



B.Tech. (Full Time) – Electrical and Electronics Engineering

Curriculum & Syllabus

2007-08

SRM UNIVERSITY
B.TECH. ELECTRICAL AND ELECTRONICS ENGINEERING
CURRICULUM AND SYLLABUS
2007-08

Semester – I

Code	Category	Course	L	T	P	C
Theory						
LE0101	G	English	1	0	2	2
MA0101	B	Mathematics – I	3	2	0	4
PH0101	B	Physics	3	0	0	3
CY0101	B	Chemistry	3	0	0	3
GE0101	E	Basic Engineering – I	4	0	0	4
Practical						
GE0107	G	NSS/NCC/NSO/YOGA	0	0	2	1
PD0101	G	Personality Development – I*	0	0	2	0
PH0103	B	Physics Laboratory	0	0	2	1
CY0103	B	Chemistry Laboratory	0	0	2	1
GE0105	B	Computer Literacy	0	0	2	1
ME0120/ME0130	E	Workshop Practice / Engineering Graphics	0/1	0	4	2/3
Total Contact Hours			15/16	2	16	22/23

Semester – II

Code	Category	Course	L	T	P	C
Theory						
GE 0108	G	Value education	1	0	0	1
MA 0102	B	Mathematics II	3	2	0	4
PH 0102	B	Materials science	2	0	2	3
GE 0102	B	Biology for engineers	2	0	0	2
GE 0104	B	Principles of environmental science	2	0	0	2
GE 0106	E	Basic engineering II	4	0	0	4
ME0102	E	Engineering Mechanics	3	0	0	3
Practical						
PD0102	G	Personality Development – II*	0	0	2	0
CS0140	B	Computer Practice	1	0	2	2
ME0130/ME0120	E	Engineering Graphics / Workshop Practice	1/0	0	4	3/2
Total Contact Hours			18/17	2	10	24/23

G: General programme comprising language/communication skills, humanities and social sciences, economics and principles of management, and NSS/NCC/NSO/YOGA.

B: Basic sciences comprising Computer Literacy with Numerical Analysis, Mathematics, Physics, and Chemistry.

E: Engineering Sciences and Technical Arts comprising Engineering Graphics, Workshop Practice, Basic Engineering, etc.

P: Professional subjects corresponding to the Branch of Studies, which will include core subjects, electives, and project work.

* Audit course

Semester – III

Code	Category	Course	L	T	P	C
Theory						
LE0201/LE0203/LE0205	G	German Language – Phase - I / Japanese Language – Phase -I / French Language - Phase -I	2	0	0	2
MA0211	B	Mathematics – III	3	2	0	4

CE0217	E	Fluid Mechanics and Machinery	3	0	0	3
EE0201	P	Electrical Machines – I	3	0	0	3
EE0203	P	Electric Circuit Analysis	3	2	0	4
EE0205	P	Electromagnetic Theory	3	0	0	3
EE0207	P	Electronic Devices	3	0	0	3
Practical						
PD0201	G	Personality Development - III	0	0	2	1
EE0209	P	Electrical Machines Lab – I	0	0	3	2
EE0211	P	Electric Circuits Lab	0	0	3	2
Total			20	4	8	27
Total Contact Hours			32			

Semester – IV

Code	Category	Course	L	T	P	C
Theory						
LE0202/LE0204/LE0206	G	German Language – Phase - II / Japanese Language – Phase -II/ French Language - Phase -II	2	0	0	2
MA0202	E	Numerical Methods	3	2	0	4
EE0202	P	Electrical Machines – II	3	0	0	3
EE0204	P	Control Systems	3	0	0	3
EE0206	P	Transmission & Distribution Systems	3	0	0	3
EE0208	P	Electronic Circuits	3	0	0	3
Practical						
PD0202	G	Personality Development – IV	0	0	2	1
EE0210	P	Electrical Machines Lab – II	0	0	3	2
EE0212	P	Electron Devices and Circuits Lab	0	0	3	2
EE0214	P	Comprehension – I	0	2	0	1
EE0216	E	Computer Skills	0	0	2	1
Total			17	4	10	25
Total Contact Hours			31			

Semester – V

Code	Category	Course	L	T	P	C
Theory						
MB0301	G	Engineering Economics and Management	3	0	0	3
EE0301	P	Electrical & Electronic Measurements & Instrumentation	3	0	0	3
EE0303	P	Digital Signal Processing	3	0	0	3
EE0305	P	Linear Integrated Circuits	3	0	0	3
EE0307	P	Digital Systems	3	0	0	3
EE0309	P	Design of Electrical Apparatus	3	1	0	4
Practical						
PD0301	G	Personality Development – V	1	0	2	2

EE0311	P	Measurements & Control Systems Lab	0	0	3	2
EE0313	P	Integrated Circuits Lab	0	0	3	2
EE0315	P	Industrial Training – I	0	0	2	1
Total Contact Hours			19	1	10	26

Semester – VI

Code	Category	Course	L	T	P	C
Theory						
EE0302	P	Power Electronics	3	1	0	4
EE0304	P	Microprocessor & Microcontrollers	3	0	0	3
EE0306	P	Switch Gear and Protection	3	0	0	3
EE0308	P	Power System Analysis	3	0	0	3
	P	Elective – I	3	0	0	3
Practical						
PD0302	G	Personality Development – VI	1	0	2	2
EE0310	P	Microprocessor and Microcontroller Lab	0	0	3	2
EE0312	P	Comprehension – II	0	2	0	1
EE0314	P	Power Electronics Lab	0	0	3	2
Total Contact Hours			16	3	8	23

Semester – VII

Code	Category	Course	L	T	P	C
Theory						
EE0401	P	Solid State Drives and Control	3	2	0	4
EE0403	P	Power System Operation & Control	3	0	0	3
	P	Elective – II	3	0	0	3
	P	Elective – III	3	0	0	3
Practical						
EE0405	P	Simulation Lab	0	0	3	2
EE0409	P	Industrial Training – II	0	0	2	1
Total Contact Hours			12	2	5	16

Semester – VIII

Code	Category	Course	L	T	P	C
Theory						
	P	Elective – IV	3	0	0	3
	P	Elective – V	3	0	0	3
EE402	P	Project Work	0	0	16	8
Total Contact Hours			6	0	16	14

* Project title and the supervisor are to be identified by the students with in two weeks from the beginning of the VII semester. The student is expected to put in a minimum of 10 hours in their project in the VII semester. The project progress in the VII and VIII semesters have to be periodically assessed for sessional marks.

Summary Table

Semester	I	II	III	IV	V	VI	VII	VIII	Total	%
Total	22/23	24/23	27	25	26	23	16	14	177	100
G	4	-	3	3	5	2	-	-	17	9.6
B	13	13	4	-	-	-	-	-	30	16.8
E	6/7	10/09	3	5	-	-	-	-	24	13.5
P	-	-	18	17	21	21	16	14	106	60.1

TOTAL CREDITS TO BE EARNED FOR THE AWARD OF THE DEGREE : 177

LIST OF ELECTIVES

Code	Course	L	T	P	C
Six Semester					
MA0352	Operations Research	3	0	0	3
EE0352	High Voltage Engineering	3	0	0	3
EE0354	Data Base Management Systems	3	0	0	3
EE0356	Special Electrical Machines	3	0	0	3
EE0358	Computer Organization and Architecture	3	0	0	3
EC0314	Communication Engineering	3	0	0	3
EE0360	Electrical Power Utilization and Illumination	3	0	0	3
Seventh Semester					
EE0451	Power Quality	3	0	0	3
EE0453	Microcontroller Based System Design	3	0	0	3
EE0455	Expert System and Fuzzy Logic	3	0	0	3
EE0457	Computer Network Engineering	3	0	0	3
EE0459	Power System Dynamics	3	0	0	3
EE0461	Artificial Neural Networks	3	0	0	3
EE0463	Biomedical Instrumentation	3	0	0	3
EE0465	Modern Control Theory	3	0	0	3
EE0467	Genetic Algorithm and its applications	3	0	0	3
Eighth Semester					
EE0452	Power Plant Instrumentation and Control	3	0	0	3
EE0454	Power Generation Systems	3	0	0	3
EE0456	Digital Control Systems	3	0	0	3
EE0458	Computer Aided Power System Analysis	3	0	0	3
EE0460	Flexible AC Transmission Systems	3	0	0	3
EE0462	Non-Conventional Energy Resources	3	0	0	3
EE0464	Embedded System	3	0	0	3
EC0466	Optical Communication	3	0	0	3

**SYLLABUS
SEMESTER – I**

		L	T	P	C
LE 0101	ENGLISH	1	0	2	2
	Prerequisite				
	Nil				

PURPOSE

To provide an adequate mastery of communicative English Language training primarily - reading and writing skills, secondarily listening and speaking skills.

INSTRUCTIONAL OBJECTIVES

To provide language training to the engineering students which will enable them to understand and acquire knowledge in technical subjects.

LISTENING

Listening Practice – Hints on Listening – Listening Practice
Note Taking: Note Taking Strategies

SPEAKING

Definitions: Expressing Opinions (agreement / disagreement)-Offering Suggestions – Technical Definitions – Describing Objects – speaking practice. Phonetics: Pronunciation-Phonetic Transcription-Stress-Intonation

READING

Comprehension: Skimming-scanning-close reading-Comprehension – Transferring Information – Exercise – An unseen passage should be given and questions may be asked in the form of True or False statements, MCQ, short answers. Transcoding : Interpreting tables, flow charts, piechart, bar diagram, tree diagram, graphs.

WRITING

Art of Writing : Writing Language – Rules for effective writing – Technical Essay Writing – Exercise Report Writing : Technical Writing – Lab Report – Exercise Letter Writing : Formal Letters – Letter to the Editor – Letter Inviting Dignitaries – Letter of Application Curriculum Vitae – Placing an Order. Dialogue Writing

FOCUS ON AND COMMUNICATION AND “COMPUNICATION”

Communication : Basic Concepts – Process – Kinds – Routes – Forms – Factors – Barriers – Triangles Communication (Communicate through Computers – Power Point & Tele Conference).

TEXT BOOKS

1. Abraham Benjamin Samuel *Practical Communication Communicative English LSRW2000* – SRMEC – June 2006 Revised Edition.
2. Staff of the Department of Humanities and Social Science, Anna University, “*English for Engineers / Technologist Vol.-I*”. Orient Longman, 1990.

REFERENCE BOOKS

1. Herbert. A. J. *The structure of Technical English* Orient Longman 1995.
2. Pickett and Laster, ‘*Technical English, Writing, Reading and Speaking*’, New York Harper and Row Publications, 1997.
3. *Interactive course in phonetics and spoken English* published by Acoustics Engineers (ACEN) 2002.
4. Munter, Mary, *Business Communication Strategy and Skil*, Prentice Hall Inc.,New Jersey, 1987.

		L	T	P	C
MA 0101	MATHEMATICS –I	3	2	0	4
	Prerequisite				
	Nil				

PURPOSE

To impart analytical ability in solving mathematical problems as applied to the respective branches of Engineering.

INSTRUCTIONAL OBJECTIVES

At the end of the course, student should be able

1. To apply advanced matrix knowledge to Engineering problems.
2. To improve their ability in solving geometrical applications of differential calculus problems.
3. To equip themselves familiar with the functions of several variables.
4. To familiarize with the applications of differential equations.
5. To expose to the concept of three dimensional analytical geometry.

MATRICES

Characteristic equation – Eigen values and eigen vectors of a real matrix – Properties of eigen values – Caley – Hamilton theorem – Orthogonal reduction of a symmetric matrix to diagonal form – Orthogonal matrices – Reduction of quadratic form to canonical form by orthogonal transformations.

GEOMETRICAL APPLICATIONS OF DIFFERENTIAL CALCULUS

Curvature – Cartesian and polar coordinates – Circle of curvature – Involutives and Evolutes – Envelopes – Properties of envelopes.

FUNCTIONS OF SEVERAL VARIABLES

Function of two variables – Partial derivatives – Total differential – Taylor's expansion – Maxima and Minima – Constrained Maxima and Minima by Lagrangean Multiplier method – Jacobians

ORDINARY DIFFERENTIAL EQUATIONS

Simultaneous first order linear equations with constant coefficients – Linear equations of second order with constant and variable coefficients – Homogeneous equation of Euler type – Equations reducible to homogeneous form.

THREE DIMENSIONAL ANALYTICAL GEOMETRY

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

TEXT BOOK

1. Grewal B.S, Higher Engg Maths, Khanna Publications, 38th Edition., Veerajan, T., *Engineering Mathematics*, Tata McGraw Hill Publishing Co., New Delhi,2000.
2. Dr.V.Ramamurthy & Dr. Sundarammal Kesavan," *Engineering Mathematics*" – Vol I & II Anuradha Publications, Revised Edition 2006.

REFERENCE BOOKS

1. Kreyszig,E, "*Advanced Engineering Mathematics*", 8th edition, John Wiley & Sons. Singapore,2001.
2. Kandasamy P etal. "*Engineering Mathematics*", Vol.I (4th revised edition), S.Chand &Co., New Delhi,2000.
3. Narayanan S., Manicavachagom Pillay T.K., Ramanaiyah G., "*Advanced Mathematics for Engineering students*", Volume I (2nd edition), S.Viswanathan Printers and Publishers, 1992.
4. Venkataraman M.K., "*Engineering Mathematics*" – First Year (2nd edition), National Publishing Co., Chennai,2000.

		L	T	P	C
PH 0101	PHYSICS	3	0	0	3
	Prerequisite				
	Nil				

PURPOSE

The purpose of this course is to develop scientific temper and analytical capability through learning physical concepts and their applications in engineering and technology. Comprehension of some basic physical concepts will enable the students to logically solve engineering problems.

INSTRUCTIONAL OBJECTIVES

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

1. Understand the general scientific concepts required for technology,
2. Apply the concepts in solving engineering problems,
3. Explain scientifically the new developments in engineering and technology, and
4. Get familiarized with the concepts, theories, and models behind many technological applications.

PROPERTIES OF MATTER AND SOUND

Properties of Matter: Hooke's law – Twisting couple on a cylinder – Shafts – Torsion pendulum – Bending of beams – Bending moment – Uniform bending and non-uniform bending – I shape girder. **Sound:** Shock waves – Mach number (simple problems) – Ultrasonic production (magnetostriction and piezoelectric methods) and application – Acoustics of buildings – Sources and impacts of noise – Sound level meter – Control of noise pollution.

ELECTROMAGNETISM AND MICROWAVES

Electromagnetism: Divergence, curl and gradient – Maxwell's equations – Wave equation for electromagnetic waves – Propagation in free space – Poynting vector – Rectangular and circular wave guides. **Microwaves:** Properties and applications – Generation by magnetron and reflex klystron oscillator – Travelling wave tube – Biological effects.

OPTICS

Photometry: Principles and Lummer-Brodhun photometer. **Lasers:** Principles and characteristics – Types of lasers (CO₂, excimer, NdYAG, GaAs, free electron) – Holographic mass storage. **Optical Fiber:** Principles – Physical structure and types – Optical fiber communication. **Photoelasticity:** Theory and applications.

CRYSTAL PHYSICS AND CRYOGENICS

Crystal Physics: Crystal directions – Planes and Miller indices – Basic symmetry elements – Translational symmetry elements – Reciprocal lattice – Diamond and HCP crystal structure – Imperfections in crystals. **Cryogenics:** Methods of liquefaction of gases (cascade process, Linde's process, and adiabatic demagnetization process) – Measurement of cryogenic temperatures.

ENERGY PHYSICS

Introduction to non-conventional energy sources – Solar cells – Thermoelectric power generators – Thermionic power generator – Magneto hydrodynamic power generator – Fuel cells (H₂O₂) – Solid state batteries (Lithium) – Low voltage and high voltage nuclear cells – Thermocouple based nuclear cell – Ultra capacitors.

TEXT BOOKS

1. Arumugam, M., *Engineering Physics*, 2nd edition, Anuradha Publishers, Kumbakonam, 2003.
2. Gaur and Gupta, *Engineering Physics*, 7th edition, Dhandapani and Sons, New Delhi, 1997.
3. Thiruvadigal, J. D., Ponnusamy, S., Vasuhi, P. S. and Kumar, C., *Physics for Technologists*, 5th edition, Vibrant Publication, Chennai, 2007.

REFERENCE BOOKS

1. Vasudeva, A. S., *Modern Engineering Physics*, Revised edition, S. Chand and Company Ltd., New Delhi, 2004.
2. Vasudevan, D. N., *Fundamentals of Magnetism and Electricity*, 11th edition, S. Chand and Company Ltd., New Delhi, 1983.
3. Nair, K. P. R., *Atoms, Molecules and Lasers*, Narosa Publishing House, New Delhi, 2006.
4. Pillai, S. O, *Solid State Physics*, 5th edition, New Age International (P) Ltd., New Delhi, 2004.
5. Khan, B. H., *Non-Conventional Energy Resources*, Mechanical Engineering Series, Tata McGraw Hill Publishing Company Ltd., New Delhi, 2006.

		L	T	P	C
CY 0101	CHEMISTRY	3	0	0	3
	Prerequisite				
	Nil				

PURPOSE

To impart a sound knowledge on the principles of chemistry involving the different application oriented topics required for all engineering branches.

INSTRUCTIONAL OBJECTIVES

The students should be conversant with

1. The role of applied chemistry the field of engineering.
2. The knowledge of water quality parameters and the treatment of water.
3. The principles involves in corrosion and its inhibitions.
4. Important analytical techniques, instrumentation and the applications.
5. Knowledge with respect to the phase equilibria of different systems.

TECHNOLOGY OF WATER

Water quality parameters: Physical, Chemical & Biological - Hardness of water – estimation of hardness (EDTA method & O. Hehner's method), Alkalinity – determination – disadvantages of using hard water in boilers: Scale, sludge formation – disadvantages – prevention – treatment: Internal conditioning – phosphate, calgon and carbonate conditioning methods – External: Zeolite, ion exchange methods - desalination – reverse osmosis and electrodialysis - domestic water treatment.

CORROSION AND ITS CONTROL

Corrosion: Basic concepts – principles, mechanism of chemical, electrochemical corrosion – Pilling Bedworth rule – galvanic corrosion – differential aeration corrosion - pitting corrosion - stress corrosion - factors influencing corrosion.

Corrosion control: cathodic protection – sacrificial anodic method – corrosion inhibitor. Protective coatings: surface preparation for metallic coatings - electro plating and electroless Plating - chemical conversion coatings – anodizing, phosphating & chromate coating.

PHASE EQUILIBRIA

Phase rule: Statement – explanation of the terms involved - one component system (water system only). Condensed phase rule - thermal analysis – two component systems: simple eutectic, Pb-Ag; Br, Cd - solid solution Cu-Ni and compound formation Mg-Zn - applications of eutectics.

POLYMERS AND REINFORCED PLASTICS

Classification of polymers – types of polymerization reactions – mechanism of addition polymerization: free radical, ionic and ziegler – Natta - effect of structure on the properties of polymers – strength, plastic deformation, plastics elasticity and physical nature –Preparation and properties of important resins:- Polyethylene, PVC, PMMA, Polyester, Teflon Bakelite, Epoxy resins, compounding of plastics, moulding methods - injection, extrusion, compression and calendaring - reinforced plastics – FRP – Carbon, Graphite, Glass– applications.

INSTRUMENTAL METHODS OF ANALYSIS

Basic principles, instrumentation of potentiometry, flame photometry – applications. Elementary theory – principle – instrumentation of UV – visible spectroscopy and atomic absorption spectroscopy and infrared spectroscopy.

TEXT BOOKS

1. Jain.P.C and Monika Jain, *Engineering Chemistry*, Danpat Raj publishing company (P) Ltd, New Delhi – 2002.
2. Dara.S.S, *Text book of Engineering Chemistry*, S. Chand & Company Ltd, New Delhi 2003.
3. Willard H.A., Merit L.L and Dean J.A., “*Instrumental methods of analysis*” 6th Edition Van Nostrand, 1986.

REFERENCE BOOKS

1. Kuriacose J.C. and Rajaram J. *Chemistry in Engineering and Technology*, Volume II, Tata McGraw Hill p.b. Co., 1988.
2. Jeyalakshmi.R & Ramar. P, *Engineering Chemistry*, 1st Edition, Devi Publications, Chennai 2006.
3. Kamaraj.P & Arthanareeswari. M, *Applied Chemistry*, 2nd Edition, Sudhandhira Publications, 2003.
4. Arivalagan. K, *Engineering Chemistry*, 1st Edition, Mass publications, 2007.
5. P.Kamatchi, *Applied Chemistry-I*, Ponnuswamy publications, Chennai.
6. Dr. Helen P Kavitha , *Engineering Chemistry – I* ILA Publications, 2002

		L	T	P	C
GE 0101	BASIC ENGINEERING – I	4	0	0	4
	Prerequisite				
	Nil				

PART A CIVIL ENGINEERING

PURPOSE

To get exposed to the glimpses of Civil Engineering topics that is essential for an Engineer.

INSTRUCTIONAL OBJECTIVES

1. To know about different materials and their properties.
2. Engineering aspects related to buildings.
3. To know about importance of Surveying.
4. To know about the transportation systems.
5. To get exposed to the rudiments of engineering related to Dams, Water Supply, Transportation system and Sewage Disposal.

BUILDING MATERIALS AND THEIR PROPERTIES

Introduction - Civil Engineering – Building Materials – Brick, Stone, Cement, Steel, Concrete, timber – Properties – Uses. Units – Stress, strain and three moduli of elasticity – factor of safety - Centre of Gravity and Moment of Inertia for rectangle and circular section – simple problems.

BUILDINGS AND THEIR COMPONENTS

Buildings – Classification - Components of buildings and their functions Foundations - functions – classification of foundations – Bearing capacity Floorings – functions - Types - Cement Concrete flooring – Mosaic flooring - Marble flooring Roofs - Types – Requirements – Madras Terrace roof. Tall structure – types of structural systems.

UTILITY AND SERVICES

Surveying - Objective – Principles – Classification – Instruments used for Surveying. Dams - Purpose – Selection of site – Classification – Gravity dam (cross-section details only) Transportation system - Classification – Roadway - components – classification of roads - Railway – Cross-section of permanent way-components parts and functions. Docks and Harbour – classification – Terminology Bridges –components of a bridge - types of bridges. Water supply - Sources - Standards of drinking water (BIS) – elementary treatment methods – RO System Sewage disposal – Septic tank – function and components.

TEXT BOOKS

1. Raju K.V.B., Ravichandran P.T., *Basics of Civil Engineering*, Ayyappa Publications, Chennai, 2000.
2. Ramesh Babu, *Civil Engineering*, VRB Publishers, Chennai, 2000.

REFERENCE BOOKS

1. Rangwala, S.C., *Engineering Materials*, Charotar Publishing House, Anand, 1980.
2. National Building Code of India, Part V, *Building Materials*, 2005
3. Surendra Singh, *Building Materials*, Vikas Publishing Company, New Delhi, 1996

PART B MECHANICAL ENGINEERING

PURPOSE

To familiarize the students with the basics of Mechanical Engineering.

INSTRUCTIONAL OBJECTIVES

To familiarize with

1. The basic machine elements
2. The Sources of Energy and Power Generation
3. The various manufacturing processes

MACHINE ELEMENTS

Springs: Helical and leaf springs – Springs in series and parallel. **Cams:** Types of cams and followers – Cam profile. **Power Transmission:** Gears (terminology, spur, helical and bevel gears, gear trains). Belt drives (types). Chain drives. **Simple Problems.**

ENERGY

Sources: Renewable and non-renewable (various types, characteristics, advantages/disadvantages). **Power Generation:** External and internal combustion engines - Hydro and nuclear power plants (layouts, element/component description, advantages, disadvantages, applications). **Simple Problems.**

MANUFACTURING PROCESSES

Sheet Metal Work: Introduction – Equipments – Tools and accessories – Various processes (applications, advantages / disadvantages). **Welding:** Types – Equipments – Tools and accessories – Techniques employed (applications, advantages / disadvantages (gas and arc welding only)) – Gas cutting – Brazing and soldering. **Lathe Practice:** Types - Description of main components – Cutting tools – Work holding devices – Basic operations. **Simple Problems.** **Drilling Practice:** Introduction – Types – Description – Tools. **Simple Problems.**

TEXT BOOKS

1. Kumar, T., Leenus Jesu Martin., and Murali, G., *Basic Mechanical Engineering*, Suma Publications, Chennai, 2007.
2. Prabhu, T. J., Jai Ganesh, V., Jebaraj, S., *Basic Mechanical Engineering*, Scitech Publications, Chennai, 2000.

REFERENCE BOOKS

1. Hajra Choudhary, S.K. and Hajra Choudhary, A. K., *Elements of Manufacturing Technology*, Vols. I & II, Media Publishers, 1986.
2. Nag, P.K., *Power Plant Engineering*, Tata McGraw-Hill, New Delhi, 2006.
3. Palanichamy, M.S., *Basic Civil & Mechanical Engineering*, Tata McGraw-Hill, New Delhi 1991.
4. Nagpal G. R., *Power Plant Engineering*, Khanna Publisher, Delhi, 2004

		L	T	P	C
GE0107	NSS/NCC/NSO/YOGA	0	0	2	1
	Prerequisite				
	Nil				

I. YOGA SYLLABUS

PRACTICE		LECTURE
I	Meditation – Agnai, Asanas, Kiriyas, Bandas, Muthras	Benefits of Agnai Meditation
II	Meditation Santhi Physical Exercises (I & II)	Benefits of santhi Meditation
III	Kayakalpa Yoga Asanas, Kiriyas, Bandas, Muthras	Lecture & Practice
IV	Meditation Santhi Physical Exercises III & IV	Analysis of Thought
V	Meditation Thuriyam Kayakalpa Asanas, Kiriyas, Bandas, Muthras	Benefits of Thuriyam
VI	Meditation Thuriyam Kayakalpa Asanas, Kiriyas, Bandas, Muthras	Attitude
VII	Meditation Thuriyam Kayakalpa Asanas, Kiriyas, Bandas, Muthras	Importance of Arutkappy & Blessings
VIII	Meditation Santhi Kayakalpa Asanas, Kiriyas, Bandas, Muthras	Benefits of Blessings
		Hours = 30

TEXT BOOKS:

1. Vedatri Maharshi, *Yoga for Modern Age*
2. Vedatri Maharshi, *Simplified Physical Exercises*

NATIONAL SPORTS ORGANISATION (NSO)

Each student must select two of the following games and practice for two hours per week. An attendance of 80% is compulsory to earn the credits specified in the curriculum.

