CHAITANYA BHARATHI INSTITUTE OF TECHNOLOGY
ELECTRICAL & ELECTRONICS ENGINEERING
B. E. I – Year

I – Semester

THEORY						
S.No	**Code**	**Subject**	**L**	**T**	**P**	**Credits**
1	EG 111	English – I	2	0	0	2
2	MT 111	Mathematics – I	3	1	0	3
3	PY 111	Engineering Physics – I	3	0	0	3
4	CY 111	Engineering Chemistry – I	3	0	0	3
5	CS 111	Programming and Problem Solving	3	1	0	3
6	CE 111	Engineering Mechanics – I	3	1	0	3
7	CE 112	Environmental Studies	3	1	0	3
PRACTICALS						
8	EG112	English Language Laboratory – I	0	0	2	1
9	PY 114/ CY 114	Engineering Physics Lab – I/ Engineering Chemistry Lab – I	0	0	3	2
10	CS 114	Programming Lab – I	0	0	3	2
11	ME 114	Workshop	0	0	3	2
TOTAL			**20**	**04**	**11**	**27**

EG 111

ENGLISH –I
(common to all branches)

Instruction	2 Periods per week
Duration of University Examination	3 Hours
University Examination	75 Marks
Sessionals	25 Marks
Credits	2

Course Objectives:
To enable the students to

- To understand the role and importance of communication and to develop their basic communication skills in English.
- To enable the students to communicate through listening, speaking, reading and writing.
- To achieve a sound foundation and acquaint the students in the basics of grammar.
- To develop vocabulary and to use appropriate idiomatic expressions, one word substitutes etc,.
- To ensure students use learning materials prescribed, and to inculcate the habit of reading for pleasure.
- To enhance imaginative creative and critical thinking through literary texts.
- To enable students to write composition and draft different kinds of letters.

Unit-I
Effective Communication: Role and importance of communication, process of communication, types of communication , barriers to communication, Verbal communication and non verbal communication , formal versus informal communication.

Unit-II
Review of Grammar: 1. Tense and aspect 2. Articles 3. Prepositions 4. Voice 5. Concord 6. Direct and indirect speech
Vocabulary Enhancement: 1. Synonyms 2. Antonyms

Unit-III
Reading comprehension and reading strategies.
Lessons Prescribed: 1. Barack Obama: A Trendsetter 2. Rendezvous with Indra Nooyi
Text based exercises
Vocabulary Enhancement: 1. Homonyms 2. Homophones 3. Homographs 4. Words often confused

Unit-IV
Writing Skills: Paragraph writing, Essay writing , Letter of application, Resume writing, Complaint letter with response.
Vocabulary Enhancement: Idiomatic expressions and one word substitutes.

Unit-V
Soft skills - Introduction to soft skills, soft versus hard skills, professional etiquette in formal and semi formal situations, telephonic etiquette, E-mail etiquette.

Text Books:

1. "Essential English"- E Suresh Kumar et al**.** (Orient Balck Swan PVT Ltd.)
2. "Communication Skills and Soft Skills: An Integrated Approach"- E Suresh Kumar et al**. (**Pearson Publications)

Suggested Reading:

1. "English Vocabulary in Use" - Michael McCarthy (Cambridge University Press)
2. "Developing Communication Skills" – Krishna Mohan & Meera Banerjee (Macmillan)
3. "Murphy's English grammar" (Cambridge University Press)
4. "English Phrasal Verbs in use" - Michael McCarthy (Cambridge University Press)
5. "Written Communication in English" –Sarah Freeman (Orient Longman)
6. "Model Business letters, E-Mails and Other Business Documents" - Shirley, Taylor (Pearson) "Effective Technical Communication" – M. Ashraf Rizvi (Tata- McGraw Hill)
7. "Business Correspondence and Report Writing – R.C Sharma and Krishna Mohan (Tata Mc Graw Hill)
8. Soft Skills, Alex , Publishers S. Chand

MT 111

MATHEMATICS-I
(common to all branches except Biotech)

Instruction	3L + 1T Periods per week
Duration of University Examination	3 Hours
University Examination	75 Marks
Sessionals	25 Marks
Credits	3

UNIT-I: Matrices: Rank of a matrix, Echelon form-Normal form-Consistency of a linear system of equations. Eigen values, Eigen vectors- properties (with out proofs). Cayley- Hamilton Theorem (statement only) inverse and powers of a Matrix by Cayley-Hamilton Theorem. Reduction of Quadratic form to Canonical form by linear transformation, rank, positive, negative, definite, semi-definite, index and signature.

UNIT-II: Sequences and Series: Convergence and divergence, ratio test, Comparison test, integral test, Cauchy's root test, Raabes's test-Alternating series, Absolute and conditional convergence, Leibniz's Test (tests without proofs).

UNIT-III: Differential Calculus:
Mean value theorems (statements only) - Rolle's Theorem, Lagrange's theorem, Cauchy's theorem, and generalized mean value theorem (Taylor's Theorem), Geometrical interpretations. Curvature and Radius of curvature, center of curvature, circle of curvature. Evolutes,involutes and Envelopes. Functional dependence, Jacobian, Taylors series in two variables, Maxima and Minima for function of two variables with and without constraints.

UNIT-IV: Integral Calculus: Curve tracing – Cartesian, polar and parametric curves (standard curves only). Double and triple integrals change of order integration, applications of integration, rectification, areas, volumes and surfaces of solids of revolution in Cartesian and polar coordinates.

UNIT-V: Beta and Gamma Functions: Definitions of Beta and Gamma functions-elementary Properties of both Beta and Gamma functions, Relation between Beta and gamma functions, differentiation under the integral sign. Error function, complementary error function, properties Differentiation of error functions.

Text Books:
1. Advanced Engineering by Kreyszig, john wiley & sons -publishers.
2. Mathematical Methods of science and engineering, Aided with MATLAB,Kanti.B.Datta.Cengage Learning India Pvt.Ltd,418 Pratapgang,New Delhi.
3. Mathematics for Engineers and Scientists by Alen Jaffery , 6th edition 2013 CRC press, Taylor & Francis Group.(Elsavier)
4. Advanced Engineering Mathematics by Michael Greenburg, Second Edition –Pearson Education.

Suggested Reading:
1. Mathematics for Engineers-a modern interactive approach by A.Craft and Robert Davison-Willey
2. Applied Mathematics and physicists by Loius Pipes-Mc Graw Hill pubulishers.
3. Advanced Engineering Mathematics by R.K.Jain & S.R.K.Iyenger, 3rd edition, Narosa Publications
4. Matrices for Engineering Dynamics by AR Collar and A. Simpson-John Willey & sons
5. Essential Mathematics for Engineers by W.Bolton-Betterworth and Heineman
6. Mathematical for Physicists and Engineers- L F Landoviz, Publishers- Rienfold Book Corporation.
7. Higher Engineering Mathematics by B.S.Grewal, Khanna Publishers.
8. Engineering Mathematics by B.V.Ramana
9. Calculus by Smith and Minton
10. Applications of Linear Algebra by David.C Lay

PY 111

ENGINEERING PHYSICS – I
(common to all branches except Chemical & Biotech)

Instruction	3 Periods per week
Duration of University Examination	3 Hours
University Examination	75 Marks
Sessionals	25 Marks
Credits	3

Unit – I

Waves and Oscillations: Simple harmonic motion – Differential equation and its solution – Torsional pendulum – Superposition of two mutually perpendicular linear SHMs of same frequency – Lissajous figures – Damped vibrations – Differential equation and its solution – Logarithmic decrement - Relaxation time – Quality factor – Forced vibrations – Differential equation and its solution – Amplitude resonance.

Ultrasonics: Introduction – Production of ultrasonics by piezoelectric and magnetostriction methods – Detection of utrasonics – Determination of ultrasonic velocity in liquids – Engineering applications.

Unit – II

Interference: Introduction – Division of amplitude & division of wavefront – Interference in thin films (reflected light) – Newton's rings – Fresnel's biprism.

Diffraction: Introduction – Distinction between Fresnel and Fraunhoffer diffraction – Diffraction at single slit & double slit – Diffraction grating (N Slits).

Unit – III

Polarization: Introduction – Brewster's law – Malus's law – Double refraction – Nicol's prism – Quarter & Half wave plates – Optical activity – Laurent's half shade polarimeter.

Lasers & Holography: Introduction – Characteristics of lasers – Spontaneous & stimulated emission of radiation – Einstein's coefficients – Population inversion – Ruby laser – He-Ne laser – Semiconductor laser – Applications.

Basic principle of Holography – Recording & Reconstruction of hologram – Applications.

Unit - IV

Electromagnetic Theory: Review of steady and varying fields – Conduction and displacement current – Maxwell's equations in differential and integral forms – Electromagnetic wave propagation in free space, dielectric and conducting media – Poynting theorem.

Fibre Optics: Introduction – Types of optical fibres – Propagation of light through an optical fibre – Acceptance angle – Numerical aperture – Pulse dispersion – Fibre materials – Fibre drawing process by double crucible method – Applications.

Unit – V

Elements of Statistical Mechanics: Introduction – Ensembles – Phase space – Thermodynamical probability – Boltzmann theorem on entropy – Maxwell-Boltzmann, Bose-Einstein & Fermi-Dirac statistics – Photon gas – Planck's' law of black body radiation – Wien's law and Rayleigh-Jean's law from Planck's law.

Text Books:

1. M.N. Avadhanulu and P.G. Kshirsagar, *A Text Book Engineering Physics*, S. Chand Publications, 2014
2. S.L. Gupta and Sanjeev Gupta, *Modern Engineering Physics*, Dhanpat Rai Publications, 2011
3. V. Rajendran, *Engineering Physics*, McGahill Education Publications, 2013

Suggested Reading:

1. R. Murugeshan and Kiruthiga Sivaprasath, *Modern Physics*, S. Chand Publications S. Chand Publications, 2005
2. M. Arumugam, *Materials Science*, Anuradha Publications, 2002.
3. Satyaprakash and Agarwal, *Statistical mechanics*, Kedannath Publications
4. P.K. Palanisamy, *Engineering Physics*, Scitech Publications, 2012
5. Hitendra K Malik and A.K. Singh, *Engineering Physics*, Tata McGahill Education Publications, 2011

CY 111

ENGINEERING CHEMISTRY - I
(common to all branches except Chemical & Biotech)

Instruction	3 Periods per week
Duration of University Examination	3 Hours
University Examination	75 Marks
Sessionals	25 Marks
Credits	3

Course Objectives:

The syllabus has sought to fulfill the objective of making the student of engineering and technology realize that chemistry like other subjects is the real base of his profession and that therefore he must have a good understanding of chemistry before he can use it in his profession. The various units of the syllabus is so designed to fulfill the following objectives.

1. Thermodynamics and Electrochemistry units give conceptual knowledge about spontaneous processes and how can they be harnessed for producing electrical energy and efficiency of systems. It also discusses the devices used for electrical energy storage and captive generation and tapping it as and when required.
2. "Those who control materials control technology". Newer materials lead to discovering of technologies in strategic areas like defense and space research. Recently modern materials synthesized find applications in industry and creating instruments for solving problems of electronics, telecommunications, health care, agriculture, and technology etc., Inorder to emphasize the above the topics like composite materials, polymers, conducting polymers and nano materials have been incorporated in the curriculum.
3. Knowledge to prevent corrosion of machinery and metallic materials and water chemistry which require serious attention in view of increasing pollution has been included in the syllabus.
4. Fuels have been taught with a view to give awareness as to materials which can be used as sources of energy and fuel cells which are the alternate energy sources for generating electrical energy on spot and portable applications.
5. To appraise the students about the importance and role of chemistry in the field of Engineering by explaining the relevant topics.
6. To enable students to apply the knowledge acquired in improving the properties of engineering materials.
   The engineer who has the above background can effectively manage the materials in his designing applications and discovering and improving the systems for various uses in industry, agriculture, health care, technology, telecommunications, electronics and instruments detecting in advance in natural calamities. The above knowledge also helps students to carry out inter disciplinary research such that the findings benefit the common man.

UNIT – I

Chemical Thermodynamics – I:

The concept of reversible and irreversible process, Work done in isothermal and adiabatic reversible and irreversible process, Success and limitations of First law of thermodynamics, need for second law of thermodynamics, statements of second law of thermodynamics, Carnot cycle, heat engine and its efficiency, Carnot theorem, numericals.

UNIT – II

Chemical Thermodynamics - II & Phase Rule:

Concept of Entropy – Entropy changes in reversible and irreversible processes, physical significance of entropy, Helmholtz free energy and Gibb's free energy functions, chemical potential, criteria of spontaneity in terms of entropy and Gibb's free energy function, Gibb's – Helmholtz equation and its applications, numericals.

Phase rule – Terminology, phase diagram – one component system (water system).

UNIT – III

Fuels – I:

Classification, requirements of a good fuel, calorific value, types of calorific value, relation between HCV & LCV and numericals. Determination of calorific value by Bomb calorimeter, Dulong's formula, numericals.

Combustion, ignition temperature of fuel, calculation of air quantities by weight and volume required for combustion of fuel, numericals.

Solid fuels: coal and its chemical composition, analysis of coal – proximate and ultimate analysis, importance.

UNIT – IV

High Polymers:

Definition of polymer, degree of polymerization. Thermo plastics and thermo sets. Molecular weight – number average and weight average. Determination of molecular weight of a polymer by viscosity method.

Preparation, properties and uses of plastics (Polyvinyl chloride, Bakelite), fibers (Kevlar, polyurethane), Rubbers – natural rubber and its chemical structure, vulcanization and its significance.

