fixed – Mechanical vibration-resonant vibration- micro accelerometers-design theory and damping coefficients- thermo mechanics -thermal stresses- fracture mechanics-stress intensity factors, fracture toughness and interfacial fracture mechanics.

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UNIT - IV MICRO SYSTEM MANUFACTURING 9

Clean room technology-Bulk Micro manufacturing - surface micro machining –LIGA-SLIGA-Micro system packaging-materials-die level-device level-system level-packaging techniques-die preparation-surface bonding-wire bonding-sealing

UNIT -V MICRO SYSTEM DESIGN 9

Design considerations-process design-mask layout design- mechanical design-applications of micro system in -automotive industry-bio medical – aerospace - telecommunications

Text Books:

1. Gad-el-Hak, Mohamed, 'The MEMS Hand book', CRC press, New York, second edition, 2005.
2. Hsu, Tai-Ran., 'MEMS and Microsystems Design and Manufacture', Tata McGraw-Hill, New Delhi, 2008.
3. Stephen Santuria," Microsystems Design", Kluwer publishers, 2000.

Reference Books:

1. Fatikow, S. and Rembold, U., 'Microsystem Technology and Microrobotics', Springer-Verlag Berlin, 1997.
2. Tay, Francis E.H. and Choong, W.O., 'Microfludics and BioMEMS Applications', Springer, Berlin, 2002.
3. Nadim Maluf," An introduction to Micro electro mechanical system design", Artech House, 2000

Web References:

1. http://www.leb.eei.unierlangen.de/termine/ferienakademie/2008/mikrosysteme/Judy_MEMS_Review.pdf
2. http://nptel.ac.in/courses/101104010/downloads/Lecture28.pdf
3. http://nptel.ac.in/courses/112104162/

BoS Chairman

Course Code: 140EE9135	Course Title: PROFESSIONAL ETHICS & HUMAN VALUES (Common to EEE,EIE,ICE)
Core/Elective: Elective	**Credits (L : T : P : C : M)** – 3 : 0 : 0 : 3 : 100
Type: Lecture	**Total Contact Hours:**45

Course Outcomes:

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

CO 1: Explain the basic perception of profession, professional ethics, various moral issues of ethical theories.

CO 2: Explain the various social issues, industrial standards, code of ethics and role of professional ethics in engineering field.

CO 3: Identify the responsibilities of an engineer for safety and risk benefit analysis.

CO 4: Explain the importance of professional rights and responsibilities of an engineer.

CO 5: Explain the various roles of engineers in variety of global issues and able to apply ethical principles to resolve situations that arise in their professional lives.

Course Content:

UNIT I ENGINEERING ETHICS 9

Senses of Engineering Ethics – Variety of moral issues – Types of inquiry – Moral dilemmas. Moral Autonomy – Kohlberg's theory – Gilligan's theory – Consensus and Controversy – Professions and Professionalism – Professional ideals and virtues – Theories about right action – Self-interest – Customs and religion – Use of Ethical Theories.

UNIT II ENGINEERING AS SOCIAL EXPERIMENTATION 9

Engineering as experimentation – Engineers as responsible experimenters – Codes of Ethics – A Balanced Outlook on Law – The Challenger Case Study

UNIT - III ENGINEER'S RESPONSIBILITY FOR SAFETY 9

Safety and risk – Assessment of safety and risk – Risk Benefit Analysis – Reducing risk – The Three Mile Island and Chernobyl Case Studies

UNIT - IV RESPONSIBILITIES AND RIGHTS 9

Collegiality and loyalty – Respect for Authority – Collective Bargaining – Confidentiality – Conflicts of Interest – Occupational Crime – Professional Rights – Employee Rights – Discrimination

UNIT -V GLOBAL ISSUES 9

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.

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Text 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

Reference Books:

1. Laura Schlesinger, How Could You Do That: The Abdication of Character, Courage, and Conscience, Harper Collins, New York, 1996.
2. Govindarajan M, Natarajan S., Senthil Kumar V. S., "Engineering Etics", Printice Hall of India, New Delhi 2004.
3. John R Boatright, "Ethics and the conduct of Business", Pearson education, New Delhi, 2003.
4. Edmund G Seebauer and Robert L Barry, Fundamentals of Ethics for Scientists and Engineers", Oxford University Press, Oxford, 2001.
5. Prof. (Col) P S Bajaj and Dr. Raj Agrawal, "Business Ethics – An Indian Perspective", Biztantra, New Delhi, 2004.
6. David Ermann and Michele S Shauf, "Computers, Ethics and Society", Oxford University Press, (2003).

Web References:

1. https://www.nspe.org/resources/ethics/code-ethics
2. https://courses.soe.ucsc.edu/courses/cmpe80e/Spring11/01/attachments/20
3. http://courses.cs.tamu.edu/daugher/engr482/RiskSafetyLiability.pdf

BoS Chairman

... Electrical and Electronics Eng...
Dr. Mahalingam College of Engineering and Technology
Pollachi - 642 003.

Course Code: 140EE9136	Course Title: COMPUTER NETWORKS(Common to EEE,CSE)
Core/Elective: Elective	Credits (L : T : P : C : M) – 3 : 0 : 0 : 3 : 100
Type: Lecture	Total Contact Hours:45

Pre-requisites: The student should have undergone the course(s):

1. Digital Electronics
2. Communication Systems

Course Outcomes:

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

CO1: Describe the OSI model and its usage in data communication

CO2: Explain the protocols of different layer.

CO3: Classify various IEEE standards and quality of service.

CO 4: Describe various addressing and internetworking methods in communication of data.

CO 5: Describe the security applications and protocols involved

Course Content:

UNIT I FOUNDATIONS OF NETWORKS 11

Requirements – Network Architecture – Implementing Network Software – Bandwidth and Latency –Delay X Bandwidth product –Application Performance needs.

UNIT II LINK LAYER 12

Perspectives on Connecting – Encoding – Framing – Error Detection – Reliable transmission – Ethernet and Multiple Access Networks – Wireless

UNIT - III INTERNETWORKING 14

Switching and Bridging – Internet Protocol – Service Model - Global Addresses - Datagram Forwarding in IP -Subnetting and Classless Addressing – ARP – DHCP – ICMP- Virtual Networks and Tunnels – Routing protocols – RIP – OSPF – BGP – Multicast Routing – IPV6 – Challenges in Mobile Networking – Mobile IP.

UNIT - IV END-TO-END PROTOCOLS 11

UDP – TCP – Connection Establishment and Termination- Sliding Window Protocol – TCP Extensions – RPC – Real Time Application – TCP Congestion Control – Congestion Avoidance Mechanisms – Quality of Service

UNIT -V SECURITY & APPLICATIONS 12

Cryptographic Building Blocks – Key Management - Authentication Protocols – PGP – SSH – Transport layer Security – IPSec – Wireless Security- Firewalls- SMTP – HTTP – Web Services - DNS – SNMP

Text Books:

1. Larry L. Peterson and Bruce S. Davie, "Computer Networks – A Systems Approach", Fifth Edition, The Morgan Kaufmann Publishers, 2011.

Reference Books:

1. James F. Kurose, Keith W. Ross, "Computer Networking – A top down Approach Featuring the Internet", Fourth Edition, Pearson Education, 2006
2. William Stallings, "Data and Computer Communication", Sixth Edition, Pearson Education, 2000.
3. Jochen Schiller, "Mobile Communication", Addison Wesley, 2000.

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