List of games:

1. Basket Ball
2. Football
3. Volley Ball
4. Ball Badminton
5. Cricket
6. Throwball

NATIONAL CADET CORE (NCC)

Any student enrolling as a member of National Cadet Core (NCC) will have to attend sixteen parades out of twenty parades each of four periods over a span of academic year. Attending eight parades in first semester will qualify a student to earn the credits specified in the curriculum.

IV.NATIONAL SERVICE SCHEME (NSS)

A student enrolling as member of NSS will have to complete 60 hours of training / social service to be eligible to earn the credits specified in the curriculum.

		L	T	P	C
PD 0101	PERSONALITY DEVELOPMENT - I	0	0	2	0
	Prerequisite				
	Nil				

PURPOSE

The purpose of this course is to build confidence and inculcate various soft skills and to help Students to identify and achieve their personal potential

INSTRUCTIONAL OBJECTIVES

1. To guide thought process.
2. To groom students' attitude.
3. To develop communication skill.
4. To build confidence.

METHODOLOGY

The entire program is designed in such a way that every student will participate in the class room activities. The activities are planned to bring out the skills and talents of the students which they will be employing during various occasions in their real life.

1. Group activities + individual activities.
2. Collaborative learning.
3. Interactive sessions.
4. Ensure Participation
5. Empirical Learning

Self-analysis SWOT - Time management - Creative chain story telling

Vocabulary games I – Attitude - Interpersonal skills

Motivation I - Vocabulary games II - Article review

Team building exercise - Critical Thinking - Event Management

Business situation - Leadership Qualities - Review

SCHEME OF INSTRUCTION

Marks allocated for regular participation in all oral activities in class

SCHEME OF EXAMINATION

Complete Internal evaluation on a regular Basis

		L	T	P	C
PH 0103	PHYSICS LABORATORY	0	0	2	1
	Prerequisite				
	Nil				

PURPOSE

The purpose of this course is to develop scientific temper and analytical capability among the engineering students.

INSTRUCTIONAL OBJECTIVES

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

1. Understand scientific concepts in measurement of different physical variables
2. Develop the skill in arranging and handling different measuring instruments and
3. Get familiarized with the errors in various measurements and planning / suggesting how these contributions may be made of the same order so as to make the error in the final result small.

LIST OF EXPERIMENTS

1. Determination of Young's Modulus of the material – Uniform bending
2. Determination of Rigidity Modulus of the material – Torsion Pendulum
3. Determination of velocity of Ultrasonic waves in liquids
4. Determination of dispersive power of a prism using spectrometer
5. Determination of laser parameter – Divergence and wavelength for a given laser source – laser grating
6. Particle size determination using laser
7. Study of attenuation and propagation characteristics of optical fiber cable
8. Calibration of voltmeter using potentiometer.
9. Calibration of ammeter using potentiometer.
10. Construction and study of regulation properties of a given power supply using IC

REFERENCE BOOKS

1. Chattopadhyay, D., Rakshit, P. C. and Saha, B., "An Advanced Course in Practical Physics", 2nd edition, Books & Allied Ltd., Calcutta, 1990.
2. Chauhan and Singh, "Advanced Practical Physics", Revised edition, Pragati Prakashan, Meerut, 1985.
3. Thiruvadigal. J. D., Ponnusamy. S., Vasuhi. P. S. and Kumar. C, "Hand Book of Practical Physics", 5th edition, Vibrant Publication, Chennai, 2007.

		L	T	P	C
CY 0103	CHEMISTRY LABORATORY	0	0	2	1
	Prerequisite				
	Nil				

PURPOSE

An integrated laboratory course consists of experiments from applied chemistry and is designed to illustrate the underlying principles of measurement techniques, synthesis, dynamics and chemical transformation.

INSTRUCTIONAL OBJECTIVES

Students should be able to understand the basic concept and its applications.

LIST OF EXPERIMENTS

1. Preparation of standard solutions.
2. Estimation of total hardness, permanent and temporary hardness by EDTA method.
3. Conductometric titration – determination of strength of an acid.
4. Estimation of iron by potentiometer – titration.
5. Determination of molecular weight of polymer by viscosity average – method.
6. Determination of dissolved oxygen in a water sample by Winkler's method
7. Determination of Na / K in water sample by Flame photometry.
8. Estimation of Copper in ore.
9. Estimation of nickel in steel.
10. Determination of total alkalinity and acidity of a water sample.

REFERENCE

1. Chemistry department manual, Edition, 2003.

		L	T	P	C
GE0105	COMPUTER LITERACY	0	0	2	1
	Prerequisite				
	Nil				

PURPOSE

This Lab Course will enable the students to understand the basics of computer and to know the basics of MS-Office.

INSTRUCTIONAL OBJECTIVES

1. To learn the basics of computer.
2. To work on Ms-Word, Ms-Excel, Ms-Power Point and Ms-Access

EXPERIMENTS TO IMPLEMENT

1. Study experiment on evolution of computer programming languages.
2. Suggest some of the Network Topologies that can be incorporated in your campus. Justify your choice.
3. Experiments to demonstrate directory creation and file creation.
4. Create a document with all formatting effects.
5. Create a document with tables.
6. Create labels in MS word.
7. Create a document to send mails using mail merge option.
8. Create an Excel File to analyze the student's performance. Create a chart for the above data to depict it diagrammatically.
9. Create Excel sheet to use built-in-function.
10. Create Excel sheet to maintain employee information and use this data to send mails using mail merge.
11. Create a Power Point presentation for your personal profile with varying animation effects with timer.
12. Consider student information system which stores student personal data, mark information and non academic details.
 - * Use MS Access to create Tables and execute SQL queries to do this following
 - * Display all student records.
 - * Display student details with respect to his identity.
 - * Delete some records from the table.
 - * Find total marks obtained by student in each list.

TEXT BOOK

1. *Introduction to Information Technology* ITL Education Solutions Ltd., Pearson 2nd Edition, 2006.

		L	T	P	C
ME 0120	WORKSHOP PRACTICE	0	0	4	2
	Prerequisite				
	Nil				

PURPOSE

To provide the students with hands on experience on different trades of engineering like fitting, carpentry, smithy, welding and sheet metal.

INSTRUCTIONAL OBJECTIVES

To familiarize with

1. The basics of tools and equipments used in fitting, carpentry, sheet metal, welding and smithy.
2. The production of simple models in the above trades.

LIST OF EXPERIMENTS

EMPHASIS TO BE LAID ON REAL LIFE APPLICATIONS WHEN FRAMING THE EXERCISES.

FITTING

Tools & Equipments – Practice in Filing and Drilling.
Making Vee Joints, Square, dovetail joints, Key Making.

CARPENTARY

Tools and Equipments- Planning practice. Making Half Lap, dovetail, Mortise & Tenon joints, a mini model of a single door window frame.

SHEET METAL

Tools and equipments - Fabrication of a small cabinet, Rectangular Hopper, etc.

WELDING

Tools and equipments - Arc welding of butt joint, Lap Joint, Tee Fillet. Demonstration of Gas welding, TIG & MIG.

SMITHY

Tools and Equipments –Making simple parts like hexagonal headed bolt, chisel.

TEXT BOOKS

1. Gopal, T.V., Kumar, T., and Murali, G., *A first course on workshop practice – Theory, practice and work book*, Suma Publications, 2005.

REFERENCE BOOKS

1. Kannaiah, P. & Narayanan, K.C. *Manual on Workshop Practice*, Scitech Publications, Chennai, 1999.
2. Venkatachalapathy, V.S. , *First year Engineering Workshop Practice*, Ramalinga Publications, Madurai, 1999.

		L	T	P	C
ME 0130	ENGINEERING GRAPHICS	1	0	4	3
	Prerequisite				
	Nil				

(Only First Angle Projection is to be followed)

PURPOSE

1. To draw and interpret various projections of 1D, 2D and 3D objects.
2. To prepare and interpret the drawings of buildings.

INSTRUCTIONAL OBJECTIVES

To familiarise with

1. The construction of geometrical figures
2. The projection of 1D, 2D & 3D elements
3. Sectioning of solids and development of surfaces
4. Preparation and interpretation of building drawing

FUNDAMENTALS OF ENGINEERING GRAPHICS

Lettering, two dimensional geometrical constructions, conics, representation of three-dimensional objects – principles of projections – standard codes – projection of points.

PROJECTION OF LINES AND SOLIDS

Projection of straight lines, projection of solids – auxiliary projections

SECTIONS AND DEVELOPMENTS

Sections of solids and development of surfaces.

PICTORIAL PROJECTIONS

Conversion of projections: Orthographic projection, isometric projection of regular solids & combination of solids.

BUILDING DRAWING

Building Drawing – plan, elevation and section of single storied residential (or) office building with flat RCC roof and brick masonry walls having not more than 3 rooms (planning / designing is not expected in this course).

TEXT BOOKS

1. Jeyapoovan, T., *Engineering Drawing and Graphics using AutoCAD 2000*, Vikas Publishing house Pvt Ltd, NewDelhi, 2005.
2. Narayanan, K.L & Kannaiah, P., *Engineering Graphics*, Scitech Publications, Chennai, 1999.

REFERENCE BOOKS

1. Bhatt, N.D., *Elementary Engineering Drawing (First Angle Projection)*, Charotar Publishing Co., Anand, 1999.
2. Venugopal, K. *Engineering Drawing & Graphics*, New Age international Pvt. Ltd., 2001.
3. Natarajan, K.V. *Engineering Drawing & Graphics*, Private Publication, Chennai, 1990.
4. Shah, M.B. and Rana, B.C., *Engineering Drawing*, Pearson Education (Singapore) Pvt. Ltd., Delhi – 110 092, 2005.

II SEMESTER

		L	T	P	C
GE 0108	VALUE EDUCATION	1	0	0	1
	Prerequisite				
	Nil				

PURPOSE

To provide guiding principles and tools for the development of the whole person, recognizing that the individual is comprised of Physical Intellectual, Emotional and Spiritual dimensions.

INSTRUCTIONAL OBJECTIVES

- To help individuals think about and reflect on different values.
- To deepen understanding, motivation and responsibility with regard to making personal and social choices and the practical implications of expressing them in relation to themselves, others, the Community and the world at large.
- To inspire individuals to choose their own personal, social, moral and spiritual values and be aware of practical methods for developing and deepening them.

Value Education—Introduction – Definition of values – Why values? – Need for Inculcation of values – Object of Value Education – Sources of Values – Types

Values:

1. Personal values
2. Social values
3. Professional values
4. Moral and spiritual values
5. Behavioral (common) values

Personal values – Definition of person – Self confidence – Self discipline – Self Assessment – Self restraint – Self motivation – Determination – Ambition – Contentment – Humility and Simplicity - Sympathy and Compassion – Gratitude -Forgiveness – Honesty – Courtesy.

Social values – Definition of Society – Units of Society - Individual, family, different groups – Community – Social consciousness – Equality and Brotherhood – Dialogue – Tolerance – Sharing – Responsibility – Co-operation Freedom – Repentance and Magnanimity.

Professional values – Definition – Competence – Confidence – Devotion to duty –Efficiency – Accountability – Respect for learning /learned – Willingness to learn-Open and balanced mind – Team spirit – Professional Ethic – Willingness for Discussion – Aims – Effort – Avoidance of Procrastination and slothfulness –Alertness.

Behavioral values – Individual values and group values – Good manners at home and outside – Equality – Purity of thought, speech and action – Understanding the role of religion – Faith – Understanding the commonness of religions – respect for other faiths – unity in diversity – Living together – Tolerance – Non-violence – Truthfulness – Common aim – Unified effort towards peace – Patriotism.

REFERENCE BOOKS

1. Dr. S. Ignacimuthu S. J., Values for life, *Better yourself Books*, Bandra Mumbai-600 050 (1999).
2. *Values(Collection of Essays)*., Published by : Sri Ramakrishna Math., Chennai—4.,(1996)
3. Prof. R.P.Dhokalia., *Eternal Human Values NCRT –Campus Sri Aurobindo Marg.*, New Delhi - 110 011.
4. Swami Vivekananda., *Education.*, Sri Ramakrishna Math., Chennai-4(1957)
5. Tirukural (English Translation by Dr.G.U.Pope).
6. The Bible
7. The Kuran
8. The Bagavath Geetha

		L	T	P	C
MA0102	MATHEMATICS II	3	2	0	4
	Prerequisite				
	MA0101				

(Common to all Branches of Engineering except BT, BP, BI, BME, FPE, & GE)

PURPOSE

To impart analytical ability in solving mathematical problems as applied to the respective branches of Engineering.

INSTRUCTIONAL OBJECTIVES

At the conclusion of the course, students should have understood Multiple Integrals, Laplace Transforms, Vector Calculus and Functions of a complex variable including contour integration and able to apply to all their Engineering problems.

MULTIPLE INTEGRALS

Double integration in Cartesian and polar coordinates – Change of order of integration – Area as a double integral – Triple integration in Cartesian coordinates.

LAPLACE TRANSFORMS

Transforms of simple functions – Basic operational properties – Transforms of derivatives and integrals – Initial and final value theorems – Inverse transforms – Convolution theorem – periodic functions – Applications of Laplace transforms for solving linear ordinary differential equations up to second order with constant coefficients only.

VECTOR CALCULUS

Gradient, divergence, curl – Solenoidal and irrotational fields – Vector identities (without proof) – Directional derivatives – Line, surface and volume integrals – Statements of Green's, Gauss divergence and Stroke's theorems only – Verification and applications to cubes and parallelepipeds only.

ANALYTIC FUNCTIONS

Definition of Analytic Function – Cauchy Riemann equations – Properties of analytic functions - Determination of harmonic conjugate – Milne-Thomson's method – Conformal mappings: $1/z$, $az+b$ and bilinear transformation.

COMPLEX INTEGRATION

Line integral – Cauchy's integral theorem (without proof) – Cauchy's integral formulae (with proof) – application of Cauchy's integral formulae – Taylor's and Laurent's expansions (statements only) – Singularities – Poles and Residues – Cauchy's residue theorem (with proof) - Evaluation of line integrals.

TEXT BOOK

1. Grewal B.S, *Higher Engg Maths*, Khanna Publications, 38th Edition.
2. Veerajan, T., *Engineering Mathematics*, Tata McGraw Hill Publishing Co., New Delhi, 2000.
3. Dr.V.Ramamurthy & Dr. Sundarammal Kesavan, *Engineering Mathematics – Vol I & II* Anuradha Publications, Revised Edition 2006.

REFERENCE BOOKS

1. Kreyszig, E., *Advanced Engineering Mathematics*, 8th edition, John Wiley & Sons. Singapore, 2001.
2. Kandasamy P et al. *Engineering Mathematics, Vol.I (4th revised edition)*, S.Chand & Co., New Delhi, 2000.
3. Narayanan S., Manicavachagom Pillay T.K., Ramanaiah G., *Advanced Mathematics for Engineering students, Volume I (2nd edition)*, S.Viswanathan Printers and Publishers, 1992.
4. Venkataraman M.K., *Engineering Mathematics – First Year (2nd edition)*, National Publishing Co., Chennai, 2000.

		L	T	P	C
PH 0102	MATERIALS SCIENCE	2	0	2	3
	Prerequisite				
	Nil				

PURPOSE

The purpose of this course is to develop comprehension of the rapidly changing technological scenario and the requisite expertise for appropriate selection of materials for specific engineering applications.

INSTRUCTIONAL OBJECTIVES

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

1. Understand electrical properties of materials,
2. Understand the properties and applications of semi conducting materials,
3. Understand general properties and applications of magnetic and dielectric materials,
4. Understand the behaviour of materials on exposure to light,
5. Understand general properties and application of modern engineering and bio materials, and
6. Get familiarized with the concepts of Nano Science and Technology.

ELECTRONIC AND PHOTONIC MATERIALS

Electronic materials: Importance of Classical and Quantum free electron theory of metals – Fermi energy and Fermi Dirac distribution function – Variation of Fermi level with temperature in intrinsic and extrinsic semiconductors – Hall effect – Dilute Magnetic Semiconductors (DMS) and their applications – High temperature Superconductivity. Photonic materials: LED and LCD materials – Photo conducting materials – Nonlinear optical materials (elementary ideas) and their applications.

MAGNETIC, DIELECTRIC AND MODERN ENGINEERING MATERIALS

Magnetic materials: Ferrites and garnets – Magnetic bubbles and their applications – Giant Magneto Resistance (GMR) – Colossal Magneto Resistance (CMR). Dielectric materials: Various polarization mechanisms in dielectrics (elementary ideas) and their frequency and temperature dependence – Dielectric loss – Piezo electric and ferro electric materials and their applications. Modern engineering materials: Shape memory alloys – Metallic glasses – Advanced ceramics and composites.

BIO MATERIALS

Classification of biomaterials – Comparison of properties of some common biomaterials – Effects of physiological fluid on the properties of biomaterials – Biological responses (extra and intra vascular system) – Metallic, Ceramic and Polymeric implant materials – Introduction to bio sensors and tissue engineering.

NANO MATERIALS AND NANOTECHNOLOGY

Basic concepts of Nano science and technology – Quantum wire – Quantum well – Quantum dot – Properties and technological advantages of Nano materials – Carbon Nanotubes and applications – Material processing by Sol – Gel method, Chemical Vapour deposition and Physical Vapour deposition – Microwave Synthesis of materials – Principles of SEM, TEM and AFM .

MECHANICAL PROPERTIES OF MATERIALS

Stress Strain diagram for different engineering materials – Engineering and true stress strain diagram – Ductile and brittle material – Tensile strength – Hardness – Impact strength – Fatigue – Creep – Fracture (Types and Ductile to brittle transition) – Factors affecting mechanical properties.

1. Band gap determination using Post office box.
2. Dielectric constant measurement.
3. Photoconductivity measurement.
4. Resistivity determination for a semiconductor wafer using Four probe method.
5. Determination of Hall coefficient and carrier type for a semiconductor material.
6. To trace the hysteresis loop for a magnetic material.
7. Magnetic susceptibility – Quincke's method.
8. Determination of thermal conductivity – Lee's Disc method
9. Visit to Nano Technology Laboratory (optional)

TEXT BOOKS

1. S.O. Kasap, *Principles of Electronic Materials and Devices*, Tata McGraw Hill Edition, New Delhi, 2002.
2. Van Vlack, L.H., *Material Science for Engineers*, 6th edition, Addison Wesley, 1985.
3. Thiruvadigal, J. D., Ponnusamy, S. and Vasuhi.P. S., *Materials Science*, 5th edition, Vibrant Publications, Chennai, 2007.

REFERENCE BOOKS

1. Rolf E. Hummel, *Electronic Properties of materials*, Narosa Publishing House, New Delhi, 1994.
2. Raghavan.V., *Materials Science & Engineering – A First Course*, 5th edition, Prentice Hall of India, New Delhi, 2005.
3. Khanna. O. P., *A Text Book of Material Science & Metallurgy*, Revised edition, Dhanpat Rai Publications, New Delhi, 2006.
4. Sujata V. Bhat, *Biomaterials*, 2nd edition, Narosa Publishing House, New Delhi, 2006.
5. Mick Wilson, Kamali Kannangara, Michells Simmons and Burkhard Raguse, *Nano Technology – Basic Science and Emerging Technologies*, 1st edition, Overseas Press, New Delhi, 2005.

		L	T	P	C
GE 0102	BIOLOGY FOR ENGINEERS	2	0	2	2
	Prerequisite				
	Nil				

PURPOSE

To provide a basic understanding of biological mechanisms from the perspective of engineers.

INSTRUCTIONAL OBJECTIVES

To familiarize the students with the basic organization of organisms and subsequent building to a living being. With this knowledge, the student will be then imparted with an understanding about the machinery of the cell functions that is ultimately responsible for various daily activities. Nervous and immune systems will be taught as examples of this signaling machinery.

FROM ATOMS TO ORGANISMS

The Cell: the Basic Unit of Life - Molecular Components of Cells - Expression of Genetic Information - Protein Structure and Function- Cell Metabolism - Cells Maintain Their Internal Environments - Cells Respond to Their External Environments - Cells Grow and Reproduce - Cells Differentiate

THE MOLECULAR DESIGN OF LIFE

Biochemistry and the Genomic Revolution- . DNA Illustrates the Relation between Form and Function- Biochemical Unity Underlies Biological Diversity-. Chemical Bonds in Biochemistry -. Biochemistry and Human Biology-. Protein Synthesis Requires the Translation of Nucleotide Sequences Into Amino Acid Sequences-.2. Aminoacyl-Transfer RNA Synthetases Read the Genetic Code- A Ribosome Is a Ribonucleoprotein Particle (70S) Made of a Small (30S) and a Large (50S) Subunit-Protein Factors Play Key Roles in Protein Synthesis-. Eukaryotic Protein Synthesis Differs from Prokaryotic Protein Synthesis Primarily in Translation Initiation

CATALYTIC STRATEGIES

Proteases: Facilitating a Difficult Reaction-. Making a Fast Reaction Faster: Carbonic Anhydrases-. Restriction Enzymes: Performing Highly Specific DNA-Cleavage Reactions- Nucleoside Monophosphate Kinases: Catalyzing Phosphoryl Group Exchange between Nucleotides Without Promoting Hydrolysis- metabolism- anabolism and catabolism-photosynthesis and carbon fixation- biological energy production.

MECHANOCHEMISTRY

How Protein Motors Convert Chemical Energy into Mechanical Work- Brief Description of ATP Synthase Structure- The F1 Motor: A Power Stroke-A Pure Power Stroke- Coupling and Coordination of Motors- Measures of Efficiency- F1-Motor of ATP synthase- The Bacterial Flagellar Motor- Motor Driven by H₊ and Na₊ Ion Flux- Proton Motive Force, Sodium-motive Force, Ion Flux- Molecular Motor Directionality- Chimeric Kinesin Motors- Backwards Myosins- Chimeric Myosin Motors- Bidirectional Dyneins?

SENSORY AND IMMUNO SYSTEMS

General Principles of Cell Signaling-Signaling via G-Protein-linked Cell-Surface Receptors-Signaling via Enzyme-linked Cell-Surface Receptors-Target-Cell Adaptation-The Logic of Intracellular Signaling: Lessons from Computer-based "Neural Networks"-The Cellular Basis of Immunity-The Functional Properties of Antibodies-The Fine Structure of Antibodies-The Generation of Antibody Diversity-T Cell Receptors and Subclasses-MHC Molecules and Antigen Presentation to T Cells-Cytotoxic T Cells-Helper T Cells and T Cell Activation-Selection of the T Cell Repertoire

TEXT BOOK

1. J.M.Berg, J.L.Tymoczko and L.Sryer. *Biochemistry*, W.H. Freeman Publications.
2. Student Companion to accompany *Biochemistry*, Fifth Edition -Richard I. Gumpert
3. Frank H. Deis, Nancy Counts Gerber, Roger E. Koeppe, II Molecular motors

REFERENCE BOOKS:

1. Alberts, 2003 Molecular Biology of the cell
2. Lodish, 2004 Molecular cell biology

		L	T	P	C
GE 0104	PRINCIPLES OF ENVIRONMENTAL SCIENCE	2	0	0	2
	Prerequisite				
	Nil				

PURPOSE

The course provides the comprehensive knowledge in environmental science, environmental issues and the management.

INSTRUCTIONAL OBJECTIVES

1. The importance of environmental education, ecosystem and ethics.
2. Knowledge with respect to biodiversity and its conservation.
3. To create awareness on the various environmental pollution aspects and issues.
4. To educate the ways and means to protect the environment.
5. Important environmental issues and protection

ENVIRONMENT AND ECOSYSTEMS

Environmental education: definition - scope - objectives and importance. Concept of an ecosystem – types (terrestrial and aquatic ecosystems) – structure and function – ecological succession - food chains, food webs and ecological pyramids

BIODIVERSITY

Introduction: definition - genetic, species and ecosystem diversity - value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values - threats to biodiversity: habitat loss, poaching of wildlife - endangered and endemic species of India, Conservation of biodiversity: in-situ and ex-situ conservations.

POLLUTION AND WASTE MANAGEMENT

Air and water pollution – classification of pollutants and their effects – control measures of air pollution. Waste water treatment (general) – primary, secondary & tertiary stages.

Solid waste management: causes - effects of municipal waste, hazardous waste, bio medical waste - process of waste management.

CURRENT ENVIRONMENTAL ISSUES

Environmental ethics -issues and possible solutions- population explosion, climatic change, ozone layer depletion, global warming, acid rain and green house effect.

Sustainable development: definition, objectives and environmental dimensions of sustainable development-environmental audit for sustainable development.

ENVIRONMENTAL PROTECTION

National and international concern for environment: Important environmental protection acts in India – water, air (prevention and control of pollution) act, wild life conservation and forest act – functions of central and state

pollution control boards - international effort – key initiatives of Rio declaration, Vienna convention, Kyoto protocol and Johannesburg summit.

TEXT BOOKS

1. Sharma.B.K. and Kaur, *Environmental Chemistry* Goel Publishing House, Meerut, 1994.
2. De.A.K., *Environmental Chemistry*, New Age International (p) Lt., , New Delhi, 1996.
3. Kurian Joseph & R. Nagendran, *Essential of Environmental Studies* Pearson Education, 2004.

REFERENCE BOOKS

1. Dara S.S., *A Text Book of Environmental Chemistry and pollution contro*, S.Chand & Company Ltd., New Delhi, 2004.
2. Jeyalakshmi.R, *Principles of Environmental Science*, 1st Edition, Devi Publications, , Chennai 2006.
3. Kamaraj.P & Arthanareeswari.M, *Environmental Science – Challenges and Changes*, 1st Edition, Sudhandhira Publications, 2007.
4. Arivalagan.K, Ramar.P & Kamatchi.P, *Principles of Environmental Science*, 1st Edition, Suji Publications, 2007.