Preparation, properties and uses of silicone rubber, conducting polymers – definition, classification and applications.

UNIT –V

Engineering Materials:

Nano materials – Introduction to nano materials and general applications, basic chemical methods of preparation – Sol-gel and hydrothermal methods. Carbon nanotubes and their applications.

Powder X-ray diffraction- particle size estimation (Scherrers equation)

Composite materials – definition, types of composites, fibre reinforced, glass fibre reinforced and carbon fibre reinforced composites and applications.

Text Books:

1. J.C. Kuriacase & J. Rajaram, "Chemistry in engineering and Technology", Tata McGraw-Hill Pub.Co.Ltd, New Delhi (2008).
2. S.S.Dara & S.S.Umare, "Engineering Chemistry", S.Chand company.
3. ShasiChawla, "Text Book of Engineering Chemistry", Dhantpat Rai Publishing Company, NewDelhi (2008).
4. P.C.Jain and Monica Jain, "Engineering Chemistry", Dhanpat Rai Pub, Co., New Delhi (2002).
5. Puri & Sharma, "Principles of Physical Chemistry
6. P.R.Vijayasarathi, "Engineering Chemistry" PHI Learning Private Limited, New Delhi (2011).

Suggested Reading:

1. Physical chemistry by P.W.Atkin (ELBS OXFORD PRESS)
2. Physical chemistry by W.J.Moore (Orient Longman)
3. Physical Chemistry by Glasstone
4. Physical Chemistry by T.Engel & Philip Reid, Pearson Publication.
5. Introduction to nano materials by T.Pradeep.

CS 111

PROGRAMMING AND PROBLEM SOLVING
(common to CSE, IT, ECE, EEE & Biotech)

Instruction	3L + 1T Periods per week
Duration of University Examination	3 Hours
University Examination	75 Marks
Sessionals	25 Marks
Credits	3

Unit-I

Introduction to computers: Hardware Components, Functional block diagram, Operating Systems, Program Development Environments.

Programming languages: System Programming, Application Programming, Low-level, High-level, Classification of Programming languages.

Translators: Compiler, Interpreter, Loader and Linker.

Number Systems: Representation of Binary, Octal and Hexadecimal Numbers, Conversions, Negative Binary Numbers, Fractional Numbers.

Unit-II

Problem solving: Algorithm: Key Features of an Algorithm, Strategy for designing an Algorithm. Tracing an Algorithm to depict logic. Specification for converting algorithms to programs, Flow chart and Pseudo codes.

Introduction to C Programming: Standardizations, Developing Programs In C, Parts and structure of C Program, character set ,Variable, Data types ,Statement, Declaration, Token, Operators and Expressions.

Unit-III

Control Structures: Test Condition for Selection and Iteration, Conditional Execution and Selection, Iteration and Repetitive Execution, Break, Continue and go to statement, Nested Loops.

Functions: Concept of Functions, Types of functions, Parameter passing techniques, Scope and Extent, Storage Classes, Recursion.

Case Studies on Control structures and Functions (Tutorial Purpose only).

Unit-IV:

Arrays: Declaration, Initialization, Accessing Array Elements, Internal Representation and Variable Length Arrays of One-dimensional Array and Multidimensional Arrays, Passing Arrays to Functions, Searching and Sorting.

Pointers: Address Operator (&),Declaring and Initializing Pointers, Indirection Operator and Dereferencing, Pointer Arithmetic, Pointers to Pointers, Array of Pointers, Pointers to Functions, Dynamic Memory Allocation, Command Line Arguments.

Case Studies on Arrays and Pointers (Tutorial Purpose only).

Unit-V:

User-defined Data Types and Variables: Structures , Declaring Structures and Structure Variables, Accessing the members of a Structure , Initialization, Nesting of Structures, Arrays of Structures, Structures and Pointers, Structures and Functions, Union, Enumeration Types.

File Processing: Working with Text and Binary Files, Sequential and Random Access File, Files of Records.

A Case Study on Files (Tutorial Purpose only).

Text Books:

1. Pradip Dey and Manas Ghosh "Programming in C 2/e" Oxford University Press , 2nd Edition 2011.
2. B. W. Kernighan & D.M. Ritchie, "The 'C' Programming Language" Prentice Hall India, 2nd Edition. 1990.
3. R S Bichkar "Programming with C "University Press, 2012.

Suggested Reading:

1. Rajaraman V. "The Fundamentals of Computers" 4th Edition, Prentice Hall of India, 2006.
2. Behrouz A .Forouzan, Richard F.Gilberg "Computer Science : A Structured Programming Approach using C" Cengage Publishers, 2006.

CE 111

ENGINEERING MECHANICS - 1
(common to all branches)

Instruction	3L + 1T Periods per week
Duration of University Examination	3 Hours
University Examination	75 Marks
Sessionals	25 Marks
Credits	3

Objectives:

- To provide fundamental understanding of any anatomy for which Engineering Mechanics forms the basis.
- To understand the concept of force transfer, necessary conditions of equilibrium, significance of friction and geometric properties in statics.
- To equip the students to apply the principles learnt for the analysis of structures and equipments.

Unit - I

Force Systems: Resolution of coplanar and non-coplanar force systems (both concurrent and non-concurrent), Determining the resultant of all force systems using scalar and vector concepts. Moment of force and its applications.

Unit – II

Equilibrium of force system: Free body diagrams, equations of equilibrium of planar force systems. Equilibrium of spatial force systems.

Unit – III

Theory of friction: Introduction, types of friction, laws of friction, application of friction to a single body & connecting systems. Wedge and belt friction.

Unit – IV

Centroids: Significance of centroids, moment of area, centroids of line elements, plane areas, composite areas, theorems of Pappus & its applications.

Unit – V

Area Moment of Inertia: Definition, polar moment of Inertia, radius of gyration, transfer theorem, moment of Inertia of plane & composite areas, product of inertia, transfer formula for product of inertia.

Text Books:

1. K. Vijay Kumar Reddy and J. Suresh Kumar, *Singer's Engineering Mechanics*, BS Publications, Hyderabad, 2011.
2. Ferdinand L Singer, *Engineering Mechanics*, Harper and Collins, Singapore, 1904.

Suggested Reading:

1. A. Nelson, *Engineering Mechanics*, Tata McGraw Hill, New Delhi, 2010.
2. S. Rajashekaran & G. Sankarasubramanyam, *Engineering Mechanics*, Vikas publications, Hyderabad, 2002.
3. S.B. Junarkar and H.J Shah, *Applied Mechanics***,** Charotar publishers, New Delhi, 2001.
4. Basudeb Bhattacharyya, *Engineering Mechanics*, Oxford University Press, New Delhi, 2008.
5. K.L Kumar & Veenu Kumar, *Engineering Mechanics*, Tata McGraw Hill, New Delhi, 2011.

CE 112

ENVIRONMENTAL STUDIES
(common to all branches)

Instruction	3L + 1T Periods per week
Duration of University Examination	3 Hours
University Examination	75 Marks
Sessionals	25 Marks
Credits	3

Course Objectives:

1. To equip the students with inputs on the environment, natural resources, ecosystems and Bio-diversity.
2. To enable the students become aware of environmental pollutions, causes, effects and control measures.
3. To make the students contribute for capacity building of nation for arresting and/or managing environmental disasters.

UNIT – I

Environmental Studies Definition, Scope and importance, need for public awareness. Natural resources: Water resources, use and over utilization of surface and ground water, floods, drought, conflicts over water, dams-benefits and problems. Effects of modern agriculture, fertilizer pesticide problems, water logging salinity. Energy resources; growing energy needs, renewable and non-renewable energy sources. Land resources; land as a resource, land degradation, soil erosion and desertification.

UNIT – II

Ecosystems: Concept of an ecosystem, structure and function of an ecosystem, producers, consumers and decomposers, energy flow in ecosystem, food chains, ecological pyramids, aquatic ecosystem (ponds, streams, lakes, rivers, oceans, estuaries).

UNIT – III

Biodiversity: Genetic species and ecosystem diversity, biogeographical classification of India. Value of biodiversity, threats to biodiversity, endangered and endemic species of India, conservation of biodiversity.

UNIT – IV

Environmental Pollution: Cause, effects and control measures of air pollution, water pollution,
soil pollutions, noise pollution, thermal pollution and solid waste management. Environment protection act: Air, water, forest & wild life acts, issues involved in enforcement of environmental legislation.

UNIT – V

Social issues and the environment: Water conservation, watershed management, and environmental ethics. Climate change; global warming, acid rain, ozone layer depletion, Environmental protection act, population explosion.
Disaster Management: Types of disasters, impact of disasters on environment, infrastructure and development, Basic principles of disaster mitigation, disaster management, and methodology disaster management cycle and disaster management in India

Text Books:

1. Y. Anjaneyulu, Introduction to Environmental Science, B.S. Publications, 2004
2. S.S.Dara, A Text book of Environmental Chemistry & Pollution Control, S.Chand & Comp. Ltd, 2000.

Suggested Readings:

1. De A.K. *Environmental Chemistry*, Wiley Eastern Ltd., 1989.
2. Odum E.P. *Fundamentals of Ecology*, W.B. Saunders Co., USA, 1975.
3. Rao M.N. and Datta A.K., *Wastewater treatment*, Oxford & IBH publishing Co., 1987.
4. Miller T.G. Jr. Environmental Science, Wordsworth Publishing Co., 1984.
5. Benny Joseph, Environmental Studies, Tata Mc. Graw Hill education Pvt. Ltd., 2000
6. Raman Siva Kumar, Introduction to environmental Science and Engineering, Tata Mc. Graw Hill education Pvt. Ltd., 2010.

EG 112

ENGLISH LANGUAGE LABORATORY – I
(common to all branches)

Instruction	2 Periods per week
Duration of University Examination	3 Hours
University Examination	50 Marks
Sessionals	25 Marks
Credits	1

Comuter Assisted Language Learning Lab (CALL)

Introduction:
The language lab focuses on the production and practice of sounds of language and familiarizes the students with the use of English in everyday situations and contexts.
The following are the **objectives** of the course:

1. To make students recognize the sounds of English through audio – visual aids and computer software.
2. To help them overcome their inhibitions and self consciousness while speaking in English and to build their confidence. The focus shall be on fluency rather than accuracy.
3. To enable them to speak English correctly with focus on stress and intonation.
4. To expose the students to a variety of self instructional, learner friendly modes of communication.

Syllabus:
1. Introduction to English Phonetics: Introduction to auditory, acoustic and articulatory phonetics, organs of speech: the respiratory, articulatory and phonatory systems.
2. Sound system of English: Phonetic sounds and phonemic sounds, introduction to international phonetic alphabet, classification and description of English phonemic sounds, minimal pairs. The syllable : types of syllables, consonant clusters.
3. Aspects of connected speech: Strong forms, weak forms, contracted forms, elision.

Interactive Communication Skills Lab (ICS LAB)

Introduction:

The objective of the course is to enrich interpretation skills, problem solving skills, interpersonal skills, analytical skills and leadership skills of the students, the most essential requirement of communication skills for Engineering students. The course lays emphasis on the language integrated skills in simple and comprehensive manner.
The following are the **objectives** of the course:

1. To expose the students to a team environment and how best one works with teams while adapting themselves to a corporate environment and to make business presentations.
2. Use proper body language expressions in presentation and speeches.
3. Depict situations in the dialogue that are relevant and useful to the learner, retain the truth value in the dialogue.
4. Public speaking is to be shown in action by incorporating narrative examples and extracts from speeches relating directly to students actual life experiences.

Syllabus:

1. Situational dialogues & role plays.
2. Group discussions: Objectives of a GD, types of GD's, initiating, continuing and concluding of GD.
3. Public speaking: Advantages of public speaking, essentials of an effective speech, rehearsal techniques, planning and delivering speeches.

Suggested Reading:

1. E Suresh Kumar et al**. English for Success**(with CD), Cambridge University Press India Pvt Ltd. 2010.
2. T Balasubramanian**. A Textbook of English Phonetics for Indian Students**, Macmillan, 2008.
3. Kavita Tyagi and Padma Misra. **Professional Communication**, PHI Learning Pvt Ltd, 2011
4. J Sethi et al. **A Practical Course in English Pronunciation** (with CD), Prentice Hall India, 2005.
5. Meenakshi Raman and Sangeeta Sharma**. Technical Communication**, Oxford Universuty Press 2009.

PY 114

ENGINEERING PHYSICS LAB - I
(common to all branches except Chemical)

Instruction	3 Periods per week
Duration of University Examination	3 Hours
University Examination	50 Marks
Sessionals	25 Marks
Credits	2

1. Error Analysis – Estimation of errors in the determination of time period of a torsional pendulum
2. Newton's Rings – Determination of wavelength of given monochromatic source
3. Single Slit Diffraction – Determination of wavelength of given monochromatic source
4. Diffraction Grating – Determination of wavelengths of two yellow lines of mercury light
5. Malus's Law – Verification of Malus's law
6. Double Refraction – Determination of refractive indices of O-ray and E-ray of given calcite crystal
7. Polarimeter – Determination of specific rotation of glucose
8. Laser – Determination of wavelength of given semiconductor red laser
9. Fibre Optics – Determination of NA and power losses of given optical fibre
10. Recording & Reconstruction of Hologram

CY 114

ENGINEERING CHEMISTRY LAB - I
(common to all branches except Chemical & Biotech)

Instruction	3 Periods per week
Duration of University Examination	3 Hours
University Examination	50 Marks
Sessionals	25 Marks
Credits	2

Course Objectives:

1. To impart fundamental knowledge in handling the equipment/glassware and chemicals in the chemistry laboratory.
2. To offer hands on experience on the basic equipment related to engineering chemistry.
3. For practical understanding of theoretical concepts of chemistry

I. Volumetric Analysis:

1. Introduction to volumetric analysis and Techniques of weighing and usage of analytical balance.
2. Estimation of amount of ferrous ion using $K_2Cr_2O_7$ solution.
3. Estimation of Carbonate and Bicarbonate in the given solution using HCL (Link) Solution

II. Kinetics:

4. Hydrolysis of methyl acetate in acidic medium.

III. Organic Polymers:

5. Preparation of urea – formaldehyde / phenol- formaldehyde resin.

IV. Instrumental Chemical Analysis:

i**) Conductometric Titrations:**

6. Strong acid vs strong base.
7. Mixture of strong acid and weak acid vs strong base.

ii) Colorimetry:

8. Determination of concentration of given $K_2Cr_2O_7$ solution.
9. Determination of concentration of given $KMnO_4$ solution.
10. Determination of viscosity of sample oil by Redwood viscometer.

Text Books:

1. Vogel's text book of quantitative chemical analysis by J.Mendham and Thomas, Person education Pvt.Ltd.New Delhi 6th ed.2002.
2. Senior practical physical chemistry by BD Khosla, A.Ghulati, VC.Garg; R.Chand and CD; NewDelhi 10th edition
3. Laboratory manual in engineering chemistry by S.K.Bhasin and Sudha Rani; Dhanpath Rai Publishing company

CS 114

PROGRAMMING LAB- I
(common to all except Chemical)

Instruction	3 Periods per week
Duration of University Examination	3 Hours
University Examination	50 Marks
Sessionals	25 Marks
Credits	2

1. Identify the hardware components, assembling of computers.

2. Basic of OS commands, Installation of OS (Linux, DOS and XP).

3. Familiarization of Editors.

4. Sin x and Cos x values using Series expansion.

5. Demonstration of switch case (menu driven).

6. Demonstration of Parameter passing in Functions.

7. Demonstration of Functions using Recursion.

7. Program to count No of lines, characters, blanks, tab and special characters.

8. Demonstration of arrays

   (i)Search-Linear.

   (ii)Sorting-Bubble, Selection.

   (iii)Operations on Matrix.

9. Generation of address labels using structures.

10. Implementation of string manipulation operations with and without library function.

11. Sequential file operations.

12. Random Access File Operations.

ME 114

WORKSHOP
(common to CSE, IT, ECE & EEE)

Instruction	3 Periods per week
Duration of University Examination	3 Hours
University Examination	50 Marks
Sessionals	25 Marks
Credits	2

Trades For Practice

1. **Carpentry**	**2. Plumbing**	3. **House Wiring**	**4. Tin Smithy & Soldering**

Exercises in Carpentry

1. To plane the given wooden piece to required size
2. To make a cross lap joint on the given wooden piece according to the given dimensions.
3. To make a Tee lap joint on the given wooden piece according to the given dimensions.
4. To make a dove tail-joint on the given wooden piece according to the given dimensions.
5. To make a bridle joint on the given wooden piece according to the given dimensions.

Exercises in Plumbing

1. To make external threads for GI pipes using dies.
2. To connect the GI pipes as per the given diagram using taps, couplings & bends.
3. To connect the GI pipes as per the given diagram using, couplings, unions, reducer & bends.
4. To connect the GI pipes as per the given diagram using shower, tap & valves
5. Demonstration of above exercise by giving water connection.

Exercises in House Wiring

1. Wiring of one light point controlled by one single pole switch, a three pin socket controlled by a single pole switch, and wiring of one buzzer controlled by a bell push.
2. Wiring of two light points connected in series and controlled by single pole switch. Verify the above circuit with different bulbs.
3. Wiring of two light points connected in parallel from two single pole switches and a three pin socket
4. Stair case wiring-wiring of one light point controlled from two different places independently using two 2-way switches.
5. Go-down wiring.

Exercises in Tin Smithy

1. To make a square tray from the given sheet metal.
2. To make a rectangular box from the given from the sheet metal with base and top open. Solder the corners.
3. To make a scoop.
4. To make a dust pan from the given sheet metal.
5. To make a pamphlet box.

Demonstration of BOSCH tools.

Note: A minimum of 12 exercises from the above need to be done

CHAITANYA BHARATHI INSTITUTE OF TECHNOLOGY

ELECTRICAL & ELECTRONICS ENGINEERINGB

B. E. I – Year

I – Semester

THEORY						
S.No	Code	Subject	L	T	P/D	Credits
1	EG 111	English - I	2	0	0	2
2	MT 111	Mathematics - I	3	1	0	3
3	PY 111	Engineering Physics - I	3	0	0	3
4	CY 111	Engineering Chemistry - I	3	0	0	3
5	CS 111	Programming and Problem Solving	3	1	0	3
6	CE 111	Engineering Mechanics - I	3	1	0	3
7	CE 112	Environmental Studies	3	1	0	3
PRACTICALS						
8	EG112	English Language Laboratory – I	0	0	2	1
9	PY 114/ CY 114	Engineering Physics Lab – I/ Engineering Chemistry Lab – I	0	0	3	2
10	CS 114	Programming Lab – I	0	0	3	2
11	ME 114	Workshop	0	0	3	2
TOTAL			20	04	11	27

II – Semester

THEORY						
S.No	**Code**	**Subject**	**L**	**T**	**P/D**	**Credits**
1	EG 121	English – II	2	0	0	2
2	MT 121	Mathematics - II	3	1	0	3
3	PY 122	Applied Physics	3	0	0	3
4	CY 121	Engineering Chemistry - II	3	0	0	3
5	CS 121	Object Oriented Programming through C++	3	1	0	3
6	EE 121	Basic Electrical Engineering	3	1	0	3
7	ME 112	Engineering Graphics	1	0	3	3
PRACTICALS						
8	EG 122	English Language Laboratory– II	0	0	2	1
9	PY 125/ CY 123	Engineering Physics Lab - II / Engineering Chemistry Lab– II	0	0	3	2
10	CS 122	Programming Lab - II	0	0	3	2
11	EE 122	Basic Electrical Engineering Lab	0	0	3	2
TOTAL			**18**	**03**	**14**	**27**

EG 121

ENGLISH – II
(common to all branches)

Instruction	2L Periods per week
Duration of University Examination	3 Hours
University Examination	75 Marks
Sessionals	25 Marks
Credits	2

Course Objectives:

- To understand the difference between oral and written communication, interpersonal and intrapersonal communication
- To acquaint the students with the process of technical writing through different types of reports and information transfer.
- To enhance the different sub- skills of reading through skimming and scanning.
- To enhance imaginative, creative and critical thinking through literary texts.
- To help students develop their Presentation skills through AV aids and different aspects of body language.

UNIT- I

Effective communication: Intrapersonal communication, Interpersonal communication, Dyadic Communication, One way versus two way communication and Johari Window.

UNIT- II

Grammer Practice: Common errors in English ad, Punctuation.

Vocabulary Enhancement:

Indian and American usage, Words often misspelt, Prefixes & Suffixes, technical vocabulary

Prose: Muthyala Raju Revu: An Engineer Turned IAS Officer.

UNIT- III

Writing Skills: Reports, Technical Report Writing, Information transfer: Flow charts, piecharts, graphs and scientific papers

UNIT- IV

Reading comprehension – Unknown passages, Skimming and Scanning, intensive reading and critical analysis

Prose: R. Madhavan : Engineering to Farming

UNIT- V

Soft Skills: Presentation skills – Rubrics, use of AV aids and making of a Power Point Presentation, Body Language. Leadership skills and Team Building

Text Books:

1. "Essential English"- E Suresh Kumar et al**.** (Orient Black Swan PVT Ltd.)
2. "Communication Skills and Soft Skills: An Integrated Approach"- E Suresh Kumar et al**. (**Pearson Publications)

Suggested Reading:

1. " High School English Grammar & Composition" – Wren and Martin (S.Chand)
2. "ABC of Common Grammatical Errors" – Nigel D Turton (Macmillan)
3. "Communication Skills & Soft Skills" – An Integrated approach – E Suresh Kumar (Pearson)
4. "Examine your English" – Margaret M Maison (Orient Longman)
5. "Professional Presentation" – Malcolm Goodale (Cambridge University Press)
6. "English Grammar at alance" – M. Gnanamurali (S. Chand)
7. "Business Communication & Soft skills" (Lab Manual) – D. Sudha Rani (Pearson)
8. "A Course Book in English" – K.R. Lakshminarayan (SciTech Publication)
9. "Effective Technical Communication" – M. Ashraf Rizvi (Tata- McGraw Hill)

MT 121

MATHEMATICS – II
(common to all branches except Bio-Tech)

Instruction	3L + 1T Periods per week
Duration of University Examination	3 Hours
University Examination	75 Marks
Sessionals	25 Marks
Credits	3

UNIT- I

Ordinary differential Equations: Exact Differential equations (integrating Factors) Applications differential equations-Orthogonal trajectories-Problems on oscillatory electrical circuits (LC and LCR circuits). Linear Differential equations of higher order with constant coefficients, complementary function and particular integrals when RHS is of the forms e^{ax}, sinax, cosax, x^m, $e^{ax}(v)$, $x^m(v)$, where v-is a function of 'x', Legender's and Cauchy's form of Homogeneous equations.

UNIT- II

Laplace Transforms: Definition of integral transform, domain of the function and kernel of the Laplace transforms. Existence of Laplace transforms. Properties- Laplace transforms of standard functions, Laplace transforms of piecewise continuous functions, first and second shifting theorems, multiplication by 't', division by 't'. Laplace transforms of derivatives and integrals of functions-Unit step function- Periodic functions (without proofs). Inverse Laplace transforms-by partial fractions (Heaviside method), Residue method-Convolution Theorem. Solving Ordinary differential equations by Laplace Transforms

UNIT- III

Series solution of Differential equations: Introduction-ordinary and singular points of an equation-power series solution- Solution of Legender equation (without proof)- Legendre polynomials-Rodrigue'sformula-Generating function of Legender polynomials-Recurrence relations- orthogonal property.

UNIT- IV

Vector Differentiation: Scalar and vector fields- directional derivative- Gradient of a scalar-Divergence and Curl of a vector point function. Properties of divergence, curl - vector identities. Solenoidal and Irrotational vectors.

UNIT-V

Vector Integration: Vector Line integrals, surface integrals and volume integrals
Greens Theorem, Gauss divergence Theorem and Stokes theorem (without proofs)
Applications of Integration-problems based on verification and evaluation using the above theorems (for cube, rectangular parallelepiped, sphere, cylinder)

Text Books:

1. Advanced Engineering by Kreyszig, John Wiley & Sons -Publishers.
2. Mathematical Methods of Science & Engg, Aided with MATLAB, Kanti.B.Datta. Cengage Learning India Pvt.Ltd.
3. Mathematics for Engineers and Scientists by Alen Jaffery , 6th ed 2013 CRC press,Taylor & Francis Group. (Elsevier)
4. Advanced Engineering Mathematics by Michael Greenburg, Second Edition –Pearson Education.

Suggested Reading: (for further reading and examples on applications)

1. Mathematics for Engineers-a modern interactive approach by A.Craft and Robert Davison-Willey
2. Applied Mathematics and physicists by Loius Pipes-Mc Graw Hill pubulishers.
3. Advanced Engineering Mathematics by R.K.Jain & S.R.K.Iyenger, 3rd edition, Narosa Publications
4. Matrices for Engineering Dynamics by AR Collar and A. Simpson-John Willey & sons
5. Essential Mathematics for Engineers by W.Bolton-Betterworth and Heineman
6. Mathematical for Physicists and Engineers- L F Landoviz, Publishers- Rienfold Book Corporation.
7. Higher Engineering Mathematics by B.S.Grewal, Khanna Publishers.
8. Engineering Mathematics by B.V.Ramana
9. Calculus by Smith and Minton
10. Applications of Linear Algebra by David.C Lay

PY 122

APPLIED PHYSICS
(common to CSE, IT, ECE & EEE)

Instruction	3L Periods per week
Duration of University Examination	3 Hours
University Examination	75 Marks
Sessionals	25 Marks
Credits	3

UNIT – I

Elements of Quantum Mechanics:

Introduction – Dual nature of light – de Broglie's hypothesis – Expression for de Broglie's wave length – Heisenberg's uncertainty principle and its illustration (diffraction of a beam of electron at a slit) – Schrödinger time independent and time dependent wave equations – Interpretation of wave function – Infinite square well potential (particle in a box) – Potential step – Potential barrier (qualitative) – Tunneling effect.

UNIT – II

Crystallography: Space lattice – Unit cell – Crystal systems – Bravais lattices – Number of atoms per unit cell – Coordination number – Atomic radius – Packing fraction (for SC, BCC, FCC) – Lattice planes – Miller indices – Bragg's law – Experimental determination of lattice constant of cubic crystals by powder diffraction method.

Crystal Defects: Classification of defects – Point defects – Concentration of Schottky & Frenkel defects.

UNIT – III

Band Theory of Solids: Salient features of classical free electron theory – Energy band formation in solids – Kronig-Penny model (qualitative) – Classification of solids into conductors, semiconductors and insulators.

Semiconductors: Intrinsic and extrinsic semiconductors – Concept of hole – Concept of Fermi level – Carrier concentration in intrinsic semiconductors – Conductivity in semiconductors – Hall Effect in semiconductors.