		L	T	P	C
GE 0106	BASIC ENGINEERING – II	4	0	0	4
	Prerequisite				
	Nil				

PURPOSE

This course provides comprehensive idea about circuit analysis, working principles of machines and common measuring instruments. It also provides fundamentals of electronic devices, transducers and integrated circuits.

INSTRUCTIONAL OBJECTIVES

1. At the end of the course students will be able
2. To understand the basic concepts of magnetic, AC & DC circuits.
3. To explain the working principle, construction, applications of DC & AC machines & measuring instruments.
4. To gain knowledge about the fundamentals of electric components, devices, transducers & integrated circuits.

PART A ELECTRICAL ENGINEERING

ELECTRICAL MACHINES

Definition of mmf, flux and reluctance, leakage flux, fringing, magnetic materials and B-H relationship. Problems involving simple magnetic circuits. Faraday’s laws, induced emfs and inductances, brief idea on Hysteresis and eddy currents. Working principle, construction and applications of DC machines and AC machines (1-phase transformers, 3-phase induction motors, single phase induction motors – split phase, capacitor start and capacitor start & run motors).

AC & DC CIRCUITS

Circuit parameters, Ohms law, Kirchoff’s law. Average and RMS values, concept of phasor representation. RLC series circuits and series resonance, RLC parallel circuits (includes simple problems in DC & AC circuits) Introduction to three phase systems – types of connections, relationship between line and phase values. (qualitative treatment only)

WIRING & LIGHTING

Types of wiring, wiring accessories, staircase & corridor wiring, Working and characteristics of incandescent, fluorescent, SV & MV lamps. Basic principles of earthing, simple layout of generation, transmission & distribution of power.

TEXT BOOKS

1. Muthusubramanian.R, Salivahanan.S, Muraleedharan.K.A, *Basic Electrical, Electronics and Computer Engineering*, Tata McGraw - Hill, 1999.
2. Mehta V K , *Principles of Electronics* S Chand & Co,1980

REFERENCE BOOKS

1. Kothari D P and Nagrath I J, *Basic Electrical Engineering*, Tata McGraw Hill,1991
2. Mithal G K , *Electronic Devices and Circuits*, Khanna Publications,1997

PART B ELECTRONICS ENGINEERING

ELECTRONIC COMPONENTS AND DEVICES

Passive components – Resistors, Inductors and Capacitors and their types.

Semiconductor: Energy band diagram, Intrinsic and Extrinsic semiconductors, PN junction diodes and Zener diodes – characteristics.

Transistors: PNP and NPN transistors – theory of operation – Transistor configurations – characteristics – comparison.

Special semiconductor devices : FET – SCR – LED – V I characteristics – applications.

Rectifiers: Half wave and full wave rectifier – capacitive filter – wave forms – ripple factor – regulation characteristics.

TRANSDUCERS AND MEASURING INSTRUMENTS

Transducers: General features and classification of transducers, Resistive Transducers – Potentiometer, Unbonded strain gauge-Bonded strain gauge-Load cell, Inductive transducers – Differential output transducers – LVDT, Flow transducers, Temperature Transducers – Thermistors, Thermocouple and pyrometers.

Measuring Instruments: Basic principles and classification of instruments, Moving coil and moving iron instruments, CRO – Principle of operation.

DIGITAL ELECTRONICS & LINEAR ICs

Digital Fundamentals: Number systems – Boolean Theorems – DeMorgan’s Theorem - Logic gates – Implementation of Boolean Expression using Gates.

Integrated Circuits: IC fabrication – Monolithic Technique, Function of Operational Amplifier.

TEXT BOOKS

1. Muthusubramanian.R, Salivahanan.S, Muraleedharan.K.A, *Basic Electrical, Electronics and Computer Engineering*, Tata McGraw - Hill ,1999.
2. Metha V.K, *Principles of Electronics* ,S. Chand & Co.,1980.
3. Kalsi H S, “*Electronics Instrumentation*”, ISTE publication,1995

REFERENCE BOOKS

1. Kothari D. P and Nagrath IJ, *Basic Electrical Engineering*, Tata McGraw- Hill, 1991.
2. Thomas L.Floyd *Electronic devices*, Addison Wesley Longman (Singapore) Pvt . Ltd., 5th Edition.

		L	T	P	C
ME 0102	ENGINEERING MECHANICS	3	0	0	3
	Prerequisite				
	Nil				

(Vectorial approach may be preferred)

PURPOSE

To develop in the engineering student the ability to analyze any problem in a simple and logical manner and to apply it to solve a few basic problems in engineering mechanics.

INSTRUCTIONAL OBJECTIVES

At the end of this course the student should be able to understand

1. The vectorial and scalar representation of forces and moments
2. Static equilibrium of particles and rigid bodies
3. Principle of work and energy
4. Analysis of trusses, friction and their application
5. Dynamic equilibrium of particles and rigid bodies

STATICS OF PARTICLES

Equilibrium of Particle: Introduction – Laws of mechanics – Forces on particles – Concurrent forces in a plane – Coplanar forces – Resolution of forces – Resultant of several concurrent forces – Free body diagram – Equilibrium of particles in space. **Equilibrium of rigid bodies:** Principles of transmissibility – Moment of a force – Varignon’s theorem – Equivalent system of forces – Reduction of system of forces into single force and couple-Types of loads-Types of supports and their reactions – Equilibrium of rigid bodies in two dimensions.

ANALYSIS OF TRUSSES AND FRICTION

Trusses: Plane Trusses – Simple Trusses – Analysis of Trusses – Method of joints, Method of sections.

Friction: Laws of Friction – Angle of Friction – Inclined plane – Wedges – Rolling friction – Belt Friction – Thrust and Journal bearings.

PROPERTIES OF SURFACES AND VOLUMES

Centre of Gravity: Centroids of areas and volumes – Determination of centroids by integration – Theorem of Pappus-Guldinus. **Moment of Inertia:** Determination of moment of inertia of area by integration – Radius of gyration – Parallel and perpendicular axis theorems – Polar moment of inertia – Mass moment of inertia.

DYNAMICS OF PARTICLES

Rectilinear motion – Curvilinear motion – Motion of projectile – Relative motion – Newton's law-Principle of work and energy – Principle of impulse and momentum – Impulsive motion – Impact of elastic bodies – D'Alembert's principle.

DYNAMICS OF RIGID BODIES

Kinematics of rigid bodies – Translation and rotation of rigid bodies – Fixed axis rotation – General plane motion – Relative velocity in plane motion – Instantaneous center of rotation in plane motion – Principle of work and energy for a rigid body – Principle of impulse and momentum.

TEXT BOOKS

1. Beer, F. P., & Johnston, E. R., *Vector Mechanics for Engineers – Dynamics and Statics*, Tata McGraw- Hill, New Delhi, 2001.
2. Palanichamy, M. S., and Nagan, S., *Engineering Mechanics (Statics and Dynamics)*, Tata McGraw Hill, New Delhi 2001.
3. Kumar, K.L., *Engineering Mechanics*, Tata McGraw- Hill, New Delhi, 1998.

REFERENCE BOOKS

1. Timoshenko, and Young, *Engineering Mechanics*, Tata Mc-Graw Hill Book Company, New Delhi, 1956.
2. Mclean, and Nelson, *Engineering Mechanics (Statics and Dynamics)*, 3rd Edition Schaum Series, 1980.
3. Rajasekaran, S., & Sankarasubramanian, G., *Engineering Mechanics*, Vikas Publishing House Pvt Ltd, 2006.
4. Shames, I.H., and Krishna Mohana Rao, G., *Engineering Mechanics (Statics and Dynamics)*, Dorling Kindersley (India) Pvt. Ltd. (Pearson Education), 2006.

		L	T	P	C
PD 0102	PERSONALITY DEVELOPMENT - II	0	0	2	0
	Prerequisite				
	Nil				

PURPOSE

The purpose of this course is to build confidence and inculcate various soft skills and to help Students to identify and achieve their personal potential

INSTRUCTIONAL OBJECTIVES

1. To guide thought process.
2. To groom students' attitude.
3. To develop communication skill.
4. To build confidence.

METHODOLOGY

The entire program is designed in such a way that every student will participate in the class room activities. The activities are planned to bring out the skills and talents of the students which they will be employing during various occasions in their real life.

1. Group activities + individual activities.
2. Collaborative learning.

3. Interactive sessions.
4. Ensure Participation.
5. Empirical Learning

Puzzles I - Poster design/Caption/Slogan writing (Social issues) - Bone of contention I – debate

Bone of contention II - Puzzle II - Survey and Reporting (favorite channel, music, food)

Interpretation of Visuals of I & II - Vocabulary games III

Book Review - Quiz I - Presentation Skills I

Presentation Skills II - Analytical Thinking - Review

EVALUATION

1. Activities assessed by both group and individual participation
2. Continuous assessment based on daily participation

SCHEME OF INSTRUCTION

Marks allocated for regular participation in all oral activities in class

SCHEME OF EXAMINATION

Complete Internal evaluation on a regular Basis

		L	T	P	C
CS0140	COMPUTER PRACTICE	1	0	2	2
	Prerequisite				
	Nil				

PURPOSE :

To introduce programming languages C and C++ as tools to solve problems and to provide hands on training.

INSTRUCTIONAL OBJECTIVES:

After completing the course, the students should be able to

- Understand the program development life cycle
- Design algorithms to solve simple problems using computers
- Convert algorithms into C and C++ programs and execute

PROGRAMMING FUNDAMENTALS

Computer Basics; Program Development Life Cycle: Flow Chart, Algorithm, Compilation and Execution; Introduction to C Language: program structure, variables, keywords, data types; Input / Output functions: scanf, printf; simple programs.

DECISION AND LOOP CONTROL STRUCTURE

Logical operators; Decision statements : if/else, switch/case statements; Loop control statements – for, while, do/while.

ARRAYS AND FUNCTIONS

Arrays: Introduction to arrays; one dimensional arrays: declaration , reading and printing array elements, sorting and searching. **Functions:** Definition; declaration of functions; return statement; recursion.

INTRODUCTION TO OOP CONCEPTS

OOP concepts: data hiding, encapsulation, inheritance, overloading, polymorphism; classes and objects; constructor and destructor; simple program in C++.

INHERITANCE AND OVERLOADING

Inheritance – single, multiple, multilevel; Overloading – Function overloading, Operator overloading.

LIST OF EXERCISES:

Note to the Instructors: Design exercise problems to demonstrate the use of C and C++ in the area of specialization.

1. programs to demonstrate the use of scanf() and printf() functions
2. programs to evaluate arithmetic expressions
3. programs using conditional statements
4. programs using for,while , do...while
5. programs on arrays
6. programs to perform matrix addition and multiplication
7. programs to implement functions
8. programs to illustrate recursion
9. Program to create classes and objects using C++
10. Program to implement Constructor and Destructor in C++
11. Program to implement single inheritance in C++
12. Program to implement Function overloading in C++
13. Program to implement Operator overloading in C++

REFERENCE BOOKS

1. “Computer Practice Laboratory” Manual, SRM University
2. Kanetkar P.Yashwant, “Let us C”, BPB publications, 2002.
3. Ashok N.Kamthane, “Programming with ANSI and Turbo C”, Pearson Education, 2006.
4. Herbert Schildt, “The Complete Reference C++”, TataMcGrawHill, 2001, 3rd Edition.
5. Robert Lafore, “Object Oriented Programming in Microsoft C++”, The Waite Group, Galgotia Publications Pvt. Ltd., 2002.

		L	T	P	C
ME 0130	ENGINEERING GRAPHICS	1	0	4	3
	Prerequisite				
	Nil				

(Only First Angle Projection is to be followed)

PURPOSE

1. To draw and interpret various projections of 1D, 2D and 3D objects.
2. To prepare and interpret the drawings of buildings.

INSTRUCTIONAL OBJECTIVES

To familiarise with

1. The construction of geometrical figures
2. The projection of 1D, 2D & 3D elements
3. Sectioning of solids and development of surfaces
4. Preparation and interpretation of building drawing

FUNDAMENTALS OF ENGINEERING GRAPHICS

Lettering, two dimensional geometrical constructions, conics, representation of three-dimensional objects – principles of projections – standard codes – projection of points.

PROJECTION OF LINES AND SOLIDS

Projection of straight lines, projection of solids – auxiliary projections

SECTIONS AND DEVELOPMENTS

Sections of solids and development of surfaces.

PICTORIAL PROJECTIONS

Conversion of projections: Orthographic projection, isometric projection of regular solids & combination of solids.

BUILDING DRAWING

Building Drawing – plan, elevation and section of single storied residential (or) office building with flat RCC roof and brick masonry walls having not more than 3 rooms (planning / designing is not expected in this course).

TEXT BOOKS

1. Jeyapooan, T., *Engineering Drawing and Graphics using AutoCAD 2000*, Vikas Publishing house Pvt Ltd, NewDelhi, 2005.
2. Narayanan, K.L & Kannaiah, P., *Engineering Graphics*, Scitech Publications, Chennai, 1999.

REFERENCE BOOKS

1. Bhatt, N.D., *Elementary Engineering Drawing (First Angle Projection)*, Charotar Publishing Co., Anand, 1999.
2. Venugopal, K. *Engineering Drawing & Graphics*, New Age international Pvt. Ltd., 2001.
3. Natarajan, K.V. *Engineering Drawing & Graphics*, Private Publication, Chennai, 1990.
4. Shah, M.B. and Rana, B.C., *Engineering Drawing*, Pearson Education (Singapore) Pvt. Ltd., Delhi – 110 092, 2005.

		L	T	P	C
ME 0120	WORKSHOP PRACTICE	0	0	4	2
	Prerequisite				
	Nil				

PURPOSE

To provide the students with hands on experience on different trades of engineering like fitting, carpentry, smithy, welding and sheet metal.

INSTRUCTIONAL OBJECTIVES

To familiarize with

1. The basics of tools and equipments used in fitting, carpentry, sheet metal, welding and smithy.
2. The production of simple models in the above trades.

LIST OF EXPERIMENTS**EMPHASIS TO BE LAID ON REAL LIFE APPLICATIONS WHEN FRAMING THE EXERCISES.****FITTING**

Tools & Equipments – Practice in Filing and Drilling.
Making Vee Joints, Square, dovetail joints, Key Making.

CARPENTARY

Tools and Equipments- Planning practice. Making Half Lap, dovetail, Mortise & Tenon joints, a mini model of a single door window frame.

SHEET METAL

Tools and equipments - Fabrication of a small cabinet, Rectangular Hopper, etc.

WELDING

Tools and equipments - Arc welding of butt joint, Lap Joint, Tee Fillet. Demonstration of Gas welding, TIG & MIG.

SMITHY

Tools and Equipments –Making simple parts like hexagonal headed bolt, chisel.

TEXT BOOKS

2. Gopal, T.V., Kumar, T., and Murali, G., *A first course on workshop practice – Theory, practice and work book*, Suma Publications, 2005.

REFERENCE BOOKS

1. Kannaiah,P. & Narayanan,K.C. *Manual on Workshop Practice*, Scitech Publications, Chennai, 1999.
2. Venkatachalapathy, V.S. , *First year Engineering Workshop Practice*, Ramalinga Publications, Madurai, 1999.

SEMESTER III

		L	T	P	C
LE0201	GERMAN LANGUAGE PHASE I	2	0	0	2
	Prerequisite				
	Nil				

PURPOSE

Enabling the Engineering Students to one more Foreign Language, especially German, which is scientific and technical language. This may be useful in the field of employment opportunities as well as helping them to develop projects on browsing German websites.

INSTRUCTIONAL OBJECTIVES

Developing pronunciation so that they can read the text and e-mail during their employment, instructing them to write their own C V and developing a fundamental conversation with any German national.

INTRODUCTION

German Language, Alphabets and Pronunciation.

THEMEN

Name, Land, Leute, Beruf, Familie geschwister, Einkaufen, Reisen, Zahlen, Haus, Freunden, Essen and Stadium, Fest, Zeit.

LISTENING

Listening to the cassette and pay special attention to the meaning and sounds. Listening Comprehension – Announcements / Airport / Station / General.

READING

Listening to the cassette and reading it allowed.
Reading Compression Basics / Station / News / Notice Boards.

GLOSSARY

Technical Words Lesson (1-5)

TEXT BOOK WITH CASSETTES

1. Grundkurs Deutsch
2. Momentmal (Max Mueller Bhavan – Goethe Institute, Germany).

		L	T	P	C
LE0203	JAPANESE LANGUAGE PHASE I	2	0	0	2
	Prerequisite				
	Nil				

PURPOSE

1. In view of globalization, learning Foreign Language by Engineering graduates enhances their employment opportunities.
2. Get awareness of understanding of International culture.
3. Widening the Linguistic Skills of the Students.

INSTRUCTIONAL OBJECTIVES

To learn the scripts of Japanese Languages namely Hiragana, Katakana and Kanji, Vocabularies etc. To learn basic grammar and acquire basic communication skills. To understand Japanese culture.

Alphabets (Hiragana), Self Introduction, Greetings, Classroom expressions, Numbers, Conversation.

Alphabets Hiragana (continued),Vocabularies. Counters .Time expression. Conversation

Katakana and related vocabulary. Kanjis –introduction. conversation.

Lesson-1 Watashiwa Nihonjin desu. Grammar,Marume &Sentence pattern.Marume. Conversation.

TEXT BOOKS

1. Nihongo Shoho I main Text sold in India by the Japanese Language Teachers Association Pune.
2. Hiragana and Katakana Work Book published by AOTS Japan
3. Grammar and Kotoba (Work Book)
4. Japanese for Dummies.(Conversation) CD.

		L	T	P	C
LE0205	FRENCH LANGUAGE PHASE I	2	0	0	2
	Prerequisite				
	Nil				

PURPOSE

1. As language skills are as valuable as technical skills a knowledge of French enables the engineering graduates in career orientation.
2. As a second international global Lang after English there is a wider choice of job opportunities in the inter national employment market and also multinationals in India and an understanding of French culture thro language.

INSTRUCTIONAL OBJECTIVE

Characterised by the Roman script, grammar, vocabulary and colloquial expressions are taught which enables them to communicate effectively with any native speaker.

INTRODUCTION AND PRONUNCIATION

Introduction of the French Language, Alphabets and Pronunciation, Greetings (Wishing, Thanking and Bidding good bye), Introducing oneself & someone Presenter quelqu'un et se presenter - conversational French sentences based on the topics discussed above.

VOCABULARY

Numbers and Dates, Days, Months and Seasons, Time, Nouns, Professions and Nationalities. C;onversational sentences on weather, time, and professions.

GRAMMAR

Basic Verbs (Avoir, Etre, Aller, Faire) – Conjugation – Present tense, Affirmative, Negative, Interrogative, Adjectives (Qualitative), Subject Pronouns and Disjunctive Pronouns.

CONVERSATION AND LISTENING

Conversational sentences on physical description and expressions with verbs like avoir, etre and faire

GRAMMAR

Prepositions (a, de,dans, en, sur,sous, pour....),Contracted Articles, Question Tag (Qui, Quel, Ou,etc)

TEXT BOOKS:

1. Panorama – Goyal Publishers
2. Apprenons le Francais I, Sarawathy publication.

		L	T	P	C
MA0211	MATHEMATICS – III	3	2	0	4
	Prerequisite				
	Nil				

(Common for EEE, ECE, IT, CSE, BM & EIE)

PURPOSE

To equip the students with the knowledge of slightly advanced topics of mathematics.

INSTRUCTIONAL OBJECTIVES

After the completion of the course, the students should be able to apply

1. The rudiments of Fourier series
2. The theory and problems of PDE
3. The applications of PDE to boundary value problems.
4. Fourier transforms and to their branches of engineering.

FOURIER SERIES

Dirichlet's conditions – General Fourier series – Half range Sine and Cosine series – Parseval's identity – Harmonic Analysis.

PARTIAL DIFFERENTIAL EQUATIONS

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

ONE DIMENSIONAL WAVE & HEAT EQUATION

Boundary and initial value problems – Transverse vibrations of elastic string with fixed ends – Fourier series solutions – One dimensional heat equation – Steady and transient states – problems.

TWO DIMENSIONAL HEAT EQUATION

Two dimensional heat equation – Steady state heat flow equation – Laplace Equation Cartesian form – Laplace equation in polar form – heat flow in circular plates including annulus – Fourier series solution.

FOURIER TRANSFORMS

Statement of Fourier integral theorem – Fourier transform pairs – Fourier Sine and Cosine transforms – Properties – Transforms of simple functions – Convolution theorem – Parseval's identity.

TEXT BOOKS

1. Grewal, B.S., *Higher Engineering Mathematics*, 36th edition, Khanna Publishers, 2002. (Unit – I Chapter 10 sections 10.2 – 10.7, 10.9, 10.11, Unit II – Chapter 17 section 17.2, 17.5, 17.6, 17.8 – 17.10, chapter 28 section 28.2, Unit III – Chapter 18 section 18.4 (2), 18.5(2), Unit IV – Chapter 18 section 18.7, 18.8(1) Unit V – Chapter 22 section 22.3 – 22.7).

REFERENCE BOOKS

1. Kreyszig, E, *Advanced Engineering Mathematics*, 8th edition, John Wiley & Sons, Singapore, 2000.
2. Kandasamy, P et al. *Engineering Mathematics*, Vol.II & Vol.III (4th revised edition), S.Chand & Co., New Delhi, 2000.
3. Narayanan, S., Maicavachagom Pillay T.K., Ramanaiah G., *Advanced Mathematics for Engineering Students*, Volume II & III (2nd edition), S.Viswanathan Printers and Publishers, 1992.
4. Venkataraman M.K., *Engineering Mathematics – Vol.III – a & B* (13th edition), National Publishing co., Chennai, 1998.

		L	T	P	C
CE0217	FLUID MECHANICS AND MACHINERY	3	0	0	3
	Prerequisite				
	Nil				

Same as CE0218

PURPOSE

To learn fundamental concepts in the field of fluid mechanics and to get exposure about application of fluid mechanics in industry and field by means of studying the devices like pumps, turbines.

INSTRUCTIONAL OBJECTIVES

1. To know the importance, application and inter-relationship of various properties of fluid.
2. To study theories those explain the behaviors and performance of fluid when the fluid is in motion.
3. To study theories those explain the behaviors and performance of fluid when the fluid is flowing through a pipe.
4. To understand the classification, components, function, and use of different types of pumps.
5. To understand the classification, components, function, and use of different types of turbines.

FLUID PROPERTIES

Units and Dimensions -Importance and Application of Fluid Mechanics – Fluid Properties – Density, Viscosity, Vapour Pressure, Bulk Modulus of Elasticity, Surface Tension, Capillarity.

FLUID KINEMATICS AND FLUID DYNAMICS

Velocity and Acceleration – Classification of Flow – Continuity Equation – Streamline, Streakline, Pathline – Potential Function and Stream Function – Flow Net Analysis – Control Volume – Euler Equation – Bernoulli's Equation – Darcy's Equation – Momentum Principle – Free and Forced Vortex Motion.

FLOW THROUGH PIPES

Hagen-Poiseuille's Equation – Laminar and Turbulent Flow – Friction Factor – Major and Minor Losses – Pipes in Series and Parallel – Flow between Reservoir – Pipe Network.

PUMPS

Pump – Classification of Pump – Centrifugal Pump – Components, Function, Types, Velocity Triangle, Work done – Specific Speed – Characteristics Curves – Efficiencies – Reciprocating Pump - Components, Function, Types, Velocity Triangle, Work done - Slip – Acceleration and Friction – Indicator Diagram – Air Vessel – Selection of Pumps.

TURBINES

Turbine – Classification of Turbine – Pelton Wheel, Francis Turbine, Kaplan Turbine – Components, Function, Velocity Triangle, Work done, Design Aspect – Draft Tube Theory – Specific Speed – Cavitation – Surge Tank - Hydro Electric Power Supply Scheme.

TEXT BOOKS

1. Modi.P.N., Seth.S.M., *Hydraulics and Fluid Mechanics including Fluid Machinery*, Standard Book House, 2001.
2. Kumar.K.L., *Engineering Fluid Mechanics*, Eurasia Publishing House, 2002

REFERENCE BOOKS:

1. Subramanya.K., *Theory and Applications of Fluid Mechanics*, TataMcGraw Hill Publishing Compnay, 1993.
2. Bansal.R.K., *Fluid Mechanics and Hydraulic Mahcines*, Laxmi Publications, 1992.

		L	T	P	C
EE 0201	ELECTRICAL MACHINES – I	3	0	0	3
	Prerequisite				
	Nil				

PURPOSE

To give the students a fair knowledge on the working of various DC machines & Transformers.

INSTRUCTIONAL OBJECTIVES

1. To analyze the performance of different types of DC machines & Transformers.
2. To appreciate the applications of them.

ELECTRO MAGNETIC INDUCTION & BASIC CONCEPTS IN ROTATING MACHINES

Introduction to magnetic circuits – Magnetically induced e.m.f and force – AC operation of magnetic circuits – Hysteresis and Eddy current losses. Energy in magnetic systems – Field energy & mechanical force – Single and Multiple excited systems. MMF of distributed windings – Magnetic fields in rotating machines – Generated voltages – Torque.

DC GENERATORS

Constructional features of DC machine – Principle of operation of DC generator – EMF equation – Types of excitation – No load and load characteristics of DC generators – commutation – armature reaction – Parallel operation of DC generators.

DC MOTORS

Principle of operation of DC motors-Back emf – Torque equation –Types of DC motors-Speed – Torque characteristics of DC motors – Starting of DC motors: 2 point starter, 3 point starter, 4 point starter – Speed control – Losses and efficiency –Applications

TRANSFORMERS

Principle of operation – Constructional features of single phase and three phase transformers – EMF equation – Transformer on No load and Load –Phasor diagram --equivalent circuit – Regulation - three phase transformer connections-parallel operation of single phase and three phase transformer- Auto transformers

TESTING OF DC MACHINES & TRANSFORMERS

Losses and efficiency –Condition for maximum efficiency – Testing of DC machines:Brake test , Swinburne’s test, Retardation test, Hopkinson’s test- Testing of transformer:polarity test,load test, open circuit and short circuit test, Sumpner’s test – All day efficiency.