UNIT – IV

Magnetic Materials: Classification of magnetic materials: dia, para, ferro, anti-ferro and ferrimagnetic materials – Weiss molecular field theory – Domain theory – Hysteresis curve – Soft and hard magnetic materials.

Dielectric Materials: Introduction – Dielectric polarization – Types of dielectric polarization: electronic, ioninc, orientation and space-charge polarization (qualitative) – Frequency and temperature dependence of dielectric polarization – Determination of dielectric constant (Schering bridge method) – Ferroelectricity – Barium titanate – Applications of ferroelectrics.

UNIT – V

Superconductors: Introduction – General properties of superconductors – Meissner's effect – Type I and Type II superconductors – BCS theory (qualitative) – Applications.

Thin Films: Distinction between bulk, thin and nanofilms – Thin film preparation techniques – Physical vapor deposition (PVD) techniques – Thermal evaporation – Electron beam evaporation – Pulsed laser deposition – Applications of thin films – Solar cell – Gas sensor.

Nanomaterials: Zero dimensional materials – Properties of materials at reduced size – Surface to volume ratio – Quantum confinement – Preparation of nanomaterials – Bottom-up methods: Sol-gel, Sputtering and Chemical vapor deposition (CVD) – Top-down methods: Ball milling – Elementary ideas of carbon nanotubes – Applications.

Text Books:

1. M.N. Avadhanulu and P.G. Kshirsagar, *A Text BookEngineering Physics*, S. Chand Publications, 2014
2. S.L. Gupta and Sanjeev Gupta, *Modern Engineering Physics*, DhanpatRai Publications, 2011
3. V. Rajendran, *Engineering Physics*, McGahill Education Publications, 2013

Suggested Reading:

1. R. Murugeshan and KiruthigaSivaprasath, *Modern Physics*, S. Chand Publications, 2005
2. M. Arumugam, *Materials Science*, Anuradha Publications, 2002.
3. Satyaprakash and Agarwal, *Statistical mechanics*, Kedannath Publications
4. P.K. Palanisamy, *Engineering Physics*, Scitech Publications, 2012
5. Hitendra K Malik and A.K. Singh, *Engineering Physics*, Tata McGahill Education Publications, 2011

CY 121

ENGINEERING CHEMISTRY - II
(common to all branches except Chemical Engg & Bio-Tech)

Instruction	3L Periods per week
Duration of University Examination	3 Hours
University Examination	75 Marks
Sessionals	25 Marks
Credits	3

Course Objectives:

The syllabus has sought to fulfill the objective of making the student of engineering and technology realize that chemistry like other subjects is the real base of his profession and that therefore he must have a good understanding of chemistry before he can use it in his profession. The various units of the syllabus is so designed to fulfill the following objectives.

1. Thermodynamics and Electrochemistry units give conceptual knowledge about spontaneous processes and how can they be harnessed for producing electrical energy and efficiency of systems. It also includes the devices used for electrical energy storage and captive generation and tapping it as and when required.
2. Newer materials lead to discovering of technologies in strategic areas like defense and space research. Recently modern materials synthesized find applications in industry and creating instruments for solving problems of electronics, telecommunications, health care, agriculture, and technology etc., Inorder to emphasize the above the topics like composite materials, polymers, conducting polymers and nano materials have been incorporated in the curriculum.
3. Knowledge to prevent corrosion of machinery and metallic materials and water chemistry which require serious attention in view of increasing pollution has been included in the syllabus.
4. Fuels have been taught with a view to give awareness as to materials which can be used as sources of energy and fuel cells which are the alternate energy sources for generating electrical energy on spot and portable applications.
5. To appraise the students about the importance and role of chemistry in the field of Engineering by explaining the relevant topics.
6. To enable students to apply the knowledge acquired in improving the properties of engineering materials.

The engineer who has the above background can effectively manage the materials in his designing applications and discovering and improving the systems for various uses in industry, agriculture, health care, technology, telecommunications, electronics and instruments detecting in advance in natural calamities. The above knowledge also helps students to carry out inter disciplinary research such that the findings benefit the common man.

UNIT – I

Electrochemistry

Introduction, construction of electrochemical cell, sign convention, cell notation, cell emf, SOP and SRP, electrochemical series and its applications

Activity, fugacity, Nernst equation and applications, numericals

Types of Electrodes – Standard Hydrogen Electrode, Saturated Calomel Electrode, Quinhydrone electrode and Ion selective electrode (Glass electrode), construction

UNIT – II

Corrosion Science

Introduction, causes and effects of corrosion, chemical and electro chemical corrosion, mechanism of electro chemical corrosion

Galvanic corrosion and types of differential aeration corrosion (pitting and waterline corrosion)

Factors affecting corrosion (position of the metals in galvanic series, relative areas of anode and cathode, nature of corrosion product – solubility and volatility of corrosion product, nature of corroding environment – temperature, humidity and P^H).

Corrosion control methods – cathodic protection, sacrificial anodic protection and impressed current cathodic protection.

Protective coatings – Anodic and cathodic coatings

Paints, constituents and their functions

UNIT – III

Water Chemistry

Hardness of water – Types, units of hardness, estimation of temporary and permanent hardness of water by EDTA method, alkalinity of water and its determination

Numericals on hardness and alkalinity

Specifications of potable water, disinfection of water by chlorination, break point chlorination and by ozone treatment

Desalination of water by reverse osmosis and electro dialysis

UNIT – IV

Fuels – II

Liquid fuels, fractional distillation of crude oil, cracking and significance, catalytic cracking by fixed bed cracking, knocking, significance, antiknocking agents (TEL, MTBE), octane number, cetane number, unleaded petrol.

Gaseous fuels, LPG, CNG, composition and uses, automobile exhaust – catalytic converter.

Battery Technology

Types of batteries, Lithium battery and Lithium ion battery, fuel cell – MeOH – Oxygen fuel cell, H_2-O_2 fuel cell Rocket propellants, requirements of a good propellant, classification, solid-liquid propellants with examples. Photo catalysis

UNIT –V

Instrumental Techniques in Chemical Analysis

Principle, method and applications of Conductometry (acid-base titration), Potentiometry (acid-base, redox titration), P^H-metry (acid – base titration), UV, Visible Spectro photometer (Beer-Lambert's Law), examples

Atomic absorption spectroscopy-Principle, instrumentation (Block Diagram only), estimation of Nickel by Atomic absorption spectroscopy

Text Books:

1. J.C. Kuriacase & J. Rajaram, "Chemistry in engineering and Technology", Tata McGraw-Hill Pub.Co.Ltd, New Delhi (2008)
2. S.S.Dara & S.S.Umare, "Engineering Chemistry", S.Chand company
3. ShasiChawla, "Text Book of Engineering Chemistry", Dhantpat Rai Publishing Company, NewDelhi (2008)
4. P.C.Jain and Monica Jain, "Engineering Chemistry", Dhanpat Rai Pub, Co., New Delhi (2002)
5. Puri & Sharma, "Principles of Physical Chemistry
6. P.R.Vijayasarathi, "Engineering Chemistry" PHI Learning Private Limited, New Delhi (2011)

Suggested Reading:

1. Physical chemistry by P.W.Atkin (ELBS OXFORD PRESS)
2. Physical chemistry by W.J.Moore (Orient Longman)
3. Physical Chemistry by Glasstone
4. Physical Chemistry by T.Engel & Philip Reid, Pearson Publication
5. Introduction to nano materials by T.Pradeep

CS 121

OBJECT ORIENTED PROGRAMMING THROUGH C++
(common to all branches)

Instruction	3L + 1T Periods per week
Duration of University Examination	3 Hours
University Examination	75 Marks
Sessionals	25 Marks
Credits	3

UNIT- I

Principles of Object Oriented Programming: Procedure Vs Object Oriented, Paradigm, Basic concepts, benefits, Applications and Object Oriented Languages.

Introduction: Program structure, Creating, Compiling and Linking of C++ program.

Token, Expression and Control Structures: Tokens, Keywords, Identifiers and Constants, Data Types, Operators, Precedence, Type Compatibility, Control Structures, New Features of C++.

Functions: Function Prototype and Parameter Passing, Inline Functions, Default, Constant Arguments, Recursion, Function Overloading, Function Template.

UNIT - II

Classes and Objects: Defining classes and Member functions, Arrays, Static Members, Friend Functions.

Constructors and Destructors: Type of Constructors, Dynamic Initialization of Objects, Destructors.

UNIT - III

C++ operator overloading: Fundamentals, restrictions, overloading unary / binary operators, overloading ++ and --, Manipulation of Strings.

C++ Inheritance: Defining derived classes, Types of Inheritance, Virtual Base class Abstract Class, Nesting of classes.

UNIT- IV

Pointers and Polymorphism: Pointers and Generic pointer, Pointer to Objects and Derived Classes, this pointer, Virtual Functions, Virtual Destructors.

C++ Stream Input/Output: Streams, Stream classes, Formatted and Unformatted operations, Manipulators.

Files: Classes for file Stream operations, Sequential and Random access operations, Command line Arguments

UNIT-V

C++ Templates: Introduction, class templates, member function template, overloading template functions.

C++ Exception Handling: Try, throw, catch

Suggested Reading:

1. E. Balagurusamy **"**Object Oriented Programming with C++" , McGraw-Hill Education (India), 6 th Edition 2013
2. Bjarne Stroustrup "The C++ Programming Language", Pearson Education, 5th Edition (2013)
3. Robert Lafore **"**Object-Oriented Programming in C++ " Fourth Edition Sams Publishing,2002

EE 121

BASIC ELECTRICAL ENGINEERING
(EEE)

Instruction	3L + 1T Periods per week
Duration of University Examination	3 Hours
University Examination	75 Marks
Sessionals	25 Marks
Credits	3

UNIT- I

DC Circuits: Electric Circuit Parameters(R, L, C), Voltage and Current relationships, Power, Description of independent and dependent sources, KVL & KCL, Passive sign convention, Simple series and parallel circuit analysis, Current and voltage division principles, star-delta transformation, Source Transformation.

UNIT- II

Magnetic circuits: mmf, magnetic flux, permeability, relative permeability, composite series & parallel magnetic circuits, series – parallel magnetic circuits, comparison between magnetic and electrical circuits.

Electromagnetic induction: Faraday's laws of electromagnetic induction, types of induced emf, self and mutual induction, coefficient of coupling, inductances in series and parallel.

UNIT- III

AC Circuits: Generation of single phase alternating voltage, basic definitions, computation of average value, rms value of time varying periodic signals, complex exponentials, definition of Phasor, phasor domain conversions, steady state response of R, L, C, networks subjected to sinusoidal excitation, Network analysis techniques in phasor domain. Complex power, reactive power, power factor and calculation of power in single phase ac circuits

UNIT- IV

Single phase transformer: constructional details, working principle, ideal transformer, emf equation.

DC Machines: constructional details, working principle of dc generator, types of winding, emf equation, types of excitation. DC machine as motor, back emf, torque equation

UNIT-V

Measuring Instruments:

Introduction, Types of Instruments, Ammeter, voltmeter, expression for torque of moving coil, moving iron, dynamometer, induction and electrostatic instruments, extension of range of instruments, watt meters.

Text Books:

1. Edward Hughes, Electrical Technology, 6th Edition, ELBS, 2001.
2. V N Mittle, Basic Electrical Engineering, TMH Edition, 2009

Suggested Reading:

1. Vincent Del Toro, Electrical Engineering Fundamentals, 2nd Edition, PHI, 2003.
2. P.V. Prasad & S. Siva Nagaraju, Electrical Engineering: Concepts & Applications, Cengage Learning.

ME 112

ENGINEERING GRAPHICS
(common to CSE, ECE, EEE and IT)

Instruction	1L + 3D Periods per week
Duration of Mid term Examination	90 minutes
Duration of University Examination	3 Hours
University Examination	75 Marks
Sessionals	25 Marks
Credits	3

Course Objectives:

1. To provide an exposure in understanding the drawings during a multidisciplinary approach towards a problem
2. To train up in perception and imagination of a three dimensional scenario.

Learning Outcome:

The student should be able to

1. Understand different engineering curves
2. Interpret the principles of visualization in first angle orthographic projection for different objects.
3. Interpret and draw isometric projection of a single engineering component

UNIT- I

Scales: Instruments and their uses, reduced and enlarged scales, representative fraction, types of scales- plain, diagonal and vernier.
Simple Geometric Constructions: Construction of Regular polygons by different methods.
Conic Sections: ellipse, parabola and hyperbola by different methods.

UNIT- II

Projection Of Points And Straight Lines: Orthographic projection, projection of points placed in different quadrants. Projection of straight lines inclined to one and two reference planes.

UNIT- III

Projection Of Planes: projection of perpendicular planes, oblique planes.

UNIT- IV

Projection Of Solids: polyhedra, solids of revolution, projection of solids with axis inclined to one plane and parallel to another reference plane.

UNIT- V

Isometric Projections: isometric projections and views of prisms, pyramids, cones and cylinders, and combination of two or three solids.

Text Books:

1. N.D.Bhatt," Elementary Engineering Drawing", Charotar Publishers,2012.
2. BasanthAgrawal and C M Agrawal "Engineering Drawing 2e ", McGraw-Hill Education(India) Pvt. Ltd.