TEXT BOOKS

1. Kothari.D.P and Nagrath.I.J. *Electrical Machines*, Tata McGraw Hill Publishing Co.Ltd, New Delhi, 5th edition 2002
2. Dr. Murugesh Kumar K. *DC Machines & Transformers*, Vikas Publishing House Pvt Ltd., 2003.

REFERENCE BOOKS

1. Fitzgerald, A.E., Charles Kingsely Jr. Stephen D.Umans, *Electric Machinery* McGraw Hill Books Company, 1992.
2. Hill Stephen, J. Chapman, *Electric Machinery Fundamentals*, McGraw Hill Book Co., new Delhi, 1985.
3. Albert E Clayton and N N Hancock, *The performance and design of direct current Machines*, Oxford and IBH publishing company Pvt., Ltd., New Delhi 1990.
4. P.S.Bimbhra ,*Electrical Machinery*,Khanna Publishers,2003
5. IL Kosow, *Electrical Machines & Transformers*, Prentice Hall of India,

		L	T	P	C
EE 0203	ELECTRIC CIRCUIT ANALYSIS	3	2	0	4
	Prerequisite				
	Nil				

PURPOSE

To enrich the students to acquire knowledge about the basics of circuit analysis, network theorems, concepts of AC circuits, coupled & three phase circuits, transient analysis.

INSTRUCTIONAL OBJECTIVES

1. To understand about the network elements, types of networks, network topology & analysis complex circuits using Mesh current & Nodal voltage method.
2. To gain knowledge about the solution methods of AC and DC circuits.
3. To get an insight into solution of RLC circuits, single phase and three phase power measurements, analysis of coupled circuits.
4. To understand the concept of two port network.
5. Determination of Butterworth and Chebyshev transfer functions of the filter starting from the filter specifications.
6. To gain knowledge about synthesis of RL, RC&RLC networks.

BASICS OF CIRCUITS,NETWORK TOPOLOGY AND TRANSIENT ANALYSIS

Ideal sources – Dependent and Independent sources – Linear relation between voltage and current of Network elements – source Transformation – Types of Networks – Network reduction – voltage division – current division – Star – delta transformation – concept of duality – Dual networks – Free & forced responses of RL, RC, RLC circuits with DC and sinusoidal excitation.

NETWORK THEOREMS

Formation of matrix equations and analysis of complex circuits using Mesh current method and nodal method - Thevenin’s Theorem- Norton’s Theorem- Superposition theorem- Maximum power transfer theorem, substitution theorem, Reciprocity theorem, Millman’s theorem, Tellegen’s theorem – Statement, illustration & application to AC & DC circuits.

POWER MEASUREMENTS AND COUPLED CIRCUITS

Single phase power measurement by 3 volt meter and 3 ammeter method – series resonance, parallel resonance – Q factor – Bandwidth. Solution of three phase balanced circuits & unbalanced circuits – Three phase power

measurement using 2 wattmeters. Self Inductance – Mutual Inductance – Coefficient of coupling – dot rule – ideal transformer effective inductance of coupled coils in series & in parallel – Analysis of coupled circuits.

TWO PORT NETWORKS

Open Circuit Impedance (Z) Parameters, short Circuit Admittance (Y) Parameters, Transmission (ABCD) Parameters and Inverse Transmission Parameters, Hybrid (h) Parameters and Inverse Hybrid Parameters, Conversion between parameters, interconnection of two-port networks.

FILTERS, ATTENUATORS AND SYNTHESIS OF NETWORKS

Classification of filters, filter network, characteristic impedance in the pass band and stop band , constant K and m-derived, BPF, BEF, attenuators. Hurwitz polynomials, Positive real function, synthesis of one port networks, synthesis of RL, RC by Foster and Caue method.

TEXT BOOKS:

1. Edminister J.A., *Theory and Problems of Electric Circuits*, Schaum’s Outline Series, McGraw Hill Book Company, 5th Edition, 1994
2. Sudhakar, A. and Shyam Mohan S.P, *circuits and Networks Analysis and Synthesis*, Tata McGraw Hill Publishing Company Ltd., New Delhi, 1994.

REFERENCE BOOKS:

1. Muthusubramanian R and Iyyappan K, *Circuit Theoyr*, Anuradha Publishing Private Ltd., Tamil Nadu, 1999.
2. Arumugam and Prem Kumar, *Electric Circuit Theory*, Khanna Publishers, 2002.
3. Hayt & Kemmerley, *Engineering Circuit Analysis*, Tata McGraw Hill, 1993.
4. Soni and Gupta, *A Course in Electric Circuit Analysis*, Dhanpat Rai and Co., 1981.

		L	T	P	C
EE 0205	ELECTROMAGNETIC THEORY	3	0	0	3
	Prerequisite				
	Nil				

PURPOSE

To enable the students to have a fair knowledge about the theory and problems of electromagnetics.

INSTRUCTIONAL OBJECTIVES

1. Understand the basic concepts of electric field and magnetic field
2. Compare between field and circuit theory
3. Get an idea about the concepts of electrostatics.

STATIC ELECTRIC FIELDS

Coulomb’s law – Electric field intensity – Field due to different types of charges – Stream lines and sketches of fields – Electric flux density – Gauss law and its application to symmetrical charge distributions – Gauss law applied to differential volume element – Concept of divergence – electric potential – Potential field due to different types of charges – Potential gradient – the dipole – field due to dipole – Energy density in electrostatic field.

CONDUCTORS, DIELECTRICS AND CAPACITANCE

Current and current density – continuity of current – conductor properties and boundary conditions – the nature of dielectric materials – boundary conditions for perfect dielectric materials – capacitance – different types of capacitances – capacitance of a two wire line – method of images – Poisson’s and Laplace’s equations – Examples of solution of each one of them.

STEADY MAGNETIC FIELDS

Biot- Savart Law – applications – Ampere’s circuital law – applications – curl of magnetic field intensity - Magnetic flux and magnetic flux density – the scalar and vector magnetic potentials – steady magnetic field laws.

FORCE TORQUE AND INDUCTANCE

Lorentz force equation – force between differential current elements – force and torque on a closed circuit – the nature of magnetic materials – magnetization and permeability – magnetic boundary conditions – inductance and mutual inductance.

MAXWELLS EQUATIONS AND TIME VARYING FIELDS

Maxwell's equations for steady fields in point form and integral form – Faraday's law – displacement current – Maxwell's equations in point form and integral form for time-varying fields. Comparison of field and circuit theory – Poynting theorem – application of Poynting vector.

TEXT BOOKS

1. William H. Hayt, Jr., *Engineering Electromagnetics*, Tata McGraw-Hill Publishing Ltd. 5th edition, 1989.
2. David J. Griffiths, *Introduction to electrodynamics*, Prentice Hall of India Private Limited. 2nd edition, 1997.

REFERENCE BOOKS

1. Muthusubramanian R and Senthil kumar N, *Electromagnetic field theory*, Anuradha publications, 1999.
2. Joseph A. Edminister, *Theory and Problems of electromagnetics* Schaum's outline series, 1999
3. Gangadhar K.A, *Field theory*, Khanna Publications, 2000.

		L	T	P	C
EE 0207	ELECTRONIC DEVICES	3	0	0	3
	Prerequisite				
	Nil				

PURPOSE

To enable the students to know about the operation, characteristics & application of various electronic devices.

INSTRUCTIONAL OBJECTIVES

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

1. Understand the theory of semiconductor & PN junction diode
2. Know the basics of BJT & FET operation.
3. Gain a thorough understanding of operation & characteristics of SCR, TRIAC & DIAC, UJT, PUT & various photo conductive devices.

SEMICONDUCTORS

Semiconductors and devices: Field intensity - potential energy - mobility - conductivity - electrons and holes - charge density in semiconductors - electrical properties of silicon and germanium - diffusion - potential variation within graded semiconductors . Energy Bands theory of Solids – Distinction between Conductors, Semiconductors and Insulators - Properties of Semiconductors

CHARACTERISTICS OF DIODES

Working and description of a PN diode- Diode Equation – Minority carrier Concentration – Varactor Diode – Avalanche and Zener Breakdown – Zener diode – Tunnel Diode – PIN diode – Photo diode – Photo voltaic cell – Light emitting diode– Light dependant resistor- Thermistors– Zener Diode Voltage Regulator.

TRANSISTORS

Principle of transistor action – Current Components – Cut off, Active and saturation regions of a transistor – CE, CB, CC Configurations- Input and output characteristics of CE, CB and CC configurations – Ebers Moll model of a BJT – Evaluation of H- parameters – Hybrid pi model – Transistor as a switch – Use of a heat sink

FIELD EFFECT TRANSISTORS

Constructional features of a field effect transistor – theory of operation and current equations – VVR operation of a FET- Junction field effect transistor – Pinch off voltage – JFET volt-ampere characteristics – MOSFET – Working and V-I Characteristics – Depletion and enhancement types – Threshold Voltage – Gate capacitance – MOS as a charge transferring Device – CCD -Power MOSFET-construction and characteristics of UJT.

THYRISTORS AND IC FABRICATION

Working and V-I characteristics features of Silicon Controlled Rectifier, DIAC , TRIAC, GTO - Device Technology – Planar process –Diffusion – Ion Implantation – Vapour Deposition – NMOS , PMOS Fabrication – Twin Tub Process of CMOS – Thick film and thin film Technology.

TEXT BOOKS

1. Jacob. Millman, Christos C.Halkias, *Electronic Devices and Circuits*, Tata McGraw Hill Publishing Limited, New Delhi, 2003.
2. David A.Bell, *Electronic Devices and Circuits*, Prentice Hall of India Private Limited, New Delhi, 2003.

REFERENCE BOOKS

1. Street Man, *Solid State Electronic Devices*, Prentice Hall Of India, Edition 1995.
2. Mathur Kulshrestha and Chadha *Electron devices and Applications and Integrated circuits*, Umesh Publications, 1986.
3. Thomas L. Floyd, *Electron Devices*, Charles & Messil Publications, 1989

		L	T	P	C
PD 0201	PERSONALITY DEVELOPMENT - III	0	0	2	1
	Prerequisite				
	Nil				

PURPOSE

The purpose of this course is to build confidence and inculcate various soft skills and to help Students to identify and achieve their personal potential

INSTRUCTIONAL OBJECTIVES

1. To guide thought process.
2. To groom students' attitude.
3. To develop communication skill.
4. To build confidence.

METHODOLOGY

The entire program is designed in such a way that every student will participate in the class room activities. The activities are planned to bring out the skills and talents of the students which they will be employing during various occasions in their real life.

1. Group activities + individual activities.
2. Collaborative learning.
3. Interactive sessions.
4. Ensure Participation.
5. Empirical Learning

Goal Setting - Problem Solving - Emotional Quotient

Assertiveness - Stress Management - Quiz II

Lateral Thinking (Situational) - Team Work (Role Plays) Impromptu - Text Analysis

Business plan presentation I - Business plan presentation II - Chinese Whisper

Picture Perfect - Case Studies – Review

		L	T	P	C
EE 0209	ELECTRICAL MACHINES LAB – I	0	0	3	2
	Prerequisite				
	EE 0201				

PURPOSE

To give students a fair knowledge of testing different types of DC machines and transformers.

INSTRUCTIONAL OBJECTIVES

1. To rig up circuits for testing a given machine.
2. To obtain the performance characteristics of machines.

LIST OF EXPERIMENTS

1. Load test on DC shunt motor
2. Load test on DC Series motor
3. Speed Control of DC Shunt Motor.
4. Load test on DC shunt generator, DC compound generator.
5. Load test on single phase transformer.
6. Open circuit & Short circuit test on single phase transformer
7. Open circuit characteristics of DC generator (Self and Separately Excited)
8. Swinburne's test and separation of losses in DC Machine.
9. Hopkinson's test
10. Sumpner's test on 1-phase transformers
11. 3-phase transformer connections
12. 3-phase to 2-phase conversion

REFERENCE

1. *Laboratory manual in Electrical Machines* by curriculum Development cell IIT, Delhi, Wiley Eastern Ltd.1990.

		L	T	P	C
EE 0211	ELECTRIC CIRCUITS LAB	0	0	3	2
	Prerequisite				
	EE 0203				

PURPOSE

This laboratory course will give a thorough knowledge about the basics of circuit analysis.

INSTRUCTIONAL OBJECTIVES

1. To understand the concepts of electric circuits.
2. To gain application knowledge.

LIST OF EXPERIMENTS

1. Power measurement in 3 phase balanced circuits.
2. Power measurement in 3 phase unbalanced circuits.
3. Verification of Kirchoff's laws
4. Verification of Thevenin's & Norton's Theorem
5. Verification of Superposition theorem
6. Verification of Maximum Power Transfer theorem
7. Power measurement using 3 Voltmeter & 3 Ammeter Method
8. Study of Resonance
9. Circuit Analysis using CRO
10. Circuit Transients by Digital simulation

REFERENCE

Laboratory Manual.

IV SEMESTER

		L	T	P	C
LE0202	GERMAN LANGUAGE PHASE - II	2	0	0	2
	Prerequisite				
	GERMAN LANGUAGE PHASE - I				

SPEAKING;

Dialogue – Questioning / Basic queries / Conversational with practical exposure.

GRAMMATIK (WRITING)

Verben, Wortstellung, Nomen, Pronomen, Artikel, Nominativ, Akkusativ, Dativ, Adjective, Präsens, Perfect and Neben Satze.

GLOSSARY

Technical words. Lesson (6-10)

TEXT BOOK WITH CASSETTES

Grundkurs Deutsch

Momentmal

(Prescribed by Max Mueller Bhavan – Goethe Institute, Germany).

		L	T	P	C
LE0204	JAPANESE LANGUAGE PHASE II	2	0	0	2
	Prerequisite				
	JAPANESE LANGUAGE PHASE I				

OBJECTIVES

For beginners with no knowledge of Japanese to acquire basic communication skills.

Lesson 2-{Korewa Tsukue desu } – Grammar, Sentence pattern, Marume .
Conversation

Lesson 3 – [Kokoni denwa ga arimasu] - Grammar, Sentence pattern, Marume .Conversation

Lesson 4– {Asokoni hito ga imasu} - Grammar, Sentence pattern, Marume .

Lesson 5– {Akairingo wa ikutsu arimasu ka}-Grammar, Sentence pattern, Marume . Conversation.

Lesson 6– {Barano hana wa ippon ikura desu ka}- Grammar, Sentence pattern.Marume.Conversation

TEXT BOOKS

1. Nihongo Shoho Imain Text sold in India by the Japanese Language Teachers Association Pune.
2. Hiragana and Katakana Work Book published by AOTS Japan
3. Grammar and Kotoba (Work Book)
4. Japanese for Dummies.(Conversation) CD.

		L	T	P	C
LE0206	FRENCH LANGUAGE PHASE II	2	0	0	2
	Prerequisite				
	FRENCH LANGUAGE PHASE I				

Sports (Ski, natation, tennis, Tour de France), Cuisine (French dishes),Cinema
(Review of a film) – Articles on these topics and group discussion will be followed.

GRAMMAR

Possessive Adjectives, Demonstrative Adjectives, Past tense – Passé Compose(Verbe Auxiliaire:.Etre et Avoir)

Culture and Civilization French Monuments (Tres celebres), French History (Jeanne d' Arc, Louis XIV,
Prise de la Bastille), Culture and Civilisation (vin, fromage, mode, parfums)

Transport system, government and media in France – articles on these topics.

Comprehension and Grammar Comprehension passages and conversational sentences in different situations (at
the restaurant, at the super market)

TEXT BOOK:

1. Panorama – Goyal Publishers
2. Apprenons le Francais II, Sarawathy Publications

		L	T	P	C
MA0202	NUMERICAL METHODS	3	2	0	4
	Prerequisite				

(Common for Civil, Mech, EEE & Chemical)

PURPOSE

To impart analytical ability in solving mathematical problems as applied to the respective branches of Engineering.

INSTRUCTIONAL OBJECTIVES

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

1. To be familiar with numerical solution of equations
2. To get exposed to finite differences and interpolation
3. To be thorough with the numerical Differentiation and integration
4. To find numerical solutions of ordinary and partial differential equations

CURVE FITTING AND NUMERICAL SOLUTION OF EQUATIONS

Method of Least Squares – Fitting a straight line – Fitting a parabola – Fitting an exponential curve – Fitting a curve of the form $y = ax^b$ – Calculation of the sum of the squares of the residuals.- Newton-Raphson method – Gauss Elimination method – Gauss Jacobi method – Gauss Seidel method.

FINITE DIFFERENCES AND INTERPOLATION

First and Higher order differences – Forward differences and backward differences and Central Differences – Differences of a polynomial – Properties of operators – Factorial polynomials – Shifting operator E – Relations between the operators. Interpolation – Newton-Gregory Forward and Backward Interpolation formulae – Divided differences – Newton’s Divided difference formula – Lagrange’s Interpolation formula – Inverse interpolation.

NUMERICAL DIFFERENTIATION AND INTEGRATION

Numerical Differentiation and Integration: Newton’s forward and backward differences formulae to compute first and higher order derivatives – The Trapezoidal rule – Simpson’s one third rule and three eighth rule.

NUMERICAL SOLUTIONS OF ORDINARY DIFFERENTIAL EQUATIONS

Solution by Taylor’s series – Euler’s method – Improved and modified Euler method – Runge-Kutta methods of fourth order (No proof) – Milne’s Method - Adam’s Bashforth method.

NUMERICAL SOLUTIONS OF PARTIAL DIFFERENTIAL EQUATIONS

Classification of Partial differential equations of the second order - Difference quotients – Laplace’s equation and its solution by Liebmann’s process – Solution of Poisson’s equation – Solutions of Parabolic and Hyperbolic equations.

TEXT BOOK

1. B.S. Grewal, *Numerical Methods*, Khanna Publishers, 6th edition.
2. (**Unit I** – Chapter 5 Section 5.3, 5.5, 5.6, 5.8, Chapter 2 Section 2.1, 2.9, 2.10, 2.12, Chapter 3 Section 3.4 (4), 3.5(1,2), Chapter 4 Section 4.2 **Unit II** – Chapter 7 Section 7.1, 7.2, 7.4, 7.12 – 7.14 Chapter 6 Section 6.6, 6.7 **Unit III** – Chapter 8 Section 8.2, 8.10 (1,2), 8.41 – 8.43 **Unit IV** – Chapter 10 Section 10.3 - 10.6, 10.8 – 10.10 **Unit V** – Chapter 11 section 11.3 – 11.6, 11.8, 11.9(1,2), 11.11,11.12).

REFERENCE BOOKS

1. Dr. M.K. Venkataraman, *Numerical Methods in Science and Engineering*, National Publishing Co., 1999.
2. S.S. Sastry, *Introductory Methods of Numerical Analysis*, 2001.
3. E. Balagurusamy, *Computer Oriented Statistical and Numerical Methods* – Tata McGraw Hill., 2000.
4. M.K.Jain, SRK Iyengar and R.L.Jain, *Numerical Methods for Scientific and Engineering Computation*, Wiley Eastern Ltd., 1987.
5. M.K.Jain, *Numerical Solution of Differential Equations*, 1979.
6. Dr.P.Kandasamy et al., *Numerical Methods*, S.Chand & Co., New Delhi, 2003.

		L	T	P	C
EE 0202	ELECTRICAL MACHINES II	3	0	0	3
	Prerequisite				
	EE0201				

PURPOSE

To enable the students to have a fair knowledge about the A.C. machines.

INSTRUCTIONAL OBJECTIVES

Analyse the performance of different types of electrical machines Appreciate the applications of them.

THREE PHASE INDUCTION MACHINES

Construction and principle of operation of three phase induction motor – Equivalent circuit – Torque & Power equations – Slip – Torque characteristics – No load & blocked rotor tests – Separation of core loss – circle diagram.

STARTING AND SPEED CONTROL OF INDUCTION MACHINES

Starting methods of three phase induction motor – Cogging & Crawling – Speed control – Voltage control – Rotor resistance control – Pole changing – Frequency control – Slip – energy recovery scheme – Double cage rotor – Induction generator – Synchronous induction motor.

SINGLE PHASE MOTORS

Single phase induction motors – Double revolving field theory – Torque – Speed characteristics – Equivalent circuit – No load and Blocked rotor test - Performance analysis – Starting methods of Single phase motors – Special motors: shaded pole motor, reluctance motor, repulsion motor.

SYNCHRONOUS GENERATORS

Types and construction features of alternators – e.m.f equation armature reaction – Synchronous reactance – determination of voltage regulation using e.m.f, m.m.f, Potier reactance and ASA methods – Synchronizing to infinite bus bars – parallel operation of synchronous generators – Salient pole synchronous machine – two reaction theory – slip test.

SYNCHRONOUS MOTOR

Constructional features and principle of operation of synchronous motor – torque and power relations – V curves and inverted V curves – Hunting and suppression methods – Short circuit transient – Starting methods – Synchronous condenser.

TEXT BOOKS

1. Nagarath.I.J. and Kothari.D.P., *Electric Machines*, T.M.H. Publishing Co Ltd., New Delhi, 5th edition 1990.
2. K.Muruges Kumar, *Induction and Synchronous Machines*, Vikas Publication Pvt. Ltd., 2003.

REFERENCE BOOKS

1. Fitzgerald Kingsley and Umans, *Electric Machinery* 4th Edition, McGraw Hill Books co., New Delhi, 1985.
2. Stephen J. Chapman, *Electric Machinery Fundamentals*, McGraw Hill Book Co., New Delhi 1985.
3. Say.M.G., *Alternating current Machines*, ELBS & Pitman London, IV edition 1980.
4. Sen.S.K., *Electrical Machinery*, Khanna Publishers, New Delhi, 1984.
5. Theraja.B.L., *Electrical Technology Vol.II AC/DC Machines* Niraja Constructions and development Co. Ltd., New Delhi.2000.

		L	T	P	C
EE 0204	CONTROL SYSTEMS	3	0	0	3
	Prerequisite				
	Nil				

PURPOSE

To provide an introduction to the analysis of linear control systems. This will permit an engineer to exploit time domain and frequency domain tools

INSTRUCTIONAL OBJECTIVES

At the conclusion of this course, the students will be able to:

1. Describe what feedback control is, basic components of control systems,
2. Describe the various time domain and frequency domain tools for analysis and design of linear control systems.
3. Describe the methods to analyze the stability of systems from transfer function forms
4. Describe the methods of designing compensators

TRANSFER FUNCTIONS

Introduction and classification of control systems – linear, nonlinear, time varying, time in-variant, continuous, discrete, SISO and MIMO systems – definitions. Mathematical modeling of mechanical (translation and rotational) and electrical systems – mechanical – electrical analogies – Transfer function block diagram reduction technique and signal flow graphs using Mason's gain formula. Transfer function of armature controlled and field controlled dc motor. Servomotors – Tacho-generators – gear train – A Brief introduction on P, PI, PD and PID controllers.

TRANSIENT AND STEADY STATE ANALYSIS

Transient and steady state response – definitions – mathematical expression for standard test signals – type and order of systems – step response of first order and second order under damped systems. - Time domain specifications of second order under damped systems – Step response of second order critically damped and over damped systems. – Responses of first order systems with P, PI, PID controllers – Steady state error analysis.

FREQUENCY DOMAIN ANALYSIS

Frequency response analysis – frequency domain specifications of second order systems – minimum phase, non-minimum phase and all pass transfer functions – polar plots, bode plots, constant M and N circles, Nichols plot, Nichols chart.

STABILITY ANALYSIS

Stability analysis-characteristic equation-location of roots in s-plane for stability – Routh's stability criterion – relative stability analysis – root locus technique – construction of root loci, stability analysis using bode plot, Nyquist stability criterion.

DESIGN OF COMPENSATORS

Design of lead, lag, lead-lag compensating networks using bode plot technique, feedback compensation, Design of PI, PD and PID using bode plot technique.

TEXT BOOKS

1. Katsuhiko Ogata, *Modern Control Engineering* second edition, Prentice Hall of India Private Ltd., New Delhi, 1995.
2. Nagrath I J and Gopal.M., *Control systems engineering*, I edition, Wiley and sons, 1985.

REFERENCE BOOKS

1. Benjamin C Kuo, *Automatic Control system*, 7th edition, Prentice Hall of India Private Ltd., New Delhi, 1993.
2. Gajic Z., Lelic M., *Modern Control System Engineering*, Prentice Hall of India Private Ltd., New Delhi, 1996.
3. Richard.C., Dorf and Robert.H.Bishop, *Modern Control System Engineering*, Addison Wesley, 1999.

		L	T	P	C
EE 0206	TRANSMISSION & DISTRIBUTION SYSTEMS	3	0	0	3
	Prerequisite				
	EE 0205				

PURPOSE

To enrich the students with the fair knowledge of distribution systems, transmission line parameters, cables and insulators and also the recent trends in power transmission.

INSTRUCTIONAL OBJECTIVES

1. Know the basic concepts of structure of power systems
2. Have a clear understanding about one line diagram and power angle diagram
3. Understand the basic concepts of EHV AC and HVDC transmission.

INTRODUCTION

Structure of electric power systems – one line diagram – Two wire DC , AC single phase and three phase systems. Recent Trends in transmission systems, comparison of EHVAC and HVDC systems.

TRANSMISSION LINE PARAMETERS

Resistance, inductance and capacitance of single phase transmission lines – stranded and bundled conductors – symmetrical and unsymmetrical spacing – transposition of conductors – Double circuit line Application of self and mutual GMD – Skin and Proximity effect – Inductive interference with neighbouring circuits – Corona loss.

PERFORMANCE OF TRANSMISSION LINES

Equivalent circuits for short, medium and long lines – attenuation constant, phase constant, surge impedance – transmission efficiency and voltage regulation – Real and reactive power flows in lines – power angle diagram – power circle diagrams for receiving and sending end, limiting factors for transmission line loadability, voltage control of lines by: shunt & series compensation – Ferranti effect.

CABLES AND INSULATION

Under ground cables: Constructional features of LT and HT cables – Insulation resistance – Dielectric and grading – Capacitance and inter – sheath grading – Thermal characteristics

Insulators: Types of insulators for overhead lines – Voltage distribution in insulator string and grading string efficiency – Methods of improving string efficiency.

MECHANICAL DESIGN OF TRANSMISSION LINE AND DISTRIBUTION SYSTEMS

Stress and Sag calculations – effect of wind and ice – supports at different levels. Types of distribution system – Radial and Ring main system. Current and voltage calculation in distributors with concentrated and distributed loads.