Suggested Reading:

1. K.L.Narayana and P.K.Kannaiah, "Text Book of Engineering Drawing", Scitech Publications, 2011.
2. P.S.Gill' "Engineering Graphics", Kataria Publications, 2011.
3. K.Veenugopal, "Engineering Drawing and Graphics + Autocad", New Age International Pvt.Ltd, 2011.
4. Shaw M.B and Rana B.C., "Engineering drawing", Pearson, 2nd edition, 2009
5. P I Varghees, " Engineering Graphics ",Tata McGraw-Hill publications, 2013
6. Bhattacharya. B, "Engineering Graphics", I. K. International Pvt.Ltd, 2009
7. Dhawan R.K., "Principles of Engineering Graphics and Drawing", S. Chand 2011

EG 122

ENGLISH LANGUAGE LABORATORY – II
(common to all branches)

Instruction	2 Periods per week
Duration of University Examination	3 Hours
University Examination	50 Marks
Sessionals	25 Marks
Credits	1

COMUR ASSISTED LANGUAGE LEARNING LAB (CALL)

Introduction:

The language lab focuses on the practice of connected speech and word stress. They are also introduced to the process of Listening.
The following are the **objectives** of the course:

1. To recognize and be familiar with word stress and identify stress patterns.
2. To develop awareness of rhythm and notion of stress time.
3. Listen effectively in a variety of situations for a variety of purposes, practice the behavior of effective , active listeners.
4. Assess strengths in listening and set goals for the future.

SYLLABUS:

1. Word stress: Primary stress, secondary stress, functional stress, rules of word stress.
2. Rhythm & Intonation: Introduction to Rhythm and Intonation. Major patterns, intonation of English with the semantic implications.
3. Aspects of connected speech: Strong forms, weak forms, contracted forms, elision.
4. Listening skills.

INTERACTIVE COMMUNICATION SKILLS LAB (ICS LAB)

Introduction:

The objective of the course is to introduce them to the art of making effective presentations. They also learn do debate, the interview process and interview skills.
The following are the **objectives** of the course:

1. To enable students to express themselves fluently and appropriately in social and professional contexts.
2. To provide techniques for preparing and delivering a presentation.
3. Practicing interview skills via an interpersonal encounter similar to real life situation.
4. To understand and communicate various forms of argument effectively, to develop the ability to analyze, evaluate, construct and refute arguments.

SYLLABUS:

1. Debate: Differences between a debate and a group discussion. Essentials of a debate, conducting a debate.
2. Presentation Skills: Making effective presentations, expressions which can be used in presentation, use of non-verbal communication, coping with stage fright , handling question and answer session; use of audio- visual aids , Power point presentations.
3. Interview skills: Planning and preparing for interviews, facing interviews confidently, use of suitable expressions during interview.

Suggested Reading:

1. E.Suresh kumar et al, **. English for Success** (with CD), Cambridge University Press India Pvt Ltd. 2010.
2. T Balasubramanian. **A Textbook of English Phonetics for Indian Students**, Macmillan, 2008.
3. J Sethi et al. **A Practical Course in English Pronunciation** (with CD), Prentice Hall India, 2005.
4. Edgar Thorpe. **Winning at Interviews**, Pearson Education, 2006

Priyadarshi Patnaik**. Group Discussions and Interviews,** Cambridge University Press Pvt Ltd 2011

PY 125

ENGINEERING PHYSICS LAB - II
(common to all branches except Bio-Tech)

Instruction	3 Periods per alternate week
Duration of University Examination	3 Hours
University Examination	50 Marks
Sessionals	25 Marks
Credits	2

1. Planck's Constant – Determination of Planck's Constant using photo cell
2. Solar Cell – Study of I-V characteristics of given solar cell and calculation of fill factor, efficiency and series resistance
3. Hall Effect – Determination of Hall coefficient, carrier concentration & mobility of charge carriers of given semiconductor specimen
4. P-N Junction Diode – Study of V-I characteristics and calculation of resistance of given diode in forward and reverse bias
5. B-H Curve – Determination of hysteresis loss of given specimen
6. Dielectric Constant – Determination of dielectric constant of given PZT sample at phase transition temperature
7. Energy Gap – Determination of energy gap of given semiconductor
8. Thermistor – Determination of temperature coefficient of resistance of given thermistor
9. *e/m* of Electron by Thomson's Method
10. Thermoelectric Power – Determination of thermoelectric power of given sample

CY 123

ENGINEERING CHEMISTRY LAB - II
(common to all branches except Chemical and Bio-Tech)

Instruction	3 Periods per alternate week
Duration of University Examination	3 Hours
University Examination	50 Marks
Sessionals	25 Marks
Credits	2

Course Objectives

1. To impart fundamental knowledge in handling the equipment/glassware and chemicals in the chemistry laboratory.
2. To offer hands on experience on the basic equipment related to engineering chemistry.
3. For practical understanding of theoretical concepts of chemistry

I. Volumetric Analysis:

1. Estimation of amount of copper ion using hypo solution.
2. To find out saponification number of oil.

II. Complexometry

3. Estimation of permanent and temporary hardness of water using EDTA solution.
4. Ore analysis – estimation of MnO_2 in pyrolusite.

III. Organic Preparations

9. Preparation of aspirin
10. Preparation of azodye

IV. Instrumental Chemical Analysis

i) Potentiometric Titrations

5. Strong acid vs strong base
6. Redox titration (estimation of Fe^{+2} using $KMnO_4$ solutions)

ii) pH metric titration

7. Strong acid vs strong base

iii) Polarimetry

8. Specific rotation of sucrose and inversion of sucrose.

Suggested Reading:

1. Vogel's text book of quantitative chemical analysis by J.Mendham & Thomas, Pearson education; Pvt.Ltd.new Delhi 6th ed.2002
2. Senior practical physical chemistry by BD Khosla, A.Ghulati, VC.Garg; R.Chand and CD; New Delhi 10th ed 2001.
3. Laboratory manual in engineering chemistry by S.K.Bhasin and Sudha Rani; Dhanpath Rai publishing company.

CS 122

PROGRAMMING LAB - II
(common to all branches)

Instruction	3 Periods per week
Duration of University Examination	3 Hours
University Examination	50 Marks
Sessionals	25 Marks
Credits	2

1. Program to implement function overloading
2. Program to implement function template
3. Program to implement types of constructors and destructor
4. Program to implement new and delete operators (Dynamic memory allocation).
5. Program to implement unary and binary operator overloading
6. Creation of inheritance hierarchy for graphic shapes.
7. Implementation of runtime polymorphism
8. Classes for Bank Account, Student information, Library catalog
9. Implementation of Streams.
10. Implementation of Template Classes.

EE 122

BASIC ELECTRICAL ENGINEERING LAB
(EEE)

Instruction	3 Periods per week
Duration of University Examination	3 Hours
University Examination	50 Marks
Sessionals	25 Marks
Credits	2

1. Verification of Ohm's law.
2. Verification of KVL & KCL.
3. Verification of Voltage and current division rules.
4. Study of operation of FLUROSCENT lamp.
5. Characteristics of Tungsten and carbon filaments.
6. Measurement of power factor of a coil using 3 ammeters.
7. Measurement of power factor of a coil using 3 volt meters.
8. Determination of the parameters of a coil.
9. Study a series RLC circuit with ac excitation.
10. Current locus of a series RL/RC circuit.
11. Measurement of frequency, time period and amplitude of a sinusoidal voltage using CRO.
12. Study of three point starter.
13. Study of different types of resistors, inductors and capacitors.
14. Introduction to PSPICE.
15. Simulation of basic dc networks using PSPICE.
16. Simulation of basic ac networks using PSPICE.

CHAITANYA BHARATHI INSTITUTE OF TECHNOLOGY
ELECTRICAL & ELECTRONICS ENGINEERING
B. E. II – Year

I – Semester

THEORY						
S.No	**Code**	**Subject**	**L**	**T**	**P/D**	**Credits**
1	MT 211	Fourier Analysis and Partial Differential Equations	4	0	0	3
2	EE 211	Electrical Circuits–I	4	1	0	3
3	EE 212	Electrical Measurements &Instruments	4	0	0	3
4	ME 218	Principles of Mechanical Engineering	4	0	0	3
5	EC 214	Electronic Engineering – I	4	0	0	3
6	EE 213	Electromagnetic Theory	4	1	0	3
PRACTICALS						
7	EC 217	Electronic Engineering Lab – I	0	0	3	2
8	EE 214	Circuits & Measurements Lab	0	0	3	2
TOTAL			**24**	**2**	**6**	**22**

Service Courses offered to other Departments

I-Semester

THEORY						
S.No	**Code**	**Subject**	**L**	**T**	**P/D**	**Credits**
1	EE215	Electrical Technology (for BE 2/4 ECEI-Sem)	4	0	0	3
2	ME 219/ EE216	Basics of Mechanical & Electrical Engineering Part-B(for B.Tech 2/4 Chemical I-Sem)	2	0	0	1 ½
PRACTICALS						
3	EE 217	Electrical Technology Lab(for BE 2/4 ECE I-Sem)	0	0	3	2
4	ME 210/ EE218	Mechanical & Electrical Engineering Lab Part-B (for B.Tech 2/4 Chemical I-Sem)	0	0	1 ½	1

MT 211

FOURIER ANALYSIS AND PARTIAL DIFFERENTIAL EQUATIONS
(common to all branches except Biotech)

Instruction	4L Periods per week
Duration of University Examination	3 Hours
University Examination	75 Marks
Sessionals	25 Marks
Credits	3

Course Objectives:

1. Introduce the concepts of Fourier analysis & z-transforms in engineering applications.
2. Introduction of boundary value problems and their applications in Heat Transfer and wave propagation.

Course Outcomes:

1. Learn the basics of Fourier series, PDEs and Transformation.
2. Learn the applications of the above topics in various Engineering branches.
3. Interpret the concepts and judge the necessity.
4. Very useful-Applications obtained in NRSA, DRDO and its aligned Institutions.
5. Very useful in handling complexing of problems at Industry level problems.
6. Applications of transforms (Fourier, Z-Transforms, Hankal) offenly occurs in various fields such as Oceanography, Health Sciences and etc.

UNIT– I

Fourier Series:

Dirichlet's conditions - expansion of a given function in Fourier series. Expansion of even and odd functions in Fourier series. Change of interval, half range sine and cosine series. Complex form of Fourier series.

UNIT– II

Fourier Transforms:

Fourier integral (statement only)-Fourier transform, Inverse Fourier transform, Fourier sine and cosine transform, definitions and properties.

UNIT– III

Partial Differential Equations:

Formation of Partial differential equations by elimination of arbitrary constants and by elimination of arbitrary functions.Partial differential equations of First Order- Lagrange's Linear equation and its solution. Partial differential equations of First order but of any degree-Standard types: I- $f(p,q)=0$, $II-f(z,p,q)=0$, III- $f(x,p)=f(y,q)$ andIV- $z=px+qy+f(p,q)$ .General Method of solution: Two independent variables-Char pit'sMethod; three or more independent variables - Jacobi's method.

UNIT– IV

Applications of Partial Differential Equations:

Solutions of Partial differential equations by the method of separation of variables - boundary value problems. One dimensional Wave equation, one dimensional Heat equation - related problems. Laplaceequation

UNIT – V

Z- Transforms: Introduction, Basic theory of Z-transforms. Z-transforms of somestandard sequences, Existence of z-transform. Properties of z-transforms: Linearity, Translation, scaling properties. Initial and final vale theorems. Differentiation of Z-transforms, convolution theorem, Solution of difference equations using Z-transforms.

Text Books:

1. Kanti B Datta "Mathematical Methods of Science and Engineering (Aided with MATLAB)" CENGAGE Learning.
2. B.S.Grewal "Higher Engineering Mathematics", Khanna Publishers 42nd Edition.2013
3. M.D.Raisinghania , Text Book of ODE and PDE , S.Chand publishers 4th -2012

EE 211

ELECTRICAL CIRCUITS – I

Instruction	4L + 1T Periods per week
Duration of University Examination	3 Hours
University Examination	75 Marks
Sessionals	25 Marks
Credits	3

Course Objectives:

1. To understand the nature of different circuit elements, fundamental circuit laws and network theorems.
2. To be acquainted with electrical circuit analysis, which is the foundation for all subjects of the Electrical Engineering discipline.
3. To understand poly-phase circuits and measurement of three phase power.
4. To Study transient response of circuits with initial conditions & forcing functions and also basics of network topology.

Course Outcomes: The student will be able to:

1. Acquire concepts of the nature of different circuit elements, network theorems and electrical circuit analysis.
2. Analyze R-L-C circuits under steady state
3. Analyze the behavior of circuits under transient conditions
4. Analyze balanced and unbalanced 3 phase AC circuits
5. Acquire the knowledge of resonance, coupled circuits and network topology

UNIT–I

DC Circuit Analysis: Nodal, loop and mesh circuit analysis; Network theorems: Superposition, Thevenin's, Norton's, Maximum Power Transfer, Reciprocity, Milliman's and Tellegen's Theorems with DC excitation.

UNIT–II

AC Circuit Analysis: Review of AC fundamentals & Power Calculations; Nodal, loop and mesh circuit analysis; Network theorems: Superposition, Thevenin's, Norton's, Maximum Power Transfer, Reciprocity, Milliman's and Tellegen's Theorems with AC excitation.

UNIT–III

Resonance: Definitions and computations of series and parallel resonance, Bandwidth and Q-factor; Locus diagrams; Coupled circuits, Analysis of circuits with mutual inductance, Linear and ideal transformers.

Network Topology: Network Graph concept, Oriented graph, Node, Branch, Complete incidence matrix, Tree and its properties, Co-tree, Tie-set, Fundamental tie-set matrix, Cut-set, Fundamental cut-set matrix; Duality.

UNIT–IV

Transient Response: Initial Conditions in zero-input response of RC, RL and RLC networks, Definitions of Unit Impulse, Unit Step and Ramp functions; Zero state response with Impulse and Step inputs; Complete response of circuits with initial conditions and forcing functions such as Step and Sinusoidal functions.

UNIT–V

Poly Phase Circuits: 3-phase circuit analysis, Star and delta connected systems, Calculations of voltage, current and power in 3-phase circuits with star and delta connected loads and generator, Balanced and unbalanced loads. Measurements of 3-phase power by two wattmeter method

Text Books:

1. M. E. Van Valkenburg, Network Analysis, Prentice Hall of India Publications, 3rd edition, 1995.
2. W. H. Hayt, J .E. Kemmerly, Engineering Circuit Analysis, McGraw Hill Publications, 8th edition, 2013.
3. Charles K. Alexander & Matthew N. O. Sadiku, Fundamentals of Electric Circuits, TMH Publications, 5th edition, 2013.

Suggested Reading:

1. A. Sudhakar&ShyammohanPalli, Network Analysis, Tata Mc-Graw Hill Publications, 4th edition, 2010.
2. N.C. Jagan& C.Lakshminarayana, Network Analysis and Synthesis, B.S.Publications, UPTU edition, 2010.
3. Roy Chowdary, Networks & Systems, Newage Publications, 2nd edition, 2010.

EE 212

ELECTRICAL MEASUREMENTS AND INSTRUMENTS

Instruction	4L Periods per week
Duration of University Examination	3 Hours
University Examination	75 Marks
Sessionals	25 Marks
Credits	3

Course Objectives:

1. To understand the electrical and magnetic measurements of different parameters followed by its respective Instruments to measure
2. To know different types of transducers which are applicable to Electrical Engineering.

Course Outcomes: The student will be able to

1. Identify a suitable instrument to measure a given parameter.
2. Indicate the right method of measuring a given quantity among many.
3. Illustrate the concept of the instrument with relevant examples and proper justification
4. Distinguish between electrical and magnetic measuring instruments as requirement.
5. Categories the Transducers based on measuring parameters.

UNIT –I

Principles of Measurement and Instrumentation: Objectives of measurements, Performance characteristics, Static and dynamic characteristics, Accuracy, Precision,Significant figures, Type of errors, Standard cell and standard resistance.

Instruments: Single Phase Induction type Energy meter, Driving torque and braking torque equation, Errors and testing compensation, Single-phase Electrodynamometer power factor meter, Weston type frequency meter, Electrodynamometer (Weston) type Synchroscope, Phase Sequence Indicators, Introduction to digital Instruments-DVM, Bidirectional meters.

UNIT –II

Measurement of Resistance, Inductance and Capacitance: Measurement of low, medium and high resistance, loss of charge method, Measurement of Inductance and Capacitance using Maxwell's inductance bridge, Maxwell's inductance and Capacitance Bridge, Anderson's bridge, De-Sauty's bridge, Schering bridge, Related problems, shielding of bridges, Wagner's Earthing device.

UNIT– III

Magnetic Measurements: Ballistic galvanometer, Calibration using Hibbert's magnetic standard, Ballistic tests, Measurement of flux density, Magnetizing force, Determination of B-H curve and Hysteresis loop, Measurement of Leakage Factor with Flux meter, Lloyd-Fischer square for measuring iron loss, Testing of magnetic material with oscillographic method.

UNIT –IV

Potentiometers and Instrument Transformer: Potentiometers,Classification-Crompton DC and AC polar type, Applications, Measurement of impedance. Calibration of ammeter, voltmeter and wattmeter, measurement of frequency, phase and amplitude with oscilloscope.Construction and theory of Instrument Transformers, Equations for ratio and phase angle error of C.T and P.T (Elementary treatment only)

UNIT– V

Transducers: Definition, classification and selection of transducers, Strain gauges, LVDT, Inductive and capacitive transducers, Thermostats, Thermocouple, Piezoelectric transducers, Photovoltaic, Photo conductive cells, Photo diodes and photo transistors.

Text Books:

1. A.K.Sawhney-"A Course in Electrical and Electronics Measurements and Instrumentation", DhanapatRai& Sons, New Delhi, 19th edition, 2011.
2. Transducers and Instrumentation by D.V.S Murthy, Prentice Hall of India Publications, 2nd edition, 2011.

Suggested Reading:

1. Helfrick, Albert D., Cooper, William D., "Modern Electronic Instrumentation and Measurement Techniques", PHI Learning Publications, 1990.
2. F.W.Golding and Widdis., "Electrical Measurements and measuring Instruments" , A. H. Wheeler & Co.,5th edition

ME 218

PRINCIPLES OF MECHANICAL ENGINEERING
(EEE)

Instruction	4L Periods per week
Duration of University Examination	3 Hours
University Examination	75 Marks
Sessionals	25 Marks
Credits	3

Course Objectives: Students will

1 learns various modes of heat transfer.
2. Understand the applications of refrigeration.
3. Learn the working principles of petrol and diesel engines along with reciprocating air compressors and steam boilers.
4. Understand various power drives such as belts and gear trains.
5. Learn working principles of pumps and various hydraulic turbines.
6. Learn principles associated with flow through pipes.

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

1. Apply the knowledge of heat transfer in estimating insulating effects and cooling problems
2. Apply the principles of refrigeration in controlling green-house effect.
3. Evaluate the performance of IC engine, reciprocating air compressors and understand the importance of boilers in thermal power plants.
4. Estimate the power transmission of various drives.
5. Select the pump and hydraulic turbines for different heads and discharge
6. Calculate the head loss through pipes with empirical relations

UNIT–IHeat Transfer: Modes of heat transfer–conduction and convection, radiation, steady state conduction–heat transfer through plane walls, cylinders, critical radius of insulation for cylinders, concept of black body radiation.
Heat Exchanger: Classification, industry applications, LMTD for parallel flow and counter flow.
Refrigeration System: COP, ton of refrigeration, air refrigeration, simple vapour compression cycle and properties of refrigerants, eco friendly refrigerants, introduction to psychometry, psychrometric processes, simple problems using psychrometric chart.

UNIT–IIIC Engines: Working of four–stroke and two–strike petrol and diesel engines with P–v diagrams, calculation of indicated power, brake power, specific fuel consumption, mechanical and thermal efficiencies.
Reciprocating air compressors: Uses of compressed air, principle of working and work done of single stage compressor–without and with clearance, multistage compressors, advantages, intercoolers and aftercooler.
Generation of Steam: Classification of boilers, Fire tube boilers–Locomotive boilers, Cochran boiler, Water tube boiler–Babcock & Wilcox boiler.
Gas Turbines: Classification, performance of simple gas turbine cycle (Joule cycle).

UNIT–IIIGears: Classification, Gear trains, types–single compound, Inverted &epi cyclic gear trains, belt& rope drives, open and cross belt, length of belt, ratio of tensions for flat belts, condition for maximum power.

UNIT–VFluid Dynamics: Introduction to Bernoulli's equation, applications–venturi meter, orifice meter, flow through pipes–Hagen's formula, friction loss in pipes, Darcy's formula, Reynolds number and its significance.
Hydraulic Turbines: Classification-working principle-Francis, Kaplan, Pelton Wheels, work done, power output, efficiency, specific speed, Unit quantities, Draft Tube, Performance characteristic curves.

UNIT–VPumps: Working principles and construction details of Centrifugal and reciprocating pumps, Effect of friction, acceleration head, work done, power required with and without air vessels, Problems faced in pumps, precaution, cavitation, primary velocity triangles of centrifugal pumps

Text Books:

1. R.K.Rajput, Thermal Engineering, Laxmi Publications (P) Ltd, 8th edition, 2011
2. Thomas Bevan, Theory of machines, CBS Publishers, 2010
3. P.N.Modi&S.M.Seth, Hydraulics and Fluid Mechanics including Hydraulic machines, Standard Book House, 18th edition, 2011

Suggested Reading:

1. Mahesh M Rathor, Thermal Engineering, Tata Mc.Graw-Hill Publishers 2013
2. S.S.Rattan, Theory of Machines, Tata Mc.Graw-Hill Publishers 3rd Edition, 2009
3. JagdishLal, Hydraulics & Fluid mechanics, Metropolitan Book Co. Pvt. Ltd., 2004

EC 214

ELECTRONIC ENGINEERING – I
(EEE)

Instruction	4L Periods per week
Duration of University Examination	3 Hours
University Examination	75 Marks
Sessionals	25 Marks
Credits	3

Course Objectives:
The aim of this course is to:
1. To introduce the fundamental concepts of semiconductor devices like PN junction Diodes, Transistors and special Diodes
2. To understand the operation of different types of electronic devices and their corresponding applications.
3. To study and analyze the rectifier and filter circuits
4. To understand the characteristics of Transistors –BJT, FET, MOSFET and analyze their behavior in terms of h-parameters.
5. Understand how to bias the transistors for their application as amplifiers
6. To get conceptual foundation on amplifiers that can be used as a basis for further study. **Course Outcomes:**

Course outcomes:
From this course student will be able to:
1. Demonstrate a systematic and critical understanding of the theories and principles of electronic devices.
2. Analyze the characteristic behavior of BJT , FET ,& MOSFET.
3. Learn how to bias the transistors for their application as amplifiers
4. Capable to develop the knowledge to understand various types of fast switching speed diodes
5. Creatively apply the concepts behind various semi-conductor devices in their mini projects.

UNIT–I
Semiconductor diodes and Rectifiers: p-n junction diode: V-I characteristics, temperature dependence of V-I characteristics; Breakdown of junctions-Zener and Avalanche; Half wave, fullwave, bridge rectifiers, L, C, pi-section filters; Regulation and Ripple characteristics.

UNIT–II
Bipolar Junction Transistor: Current components; CE, CB, CC Configurations, characteristics; Transistor as an amplifier, operating point, bias stabilization circuits.

UNIT–III
Field Effect Transistors: V-I characteristics of JFET and MOSFET; Depletion and Enhancement modes, Biasing of JFET's and MOSFET's: Self-bias, biasing for zero current drift, biasing against device variations, biasing the enhancement MOSFET.

UNIT–IV
Low frequency amplifier Circuits: Small signal low frequency analysis of amplifier in 3 configurations using BJT and FET, Frequency response- effect of C_E/C_S and C_C on frequency response, Miller's theorem.

UNIT–V
CRO: Constructional details of CRO and its applications.
Special devices: Elementary treatment on the functioning of Tunnel/Backward diode, Varactor diode, Photo diode, Light Emitting diode. Liquid Crystal Display, Working of UJT, photo transistor.

Text Books:
1. Jacob Millman and Christos C. Halkias, Electronic Devices and Circuits, McGraw Hill, 3rd Edition, 2010
2. Jacob Millman and Christos C. Halkias, Integrated Electronics, McGraw Hill, 1991

Suggested Reading:
1. Robert L. Boylestad and Louis Nashelsky, "Electronic Devices and Circuit Theory", PHI, 10th edition, 2006
2. David Bell, "Fundamentals of Electronic Devices and Circuits", 5th edition, Oxford University press, 2008
3. Beng Streetman and Sanjay Banerjee, "Solid state electronic devices" 6th edition, Pearson education, 2005

EE 213

ELECTROMAGNETIC THEORY

Instruction	4L +1TPeriods per week
Duration of University Examination	3 Hours
University Examination	75 Marks
Sessionals	25 Marks
Credits	3

Course Objectives:
1. To understand various coordinate systems and applications of vector calculus
2. To comprehend the electrostatic field concepts and applications
3. To assimilate the concepts and applications of magnetic fields
4. To know the significance of EMI & EMC

Course Outcomes: The student will be able to
1. Recognize the importance of different coordinate systems and vector algebra in field theory.
2. Analyse electric and magnetic field intensity, flux density and potential due to various charge distributions.
3. Differentiate between conduction & convection currents through various materials.
4. Apply Maxwell's equations for EM wave propagation.
5. Identify EMI & EMC, the causes and effects, various control methods of EMI.

UNIT – I

Orthogonal Coordinate Systems &Review of Vector Calculus: Rectangular, Cylindrical, Spherical coordinate systems; Line, Surface and Volume integrals; Operator Del, Gradient, Divergence, Curl &Laplacian of a field; Divergence, Stokes' theorems.
Electrostatic fields: Various charge configurations, Coulomb's law, Electric field intensity and flux density of different charge distributions, Gauss law, Integral and Point form of Maxwell's Electrostatic Equation.

UNIT – II

Electrostatic Field in Materials: Electrical Potential, Capacitance of Parallel plate capacitor, Equi-potential lines, Properties of materials, convection and conduction currents, conductors, dielectric constant, continuity equation and relaxation time, boundary conditions, Poisson's and Laplace's equations, Uniqueness theorem.

UNIT – III

Magneto Static Fields: Biot-Savart's law, Ampere's law, Displacement current, Magnetic scalar and Vector Potentials, boundary conditions, Forces in Magnetic fields, Lorentz force equation, Force between parallel conductors, Inductance Calculations (Solenoid, Toroid), Mutual Inductance.

UNIT – IV

Time Varying Electromagnetic Fields: Faraday's laws of electromagnetic induction, Final forms of Maxwell's Equations, Power and Poynting theorem, Time-Harmonic Electromagnetic fields, Wave equations (One dimension), Plane Wave, Propagation in perfect and lossydielectrics.

UNIT – V

Electromagnetic Interference and Compatibility(Theoretical Aspects only): Introduction to Electromagnetic Interference and Electromagnetic Compatibility (EMI & EMC)- Sources and Characteristics of EMI- Control Techniques of EMI- Grounding- Shielding- Filtering. Introduction to numerical electro magnetics

Text Books:

1. Hayt, W.H and J.A Buck, Engineering Electromagnetics, Tata Mc-Graw Hill, 7th edition, 2006.
2. Sadiku, M.N.O, Principles of Electromagnetics, Oxford University press, 4th edition, 2006.