TEXT BOOKS

1. Wadwa. C.L., *Electric Power Systems*, Wiley Eastern Ltd., New Delhi 2001.
2. Despande.M.V., *Electrical Power Systems Design*, Tata McGraw Hill Publishing Company, New Delhi, 1990.

REFERENCE BOOKS

1. Nagarath.I.J. & Kothari.D.P., *Modern Power System Analysis*, Tata McGraw Hill Publishing Company, New Delhi 1990.
2. Steveson.W.L., “*Elements of Power System Analysis*”, McGraw Hill, New Delhi, 1999.
3. Singh S.N., “*Electric Power Generation, Transmission and Distribution*”, Prentice Hall of India Pvt Ltd., New Delhi, 2002.

		L	T	P	C
EE 0208	ELECTRONIC CIRCUITS	3	0	0	3
	Prerequisite				
	EE 0203, EE 0207				

PURPOSE

To enable the students to have a fair knowledge about the h-parameters and r-parameter in the transistors, amplifiers, basic concepts of feedback, oscillators, power supply.

INSTRUCTIONAL OBJECTIVES

1. To get an exposure to various transistor configurations and analyse FET amplifiers.
2. To have an idea about the frequency response of amplifiers and different types of feedback.
3. To have a clear understanding of operation of oscillators and power supplies.

AMPLIFIERS

Amplifier circuits: Operating point of a BJT - Bias stability - thermal runaway - Biasing circuits for transistors - fixed bias and self bias design -Two port devices and network. - Small signal models for transistors – concept

of small signal operation - amplification in CE amplifier - h parameter model of a BJT- CE, CB and Emitter follower analysis and comparison using hybrid equivalent circuit - hybrid pi models, Biasing a JFET and MOSFET - small signal FET amplifier, operation of JFET amplifier - small signal model - CS and CD amplifiers.

DIFFERENTIAL & TUNEDAMPLIFIERS

Classification of amplifiers-Distortion in amplifiers-frequency response of amplifiers- Low frequency response of BJT and FET amplifiers-- high frequency response of CE amplifier-cut off frequencies - gain bandwidth product - cascade and Darlington connections, operation and analysis of class A Power amplifier, push-pull amplifier, Class B amplifier, class C amplifiers, complementary symmetry power amplifier Differential amplifiers – DC and AC analysis - common mode and differential mode gains – CMRR- operation of emitter – coupled differential amplifier. Characteristics of tuned amplifiers –single tuned and double tuned amplifier, stagger tuned amplifier.

FEEDBACKAMPLIFIERS&WAVESHAPINGCIRCUITS

Basic concepts of feedback, Four types of negative feedback – Effect of feedback on gain stability, distortion - bandwidth - Input and output impedances - advantages of negative feedback– Topologies of feedback amplifiers. Voltage / current, series/shunt feed back RC wave shaping circuits- diode clippers- single level and two level clippers - clamping circuits - voltage multipliers- RC Integrator and differentiator circuits.

OSCILLATORS& MULTIVIBRATORS

Classification of oscillators – Barkhausen criterion- operation and analysis of RC phase shift, Wienbridge, Hartely, colpitts and crystal oscillators. Multivibrators – astable, monostable and bistable – Analysis of performance parameters of multivibrators-schmitt Trigger – Blocking oscillators. (Theory of sinusoidal oscillators – Phase shift and Wien bridge oscillators – Colpitts, Hartley and crystal oscillators.)

RECTIFIERS AND POWER SUPPLY CIRCUITS

Single phase, half-wave and full-wave rectifiers – Bridge rectifiers – Ripple factor, rectification efficiency, Transformer utilisation factor and regulation – Performance characteristics of rectifiers with filters – Regulated power supply – series and shunt type voltage regulators – switched mode power supplies

TEXT BOOKS

1. Millman and C.Halkias, *Electronic Devices and Circuits*, Tata McGraw Hill.,2001
2. Mathur.S.P., KulshreshthaD.C. & Chanda.P.R., *Electronic Devices – Applications and Integrated circuits* – Umesh Publications.,1999.

REFERENCE BOOKS

1. Malvino, *Electronic Principles*, Tata McGraw Hill, 6th edition,2000
2. Boylestad & Nashelsky, *Electronic Devices & Circuit Theory*, Eighth edition, Prentice Hall Of India (P) Ltd., 2003.
3. Sedha.R.S., *A Text Book of Applied Electronics*, Sultan chand Publishers,1999
4. Allen Mottershed, *Electronic Devices & Circuits, An Introduction* Prentice Hall Of India (P) Ltd,1999.

		L	T	P	C
PD 0202	PERSONALITY DEVELOPMENT - IV	0	0	2	1
	Prerequisite				
	Nil				

PURPOSE

The purpose of this course is to build confidence and inculcate various soft skills and to help Students to identify and achieve their personal potential

INSTRUCTIONAL OBJECTIVES

1. To guide thought process.
2. To groom students' attitude.
3. To develop communication skill.
4. To build confidence.

METHODOLOGY

The entire program is designed in such a way that every student will participate in the class room activities. The activities are planned to bring out the skills and talents of the students which they will be employing during various occasions in their real life.

1. Group activities + individual activities.
2. Collaborative learning.
3. Interactive sessions.
4. Ensure Participation.
5. Empirical Learning

Motivation II - Interpretation of Visuals of I & II

Humor in real life - Body language - Collage and poster designing and slogan writing

Brain Teasers – JAM - Current News Update I

Current News Update II - Enactment (SKIT –I) - Enactment (SKIT – II)

Survey and Reporting (heroes, sports persons etc.) - Quiz III – Review

		L	T	P	C
EE 0210	ELECTRICAL MACHINES LAB – II	0	0	3	2
	Prerequisite				
	EE 0202, EE 0209				

PURPOSE

To give students a fair knowledge of testing different types of AC machines

INSTRUCTIONAL OBJECTIVES

1. To rig up circuits for testing a given AC Machines
2. To Obtain the performance characteristics of a given AC machines

LIST OF EXPERIMENTS

1. Voltage regulation of alternators
2. Determination of X_d and X_q
3. Determination of positive, Negative and Zero sequence reactances of synchronous machines
4. Synchronization and parallel operation of alternators
5. Determination of V curves
6. Power angle characteristic of synchronous machine.
7. Circle diagram of induction motor
8. Load test on 3-phase induction motor
9. Load test on 1-phase induction motor
10. Speed control of squirrel cage induction motor by variable frequency
11. Rotor Rheostat speed control of slip ring induction motor
12. Effect of rotor injected EMF on speed control of induction motor

REFERENCE

1. *Laboratory Manual for Electro-mechanics.* Curriculum Developed Cell IIT Delhi Wiley Eastern Ltd.,

		L	T	P	C
EE 0212	ELECTRON DEVICES AND CIRCUITS LAB	0	0	3	2
	Prerequisite				
	EE 0203, EE 0207				

PURPOSE

This laboratory course will give the students a fair knowledge on the performance characteristics of various electron devices.

INSTRUCTIONAL OBJECTIVES

1. To design circuits for testing various devices.
2. To obtain the performance characteristics of various devices.

LIST OF EXPERIMENTS

Input and Output characteristics of CB ,CE configuration
Drain and Transfer characteristics of JFET
Characteristics of SCR ,Triac, Diac & UJT
Half wave Rectifier & Full Wave rectifier
Characteristics of PN Junction diode & Zener diode
Series voltage regulator
Design of RC coupled amplifier &FET Amplifier
Design of Wien – bridge Oscillator & RC phase shift oscillator.
Hartley Oscillator & Colpitt’s oscillator
Astable, Monostable , Bistable Multivibrator
Frequency response of voltage series feedback amplifier
Clippers & clampers

REFERENCE

Laboratory Manual

		L	T	P	C
EE 0214	COMPREHENSION - I	0	2	0	1
	Prerequisite				
	EE0201,EE0203,EE0205,EE0207,EE0202,EE0204,EE0206,EE0208				

PURPOSE

The students will be vigorously tested on the understanding of all the concepts in engineering that they have learnt so far in the Electrical and Electronics Engineering programme. This will enable the students attain the confidence and competence to solve real life engineering problems.

IMPLEMENTATION

Class room exercises, group discussions, case studies and topics on how the stuff works are assigned to students on an individual basis and evaluation done by a panel of teachers. The students are required to take-up an end semester examination and obtain a minimum mark for gaining the required credit.

		L	T	P	C
EE 0216	COMPUTER SKILLS	0	0	2	1
	Prerequisite				
	Nil				

PURPOSE

To acquire extramural knowledge on the computer implementation of various engineering solutions.

IMPLEMENTATION

The students are expected to undergo atleast two computer courses from a list of courses provided from time to time by all the departments of engineering and technology. Resources for conducting the courses will be found from in-house talents and outside professionals with expertise in the particular course. Certification will be done by both the university and the bodies drafted for the purpose.

V SEMESTER.

		L	T	P	C
MB0301	ENGINEERING ECONOMICS AND MANAGEMENT	3	0	0	3
	Prerequisite				
	Nil				

PURPOSE

To provide engineering students with the management skills to enable them to assess, evaluate and take key management decisions by the application of management concepts.

INSTRUCTIONAL OBJECTIVES

At the end of the course, the students are expected to:

- Understand the various key concepts of micro economics.
- Demonstrate the effect of time value of money and depreciation.
- Apply the various project management techniques
- Understand the various issues related to industrial safety.

Role and importance of economics for engineers, law of demand and supply, break-even analysis, Pricing Policies.

Cost determination, Balance sheet, Cost benefit analysis, Time Value of money, Methods of Depreciation, Long Term and short term financing, Financial Institutions

Management – Nature and functions, project management – Phases and techniques, CPM, PERT, Human Aspects of project management – Issues and problems, Managing – vs-Leading a project.

Marketing concepts, Marketing Mix, Product life cycle, Plant layout, Plant location, Material Handling, Productivity, Plant Maintenance and Industrial Safety.

Current trends in financing, Role of industrial engineer and applications of industrial engineering, Process of Project Management and the future, Ethics and project management, E-Marketing-Ethical and legal issues.

TEXT BOOKS

1. R.Pannerselvam, *Engineering Economics*, PHI, 2001.
2. O.P. Khanna, *Industrial Engineering and Management*, Dhanpat Rai sons, 1992.

REFERENCE BOOKS

1. Kotler, *Marketing Management*, PHI
2. Prasanna Chandra, *Finance Sense for non-finance executives*, TMH.

		L	T	P	C
EE 0301	ELECTRICAL AND ELECTRONICS MEASUREMENTS AND INSTRUMENTATION	3	0	0	3
	Prerequisite				
	Nil				

PURPOSE

To enable the students gain knowledge about different types of measuring techniques for measurement of circuit components and electrical quantities using electrical and electronic instruments.

INSTRUCTIONAL OBJECTIVES

1. To learn the use of DC and AC bridges for measuring R, L and C
2. To learn the use of different types of analog meters for measuring electrical quantities such as current, voltage, power energy power factor and frequency.
3. To learn the principle of working and applications of CRO and other electronic measuring devices.

MEASUREMENT OF R,L,C

Functional elements of an instrument – static and dynamic characteristics – Errors in measurement. Measurement of R, L, C – Wheatstone, Kelvin's double, Maxwell, Anderson and Schering bridges. Measurement of high resistance – Megger – loss of charge method.

MEASURING INSTRUMENTS

Principle of operation and construction of PMMC, MI, Dynamometer, Induction, Thermal and Rectifier type instruments – Measurement of voltage and current – use of ammeter shunts and voltmeter multiplier – Use of CT and PT for extending instrument ranges.

MEASUREMENT OF POWER AND ENERGY

Dynamometer type wattmeter – induction type energymeter- 1 phase & 3 phase – errors and compensation – energymeter calibration by direct and phantom loading – Maximum demand indicator – Measurement of reactive power – Trivector meter.

MEASUREMENT OF FREQUENCY, POWER FACTOR AND PHASE SEQUENCE

Frequency meters – Powerfactor meter - 1 phase & 3 phase – Synchroscope – Phase sequence indicator. Magnetic tape recorders – Stripchart recorder – X-Y recorder – Cathode Ray Oscilloscope – block diagram – CRT – Dual Trace oscilloscope.

ELECTRONIC INSTRUMENTS

Electronic voltmeters – Digital voltmeter – Multimeter – Signal generator – Function generator. Classification of transducers – resistive, capacitive and inductive – piezoelectric transducer – strain gauges – LVDT – thermoelectric – piezoelectric. Transducers for measurement of displacement – temperature – pressure – velocity.

TEXT BOOKS

1. Golding, EW. & Widdies, FW. *Measurements & Measuring instruments*, Sir Issar Pitman & sons (P) Ltd. 1998.
2. Albert D Halfride & William D Cooper, *Modern Electronic instrumentation and measurement techniques*, Prentice Hall of India Pvt Ltd. 1998.

REFERENCE BOOKS

1. Stout MB, *Basic Electrical Measurements*, Prentice Hall of India Pvt Ltd. 1987.
2. Rajendra Prasad, *Electrical Measurements & Measuring instruments*, Khanna Publishers. 1998.
3. Sawhney AK, *A course in Electrical and electronic Measurement and Instrumentation*, Dhanpat Rai & sons, New Delhi, 2001

		L	T	P	C
EE 0303	DIGITAL SIGNAL PROCESSING	3	0	0	3
	Prerequisite				
	Nil				

PURPOSE

This course enables us to understand the concepts of digital signal processing and its applications.

INSTRUCTIONAL OBJECTIVES

1. Discrete time signal and systems
2. Z transforms and filters realization
3. Frequency analysis of signals
4. Digital filter : IIR, FIR

DISCRETE TIME SIGNAL AND SYSTEMS

Characteristics and classification of signals-discrete time signal-basic definitions – representation of signals, discrete time systems-linear time invariant systems-properties of LTI systems-linear constant coefficient difference equations – Fourier transform of discrete time signals, sampling techniques – Nyquist rate, aliasing effect.

Z- TRANSFORM AND FILTER REALIZATION

Z Transform and its properties – inverse Z transform – stability – causality – linear difference equations with constant coefficients and their solutions -digital filter realization: direct form I, II, cascade, parallel types.

FREQUENCY ANALYSIS OF SIGNALS

Introduction to analysis of analog and discrete signals – Fourier series. Fourier transform – discrete time Fourier series – discrete Fourier transform-properties of discrete Fourier transform-computation of discrete Fourier transform – decimation in time-decimation in frequency –FFT algorithms- radix-2 FFT algorithm.

DIGITAL IIR FILTER

Introduction – types of filters, digital filter design-design of IIR filters-impulse invariance and bilinear transform methods-analog to digital transformation.

DIGITAL FIR FILTER

FIR filter – design of FIR filter using windows: rectangular, triangular,hanning,hamming ,Blackman windows – comparison of IIR and FIR digital filter- Effect of word length and quantization-fixed point and floating point arithmetic .

TEXT BOOKS

1. John G.Proakis, Dimitris G. Manolakis, *Digital Signal Processing*, Prentice Hall of India, Pvt, Ltd., 3rd edition. 2000
2. Alan V. Oppenheim, Ronald W. Schafer *Digital Signal Processing*, Prentice Hall of India, Pvt Ltd., 2002.

REFERENCE BOOKS

1. Sanjit K.Mitra, *Digital Signal Processing*, Tata McGraw Hil, 2001.
2. Alan V.Oppenheim, Ronald W. Schafer, *Discrete-time signal processing*, Prentice Hall of India Pvt Ltd., 1998.
3. Edward W. Kamen and Bonnie S.Heck *Fundamentals of Digital Systems*, Prentice Hall of India Pvt .Ltd, 2000.

		L	T	P	C
EE 0305	LINEAR INTEGRATED CIRCUITS	3	0	0	3
	Prerequisite				
	Nil				

PURPOSE

To enable the students to understand the fundamentals of intergrated circuits and designing electronic circuits using it

INSTRUCTIONAL OBJECTIVES

1. To design simple circuits like amplifiers using Op – Amps.
2. To design waveform generating circuits.
3. To design simple filter circuits for particular application.
4. To gain knowledge in designing stable voltage regulators.

OP-AMP FUNDAMENTALS, CHARACTERISTICS AND APPLICATIONS

Basic information, Op-amp configurations, Ideal op-amp circuit analysis-DC and AC characteristics of ideal op-amp, - Inverting and Non-inverting amplifiers - summing amplifier - difference amplifier - voltage follower - Differentiator - Integrator –Nonlinear applications- clamper - clipper – sample and hold circuit, Log and Antilog Amplifier, Multiplier and Divider.

COMPARATORS AND WAVEFORM GENERATORS

Introduction - Basic comparator application, sine wave generator- wein bridge and phase shift oscillator, square wave, triangular wave, saw tooth wave generation, Schmitt trigger, window detector.

ACTIVE FILTERS &PLL

RC active filters- Low pass , High pass, band pass, band reject and notch filter. PLL –Description and application – Frequency multiplier , Frequency divider, AM detector and FM detector.

ANALOG/DIGITAL AND DIGITAL/ ANALOG CONVERTERS

Digital to analog converters- basic concepts, analog switches, types-weighted, R-2R ladder DAC. Analog to Digital converter- basic concepts , types-Flash, counter, successive approximation and dual slope .

VOLTAGE REGULATORS AND TIMERS

voltage regulators - Fixed voltage regulators, Adjustable voltage regulators –723 general purpose voltage regulator. IC555 Timer-Timer functional diagram, monostable and astable operation, Schmitt trigger and their applications.

TEXT BOOKS:

1. Roy choudry and Shail Jain, *Linear Integrated Circuits*, Wiley Eastern Ltd., 1995
2. Gayakwad, R.A., *Op-amps & Linear Integrated Circuits*, Prentice Hall of India, New Delhi, 3rd edition, 1993.

REFERENCE BOOKS

1. Sergio Franco, *Design with operational amplifiers and Analog Integrated circuits*, Tata McGraw Hill 3rd Edition 2002
2. Millman, J. and Halkias, C.C., *Integrated Electronics-Analog and Digital Systems*, McGraw Hill, 9th Reprint, 1995.
3. Coughlin R.F. and F.F. Driscall, *Operational Amplifiers and Linear Integrated Circuits*, Prentice Hall Inc. NJ 1977.

		L	T	P	C
EE 0307	DIGITAL SYSTEMS	3	0	0	3
	Prerequisite				
	Nil				

PURPOSE

To develop a strong foundation in the field of Digital Electronics. The subject gives the students an in – depth knowledge about Digital logic families, Combinational circuits and enable them to analyse and design any sequential circuits.

INSTRUCTIONAL OBJECTIVES

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

- Understand Digital concepts
- Logically explain the concepts of combinational and sequential circuits.
- Logically analyse any synchronous sequential circuit.

NUMBER SYSTEMS AND BOOLEAN ALGEBRA

Review of Number systems – Binary ,Octal, Decimal , Hexadecimal and conversions - Complements - Subtraction using complements - Binary codes - Theorems of Boolean algebra - Canonical forms - Logic gates, Simplification of Boolean functions-K maps-Tabulation method.

LOGIC FAMILIES

Digital Logic Families - Introduction to RTL, DTL, TTL, ECL and MOS families - Details of digital logic family -Wired AND operation, characteristics of digital logic family - comparison of different logic families.

COMBINATIONAL LOGIC CIRCUITS

Combinational logic - Representation of logic functions - Simplification and Implementation of combinational logic - Multiplexers and demultiplexers - Code converters, comparator, adders- full adder-half adder-decimal adder, subtractors-half subtractor- full subtractor.

SEQUENTIAL LOGIC CIRCUITS

Sequential Logic-Flip flops - SR, JK, D and T flip flops - Level triggering and edge triggering - Excitation tables - Counters - Asynchronous and synchronous type - Modulo counters - Shift registers - Ring counters.

DESIGN OF DIGITAL SYSTEMS

Design aspects; asynchronous type: concept of state - state reduction - analysis of asynchronous sequential logic circuits–introduction to design; programmable logic array and devices;finite state machine.

TEXT BOOKS:

1. Morris Mano, M .*Digital logic and computer design* Prentice Hall of India, 1997.
2. Donald D. Givone, *Digital Principles and Design*, Tata McGraw Hill, 2002.

- Tocci R.J., Neal S. Widmer, *Digital Systems: Principles and Applications*, Pearson Education Asia, Second Indian Reprint 2002.

REFERENCE BOOKS

- Floyd, *Digital Fundamentals*, Universal Book stall, New Delhi, 1986. R.P. Jain, *Modern Digital Electronics* Tata Mcgraw Hill, 3rd edition, 1997. William I. Fletcher, *An Engineering Approach to Digital Design*, Prentice Hall of India, 1980
- Morris Mano, *Digital Logic and Design*, Prentice Hall of India, 1979
- William I. Fletcher, *An Engineering Approach to Digital Design*, Prentice Hall of India, 1980
- Morris Mano, *Digital Logic and Design* Prentice Hall of India, 1979

		L	T	P	C
EE 0309	DESIGN OF ELECTRICAL APPARATUS	3	1	0	4
	Prerequisite				
	EE 0201, EE 0202				

PURPOSE

To enable the students gain fair knowledge on design of magnetic circuits and electrical machines.

INSTRUCTIONAL OBJECTIVES

- To understand basics of design considerations
- To design transformers
- To design rotating electrical machines

BASIC CONSIDERATION IN DESIGN

Classification of Areas of Design, Electrical Engineering materials – conducting, insulating & magnetic materials, design limitations and specifications, modes of Heat dissipation, internal temperature, temperature gradient in cores & slots, thermal resistivity of winding.

TRANSFORMERS

Output equation of single phase and three phase transformers – window space factor – overall dimensions – design of core and windings, design of tank with cooling tubes – core area factor.

DESIGN OF DC MACHINES

Magnetic circuit calculations – total gap contraction factor, net length of Iron, MMF for air gap, MMF for teeth, real and apparent flux densities. Output equation for DC machine, choice of specific loadings, selection of number of poles, separation of D and L, Armature Design – selection of number of slots, number of conductors, number of coils, Design of commutator and brushes.

DESIGN OF THREE PHASE INDUCTION MOTORS.

Output equation for induction motor – choice of specific loadings, separation of D and L, L/τ criteria, Armature Design – selection of number of slots, number of conductors, determination of depth of core and other dimensions. Design of squirrel cage rotor, design of wound rotor.

DESIGN OF SYNCHRONOUS MACHINES

Pole construction – run away speed – output equation, choice of specific loading, separation of D and L, design of armature – number of slots, number of conductors. Determination of depth of core and other dimensions, Estimation of air gap length, short circuit ratio – Design of field system.

TEXT BOOKS:

- Mittle V.M. and Mittle.A, *Design of Electrical Machines*, Standard Publishers Distribution, Fourth edition, 1996.
- Sawhney, A.K. *A course in Electrical Machine Design*, Dhanpat Rai & Sons, 1993.

REFERENCE BOOKS:

- Rai, H.M. *Electrical Machine Design*, Sathiyha Prakashan Publications, 3rd edition, 1992.
- Say M.G., *The Performance & Design of Alternating Current Machines* Isaac Pitman & Sons Ltd., London 1995.
- Clayton, A.E., *Performance & Design of Direct Current Machines*, English Language Book Society & Sri Isaac Pitman & sons Ltd., London 1995.

		L	T	P	C
PD0301	PERSONALITY DEVELOPMENT - V	1	0	2	2
	Prerequisite				
	Nil				

PURPOSE

The purpose of this course is to build confidence and inculcate various soft skills and to help Students to identify and achieve their personal potential

INSTRUCTIONAL OBJECTIVES

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

1. Acquire the important soft skills for employment
2. Take part in group discussions and job interviews confidently
3. Appear for placement aptitude tests confidently
4. Gain self confidence to face the placement process

METHODOLOGY

The entire program is designed in such a way that every student will participate in the class room activities. The activities are planned to bring out the skills and talents of the students which they will be employing during various occasions in their real life.

1. Group activities + individual activities.
2. Collaborative learning.
3. Interactive sessions.
4. Ensure Participation.
5. Empirical Learning

Syllogism - Binary Logic [cause & effect] - Assertive & Counter Argument - Simple Interest - Time & Work - Time & Distance

Upstream & Downstream Reasoning - Verbal Comprehension I - Verbal Comprehension II- Compound Interest Logarithms - Surds & Indices

Verbal Reasoning I - Verbal Reasoning II - Verbal Reasoning III – Percentage – Test – Averages

Deductive Reasoning I - Deductive Reasoning II - Language Usage I - Decimal Fractions - Profit & Loss – Probability

Language Usage II - Logic Games I - Logic Games II – Area - Pipes & Cisterns – Test

		L	T	P	C
EE 0311	MEASUREMENTS & CONTROL SYSTEM LAB	0	0	3	2
	Prerequisite				
	EE 0301,EE 0204				

MEASUREMENTS

PURPOSE

To acquire skills on using different measuring devices.

INSTRUCTIONAL OBJECTIVES

1. To understand the operation of DC and AC bridges
2. To calibrate different types of meters.
3. To understand the use of special purpose instruments.

LIST OF EXPERIMENTS

1. Measurement of resistance
2. Measurement of inductance & capacitance
3. Calibration of single phase energy meter

4. Calibration of three phase energy motor
5. Measurement of power factor

CONTROL SYSTEMS

PURPOSE

To acquire skills in the mathematical modeling of machines and use of control system components.

INSTRUCTIONAL OBJECTIVES

1. To find transfer function of DC Machines and compensating networks.
2. To understand the use of various control system components.

LIST OF EXPERIMENTS

1. Transfer function of armature controlled and field controlled DC Motor.
2. Transfer function of DC and AC servomotor.
3. Design and implementation of Lag, lead compensator.
4. Design and implementation of P, PI, PD, PID controllers.
5. Digital simulation of the above controllers using MATLAB software.
6. Stability analysis of a second order system using MATLAB software.
7. Study of synchros.