Suggested Reading:

1. S. P. Seth, Elements of Electromagnetic Fields, DanpatRai& Co,2007
2. David K. Cheng, Field and Wave Electromagnetics, Pearson Education. 2nd edition 2,004
3. AshutoshPramanik, Electromagnetism Theory and Applications, PHI pvt. Ltd, 3rd edition ,2008

EC 217

ELECTRONIC ENGINEERING LAB – I

Instruction	3 Periods per week
Duration of University Examination	3 Hours
University Examination	50 Marks
Sessionals	25 Marks
Credits	2

Course Objectives:

The main objectives of this course are to teach:

1. Fundamental concepts of semiconductor diodes and transistors.
2. Applications of various semi-conductor devices.
3. V-I Characteristics of special devices.
4. Transistor circuit behavior and their characteristics.
5. Working and frequency response of BJT and FET amplifier circuits
6. Function of front panel controls and usage of CRO

Course Outcomes:

The student will be able to:

1. Verify the working of PN Junction diodes, transistors and their characteristic behavior
2. Learn the usefulness of semiconductor devices in circuit making like rectifiers, filters etc
3. Build an amplifier and find its voltage gain and frequency response
4. Use CRO for measuring amplitude, frequency and phase difference.
5. Understand practical issues in Electronic Engineering lab

List of Experiments:

1. Study of RLC components, Bread board, Regulated power supply, Function generator
2. Measurement of phase, frequency and sensitivity with CRO
3. V-I characteristics of semiconductor diodes (Germanium, Silicon and Zener)
4. Static Characteristics of BJT (CE)
5. Static Characteristics of BJT (CB)
6. Static Characteristics of FET (CS)
7. Design of Half wave and Full wave Rectifier with and without filters
8. Design of rectifiers with C, L, LC & Pi-filters
9. Static characteristics of SCR
10. Static characteristics of UJT
11. Biasing of BJT and FET
12. Emitter Follower
13. Source Follower
14. Frequency Response of CE amplifier
15. Frequency Response of CS amplifier

Suggested Reading:

1. Paul B. Zbar, Albert P. Malvino, Michael A. Miller, "Basic Electronics, A Text-Lab Manual", 7th Edition, TMH, 1994.
2. S. Poorna Chandra, B. Sasikala, "Electronics Laboratory Primer- A design approach", Wheeler Publishing, 1998.

General Note:

1. There should not be more than 2 students per batch while performing any of that lab experiment.
2. Mini project cum design exercise:
   a. The students must design, rig-up, and test the circuits wherever possible and should carry out the experiments individually.
   b. This exercise carries Sessional marks of 10 out of 25, while the remaining 15 marks are for the remaining lab exercise.

EE 214

CIRCUITS AND MEASUREMENTS LAB

Instruction	3 Periods per week
Duration of University Examination	3 Hours
University Examination	50 Marks
Sessionals	25 Marks
Credits	2

Course Objectives:

1. To understand thoroughly the fundamental concepts of all theorems.
2. To comprehend the basic principles of operation of measuring various circuit parameters.
3. To become familiar in operating the various instruments in different contexts.

Course Outcomes: The student will be able to:

1. Identify the importance and applications of various theorems in circuit analysis.
2. Calculate the time and frequency responses RLC circuits.
3. Use various bridges to determine the unknown R, L & C.
4. Calibrate energy meter using direct & indirect loadings.
5. Measure and calculate iron losses and frequency of magnetic circuits.

List of Experiments:

PART – A: CIRCUITS

1. Transient response of first order circuits.
2. Frequency response of a RLC series circuit.
3. Determination of two port network parameters. (Z, Y,h& ABCD)
4. Verification of Thevenin's& Norton's Theorems.
5. Verification of Superposition & Reciprocity Theorems.
6. Verification of Maximum power transfer theorem.
7. Transient response of series RLC circuit.
8. Simulation of Thevenin's equivalent using PSpice.
9. Simulation of Transient response of series RLC circuit using PSpice.

PART – B: MEASUREMENTS

1. Measurement of low resistance by Kelvin's double bridge.
2. Calibration of Single phase energy meter by Phantom loading.
3. Measurement of Inductance by Maxwell's and Anderson's bridges.
4. Measurement of capacitance by Schering bridge.
5. Measurement of Iron losses using Epstein's square bridge.
6. Use of DC Potentiometer for measurement of unknown voltage and impedance.
7. Calibration of three phase energy meter(Electromagnetic/Static) by direct loading.
8. Use of Oscilloscope and plotting BH curve and calculation of Iron loss.
9. Measurement of frequency using Lissajous figures Note: At least **five** experiments should be conducted from each part.

EE 215

ELECTRICAL TECHNOLOGY
(BE 2/4 ECE I-SEM)

Instruction	4 Periods per week
Duration of University Examination	3 Hours
University Examination	50 Marks
Sessionals	25 Marks
Credits	3

Course Objectives:

1. To know the fundamentals of DC Generators and DC motors
2. To study AC generators & Transformers
3. To understand the concepts of poly phase systems.
4. To know the concepts of 1 Φ & 3 Φ Induction motors.
5. To understand fundamentals of Power system.

Course Outcomes: The student will be able to:

1. Know the fundamentals of DC Generators and DC motors
2. Study AC generators & Transformers
3. Understand the concepts of poly phase systems.
4. Know the concepts of 1 Φ & 3 Φ Induction motors.
5. Understand fundamentals of Power system.

UNIT-I

D.C. Generators: Constructional details, Simple lap & wave windings, Methods of excitation, Induced EMF, Basic ideas of armature reaction and commutation, Characteristics of shunt, series and compound generators and their applications.

DC Motors: Significance of back EMF, Torque developed in motors, Three point starter, Characteristics of shunt, series and compound motors, Speed control of DC motors.

UNIT-II

Poly Phase System: Advantages of three phase system, Star and delta connections, Relationship between line and phase quantities, Measurement of power by Two Wattmeter method.

A.C. Generators: Construction, EMF equation, Armature reaction, Synchronous impedance, Regulation.

UNIT-III

Transformers: Single Phase transformer, Construction, Working principle, EMF equation, Ideal transformer, Phasor diagram under no load and loaded conditions, OC and SC tests on transformer, Efficiency and regulation, Working principle of auto transformer.

UNIT-IV

Induction Motors: Construction, Production of rotating magnetic field, Slip, Slip-torque characteristics, Starting methods of Induction motors.

Single Phase Induction Motors: Construction, Theory of operation, Characteristics of shaded pole, Split phase and capacitor motors, Applications.

UNIT-V

Power Systems: Basic ideas of thermal, hydro, nuclear and non-conventional generating systems and layout, Block diagram of power systems, Transmission using high voltages, Advantages, Basic idea of line parameters of short lines.

Text Books:

1. H. Cotton, Electrical Technology,CBS Publishers and distributors,7th edition,2005.
2. V.K.Mehta, Principles of Electrical Engineering, S.Chand& Co,2nd edition,2004.
3. M.L.Soni, PV Gupta and VS Bhatnagar, A course in Electrical Power, DhanpatRai and Sons, 4th edition,2008.

Suggested Reading:

1. P.V. Prasad & S. Siva Nagaraju, Electrical Engineering: Concepts & Applications, Cengage Learning, 1st edition, 2012
2. B.L.Theraja, Electrical Technology Vol.I&Vol.II, S.Chand& Co, 23rd edition.
3. M.S.Naidu and Kamakshaiah – Electrical Technology –TMH Publications,1st edition,2007

ME-- / EE 216

BASICS OF MECHANICAL &ELECTRICAL ENGINEERING
(B. Tech 2/4 Chemical I-SEM)
PART-B
ELECTRICAL ENGINEERING

Instruction	2 Periods per week
Duration of University Examination	1½Hours
University Examination	37 Marks
Sessionals	13 Marks
Credits	1½

Course Objectives:

1. To understand the basic technique of measuring various circuit parameters.
2. To infer the accuracy of energy measurement.
3. Obtain the efficiency of electrical machines
4. To comprehend the characteristics of diode and transistor.

Course Outcomes: The student will be able to

1. Identify the necessity of circuits both in AC, DC circuits and recognize the related Parameters
2. Differentiate the various AC machines by its application on characteristics
3. Infer the building blocks of electronic devices for a given application

UNIT I

D.C. Circuits: Kirchhoff's laws, Mesh current and node voltage analysis. Electromagnetic induction: Faraday's law, Direction of emf and current. Energy stored in a magnetic field, Hysteresis and eddy current losses.
AC circuits: generation of alternating voltage and currents, Average and rms value of sinusoidal quantities.

Unit II

Single phase transformer: Constructional details, Working principle, EMF equation, practical transformers. Equivalent circuits, voltage regulation, losses and efficiency, open circuit and short circuit test.
Three phase induction motors: construction, principle, advantage and disadvantages, working principle. Torque– slip characteristics, losses and efficiency.

Unit III

Electronic devices and circuits. P-N junction, semiconductor diode, characteristics of diode, diode as rectifier, half wave & full wave rectifiers, bridge rectifier, filter circuits.
Transistor: construction, action, symbols, as an amplifier in CE arrangement, characteristics of common base connection.

Text Book:

1. V. K. Mehta -- Principles of Electrical Engineering and Electronics, Multi colour illustrative edition,2006

Suggested Reading:

1. B. L.Theraja –A Text book of Electrical Technology, S.Chand& Co, 24th revised edition,2007.

EE 217

ELECTRICAL TECHNOLOGY LAB
(BE 2/4 ECE I-SEM)

Instruction	3 Periods per week
Duration of University Examination	3Hours
University Examination	50 Marks
Sessionals	25 Marks
Credits	2

Course Objectives:

1. To comprehend various characteristics of DC machines.
2. To become familiar with the operation of various electrical apparatus.
3. To Study the characteristics of DC generators
4. To study the characteristics of DC motors
5. To understand the characteristics of Different AC machines.

Course Outcomes: The student will be able to

1. Know the right instrument and its usage for the given circuit.
2. Identify the suitable machine for required application.
3. Study the characteristics of DC generators
4. Study the characteristics of DC motors
5. Understand the characteristics of Different AC machines.

LIST OF THE EXPERIMENTS:

1. Magnetization curve of a separately excited DC generator.
2. Load characteristics of a shunt generator.
3. Load characteristics of a series generator.
4. Performance characteristics of a DC shunt motor.
5. Load characteristics of a DC series motor.
6. Performance characteristics of a compound motor.
7. Speed control of DC shunt motor.
8. O.C. and S.C. tests on single phase transformer.
9. Load test on single phase transformer.
10. Performance characteristics of a three phase induction motor.
11. Speed control methods of induction motor.
12. Regulation of alternator by O.C. and S.C. tests.
13. Measurement of three-phase power by two wattmeter method.

Note: At least **10**Experiments should be conducted in the semester

ME--- / EE 218

MECHANICAL & ELECTRICAL ENGINEERING LAB

(B.Tech2/4 Chemical I-SEM)

PART-B

ELECTRICAL ENGINEERING LAB

Instruction	3 Periods per week
Duration of University Examination	1 ½ Hours
University Examination	25 Marks
Sessionals	13 Marks
Credits	1

Course Objectives:

1. To understand the basic technique of measuring various circuit parameters.
2. To infer the accuracy of energy measurement.
3. Obtain the efficiency of electrical machines
4. To comprehend the characteristics of diode and transistor.

.

Course Outcomes: The student will be able to

1. Identify the suitability of circuit solving technique for given network.
2. Make out percentage error in reading of an energy meter.
3. Determine the efficiency of transformer and induction motor.
4. Obtain & plot the characteristics of diode & transistor.

1. Verification of Ohm's law.
2. Verification of KVL & KCL.
3. Verification of Voltage and current division rules.
4. Power factor measurement of and R-L series circuits
5. Calibration of single phase energy meter
6. Brake test on induction motor
7. Open circuit & short circuit tests on single phase transformer
8. Static characteristics of junction diode
9. Static characteristics of a common base transistor circuit.
10. Static characteristics of common emitter transistor circuit

Note: At least **4** Experiments should be conducted in the semester

CHAITANYA BHARATHI INSTITUTE OF TECHNOLOGY
ELECTRICAL & ELECTRONICS ENGINEERING
B. E. II – Year

II – Semester

THEORY						
S.No	**Code**	**Subject**	**L**	**T**	**P/D**	**Credits**
1	EE221	Electrical Circuits–II	4	1	0	3
2	EC 225	Electronic Engineering – II	4	0	0	3
3	EE222	Power Systems – I	4	1	0	3
4	EE223	Electrical Machinery – I	4	1	0	3
5	EE224	Digital Electronics and Logic Design	4	0	0	3
6	CE 228	Solid Mechanics	4	0	0	3
PRACTICALS						
7	EC 228	Electronics Engineering Lab – II	0	0	3	2
8	ME 225	Mechanical Engineering Lab	0	0	3	2
9	EG 221	Soft Skills and Employability Enhancement	0	0	2	1
TOTAL			**24**	**3**	**8**	**23**

Service Courses offered to other Departments

II-Semester

THEORY						
S.No	**Code**	**Subject**	**L**	**T**	**P/D**	**Credits**
1	EE225	Electrical Circuits and Machines (for BE 2/4 Mech. &Prod.II-Sem)	4	0	0	3
2	EE226	Electrical and Mechanical Technology (for BE 2/4 Civil II-Sem)	2	0	0	1 ½
PRACTICALS						
3	EE227	Electrical Circuits & Machines Lab (forBE 2/4 Mech. & Prod. II-Sem)	0	0	3	2

EE 221

ELECTRICAL CIRCUITS – II

Instruction	4L + 1T Periods per week
Duration of University Examination	3 Hours
University Examination	75 Marks
Sessionals	25 Marks
Credits	3

Course Objectives:

1. To understand the application of Laplace Transforms for analysis of Electrical Circuits
2. To comprehend the application of Fourier series and Fourier transform representation of periodic signals
3. To study the analysis of two port networks
4. To study the aspects of network synthesis.