REFERENCE

Laboratory Manual

		L	T	P	C
EE 0313	INTEGRATED CIRCUITS LAB	0	0	3	2
	Prerequisite				
	EE 0305				

PURPOSE

To acquire skills of designing and testing integrated circuits

INSTRUCTIONAL OBJECTIVES

1. To design various types of amplifier using Op-Amp
2. To design function generator circuits
3. To design basic timer circuits
4. To design simple logic circuits using digital IC's

LIST OF EXPERIMENTS

1. Operational Amplifiers (IC741)-Characteristics and Applications.
2. Waveform Generation using Op-Amp (IC741).
3. Applications of Timer IC555.
4. Design of Active filters.
5. Study and application of PLL IC's
6. Design of binary adder and subtractor.
7. Design of counters.
8. Study of multiplexer and demultiplexer /decoders.
9. Implementation of combinational logic circuits.
10. Study of DAC and ADC
11. Op-Amp voltage Regulator- IC 723

REFERENCE

Laboratory Manual

		L	T	P	C
EE 0315	INDUSTRIAL TRAINING - I	0	0	2	1
	Prerequisite				
	Nil				

PURPOSE

To expose the students to the industrial working environment.

IMPLEMENTATION

A minimum of 2 weeks in-plant training has to be undergone by the student during winter / summer vacation following III / IV semester. A certificate from the company to the effect that he/she has undergone the training successfully has to be produced. The student is required to present a report on the observations and knowledge gained during the training which will be evaluated by a panel of faculty members.

SEMESTER VI

		L	T	P	C
EE 0302	POWER ELECTRONICS	3	1	0	4
	Prerequisite				
	Nil				

PURPOSE

To enable the students gain a fair knowledge on characteristics and applications of power electronic devices.

INSTRUCTIONAL OBJECTIVES

- To learn the characteristics of different types of semiconductor devices
- To understand the operation of controlled rectifiers
- To understand the operation of choppers and inverters

POWER SEMICONDUCTOR DEVICES

Basic structure & switching characteristics of power diodes, Power transistor & SCR, Triggering methods of SCR, R, RC, and UJT firing circuits for SCR, series and parallel operation of SCR, need for snubber circuits, di/dt & dv/dt protection. Introduction to Triac, GTO, MOSFET, IGBT, FCT and MCT.

CONTROLLED RECTIFIERS

Operation of 1-phase half wave rectifiers with R load, 1-phase FWR with R, RL & RLE load (fully controlled & half controlled), operation and analysis of FWR using R & RL loads (RMS, average & PF), operation of 3-phase HWR & FWR with R & RL loads for continuous current mode, effect of source inductance in 1-phase FWR, Introduction to 1-phase dual converter operation.

CHOPPERS

DC Choppers: Classification & operation of choppers (A,B,C,D,E), control strategies, operation of voltage, current and load commutated choppers.

AC Choppers: Operation of 1-phase voltage regulator with R, RL loads, 1-phase step up & step down cycloconverters.

INVERTERS

Types of inverters, operation of 1-phase VSI and 3-phase VSI (120° , 180°) modes, Y with R load, operation 1-phase of CSI with ideal switches, 1-phases ASCSI operation, basic series inverter, Modified series Inverter, 1-phase parallel inverter operation (without feedback diode), 1-phase basic McMurray inverter, Introduction to harmonics and PWM inverters.

APPLICATIONS OF POWER ELECTRONIC CONVERTERS

Speed control of DC motor using rectifiers and choppers, SMPS, UPS (on line and off line), Introduction to FACTS – shunt and series compensators.

TEXT BOOKS

1. Bhimbra. Dr.P.S., *Power Electronics* Khanna Publishers, 2001.
2. Singh. M.D. & Khanchandani. K.B *Power Electronics* Tata McGraw Hill Publishing Co. Ltd., New Delhi, 2000.

REFERENCE BOOKS

1. Mohammed H. Rashid, *Power Electronics – Circuits, Devices & Applications*, Prentice Hall of India, New Delhi, 1995.
2. Dubey, G.K. et al, *Thyristorised Power Controllers*, New Age International (P) Publishers Ltd., 2002.
3. Vedam Subramaniam, *Power Electronics*, New Age International (P) Publishers Ltd., 2000.

		L	T	P	C
EE 0304	MICROPROCESSORS AND MICROCONTROLLERS	3	0	0	3
	Prerequisite				
	Nil				

PURPOSE

To gain knowledge in microprocessor architecture, programming and its various applications.

INSTRUCTIONAL OBJECTIVES

- To perform basic arithmetic calculation
- To interface external peripheral devices with microprocessors.

INTRODUCTION

Evolution of Microprocessors, microcontrollers and Computers, - Microprocessor based system design - need - steps, Advantages and limitations-bus system - Decoders – Tri state logic -Intel 8085 Architecture - Functions of various blocks and signals - organisation of a microcomputer Memory devices: classifications and its interfacing.

ASSEMBLY LANGUAGE PROGRAMMING

The origin of software - Mnemonics - Instruction format - Classification - Addressing modes - Program execution - Intel 8085 instruction set - Assemblers - Instruction Timing and status signals - Stack and subroutine Simple program.

I/O INTERFACING

Data Transfer - Concepts, Methods - Parallel I/O interfacing - 8255 programmable peripheral interface - Serial I/O interfacing concepts -Use of SID and SOD lines - DMA method of transfer - 8257 / 8237 programmable DMA controller.

INTERRUPTSTRUCTURES

Need for interrupt structures - Handling of specific sources of interrupts - Software and hardware interrupts - Multiple interrupts - Polling and vectoring - 8259 programmable interrupt controller - 8279 keyboard / display interfacing - 8253 / 8254 - Programmable interval timer.

MICROCONTROLLER

Role of microcontrollers – 8 bit microcontrollers – architecture of In 8031/8051/8751 –hardware description – memory organization – addressing modes – overview of instruction set – simple programs.

Applications of microprocessors:

1. Stepper motor control
2. Speed control of dc motor
3. Temperature control of furnace

TEXT BOOKS

1. Gaonkar, R.S. *Microprocessor Architecture, Programming and Applications*, Wiley Eastern Limited, New Delhi.1997.
2. Kenneth ayala, *Intel 8051 – Microcontrollers*, Prentice hall of India,2005
3. Mazidi and Mazidi, *8051 Microcontrollers* ,Pearson Education India,2006

REFERENCE BOOKS

1. Mathur A.P., *Introduction to Microprocessors*, Tata McGraw Hill, India.1995.
2. Peatman, *Microcomputer Hardware*, McGraw Hill Book Company.,1995.
3. Leventhal L.A., *8080A/8085 Assembly Language Programming*, Asborne and Associates.1998.
4. Ghosh and Sridhar.,S.S , *0000 to 8085*, Prentice Hall of India Pvt Ltd.,1995.
5. Leventhal, L.A. *Introduction to Microprocessor, Software, Hardware, Programming* Prentice – Hall of India Pvt Ltd., .1987.

		L	T	P	C
EE 0306	SWITCH GEAR AND PROTECTION	3	0	0	3
	Prerequisite				
	Nil				

PURPOSE

To introduce the students to different types of circuit breakers and protective relays for protecting power system equipments.

INSTRUCIONAL OBJECTIVES

1. Concept and working of different types of relays
2. Protection schemes for various power system components
3. Principle and working of different circuit breakers
4. Characteristics and use of fuse.
5. Protection from lightning.

PROTECTIVE RELAYS

Introduction to protective relaying-classification of relays – over current relays - directional over current relays - differential relays-distance relays - frequency relays-negative sequence relays - Introduction to static relays - comparison of electromagnetic and static relays, Buchholz Relay.

PROTECTION OF GENERATOR,TRANSFORMER AND BUSBAR

Generator protection-differential protection,balanced earth fault protection, restricted earth fault protection, statorinter-turn protection.Transformers protection-percentage differential protection-station bus zone protection-differential ,fault bus protection- protection of transmission lines-time-graded,differential,distance protection.

CIRCUIT BREAKERS

Theory of arcing and arc quenching-RRRV-current chopping-capacitive current breaking-DC circuit breaking-switchgear-fault clearing and interruption of current-Breakers-classification of circuit breakers-construction and operation of circuit breakers-minimum oil circuit breaker-air-blast circuit breaker-vacuum circuit breaker-SF₆ circuit breaker-circuit breaker rating-circuit breaker testing.

FUSES & MICROPROESSOR BASED RELAYS

Definitions-characteristics of fuses-types of fuses-low voltage fuses-HRC fuses-high voltage fuses
Intrdoduction to Microprocessor based overcurrent relays, impedance relays, Directional and reactance relay.

LIGHTNING AND ITS PROTECTION

Causes for over voltages-lightning-switching-insulation failure-arcing grounds-methods of protection- earthing screen-ground wires- peterson coil-surge arrestors-surge absorbers-neutral earthing -Insulation co-ordination.

TEXT BOOKS

1. Sunil.S.Rao, *Switchgear and Protection*, Khanna Publishers, New Delhi, 1986.
2. Soni,Bhatnagar & Gupta, *A Course in Electrical Power*, Dhanpat Rai & Sons, New Delhi - 6, 1976.

REFERENCE BOOKS

1. Ravindranath.B. and Chander.M., *Power System Protection And Switchgear*, Wiley Eastern Ltd., 1996.
2. Wadhwa.C.L., *Electrical power systems*, New age international (P) Ltd., publishers, 1995.
3. Uppal, S. L. *Electrical Power*, Khanna Publishers, New Delhi, 1997.

		L	T	P	C
EE 0308	POWER SYSTEM ANALYSIS	3	0	0	3
	Prerequisite				
	Nil				

PURPOSE

To enable the students gain comprehensive knowledge on analysis of a power system

INSTRUCIONAL OBJECTIVES

1. To construct that circuit model mathematical model of a given power system

2. To perform load flow studies using numerical techniques.
3. To analyse the behavior of the power system under abnormal
4. To check whether given system perform within its stability limits.

POWER SYSTEM OVERVIEW

Power system components, Representation. Single line diagram, per phase analysis of symmetrical three phase systems, general aspects relating to power flow, short circuit and stability analysis, per unit quantities impedance diagram.

POWER FLOW ANALYSIS

Primitive network, Formation of Bus admittance matrix by inspection method and singular method-Bus classification- Formulation of power flow problems – Power flow solution using Gauss Seidel method and Newton Raphson method, Comparison between these methods. Handling of voltage controlled buses, off nominal transformer ratios and phase shifting transformer.

SYMMETRICAL FAULT ANALYSIS

Formation of Bus impedance matrix by Z- bus building algorithm. Types of faults in power systems-symmetrical fault analysis. Short circuit capacity- symmetrical fault analysis through bus impedance matrix.

UNSYMMETRICAL FAULT ANALYSIS

Symmetrical components -sequence impedance-sequence networks, Introduction to unsymmetrical faults. Single line to ground, line to line and double line to ground faults-unsymmetrical fault analysis using bus impedance matrix.

POWER SYSTEM STABILITY

Introduction to stability studies – classification of stability-Transient stability- Equal area criterion – critical clearing angle and time-factors affecting transient stability.Numerical integration method: Euler’s method, modified Euler’s method, Fourth order Runge Kutta method.

TEXT BOOKS

1. Hadi Sadat, *Power System Analysis*, Tata Mcgraw Hill publishing company, New Delhi, 2002.
2. John.J.Grainger,William D. Stevenson, *Power System Analysis*, Tata Mc.Graw Hill, New Delhi 2003.

REFERENCE BOOKS

1. Nagrath I.J and Kothari D.P, *Modern Power System Analysis*, Tata Mcgraw Hill publishing company, New Delhi, 2002.
2. Wadhwa.C.L., *Electrical power systems*, New age international (P) Ltd., publishers, 1995.
3. Pai.M.A *Computer Techniques In Power System Analysis*, Tata Mcgraw Hill publishing company, New Delhi, 2003.

		L	T	P	C
PD0302	PERSONALITY DEVELOPMENT VI	1	0	2	2
	Prerequisite				
	Nil				

PURPOSE

The purpose of this course is to build confidence and inculcate various soft skills and to help Students to identify and achieve their personal potential

INSTRUCTIONAL OBJECTIVES

- At the end of the course the students will be able to
1. Acquire the important soft skills for employment
 2. Take part in group discussions and job interviews confidently
 3. Appear for placement aptitude tests confidently
 4. Gain self confidence to face the placement process

METHODOLOGY

The entire program is designed in such a way that every student will participate in the class room activities. The activities are planned to bring out the skills and talents of the students which they will be employing during various occasions in their real life.

1. Group activities + individual activities.

2. Collaborative learning.
3. Interactive sessions.
4. Ensure Participation.
5. Empirical Learning

Self Introduction - Narration - Current News Update – Numbers - Height & Distance - Square & Cube Roots

Current Tech Update - Verbal Aptitude Test I - GD –I - Odd man out series - Permutation & Combination - Problems on ages

GD –II - Resume Writing - Mock Interview I / reading comprehension - Problems on trains – Allegation of Mixtures - Test

Mock Interview II / reading comprehension - Mock Interview III/ reading comprehension - GD – III - Ratio & Proportion - Clocks - H.C.F & L.C.M

GD – IV - Verbal Aptitude Test II – Review – Partnership – Puzzles - Test

		L	T	P	C
EE 0310	MICROPROCESSOR AND MICROCONTROLLER LAB	0	0	3	2
	Prerequisite				
	EE 0304				

PURPOSE

To enable the students to do basic programs in the microprocessors INTEL 8085 and INTEL 8051.

INSTRUCTIONAL OBJECTIVES

- To carryout basic arithmetic calculations.
- To understand the architecture of specific IC's
- Programming to Interface peripherals IC's with the processors

LIST OF EXPERIMENTS

1. Addition and subtraction of 8 bit numbers.
2. Addition and subtraction of 16 bit numbers.
3. Multiplication and division of 16 bit number.
4. Ascending and Descending order
5. Factorial of the given number.

Code conversion: BCD to BIN BIN to BCD BIN to ASCII ASCII to BIN BCD to 7 segment using look up table
 Study of monitor routines Study of 8255 chip and waveform generator Study of 8253 chip and waveform generator
 Study of interrupts and experiment using interrupts for real time control applications (using RIM and SIM)
 Interfacing matrix keyboard and 7 segment display using 8255, 8279. Stepper motor control Interfacing ADC, DAC CRO and printer interface

REFERENCE

1. *Laboratory Manual.*
2. *Processor User Manual.*
3. *Microcontroller user Manual.*

		L	T	P	C
EE 0312	COMPREHENSION – II	0	2	0	1
	Prerequisite				
	EE 0214,EE0301, EE0303, EE0305, EE0307, EE0309				

PURPOSE

The students will be vigorously tested on the understanding of all the concepts in engineering that they have learnt so far in the Electrical and Electronics Engineering programme. This will enable the students attain the confidence and competence to solve real life engineering problems.

IMPLEMENTATION

Class room exercises, group discussions, case studies and topics on how the stuff works are assigned to students on an individual basis and evaluation done by a panel of teachers. The students are required to take-up an end semester examination and obtain a minimum mark for gaining the required credit.

		L	T	P	C
EE 0314	POWER ELECTRONICS LAB	0	0	3	2
	Prerequisite				
	EE 0302				

PURPOSE

To make the students gain comprehensive knowledge on testing of power electronics devices and their applications

INSTRUCTIONAL OBJECTIVES

To rig up circuits for various applications in power electronics
To understand the operation of different types of power controllers

LIST OF EXPERIMENTS

1. R, RC & UJT Triggering circuits
2. Single phase & Full converter
3. Single phase AC voltage controller using Traic
4. Single phase series inverter (Basic & Proto type)
5. Single phase Parallel inverter
6. Single phase Mc Murray inverter
7. Commutation circuits
8. Speed control of DC shunt motor (using Rectifier & Chopper)
9. Speed control of Universal motor.
10. Speed control of TPIM using PWM inverter

REFERENCE

Laboratory Manual

SEMESTER VII

		L	T	P	C
EE 0401	SOLID STATE DRIVES AND CONTROL	3	2	0	4
	Prerequisite				
	EE 0201,EE 0202,EE 0302				

PURPOSE

To enable the students to get a comprehensive knowledge on various power controllers for solid state drives and computer control of drives

INSTRUCTIONAL OBJECTIVES

1. To learn characteristics and control of solid state DC motors drives, induction motor drives & Synchronous motor drives
2. To learn digital control of various drives

REVIEW OF ELECTRIC DRIVES

Electric Drives-Advantage of Electric Drives-selection of Motor power rating-Thermal model of motor for heating and cooling – Classes of duty cycle-Determination of motor rating – control of Electric drives- modes of operation – speed control and drive classifications – closed loop control of drives.

SOLID STATE CONTROL OF DC DRIVESDC Motor Drives:-DC motor and their performance-Braking – Transient analysis – Ward Leonard drives – Transformer and uncontrolled rectifier control – controlled rectifier fed DC drives – Chopper controlled DC drives – Time ratio control and current limit control – Single, two and four quadrant operations – Effect of ripples on the DC motor performance.

SOLID STATE CONTROL OF INDUCTION

Induction Motor Drives-Stator control-Stator voltage and frequency control – AC chopper, Inverter and cyclo converter fed induction motor drives – Rotor control – Rotor resistance control and slip power recovery scheme-static control of rotor resistance using DC chopper.

SOLID STATE CONTROL OF SYNCHRONOUS

Synchronous Motor Drives-Speed control of three phase synchronous motors- Voltage and current source fed synchronous motor-Cyclo converter fed synchronous motors-Effects of harmonics on the performance of AC motors.

DIGITAL TECHNIQUE IN SPEED CONTROL

Digital Control and Drive Applications-Digital technique in speed control-Advantages and limitations-microprocessor based control of drives- selection of drives and control schemes for steel rolling mills, paper mills, lifts and cranes.

TEXT BOOKS

1. Dubey.G.K., *Fundamental of Electrical Drives*, Narosa publishing House 1995.
2. Pillai.S.K., *A first course on Electrical Drives*, New Age International (P) Ltd 1984.

REFERENCE BOOKS

1. Gaekward, *Analog and Digital control systems*, Wiley Eastern Ltd, 1989.
2. Vedam Subramanyan, *Thyristor control of Electrical Drives*, Tata Mc Graw Hill Publications, 1996.
3. Bimal K.Bose *Modern Power Electronics and AC Drives*, Prentice Hall of India, 2005.

		L	T	P	C
EE 0403	POWER SYSTEM OPERATION AND CONTROL	3	0	0	3
	Prerequisite				
	Nil				

PURPOSE

To enable the students gain knowledge on factors involved in the operation control of power system and also to learn how to control a power system using digital computers

INSTRUCTIONAL OBJECTIVES

1. To learn the basics of power system control
2. Controlling a power system by controlling system frequency and system voltage.
3. To learn how to reduce losses and hence the cost of power system operation.
4. To control the operation of a power system using digital computers.

INTRODUCTION

Necessity for voltage and frequency regulation of power system-p-f and Q-v control loops-recent trends in real time control of power system-Introduction to load dispatching, load forecasting, unit commitment, Load shedding and Islanding

FREQUENCY CONTROL

Plant and system level control-mathematical model of speed governing system-speed load characteristics-regulation of two generators in parallel-concept of control area-LFC control of a single area system-static and dynamic response of uncontrolled and controlled system-LFC of two area system- static and dynamic response of uncontrolled system-tie line with frequency bias control of two area system.

VOLTAGE CONTROL

Types of Excitation system-Characteristics of excitation systems-block diagram of excitation system-Static and Dynamic analysis- Methods of voltage control: OLTC, synchronous condenser, SVC, Shunt capacitor- Power system level voltage control using tap changing transformer (simple problems)

ECONOMIC DISPATCH AND UNIT COMMITMENT

Incremental cost curve-co-ordination equations without loss-solution by Lambda iteration method- co-ordination equations with loss-solution of co-ordination equations using B_{mn} co-efficients (no derivation) -base point and participation factors. Unit commitment(UC) problem-constraints in UC-Solution methods-Priority list methods(Numerical problems) Economic dispatch controller added to load frequency control.

COMPUTER CONTROL OF POWER SYSTEM

Energy control center-various levels-national,regional and state level-SCADA system-computer configuration-functions-monitoring, data acquisition and controls-EMS system-System operating states:Normal,Alert,Emergency,Inextremis,Restorative-Control strategies.

TEXT BOOKS:

1. Olle.I.Elgerd, *Electric energy systems theory-An introduction*, Tata McGraw Hill publishing company, New Delhi, 2003.
2. Allen J.Wood, Bruce F. Woollenberg, *Power generation operation and control*, John Wiley and sons, 2003.

REFERENCE BOOKS :

1. Kundur.P., *Power system stability and control*, McGraw Hill publishing company, 1994.
2. Mahalanabis A.K., Kothari.D.P., and Ahson.S.I., *Computer aided power system analysis and control*, Tata McGraw Hill publishing company, New Delhi, 1999.
3. Nagrath I.J and Kothari D. P. *Power System Engineering*, Tata McGraw Hill Publishing Company, New Delhi, 1994.

		L	T	P	C
EE 0405	SIMULATION LAB	0	0	3	2
	Prerequisite				
	EE 0302,EE 0308				

PURPOSE

To enable the students gain a fair knowledge on the techniques of simulation of Power Electronics and Power System

INSTRUCTIONAL OBJECTIVES

To acquire skills of using computer packages such as MATLAB & ETAP for Power Electronics and Power System studies

LIST OF EXPERIMENTS

1) Use of MATLAB for the following

1. Single phase half controlled converter with R and RL load.
2. Single phase fully controlled converter with R and RL load
3. Three phase fully controlled converter with R and RL load.
4. Single phase AC voltage controller with R and RL load.

2) Use of MATLAB coding for solving the following

1. Formation of YBus by inspection method and analytical method.
2. Formation of ZBus matrix.
3. Load flow analysis for GS, NR and FDLE methods

3) Use of ETAP software for the following

1. Load flow solution for GS, NR and FDLF
2. Symmetrical and unsymmetrical fault analysis
3. Transient stability analysis
4. Microcontroller based simulations

REFERENCE

Laboratory Manual

		L	T	P	C
EE0409	INDUSTRIAL TRAINING II	0	0	2	1
	Prerequisite				
	Nil				

PURPOSE

To expose the students to the industry working environment.

IMPLEMENTATION

A minimum of 2 weeks in-plant training has to be undergone by the student during winter / summer vacation following V / VI semester. A certificate from the company to the effect that he/she has undergone the training successfully has to be produced. The student is required to present a report on the observations and knowledge gained during the training which will be evaluated by a panel of faculty members.

ELECTIVE (VI SEMESTER)

		L	T	P	C
MA 0352	OPERATIONS RESEARCH	3	0	0	3
	Prerequisite				
	Nil				

PURPOSE

To introduce the concepts of operational research and apply the same to practical project management

INSTRUCTIONAL OBJECTIVES

1. To introduce net work analysis in project management.
2. To inculcate the ideas of game theories

- To underline the importance of inventory control through scientific tools
- To introduce linear programming techniques.

RESOURCE SCHEDULING AND NETWORK ANALYSIS

Problem of sequencing – Sequencing n jobs through 2 machines and 3 machines, 2 jobs through m machines. PERT and CPM –Critical path calculation – Probability and cost consideration.

REPLACEMENT AND GAME THEORY

Replacement Models – Replacement of items that deteriorate with time – Equipment that fails suddenly. Two person zero sum games – Pure strategies and saddle point – Mixed strategies – 2 x n and m x 2 games – Method of dominance – Numerical and graphical solutions.

INVENTORY CONTROL

Inventory models – Deterministic models – Economic ordering quantity, Reorder level, optimum cost – Instantaneous and Non-instantaneous receipt of goods with or without shortages.

LINEAR PROGRAMMING

Introduction to Linear Programming – Formulation of the problem – Graphical method – Simplex method – Artificial variable techniques - Primal-dual problems – Dual Simplex method.

ADVANCED LINEAR PROGRAMMING PROBLEMS

Integer programming problem - Cutting plane algorithm – Transportation models - Vogel’s Approximation method – MODI method – Unbalanced transportation problem – Degeneracy in transportation models – Assignment models – Traveling salesman problem-Dynamic Programming problem.

TEXT BOOK

- Kanti Swarup, Gupta P.K., and Man Mohan, *Operations Research*, Sultan Chand & Sons, 1994. (Unit I Chapter 10 Section 10.1 – 10.4, 10.6, Chapter 19 Section 19.1, 19.11, Unit – II Chapter 18 Section 18.1-18.3, Chapter 9 Section 9.1 – 9.9, Unit – III Chapter 17 Section 17.1, 17.2, 17.6, 17.7, 17.9, 17.10, 17.17, Unit – IV Chapter 2,3,4 Unit – V Chapter 4 Section 14.1-14.4 Chapter 6, 7, 11).

REFERENCE BOOKS

- Gupta P.K., and Hira D.S., *Operations Research*, S.Chand & Sons, 2000 .
- Sundaresan.V, Ganapathy Subramanian.K.S. and Ganesan.K, *Resource Management Techniques*, A.R. Publications,2002
- Taha H.A., *Operations Research – An introduction*, 7th edition, PHI, 2002.
- Sharma S.D., *Operations Research*, Kedarnath Ramnath & Co., Meerut,1994.
- Billy B. Gillet, *Introduction to Operations Research – TMH Publishing Co.*
- Gupta P.K., and Manmohan, *Operations Research and Quantitative Analysis – S.Chand & Co., New Delhi.*
- Hamblin S., and Stevens Jr., *Operations Research*, Mc Graw Hill Co.

		L	T	P	C
EE 0352	HIGH VOLTAGE ENGINEERING	3	0	0	3
	Prerequisite				
	Nil				

PURPOSE

To get a fair knowledge about the generation of high voltage and currents

INSTRUCTIONAL OBJECTIVES

- To have an idea about conduction & breakdown in solid, liquid & gaseous dielectrics.
- To get an understanding about generation and measurement of high voltages and currents.

CONDUCTION AND BREAKDOWN OF GASEOUS INSULATION MATERIALS

Ionization process and current growth – Townsend’s criterion for breakdown- breakdown in electronegative gases-time lags for breakdown –Paschen’s law – corona discharges – breakdown in non – uniform fields- factors to be considered for selecting gases as insulating material.

CONDUCTION AND BREAKDOWN IN LIQUID AND SOLID DIELECTRICS

Breakdown mechanisms in liquid dielectrics-liquid dielectrics used in practice-various processes of breakdown in solid dielectrics-solid dielectrics -solid dielectrics used in practice.

GENERATION OF HIGH VOLTAGE AND CURRENTS

Generation of high DC voltages - multiplier circuits -Van de Graff generator – high alternating voltage generation using cascade transformers-production of high frequency AC high voltages-standard impulse wave shapes-Marx circuit-generation of switching surges-impulse current generation-tripping and control of impulse generators.

MEASUREMENT OF HIGH VOLTAGES AND CURRENTS

HVDC measurement techniques – measurement of power frequency A.C voltages-sphere gap measurement technique-potential divider for impulse voltage measurements-measurement of high D.C, A.C and impulse currents-use of CRO for impulse voltage and current measurements.

HIGH VOLTAGE TESTING

Tests on insulators-testing of bushings-testing of isolators and circuit breakers-cable testing-testing of transformers-surge divertor testing-radio interference measurement-use of I.S for testing.

TEXT BOOKS

1. Wadhwa.C.L., *High Voltage Engineering* Wiley Eastern Limited, 1994
2. Naidu M.S., and Kamaraju, *High Voltage Engineering*, Tata McGraw Hill, 1982.

REFERENCE BOOKS

1. Kuffel.E and Abdullah. M, *High Voltage Engineering*, Pergamon Press, 1970.
2. Dieter Kind, *An Introduction to High Voltage Experimental Technique* Wiley Eastern Limited, 1978.
3. Alston, “*High Voltage Technology*” BS Publications, 2007.

		L	T	P	C
EE 0354	DATABASE MANAGEMENT SYSTEMS	3	0	0	3
	Prerequisite				
	Nil				

PURPOSE

To enable the students to have an idea about the principles and concepts of database systems.

INSTRUCTIONAL OBJECTIVES

1. To have an idea about database applications.
2. To gain knowledge about relational algebra and calculus.
3. To know the basic concepts of recovery systems and transactions.

INTRODUCTION

Database system applications - View, Model, language of database - system structure
E-R model - concepts - constraints - keys - design issues - E.R - diagram - Extended features design and reduction of database schema.

RELATIONAL MODEL

Structure - relational algebra - Relational calculus - SQL - structure - Set operations - Aggregate functions - Views - Modification of database- Data - Definition Language. Relational database design : Pitfalls - Normalization using functional dependencies - Decomposition - Desirable properties - Boyce - Codd Normal form.

INDEXING AND HASHING

Basic concepts - B⁺ tree, B tree Index files - Static and Dynamic hashing, comparison of ordered indexing and hashing. Query Processing : Equivalent of expressions - Transformation of relational expressions - cost based optimization - Heuristic optimization - structure of Query optimizer.

TRANSACTION

Concept - Implementation of Atomicity and Durability - Concurrent executions - Serilizability - Recoverability- Testing of serilizability. Concurrency Control Lock - based, Time-stamp based, validation based protocols - Dead lock handling.

RECOVERY SYSTEM

Failure classification - storage structure - log based recovery - Shadow paging - concurrent transaction recovery - Buffer management. Integrity & Security Domain constraints - Referential integrity - Assertion - Triggers - Security and Authorization - Encryption and Authentication.

TEXT BOOK

1. Silberschaty. Korth. Sudarshan, *Database system concepts*, McGraw Hill International Publication.1984.

REFERENCE BOOKS

1. Jeffrey D. Ullman, *Principles of Database systems* 1984.
2. Date C.J., *An introduction to Database Systems* 2000.

		L	T	P	C
EE 0356	SPECIAL ELECTRICAL MACHINES	3	0	0	3
	Prerequisite				
	EE 0201,EE 0202				

PURPOSE

To enable the students to have an idea in the advanced electrical machines.

INSTRUCTIONAL OBJECTIVES

1. To analyse the performance of different types of special machines
2. To appreciate the applications of them.

INDUCTION MOTORS

Effect of injected EMF into the rotor of a three phase slip ring induction motor – Action of commutator as a frequency converter – Principle of operation of schrage motor – Principle of operation of un compensated & compensated single phase series motors – Universal motors – Repulsion motors – Linear induction motor.

STEPPER MOTORS

Stepping motors – constructional features – Principle of operation – Modes of excitation – variable reluctance motor – Hybrid motor – single and multi stack configurations – Theory of torque predictions – Drive circuits for open loop control & closed loop control of stepping motors.

SWITCHED RELUCTANCE MOTORS

Constructional features – Principle of operation – Torque prediction – Power controllers - speed torque characteristics.

PERMANENT MAGNET BRUSH LESS DC MOTORS

Commutation in DC motor, difference between mechanical and electronic commutations, square wave permanent magnet brushes motor drives; torque / emf equations, torque / speed characteristics, power controllers.

PERMANENT MAGNET SYNCHRONOUS MOTORS

Principle of operation, emf and torque equations, phasor diagram, torque / speed characteristics. Principle of operation of linear synchronous motor, its applications.

TEXT BOOKS:

1. T.J.E. Miller, *Brushless Permanent Magnet & Reluctance Motor Drives*, Clarendon Press, Oxford 1989.
2. P.P. Acarnley, *Stepping Motors – A Guide to Modern Theory & Practice* Peter Peregrins, London, 1982.

REFERENCE BOOKS:

1. Hughes.A, *Electric Motor Drives*, Affiliated East – West Press Pvt Ltd, Madras, 1990.

- Kenjo.T, *Stepping motor & their microprocessor control*, Clarendon Press, Oxford, 1989.
- Kenjo.T & Nagamori.S, *Permanent Magnet & Brushless DC Motors*, Clarendon Press, Oxford, 1989.
- Denis O' Kelly, *Performance & Control of Electrical Machines*
- J.B. Gupta *Electrical Machines*,

		L	T	P	C
EE 0358	COMPUTER ORGANIZATION AND ARCHITECTURE	3	0	0	3
	Prerequisite				
	Nil				

PURPOSE

The purpose of this course is to give a strong foundation of the computer organization and its internal architecture.

INSTRUCTIONAL OBJECTIVES

- Gives a knowledge of various architectures
- CPU, Control unit, I/O Processing
- Memory and its types
- Design of the above components

INTRODUCTION

Evolution of Computer Systems-Computer Types-Functional units-Basic operational concepts-Bus structures-Memory location and addresses-memory operations- Addressing modes-Design of a computer system-Instruction and instruction sequencing,RISC versus CISC.

CENTRAL PROCESSING UNIT

Introduction-Arithmetic Logic Unit - Fixed point arithmetic, floating point arithmetic-Execution of a complete instruction-Basic concepts of pipelining.

CONTROL UNIT DESIGN

Introduction-Control Transfer-Fetch cycle - Instruction Interpretation & Execution - Hardwired control - Microprogrammed control.

MEMORIES AND SUBSYSTEMS

Semiconductor memory - Static and Dynamic -Associative memory- Cache memory- Virtual memory-Secondary memories-Optical magnetic tape & magnetic disks & controllers.

I/O PROCESSING

Introduction-Data transfer techniques- Bus Interface- I/O Channel-I/O Processor, I/O devices -Direct memory access.

TEXT BOOK

- Carl Hamacher,"Computer Organization",Fifth Edition,McGrawHill International Edition , 2002

REFERENCE BOOKS

- P.Pal Chaudhuri, *Computer Organization and Design* , 2nd Edition, PHI ' 2003
- William Stallings , *Computer Organization and Architecture – Designing for Performance* , PHI, 2004.
- John P.Hayes, *Computer Architecture and Organization* III Edition, McGraw Hill International Editions, 1998.

		L	T	P	C
EC0314	COMMUNICATION ENGINEERING	3	0	0	3
	(Same as EC0311)				
	Prerequisite				
	Nil				

PURPOSE

To know about the basics of communication engineering such as Analog modulation methods (AM,FM,PM Transmission, Reception), PCM and finally Digital modulation techniques.

INSTRUCIONAL OBJECTIVES

1. AM Modulation and Demodulation – DSB-FC,DSB-SC,SSB,VSB.
2. FM Modulation and Demodulation
3. Data Transmission – ASK, FSK, PSK.
4. PAM, PPM, PWM, PCM, TDM AND FDM.
5. Fundamentals of Radar, TV, satellite and fiber optical communication.

AMPLITUDE MODULATION

Source of noise – Internal and external – Types – Need for Modulation_ Amplitude Modulation – Generation of AM waves (DSB-FC) - Suppressed carrier systems (DSB-SC) – Single side band modulation(SSB) – Vestigial side band modulation (VSM) - comparison of various AM systems.

TRANSMITTERS AND RECEIVERS

Demodulation of AM waves – Envelope Detectors – Synchronous Detectors - Pilot carrier method – AM Transmitters - Low level and High level transmitters – AM Receivers – TRF receiver, super heterodyne receiver – Frequency Division Multiplexing.

FREQUENCY MODULATION AND DEMODULATION

Introduction to angle modulation systems – Definitions for FM & PM – Narrow band FM – Wide band FM – FM Modulators - Direct and Indirect method – FM Transmitters - FM Demodulators – Slope detector - Ratio Detector – Frequency discriminator – PLL - FM Receivers - Noise in angle modulated systems – Comparison between AM & FM.

PULSE MODULATION

Introduction to Pulse modulation systems – Pulse amplitude modulation – Pulse Time modulation – Pulse code modulation – Inter symbol Interference - Eye Patterns – Equalization - companding – time division multiplexing – synchronous and asynchronous - pulse stuffing – Bandwidth of PCM – noise in PCM – delta modulation – adaptive delta modulation – comparison between PCM and DM – DPCM.

COMMUNICATION SERVICES ELEMENTARY TREATMENT ONLY

Radar: Basic Radar system – Radar range equation – Pulsed radar systems. Television: Picture elements – Transmission and reception of picture information – Motion picture – Horizontal and vertical scanning frequencies – TV transmitters – TV Receivers – TV channels. Satellite communication: Read – orbit – Satellite altitude – Transmission path – its loss – Satellite system. Fiber optical communication: Need – Principles of light transmission in a fiber – optical fiber communication system – optical fiber – Light sources – Photo detectors – Advantages.

TEXT BOOKS

1. Singh.R.P., Sapre.S.D, *Communication Systems, Analog and Digital* – McGraw Hill Pub. 5th Reprint 2000.
2. Deshpande, N.D , *Communication Electronics* – Tata McGraw Hill Pub.1989.

REFERENCE BOOKS

1. Kennedy, *Electronics of Communication Systems* – McGraw Hill – 5th reprint – 2000.
2. Roddy D. and Coolen J. *Electronic communications*, Prentice Hall of India P. Ltd. 1987.
3. Anokh Singh, *Principles of communication Engineering* – S.Chand & Co. 1991.

		L	T	P	C
EE 0360	ELECTRIC POWER UTILIZATION AND ILLUMINATION	3	0	0	3
	Prerequisite				
	Nil				

PURPOSE

To enable the students to have a fair knowledge about Electric heating welding, illumination, traction and their uses in industry.

INSTRUCIONAL OBJECTIVES

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

1. Understand the concept behind illumination and about battery maintenance.
2. Select a particular motor for specific PURPOSE

3. Have basic knowledge about traction systems.

ELECTRIC HEATING & WELDING

Advantages of Electric Heating- Modes of heat transfer- Resistance heating – Infra red heating – Arc furnaces- Induction Heating- High frequency eddy current heating- Dielectric heating – Choice of frequency Resistance welding – arc welding- Ultrasonic welding- Preparation of work-Electrodes- Power supply for arc welding- arc welding with D.C and A.C – Circuits used in Resistance welding- Comparison of different types of welding- Simple problems

ILLUMINATION

Production of light – Laws of illumination – lighting calculation – Determination of MHCP and MSCP – Polar curves of different types of sources – Rousseau’s construction – photometers – interior and exterior illumination systems – lighting schemes – design on lighting schemes – factory lighting – flood lighting – electrical lamps – Gaseous discharge lamps – High pressure and low pressure neon sign – high frequency , low pressure discharge tubes.

INDUSTRIAL UTILIZATION

Introduction – Selection of Motors- Types of drives- Nature of Load- Running , Starting Characteristics- Speed Control- Types of enclosures- Bearings-Transmission of drive- Choice of drive- Noise- Size and rating- Temperature Rise-time curve- Choice of rating of motors- Insulation Materials- problems- Motors for particular Services

TRACTION SYSTEMS

Different types of traction- Systems of Electric Traction- Track Electrification- comparison between DC and AC systems of Railway electrification

Train movement and Energy Consumption: Typical Speed- Time curves- Factors affecting Schedule Speed- Simplified Speed-time Curve- Mechanics of Train movement- tractive effort – Power, Energy output from the driving axles- Determination of specific energy output- Factors affecting Energy consumption, Specific Energy consumption- Dead weight, accelerating weight and adhesion weight- Problems

BRAKING

Advantages and disadvantages of regenerative braking- Calculation of energy returned- Mechanical Regenerative Braking- Mechanical Braking- Mechanical Consideration- Control Equipment- Auxiliary equipment

Power Supply: Current collector-overhead construction for Tramways and Trolley buses and Railways-sag and tension calculation for trolley wire- substations- their location- Feeding and Distributing Systems- Interference in Telecommunication circuits.

TEXT BOOKS

1. Open Shaw Taylor, *Utilisation of Electrical Energy*, Oriented Longmans Limited.1978
2. Partab H, *Art and science of Utilisation of Electrical Energy*, Dhanpat Rai & Sons,1995

REFERENCE BOOKS

1. Uppal S. L. *Electric Power*, Khanna Publications., 1997.
2. Soni, Gupta &Bhatnagar *A Course in Electric Power* – Dhanpat Rai & Sons,1999.
3. Gupta, J. B. *Utilisation of Electric Power & Electric Traction*, S.K.Kataria & sons.1995.

ELECTIVE (VII SEM.)

		L	T	P	C
EE 0451	POWER QUALITY	3	0	0	3
	Prerequisite				
	Nil				

PURPOSE

To study the various issues affecting Power Quality, their production, monitoring and suppression.

INSTRUCTIONAL OBJECTIVES

1. To study the production of voltages sags, interruptions and harmonics and methods of control.

- To study various methods of power quality monitoring.

INTRODUCTION TO POWER QUALITY

Power Quality phenomenon-Terms and definitions-Variou Power events in power quality - causes for reduction in power quality

VOLTAGE SAGS

Sources of sags – Magnitude & duration of sag-effect of sag on computer and consumer Electronics- Monitoring and mitigation of voltage sag.

INTERRUPTIONS

Origin of Long & Short interruption –influence on various equipments-Basic reliability indices related interruption -monitoring and mitigation of interruption

HARMONICS

Harmonic distortion: Voltage and current distortion- harmonic indices- harmonic sources from commercial and industrial loads- Effects of harmonics on various equipments- harmonic distortion evaluation- Devices for controlling harmonic distortion

POWER QUALITY MONITORING

Monitoring considerations: Power line disturbance analyzer, power quality measurement equipment, harmonic / spectrum analyzer, flicker meters, disturbance analyzer

REFERENCE BOOKS

- Math H.J.Bollen, *Understanding Power Quality Problems-Voltage sag & Interruptions*, IEEE Press,2000
- Roger.C.Dugan, Mark.F.McGranagham, Surya Santoso, H.Wayne Beaty, *Electrical Power Systems Quality* McGraw Hill, 2003.

		L	T	P	C
EE 0453	MICROCONTROLLER BASED SYSTEM DESIGN	3	0	0	3
	Prerequisite				
	Nil				

PURPOSE

This course on Micro-controller based system design aims at introducing the need of micro-controllers-8 bits & 16 bits in a device/instrument development. Also, the detailed view of designing both the hardware and software of a completed system based on Intel 8051/31 & 8096 is also given.

INSTRUCTIONAL OBJECTIVES

The students will be able to

- Understand the need of Micro-Controller family.
- Develop the assembly level programs based on Intel 8031, 8096 & PIC micro-controllers.
- Design the detailed hardware circuits for the given applications.
- Identify the need for I/O and memory expansion methods for an application.

8031 MICROCONTROLLER

Role of microcontrollers – 8 bit microcontrollers – architecture of In 8031/8051/8751 –hardware description – memory organization – addressing mode – Boolean processing – instruction set – simple programs.

INTERFACING & APPLICATIONS

Peripheral interface – interrupt – applications – small motor control – keyboard interfacing – pulse width and frequency interfacing – analog and digital interfacing.

8096 MICROCONTROLLER PROGRAMMING FRAMEWORK

16bit microcontroller – Intel 8096 – architecture – modes of operation – addressing modes – Instruction set – simple programs.

REAL TIME CONTROL

Peripheral functions of Intel 8096 – Interrupt structure – Timer – High speed inputs and outputs analog interface- PWM output I/O ports- status and control registers – watch dog timer- bus timing and memory interface – need for expansion methods.

PIC MICROCONTROLLER

Introduction - PIC microcontroller- Architecture-memory organization – I/O ports – Reset circuits – Instruction set – compare/capture/PWM- Application and introduction to MPLAB.

TEXT BOOKS

1. Intel, *16Bit Embedded Controller Hand Book*, Intel Corporation USA, 1989.
2. Mazidi and Mazidi, *Intel 8051 Microcontrollers* Pearson education ,India,2006

REFERENCE BOOKS

1. John Peatman, *Design with Microcontrollers*, McGraw Hill Book company, Singapore,1988.
2. John Peatman, *Design with PIC Microcontrollers*, Pearson Education Asia, 2001.

		L	T	P	C
EE 0455	EXPERT SYSTEM AND FUZZY LOGIC	3	0	0	3
	Prerequisite				
	Nil				

PURPOSE

To learn the concept of expert system and fuzzy logic with application

INSTRUCTIONAL OBJECTIVES

1. Expert systems and their tools with methodology for building and expert system
2. Fuzzy logic basics & operations.
3. Fuzzy arithmetic & representations, classical logic.

EXPERT SYSTEMS – INTRODUCTION & TOOLS

Introduction, Characteristics, Acquiring, representing knowledge reasoning. Nature of ES tools, stages in development of ES tools. EMYCIN, EXPERT, OPSS, ROSIE, Block board architecture, Rule based Systems, Associative nets and symbolic computing.

BUILDING AN EXPERT SYSTEM

Building an Expert System, Difficulties in development of ES, Common pitfalls, pitfalls during development, Expert systems in market place, commercial implications.

INTRODUCTION OF FUZZY SETS AND RELATIONS

Crisp set-vagueness – uncertainty and imprecision – fuzzy set-fuzzy operators – properties – crisp versus fuzzy sets-representation of fuzzy sets-fuzzy complements, union, interaction-combination of operators, crisp and fuzzy relations – compositions of fuzzy relations.

FUZZY LOGIC AND CONTROLLERS

Fuzzy logic-classical logic-fuzzy propositions and quantifiers – linguistic hedges – fuzzification and its types-defuzzification methods – data base – rule base – inference engine structure of FLC.

APPLICATIONS OF EXPERT SYSTEMS AND FUZZY LOGIC.

Applications of expert systems and fuzzy logic In ac and dc drives. VAR control, contingency analysis-control system-inverted pendulum and aircraft control application.

TEXT BOOKS

1. Timothy J.Ross, *Fuzzy Logic with Engineering Applications*, International edition, McGraw Hill, 2000.
2. Donald A. Waterman, *A guide to Expert System*, Addison Wiley, 1999.

REFERENCE BOOKS

1. Dan W.Patterson, *Introduction to AI and expert systems*, Pearson education.
2. John yen and reza lansari, *Fuzzy logic. Fuzzy logic intelligence*, control and information-Pearson’s education.

		L	T	P	C
EE 0457	COMPUTER NETWORK ENGINEERING	3	0	0	3
	Prerequisite				
	Nil				

PURPOSE

To make the students acquire fairly good knowledge on networking computers for reliable and secured operation.

INSTRUCTIONAL OBJECTIVES

1. To understand the rudiments of computer networking
2. To analyze in detail and understand the different protocols.
3. To learn network security aspects.

INTRODUCTION

Uses of computer networks - LAN, MAN, WAN - Protocol Hierarchies - Design issues for the layers - Service Primitives - ISO reference model - TCP / IP - comparison of OSI & TCP - ARPANET - Broadband ISDN

Transmission Media : Twisted pair - Co-axial cable - fibre optics.

MEDIUM ACCESS SUB LAYER

ALOPHA - CSMA protocols - Collision free protocols - Limited contention protocols - IEEE 802 for LANs

Data link Layer : Design issues - Error detection and correction - A simplex stop-and-wait protocol sliding window protocols.

NETWORK LAYER

Design issues - Routing algorithms - Congestion control algorithms - Fragmentation in Internet - Firewalls.

TRANSPORT LAYER

Services provided to upper layer - Quality of service - Addressing - Establishing and releasing a connection - Flow control and Buffering - Crash recovery.

TCP : Service model - protocol - segment Header - connection management - Transmission policy - TCP Timer management.

NETWORK SECURITY

Cryptography - Secret key public key algorithms - Authentication protocols - Digital signatures. **SNMP:** Model - ASN1 - SMI - MIB and protocol.

TEXT BOOK

1. Andrew .S. Tanenbaum, *Computer Networks*, Prentice Hall of India publications, 1996.

REFERENCE BOOKS

1. Dimitre Bartsekar and Robert Gall, *Data Networks*, Prentice Hall of India Publications, 1992.
2. Stallings, *Data and Computer Communications*, Prentice Hall of India Publications. 1997.

		L	T	P	C
EE 0459	POWER SYSTEM DYNAMICS	3	0	0	3
	Prerequisite				
	Nil				

PURPOSE

To become familiar with the modelling of components and system for carrying out transient and dynamic stability analysis of large scale power system.

INSTRUCTIONAL OBJECTIVES

1. To study detailed modeling of synchronous machine and its excitation and speed-governing controllers.
2. To study transient stability simulation of multi machine power system.

- To study small signal stability analysis of a single-machine infinite bus system with excitation system and power system stabilizer.

INTRODUCTION

Concept and importance of stability in power system operation and design; distinction between transient and dynamic stability; complexity of stability problem in large system: Need for reduced models; stability of interconnected systems.

MACHINE MODELLING

Park's transformation; flux linkage equations, current space model, per unit conversion, normalizing the equations, equivalent circuit, flux linkage state space model, sub transient and transient inductances and time constants. Simplified models (one axis and constant flux linkage), steady state equations and phasor diagrams.

MACHINE CONTROLLERS

Exciter and voltage regulators, function of excitation systems, types of excitation systems, typical excitation system configuration, block diagram and state space representation of IEEE type 1 excitation system, saturation function, stabilizing circuit. Function of speed governing systems, block diagram and state space representation of IEEE mechanical hydraulic governor and electrical hydraulic governors for hydro turbines and steam turbines.

TRANSIENT STABILITY

State equation for multimachine simulation with one axis model, transient stability simulation of multimachine power system with one axis machine model including excitation system and speed governing system using R-K method of fourth order (Gill's technique), power system stabilizer.

DYNAMIC STABILITY

System response to small disturbances: Linear model of the unregulated synchronous machine and its modes of oscillation, regulated synchronous machine, distribution of power impact, linearization of the load equation for the one machine problem – Simplified linear model, effect of excitation on dynamic stability, approximate system representation; supplementary stabilizing signals, dynamic performance measure, small signal performance measures.

TEXT BOOKS

- P.M. Anderson and A.A.Fouad, *Power System Control and Stability* Galgotia Publications, New Delhi, 2003.
- P.Kundur, *Power System Stability and Control*, McGraw Hill Inc., USA, 1994.

REFERENCE BOOK

- M.A.Pai and W.Sauer, *Power System Dynamics and Stability*, Pearson Education Asia, India, 2002.

		L	T	P	C
EE 0461	ARTIFICIAL NEURAL NETWORK	3	0	0	3
	Prerequisite				
	Nil				

PURPOSE

This course enables us to understand the concepts of artificial neural networks and its application.

INSTRUCTIONAL OBJECTIVES

- Introduction of neural networks
- Pattern classification: neural nets
- Statistical methods
- Competitive and self organizing network
- Art and applications of ANN

INTRODUCTION

Artificial neural networks – definition and fundamental concepts – engineering approaches to neural computing- biological neural networks – Artificial neural activation functions – setting of weights – typical architectures – biases and thresholds – learning and its methods – training algorithm.

PATTERN CLASSIFICATION : NEURAL NETS

Perception – architectures, algorithm and applications – linear separability – adaline – feed networks – back propagation algorithm-application – alternate activation functions-no of hidden layers – practical consideration – gradient decent algorithm.

STATISTICAL METHODS

Associate memory-hetero associative – bidirectional associative memory-Hopfield neural networks – discrete and continuous net-boltzmann machine.

COMPETITIVE AND SELF ORGANIZING NETWORK

Kohonen’s self organizing maps-learning vector quantization-architecture, algorithm-applications, counter propagation networks and its types-radial basis function networks – applications.

ART AND APPLICATIONS OF ANN

Adaptive resonance theory – ART 1, ART2 – architecture, algorithm-applications. Applications of ANN in (1) power systems – load forecasting- unit commitment -load scheduling –load flow-studies (2) drives AC, DC and electrical circuit analysis.

TEXT BOOKS

1. Simon haykin, *Neural Networks* Pearsons education asia (2001), II edition.
2. Laurene fausett, *Fundamentals of Neural Network Architecture*, algorithms and applications – pearsons education.

REFERENCE BOOKS

1. Robert.S.Schalk off-artificial neural networks – Mc Graw Hill International edition.
2. James a Freeman/david, and M.Sakapura, “*Neural Network Algorithms applications and programming techniques – pearsons education* (2004).
3. Bose (NK) Liang(P)-*neural networks fundamentals with graph., algorithm and applications* – McGraw Hill International edition.

		L	T	P	C
EE 0463	BIO MEDICAL INSTRUMENTATION	3	0	0	3
	Prerequisite				
	Nil				

PURPOSE

To enable the students to have a fair knowledge about human physiology and bio-medical instruments.

INSTRUCTIONAL OBJECTIVES

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

1. Know the basic aspects of instrumentation systems
2. Get an idea about transducers and recorders.
3. Have basic knowledge about medical imaging systems and pacemaker systems.

HUMAN PHYSIOLOGY

Introduction, generalized medical instrumentation system, components of instrumentation system, physiological systems of the body, cardiovascular system. Respiratory system, Nervous system generation of bioelectric potentials, Action potential, Resting potential, Neuronal communication.

BIO- POTENTIAL ELECTRODES, TRANSDUCERS & RECORDERS

The electrode – electrolyte interface, Polarization, Ag/Agcl Electrodes, Body surface electrodes, Internal Electrodes. Transducers in general, Pressure Transducers, Temperature transducers, pulse sensors, Basic recording system, Direct Writing recorder, UV recorders, Thermal array recorders, Electrostatic recorder, Instrumentation Tape recorder.

MEDICAL IMAGING SYSTEMS

Information content of an image, Modulation transfer function, Noise – equivalent bandwidth, generation of X-rays, X-ray machine, computed Tomography, Magnetic Resonance Imaging – Principle, Image reconstruction techniques, Basic NMR components, Ultrasonic Imaging systems – Types of ultrasound imaging, Applications of different scan, Bio Telemetry.

MONITORING SYSTEMS

Electrocardiogram, Effects of artifacts on ECG recordings, ECG recorder Principles, EEG & EMG recorders, Phonocardiogram, stethoscope, BP measuring Instrument- Sphygmomanometer and cardiac catheterization, ultrasonic blood flow meter, Principle of Photoelectric calorimeter, computerized patient monitoring system.

SUPPORTING SYSTEMS

Pacemaker systems – Different pacing modes of operation, Transcutaneous Electrical Nerve stimulation (TENS) – Stimulation modes & application techniques, surgical diathermy, laser applications in medicine, Hemo Dialysis, Lithotripsy and introduction to electrical safety.

TEXT BOOKS

1. John. G. Webster, Editor, *Medical Instrumentation, Application and Design*, John Wiley & Sons.1989.
2. Prof.Venkataram.S.K., *Bio-Medical Electronics & Instrumentation*, Galgotia Publications.2000

REFERENCE BOOKS

1. Khandpur.R.S., *Hand book of Bio-Medical Instrumentation* Tate McGraw –Hill1987
2. Dr.Arumugam , *Bio-Medical Instrumentation* ,Anuradha Agencies,1994.
3. Cromwell, *Bio-Medical Instruments and Measurements*, Prentice Hall of India,1990.
4. John. Can.Brown, *Introduction to Bio Medical Equipment Technology*, Pearson Education of ASIA,2001.

		L	T	P	C
EE 0465	MODERN CONTROL THEORY	3	0	0	3
	Prerequisite				
	EE 0204				

PURPOSE

To enable the students to have a fair knowledge about the use of mathematical techniques in control system.

INSTRUCTIONAL OBJECTIVE

To learn the concepts of state variable techniques, non-linear systems and basics of optimal and adaptive control.

NONLINEAR SYSTEMS & DESCRIBING FUNCTION METHODS

Common types of non-linear phenomena- singular points- phase plane method- construction of phase trajectories- Derivation of describing functions - stability of non- linear systems by describing function method- jump resonance- Liapunov's method of stability studies- Popov's criterion.

STATE VARIABLE REPRESENTATION&SOLUTION OF STATE EQUATION

Introduction to state space analysis – advantages of state space analysis – state equation & output equation – block diagram representation of state & output equation – state space model of electrical networks, State space representation of armature controlled dc motor – state space model from block diagrams. Diagonal form – diagonalisation techniques – statespace representation in canonical forms & Jordan Canonical form – Transfer function from state equation – time response of state equation – calculation of generalized eigen vector.

CONTROLLABILITY AND OBSERVABILITY

State transition matrix – properties of state transition matrix – computation of e^{At} by Laplace transform approach & Cayley Hamilton theorem – Controllability & Observability – Test for Controllability & Observability by Kalmans and Gliberts method. State variable feedback and its effect on controllability and observability- pole assignment and feedback

OPTIMAL CONTROL

Formulation of optimal control problems- solving of optimal control problems - Hamiltonian formulation- linear regulator problem- solution of Richatti equation- Pontryagin's minimum principle- time optimal control.

ADAPTIVE CONTROL

Classification of adaptive control systems- MRAC systems- different configuration- classification- Mathematical description- Direct and indirect MRAC- self tuning regulators- different approaches to self-tuning- recursive parameter estimation- implicit STR- Explicit STR.

TEXT BOOKS:

1. Nagrath, I.J. and Gopal, M., *Control System Engineering*, Wiley Eastern, Reprint 1995.
2. K. Ogata, *Modern Control Engineering*, PHI, III Edition.

REFERENCES

1. Astrom K.J., and Wittenamrk B. Adaptive control, Addison Wesley Publishing Co. USA, 1989.
2. Chessman, Wilson and Leila, *Advanced Control System Technology*, Viva-low priced edition, 1998
3. Stefani, Shahian, Savant & Hostetter, *Design of feedback control systems*, Oxford University Press, 2002.
4. Stanley M. Shinnars, *Modern Control System Theory & Design*, John Wiley & Sons Inc., 1998.
5. K.Ogata., "Modern Control Engineering" PHI, III edition.
6. Doebelin, E.O, *Control System Principles and Design*, John Wiley, 1990.
7. Optimal Control – Brian P.O. Anderson, John B

		L	T	P	C
EE 0467	GENETIC ALGORITHM AND ITS APPLICATIONS	3	0	0	3
	Prerequisite				
	Nil				

PURPOSE

This course enables us to understand the concepts of genetic algorithm and its application

INSTRUCTIONAL OBJECTIVES

1. History and introduction to genetics algorithm
2. Various types of coding
3. Genetic operators and modeling
4. GA applied to power systems

INTRODUCTION TO GENETIC ALGORITHM

Introduction to genetic algorithm-history –basic concepts-creation of offspring-working principle-encoding-binary encoding-octal encoding-hexadecimal encoding –permutation encoding –value encoding-tree encoding-fitness function.

GENETIC ALGORITHM OPERATORS

Reproduction – roulette – wheel selection-boltzman selection-tournament selection-rank selection-steady – state selection – Elitism – generation gap and steady – state selection – inheritance operators – crossover-single point crossover-two point crossover-multi point crossover-uniform crossover-matrix crossover – crossover rate mutation operators – mutation – mutation rate.

GENETIC MODELING

Inversion and deletion: Inversion-deletion and duplication – deletion and regeneration –segregation – crossover and inversion-bitwise operation-one’s complement operator-logical bitwise operation-shift operators – bitwise operators used in GA-generational cycle-convergence of GA –difference and similarities between GA and others.

GA IN MULTI OBJECTIVE OPTIMIZATION

Current application of GA-techniques in genetic search : dominance, diploidy and abeyance-multi objective optimization-knowledge-based techniques-GA and parallel processes-real life problem.

GA IN ELECTRICAL ENGINEERING

Application of GA in power system optimization problems, AC drives, DC drives, neuro – GA applications, GA based optimal weight training for neural networks.

TEXT BOOKS

1. David E-Gold berg, *Genetic algorithm in searching optimization and machine learning*, Pearson educaton, 2001.
2. S.Rajasekaran, G.A.Vijay Lakshmi pai, *Neural Networks, Fuzzy logic and genetic algorithms*, PHI, 2003,)Chapter 8 and 9)

REFERENCE BOOKS

1. Kalyanmoy deb, *Optimization for Engineering Design, algorithms and examples*, PHI 1995.
2. John yen and langari, fuzzy logic” Pearson’s edition.

ELECTIVE (VIII SEM.)

		L	T	P	C
EE 0452	POWER PLANT INSTRUMENTATION AND CONTROL	3	0	0	3
	Prerequisite				
	Nil				

PURPOSE

To enable the student to gain a fair knowledge on various power plants & their related instruments.

INSTRUCTIONAL OBJECTIVES

1. To get detailed knowledge on thermal power plant.
2. To learn the measurements of various parameter in power plant and their control.

GENERAL CONCEPTS

Importance of instrumentation and automation in power plants – Thermal power plants – Complete layout of Boiler, Turbine and auxillaries – Process and instrumentation diagram of thermal power plant – distributed digital control system in power plants - co-generation plants.

MEASUREMENTS IN POWER PLANTS

Use of transducers in electrical measurements and function of synchroscope – measurement of non-electrical parameters – measurement of steam pressure and temperature and boiler tube metal temperature – Need for seal pots and condensing pots – primary sensing elements for flow measurements – measurement of flow of feed water, steam & air with focus on impulse pipe routing – Drum level measurement – DP and hydrastep methods – use of correction factors, need for pressure, temperature, flow and level switches.

ANALYSERS IN POWER PLANTS

Flue gas analysis – oxygen analyser – CO analyzer – analysis of impurities in feed water and steam – conductivity and dissolved oxygen analyzers – Gas chromatography – PH meter – pollution monitoring instruments for NOX and SOX measurements, smoke density measurements, dust monitors.

CONTROL LOOPS IN BOILER

Combustion control – air fuel ratio control furnace draft control – drum level control – steam temperature control and attemperation – Deaerator control interlocks in boiler operation.

TURBINE MONITORING AND CONTROL

Speed measurement, vibration and eccentricity measurement, shell expansion and differential expansion measurement – shell temperature monitoring and control – lubricating oil temperature control – cooling system, protection and interlocks in turbines.

TEXT BOOKS

1. Sam G.Dukelow, *The control of Boilers*, instrument society of America, 1991.
2. Modern power station practice, Vol.6, Instrumentation, Controls and Testing Pergamon Press, Oxford, 1971.

REFERENCE BOOKS

1. Elonka, S.M., and Kohan A.L., *Standard Boilers Operations*, McGraw Hill, New Delhi, 1994.
2. R.K.Jain, *Mechanical and industrial Measurements*, Khanna Publishers, New Delhi, 1995.

		L	T	P	C
EE 0454	POWER GENERATION SYSTEMS	3	0	0	3
	Prerequisite				
	Nil				

PURPOSE

To familiarize the students with different types of power generating systems and the economics associated with power generation.

INSTRUCTIONAL OBJECTIVES

1. To learn generation of electrical power from different types of power plants like thermal nuclear and hydro power stations.
2. To understand the concepts of generation of electrical power using non conventional energy resources
3. To learn the economics connected with power generation

ECONOMICS OF GENERATION

Load and load duration curve – Load, demand and diversity factors – Plant capacity and plant use factors – choice of type of generation – choice of size and number of unit – cost of energy generated – Tariffs.

THERMAL POWER PLANTS

Location, Layout and working of steam and diesel power plants - Types of boilers and turbines and other accessories for steam and gas power plants, Environmental issues.

NUCLEAR POWER PLANTS

Principles of nuclear power generation, Types of nuclear power plants and their comparison, Layout and working of nuclear power plants, Advantages and disadvantages of nuclear energy, Reactor control, Reactor safety, Environmental issues.

HYDRO POWER STATIONS

Layout and working, Types of turbines for high medium and low head plants, Advantages of hydro generation, Environmental issues, Hydro-Thermal scheduling problem.

NON CONVENTIONAL POWER PLANTS (Block Diagram and Explanation In Respect Of Power Generation)

Basic concepts, Principle of working and layout of MHD, Solar, Wind, Tidal, Biomass and Geothermal Power Generation Systems.

TEXT BOOKS

1. Uppal, S.L., *Electrical Power*, Khanna Publishers, New Delhi, 1997.
2. Soni, Gupta, Bhatnagar, *A Course in Electrical Power*, Dhanpat Rai & Sons, Delhi.1992.

REFERENCE BOOKS

1. Nagrath and Kothari, *Modern Power System Analysis*, Tata Mc Graw Hill.1989
2. Wadhwa, C.L., *Generation, Distribution and Utilization of Electric Energy*, New Age International Ltd.1998.
3. Deshpande MV, *Elements of Electrical Power Station design*, Pitman, New Delhi.1991.

		L	T	P	C
EE 0456	DIGITAL CONTROL SYSTEMS	3	0	0	3
	Prerequisite				
	EE 0204,EE 0465				

PURPOSE

To enrich the students with the knowledge of digital control system and the implementation of control algorithm using microprocessor

INSTRUCTIONAL OBJECTIVES

1. Understand concepts of digital control system sampling theory
2. Get an idea of stability analysis and discrete time state equations
3. Get a thorough knowledge of design specification and implementation of control algorithm using microprocessor

INTRODUCTION

Introduction – closed loop sampled data control system – typical digital control systems – sampling theorem – sample and hold operation – advantages of sampling – examples – review of Z-transform – pulse transfer function – Z-domain equivalence to S-domain.

STABILITY ANALYSIS

Stability analysis – Jury stability test –Bilinear transformation method – root locus method – effect of pole zero configuration in Z-plane – dominant pole concept – transient response of sampled data control systems – steady state error.

STATE VARIABLE APPROACH

Discrete time state equations –state diagram – realization of pulse transfer function – direct realization – cascade realization – parallel realization –sampled data model of continuous time systems- concepts of controllability and observability – systems with dead time.

DESIGN

Transform of digital control system – Design specifications- Design on the W plane- Digital PID controller – Introduction to design on the Z plane.

INTRODUCTION TO DSP APPLICATIONS

Implementation of control algorithm using microprocessor - General description of microcontroller – Digital Quantization signal Quantization – Digital Signal Processing (DSP) in control systems – Fundamentals of DSP – Sampling Theorem, Sampling rate – single chip DSP – Von Neumann architecture, Harvard architecture – Comparison of DSP and General purpose Microprocessor - application of DSP in motion control systems.

TEXT BOOKS

1. Gopal M, *Digital Control Engineering* Wiley Eastern Publishers, 1997.
2. Kuo B C, *Digital control system*, Prentice Hall.PA, 1996

REFERENCE BOOKS

1. Santina, Stubberud,Hostter, *Digital control system Design* Saunders college publishing 1998.
2. Farzad Nekoogar, Genemoriarty, *Digital control using DSP*,Prentice Hall Pvt. Ltd,1999.
3. Richard C.Dorf, Robert H.Bishop, *Modern Control systems*, Addison Wesley, 1999.

		L	T	P	C
EE 0458	COMPUTER AIDED POWER SYSTEM ANALYSIS	3	0	0	3
	Prerequisite				
	EE 0308				

PURPOSE

To introduce the students to various numerical tools for analyzing power system operation

INSTRUCTIONAL OBJECTIVES

1. To learn the algorithms for computing network matrices
2. To understand the use of numerical methods for power flow analysis optimal power flow analysis short circuit analysis and stability analysis

FORMATION OF NETWORK MATRICES

Matrix representation of Power system equations – Admittance and impedance matrices – Formation and algorithms – Computer programs for Building up of Z bus and Y Bus

POWER FLOW ANALYSIS

Formation of power flow equations – Newton Raphson and Fast Decoupled Power flow algorithms – Computer flow chart and algorithms – Voltage controlled buses – Off nominal transformer ratios – Phase shifting transformers.

OPTIMAL POWER FLOW ANALYSIS

Review of economic dispatch problems – Formation of operating cost minimization problems – Transmission loss minimization problems – Solution by non linear and successive linear programming methods.

SHORT CIRCUIT ANALYSIS

Symmetrical and unsymmetrical short circuit – Algorithms for short circuit analysis – Z bus formation for fault analysis.

STABILITY ANALYSIS

Transient stability analysis – Swing equation for single machine infinite bus system – Solution of swing equation by modified Euler method and Runge – Kutta methods – stability of multi-machine systems – Computer flow charts and programs.

TEXT BOOKS

1. Nagrath. J & Kothari, D.P., *Modern Power System Analysis*, Tata McGraw Hill, New Delhi, 1994.
2. Stagg S.W.,& Abiad, A.E. El. *Computer Methods in power system analysis*, McGraw Hill, Newyork 1994.

REFERENCE BOOKS

1. Pai, M.A., *Computer techniques in Power System Analysis*, Tata McGraw Hill, New Delhi, 1979.
2. Wood, A.J. & Wollenberg, N.F.,*Power Generation Operation & Control*, John Wiley and Sons, Newyork, 1984.

		L	T	P	C
EE 0460	FLEXIBLE AC TRANSMISSION SYSTEMS	3	0	0	3
	Prerequisite				
	Nil				

PURPOSE

To enable the students gain a fair knowledge on the concepts and technology of flexible AC transmission systems.

INSTRUCTIONAL OBJECTIVES

1. To understand the need for FACTS
2. To learn shunt and series compensation techniques
3. To learn about controlled voltage and face angle regulator
4. To learn the concept of unified power flow controller

INTRODUCTION TO FACTS

Electrical Transmission Network – Necessity – Power Flow in AC System – relative importance of controllable parameter – opportunities for FACTS – possible benefits for FACTS

STATIC VAR COMPENSATION

Need for compensation – introduction to shunt & series compensation – objectives of shunt & series compensation – configuration & operating characteristics – Thyristor Controlled Reactor (TCR) – Thyristor Switched Capacitor (TSC) –Comparison of TCR & TSC

SERIES COMPENSATION

Variable Impedance Type Series Compensation: Thyristor Switched Series Capacitor (TSSC) – Thyristor Controlled Series Capacitor (TCSC) – Basic operating control schemes for TSSC & TCSC

STATIC VOLTAGE PHASE ANGLE REGULATOR

Objectives of voltage & phase angle regulators – approaches to Thyristor – Controlled Voltage & Phase Angle Regulator

EMERGING FACTS CONTROLLER

STATCOM – Introduction to Unified Power Flow Controller (UPFC) & Interline Power Flow Controller (IPFC)
– basic operating principles UPFC – introduction to sub synchronous resonance

TEXT BOOKS

1. Narain G. Hingorani & Laszlo Gyugyi, *Understanding FACTS – Concepts & Technology of Flexible AC Transmission Systems*, Standard Publishers, New Delhi, 2001.
2. Mohan Mathur, R. & Rajiv K. Varma, *Thyristor Based FACTS Controller for Electrical Transmission Systems*, Wiley Interscience Publications, 2002

REFERENCE BOOKS

1. Miller. T.J.E., *Reactive Power Control in Electric System*, John Wiley & Sons, 1997.
2. Dubey G.K., *Thyristerized Power Controller*, New Age international (P) Ltd., New Delhi 2001.
3. Narain G. Hingorani, *Flexible AC Transmission*, IEEE Spectrum, April 1993, pp 40 – 45.
4. Narain G. Hingorani, *High Power Electronics in Flexible AC Transmission*, IEEE Power Engineering Review, 1998.
5. Elinar V. Larsen, Juan J Sanchez – Gasca Joe H. Chow, *Concepts for design of FACTS controllers to damp power swings*, IEEE Transactions on Power Systems, Vol. 10, No. 2, May 1995.

		L	T	P	C
EE 0462	NON CONVENTIONAL ENERGY RESOURCES	3	0	0	3
	Prerequisite				
	Nil				

PURPOSE

To familiarize the students with the different types of non conventional energy resources like solar, wind, biomass, ocean and tidal sources.

INSTRUCTIONAL OBJECTIVES

1. To review and compare different types energy resources
2. To understand in detail the use of - and production of electrical energy from - solar energy, wind energy, biomass energy ocean and tidal energy.

CONVENTIONAL SOURCES OF ENERGY

Energy - Conventional, renewables, non-conventional and alternate sources of energy - Energy supply system in India. Coal and Coal technologies - Petroleum and natural gas - nuclear fuels and power plants - Hydro sources and power plants - Energy strategies - energy conservation - energy audit - cost of energy.

SOLAR ENERGY

Application of Solar Energy - Various solar energy systems and their applications, radiations, solar spectral-latitude and longitude, Declination angle, solar window, cosine law, seasonal variations, daily variation, hour angle, calculation of angle of incidence, angstroms equation and constants, solar radiation data, daily global radiation calculations.

WIND ENERGY

Wind energy - energy chains, application - historical background, merits and limitations, nature of wind, planetary and local day / night winds, wind energy quantum, variables and units used in calculations, wind power density P_w , Power calculations, power in wind, power by turbine, efficiency, kinetic energy, incoming velocity V_i , exit velocity V_e , Power, torque thrust calculations, velocity at different heights, site selection, Favourable wind speed range, wind energy wind velocity duration, energy pattern factor.

BIOMASS ENERGY

Biomass energy resources : Photosynthesis and origin of biomass energy, biomass energy resources, cultivated biomass resources, waste to biomass resources, Terms and definitions, Incineration, wood and wood waste, Harvesting super trees and energy forests, phyrolysis, Thermo chemical biomass conversion to energy, gasification, Anaerobic digestion, Fermentation, Gaseous fuel from biomass.

OCEAN & TIDAL ENERGY

Ocean and Tidal energy conversion, Energy sources in ocean - Ocean tidal, wave and thermal energy, Ocean saline gradient concept, ocean currents, ocean chemical energy, ocean energy conversion routes, electrical and

non electrical routes, Bipolar, mono polar, HVDC cable transmission , Merits and demerits of ocean energy technologies, limitation, preconditions for commercial installation. Tides - spring tide, neap tide, daily and monthly variation, Tidal range, Tidal Power, Types of tidal power plants, single basin & double basin schemes, main requirements in tidal power plants, energy storage, prospects of tidal power, economic factors.

TEXT BOOKS

1. Rao. S. & Pamlekar Dr.B.B. *Energy Technology* Khanna Publishers, Second Edition 1997.
2. Pai & Ramaprasad , *Power Generation through Renewal sources*, Tata McGraw Hill - 1991.

REFERENCE BOOKS

1. Rai ,G.D.,*Non Conventional sources of Energy*, Khanna Publishers ,4th Edition 1996.
2. Bansal NK, Kleeman and Meliss, M *Renewable energy sources and conversion Techniques*, Tata Mc Graw Hill, 1990 .

		L	T	P	C
EE 0464	EMBEDDED SYSTEMS	3	0	0	3
	Prerequisite				
	Nil				

PURPOSE

This course enables us to understand the concepts of embedded systems and its application.

INSTRUCTIONAL OBJECTIVES

1. History and introduction to embedded system
2. Overview of processor
3. Software architecture and development tools
4. Real time operating systems

INTRODUCTION

Review of embedded hardware – Embedded systems overview – design challenge-processor-IC and design technology – trade-offs, custom single purpose processors: combinational logic-sequential logic custom single purpose processors and RT level custom single purpose processor design – optimizing custom single purpose processor.

PROCESSOR OVERVIEW

General purpose processor: software, standard single purpose processor: peripheral interrupts: microprocessor architecture – interrupt – basic – shared data problem-interrupt latency.

DEVELOPMENT ENVIRONMENT

The execution environment-memory organization-system space-code space-data space-unpopulated memory space-I/O space-system start up-interrupts response cycle-function calls and stack frames-run time environment-object placement.

SOFTWARE ARCHITECTURE AND DEVELOPMENT TOOLS

Software architecture: round – robin-round-robin with interrupts-function queue – scheduling architecture-real time operating system architecture. Development tools: lost and target machines-linker/locators for embedded software debugging techniques.

REAL TIME OPERATING SYSTEMS

Introduction: task and task status-tasks and data-semaphore and shared data. More operating system services message queues-mail boxes and pipes-timer functions-events-memory management-interrupt routines in an RTOS environment.

TEXT BOOKS

1. Arnold S. Berger, *Embedded systems design* an introduction to processor, tools and techniques.
2. David e Simon-an *embedded software primer*-Person education Asia (2001).

REFERENCE BOOKS

1. Frank vahid and Tony givargis *embedded system design* a unified hardware/software approach – Pearson education Asia (1999)

2. Heath Steve-*embedded systems design* – Elsevier publications, second edition.

		L	T	P	C
EC 0466	OPTICAL COMMUNICATION	3	0	0	3
	Prerequisite				
	Nil				

PURPOSE

This course is intended to bring to the students the information necessary to understand the design, operation and capabilities of fiber systems. Students will be introduced to the fundamental concepts of various optical components. Latest topics are included to keep in touch with the recent trends.

INSTRUCTIONAL OBJECTIVES

1. To introduce the terminology used in optical fibers
2. To describe the building blocks of an Optical Fiber system
3. To give clear understanding of various components such as Optical fibers, Photo detectors, connectors, coupling devices and optical amplifiers.
4. To facilitate the first- order design of optical links

OPTICAL PROCESSES IN SEMICONDUCTORS AND BASIC SYSTEM CONCEPTS

Electron-hole pair formation and recombination – Intrinsic and Extrinsic semiconductor materials- PN junction – Direct and Indirect bandgap materials - Light source material Review of electrical communication system - Need for optical communication – Electrical Vs Optical Communication - Advantages and applications – Selection of operating wavelength and System components – Elements of an optical fiber transmission links

OPTICAL FIBERS

Principles of light propagation through a fiber-Waveguide equations - Different types of fibers – SI and GI fiber- Fiber modes and configurations – Structures- Fiber Dispersion and Attenuation – Signal distortion Bit rate and Bandwidth – Choice of wavelength for fiber optic transmission – Fiber Fabrication - Cable configurations.

OPTICAL SOURCES AND DETECTORS

Optical sources – Principles of operation – LED and Laser diode sources – Hetero Junction structures – Spectral response Detectors - Requirements – Basic principles of photo detection – Photodiode – PIN diode – Avalanche photo multiplier – Response - Comparison

POWER LAUNCHING, COUPLING AND LINK ANALYSIS

Source to fiber power launching – Lensing schemes – Fiber to fiber joints- Fiber splicing – Intrinsic and Extrinsic splice loss – Optical fiber connectors - System consideration – Link Power Budget – Rise time budget

FIBER OPTIC SYSTEM CONFIGURATIONS

Fiber optic communication systems – Transmitter modules – Receiver modules – WDM system – Classification – Couplers and Repeaters for Fiber optic System – Basic concepts – Semiconductor laser amplifiers – Soliton Transmission.

TEXT BOOKS

1. Keiser G, *Optical fiber communication* Tata McGraw Hill, 2000.
2. John Gower, *Optical Communication systems* PHI, 2 nd edition, 1993.

REFERENCE BOOKS

1. John M. Senior, *Fiber Optical Communication Principle & Practice*, PHI, 1992.
2. Agarwal, D.C., *Fiber Optic Communication Systems*, John Wiley and Sons, 1993.
3. Franz, F.J.H., and Jain, V.K., *Optical Communication Components & Systems*, Narosa Publishing house., 2000.
4. Djafar K. Mynbaev and Lowell L. Scheiner, *Fiber Optic Communication systems* Pearson Education Asia, 2001.