Course Outcomes: The student will be able to

1. Apply Laplace transform for circuit analysis and also able to draw the pole zero plots.
2. Find network functions and two port parameters
3. Acquire the knowledge to find the Fourier series of given function
4. Acquire the knowledge to find the Fourier transform of the given function.
5. Acquire the knowledge synthesize the RL and RC circuits

UNIT– I

Laplace Convolution of time functions, Initial and Final value theorems, Partial fraction expansion method of obtaining inverse transforms.

UNIT – II

Application of Laplace Transform: Application of Laplace transform for circuit analysis, Concept of transfer function, Pole, Zero plots.**Transform Method**: Laplace transforms of common time functions in particular delta, Unit Step, Ramp, Sinusoidal and Exponential functions; building of Laplace Transform tables, Laplace transform theorems relating time shifting; Differentiation, Integration and

UNIT –III

Two port parameters: Z, Y, ABCD and h-parameters, their interrelationships; series, parallel and cascade connection of two port networks, image & iterative impedances, terminated two port networks.

UNIT – IV

Fourier series: Representation of periodic functions using both trigonometric and exponential functions; Symmetry conditions, Fourier transform representation of a periodic signals, Symmetry properties; Power and bandwidth concepts; System function and its application in determining steady-state response.

UNIT –V

Network Synthesis: Hurwitz polynomials and their properties-Positive Real functions and their properties-Synthesis of reactive network (one port) by Foster method-pole-zero interpretations of elements of Foster form, Cauer form of reactive networks-RL network synthesis by Foster and Cauer form of representation-RC network synthesis by Foster and Cauer method.

Text Books:

1. M.E. Van Valkenburg, Network Analysis, Prentice Hall of India Publications, 3rd edition, 1995.
2. W.H.Hayt, J.E.Kimmerly, Engineering Circuit Analysis, McGraw Hill, 8th edition, 2013.

Suggested Reading:

1. N.C. Jagan&C.Lakshminarayana, Network Analysis and Synthesis, B.S.Publications, UPTU edition, 2010.
2. Franklin F. Kuo, Network Analysis And Synthesis, 2nd Ed, Wiley Publications,2009.

EC 225

ELECTRONIC ENGINEERING –II
(EEE)

Instruction	4L Periods per week
Duration of University Examination	3 Hours
University Examination	75 Marks
Sessionals	25 Marks
Credits	3

Course Objectives:

1. To study and analyze the performance of negative and positive feedback circuits
2. To understand the concept of multistage amplifiers, analysis of multistage amplifier
3. To study and analyze differential amplifiers and its importance as a building block in operational amplifier
4. To understand the working principle of power amplifiers.
5. To study and analyze the linear wave shaping and non linear wave shaping circuits.
6. To pursue any advance level course in electronics.

Course Outcomes: The student will be able to:

1. Design feedback amplifiers and various kinds of oscillators.
2. Analyze and Design various multistage amplifiers.
3. Design differential amplifier with high CMRR
4. Design of power amplifiers with higher conversion efficiency.
5. Design different analog processing circuits.
6. Design differentiating and integrating circuits using linear elements.

UNIT – I

Feedback amplifiers: Concept of Feedback, feedback amplifier configuration, circuits, advantages of negative feedback, analysis of simple feedback amplifiers using BJTs and FETs.

UNIT – II

Oscillators: Barkhausen criterion; RC oscillators; Weinbridge, phase shift, LC, Hartley and colpitts oscillators; Crystal controlled oscillators (Analysis of oscillators using BJTs only), stability of oscillators, Voltage regulators.

UNIT – III

Multistage amplifiers: Cascade and cascode configuration, High input impedance transistor circuits, frequency response of RC coupled amplifiers, Transformer coupled amplifiers, Step response, effect of cascading on bandwidth.

D.C. Amplifiers: Problems of dc amplifiers. Drift compensation techniques, differential amplifiers, importance of CMRR, high CMRR differential amplifier.

UNIT – IV

Power Amplifiers: Classification of power amplifiers, analysis of class A and B power amplifiers; Distortion in amplifiers, push pull amplifiers, complementary symmetry, Phase inverters

UNIT– V

Wave shaping circuits: RC low pass and high pass circuits; response to step, pulse, Ramp, Exponential and Square wave inputs; clipping circuits for single level and two levels; clamping circuits, Comparators

Text Books:

1. Jacob Millman and Christos C. Halkias, “Integrated Electronics”, McGraw Hill, 1991
2. Jacob Millman and Christos C. Halkias, “Electronics Devices and Circuits”, McGraw Hill, 3rd Edition, 2010
3. Jacob Millman and Taub: Pulse, “Digital and Switching wave forms”, McGraw Hill, 2003

Suggested Reading:

1. Sedra and Smith, “Microelectronic Circuits”, Oxford University. Press, 5th Edition, 2009
2. S. Salivahanan& N. Suresh Kumar, “Electronic Circuit Analysis”, McGraw Hill, 2nd Edition, 2011

EE 222

POWER SYSTEMS – I

Instruction	4L + 1TPeriods per week
Duration of University Examination	3 Hours
University Examination	75 Marks
Sessionals	25 Marks
Credits	3

Course Objectives:

1. To introduce Generation of energy through conventional sources such as: Thermal, Hydro and Nuclear, also gives insight into the generation of power through non-conventional sources along with economic aspects.
2. To familiarize mechanical design of transmission lines and cables.
3. To familiarize present practices in tariff calculations.
4. To develop knowledge to understand classification and connection schemes of distribution systems

Course Outcomes: The student will be able to

1. Gain knowledge of construction and operation of conventional and non-conventional sources of energy along with financial management.
2. Know the effects sag on transmission lines.
3. Acquire the concepts to study the performance of insulators and cables.
4. Gain knowledge in calculating the current practices in tariff.
5. Gain the knowledge to classify the connection schemes of distribution systems.

UNIT-I

Thermal- Hydro -Power Plants: Principles, Choice of site, layout and various parts of generating stations,Brief description of Hydro Power Plant Dam, Spillways, Head works, Surge tank, Penstocks, Line diagram of Thermal Power Station (TPS) showing paths of coal, steam, water, air, ash and flue gasses, Brief description of TPS components: Economizers, Boilers, Super heaters, Turbines, Condensers, Chimney and Cooling towers.

UNIT-II

Nuclear Station: Schematic Arrangement of Nuclear Power Station, Advantages and disadvantages,Types of Nuclear reactors, Gas Turbine Power Plant, Schematic arrangement of Gas Turbine power plant, Advantages and disadvantages, Introduction to Non-Conventional EnergySources: Solar, Wind and Tidal.

UNIT-III

Construction of Over Head Lines: Over head line materials, Supports, Types, Vibration dampers, Arcing horns, Ground wires, Sag /Tension calculations, Equal / Unequal supports, Effects of wind, ice / Erection Conditions Stringing charts; Insulators, Types, Material for construction potential distribution over string of insulators, equalizing of potential, Methods. Insulator testing; Insulated cables, Insulating Materials, Mechanical protection, EHV / HV/ LV cables, Grading, Capacitance of 3 core cables.

UNIT-IV

Economics of Power Generation-Load curve, Load demand and diversified factors, Base load operation, Types of costs and depreciation calculations; Tariffs, different types of tariffs; Methods of power factor improvement.

UNIT-V

General Aspects of AC and DC Distribution Systems: Underground, Overhead lines, Classification of Distribution Systems, Connection Schemes of Distribution System, Requirements of a Distribution System, Types of D.C. Distributors, D.C. Distribution Calculations for Distributor fed at one end, distributor fed at both ends. AC distribution systems, Distributor fed at one end, distributor fed at both ends.

Text Books

1. C.L. Wadhwa, Electrical Power Systems, Wiley Eastern Ltd,5th edition,2009.
2. M.L.Soni, P.V.Gupta, V.S.Bhatnagar and A.Chakraborti,A Text Book on Power System Engineering DhanpatRai& Co. Pvt. Ltd,4th edition,2008
3. V.K Mehta and Rohit Mehta, Principles of Power Systems,S.Chand& Company Ltd., New Delhi, 24th edition,2006
4. S.N.Singh, Electric Power Generation, Transmission and Distribution, Prentice Hall of India Ltd., Newdelhi, 2nd edition, 2011

Suggested Reading

1. M.V. Deshpande,Elements of Power Station design ,Eastern economy edition, 2010.
2. P.P. Walsh, P.Fletcher, Gas turbine performance, Blackwell Publisher,2ND edition,2004.

EE 223

ELECTRICAL MACHINERY– I

Instruction	4L + 1TPeriods per week
Duration of University Examination	3 Hours
University Examination	75 Marks
Sessionals	25 Marks
Credits	3

Course Objectives:

1. To study the principles of electro mechanical energy conversion, Armature reaction and commutation in DC machines.
2. To understand types of DC generators and motors, and their characteristics and applications.
3. To discuss different methods of speed control of DC motors and Testing of DC Machines.
4. To familiarize the construction details, principle of operation, prediction of performance, methods of single phase transformers.
5. To know different connections of 3Φ transformers and parallel operation

Course Outcomes: The student will be able to:

1. Apply basic principles of electromagnetic laws and energy conversion
2. Acquire knowledge about operating characteristics of generators, speed control of DC machines and their application in Industry and domestic appliances.
3. Acquire the concept of single phase and three phase transformers and their applications .
4. Distinguish between different types of 3Φ transformers connection
5. Analyze the performance of 1Φ and 3Φ transformers during parallel operations
6. Design a 3 Φ to 2Φ conversion system through Scott connection.

UNIT – I

Principles of Electro-mechanical Energy Conversion: Energy in magnetic system, Field energy and mechanical force, Direction of mechanical force developed, Flow of energy in electro-mechanical devices, singly excited and multiply excited systems, Basic concepts of magnetically induced emf and force.

UNIT – II

DC Machines: Brief description of constructional features, Armature windings, simple lap and wave windings, Brush position, Classification of DC Machines. DC Generators: Generated EMF, Methods of excitation, Armature reaction, Theory of commutation, Types of generators and their characteristics, Series and parallel operation.

UNIT– III

DC Motors: Generation of electromagnetic torque, Types 6fmotors and their characteristics, Application of motors, Starting and speed control methods of DC motors. Testing of DC Motors, Losses and efficiency, Swinburne's test, Hopkinson's test, Field test for series motors, Retardation test, Separation of losses.

UNIT– IV

Single Phase Transformers: Constructional features, Principle of operation, Ideal transformer, Transformer on 'No load' and 'On load', Vector diagram, Equivalent circuit, Polarity test, O.C & S.C tests, Sumpner's test, Regulation & efficiency, All day efficiency, Separation of losses- Excitation Phenomena of Transformers.

UNIT– V

Three Phase Transformers: Three phase transformers connections Y-Y, Δ-Δ,Δ-Y,Y-Δ,V-V and Scott connections. Parallel operation of transformers

Text Books:

1. Nagrath I.J & Kothari D.P, Electrical Machines, Tata McGraw Hill Publications, Sigma series, 2006.
2. H.Cotton, Advanced Electrical Technology, Wheeler & Co,7th edition, CBS publishers,2005.
3. Theory and performance of electrical machines by J.B Gupta ,S.K. Kataria& Sons,14th edition,2014.

Suggested Reading:

1. P.S. Bhimbra Electrical machinery, Khanna Publications,7th edition,2003.
2. Fitzgerald, Kingsley, Umans, Electric Machinery, Tata Mc-Graw Hill Publications, 6th edition, 2002.
3. Electrical machines by Ashfaqhusain, Danpatrai and sons, 2nd edition,2012

EE 224

DIGITAL ELECTRONICS AND LOGIC DESIGN

Instruction	4L Periods per week
Duration of University Examination	3 Hours
University Examination	75 Marks
Sessionals	25 Marks
Credits	3

Course Objectives:

1. To understand the basics of Boolean Algebre and Minimization Techniques.
2. To know the basics of Digital logic family
3. To study binary arithmetic & its circuits and code converters.
4. To understand the Design of synchronous sequential circuits.
5. To know design of sequence detector and generators and programmable logic circuits.

Course Outcomes: The student will be able to

1. Understand the basics of Boolean Algebra and Minimization Techniques.
2. Know the basics of Digital logic family
3. Study binary arithmetic & its circuits and code converters.
4. Understand the Design of synchronous sequential circuits.
5. Know design of sequence detector and generators and programmable logic circuits.

UNIT– I

Boolean Algebra: Boolean and combinational logic; AND,OR and NOT operations; Laws of Boolean Algebra, Minimization of Boolean expressions, Truth tables and maps, Sum of products and product of sums, Map method of reduction, Incompletely specified functions multiple output minimization.

UNIT– II

Tabular minimization: Digital logic families and IC's, Characteristics of Digital IC's, Introduction to RTL, DTL, TTL, CMOS, ECL families, Details of TTL logic family totem pole, open collector outputs, Wired AND operation, Comparison of performance, TTL subfamilies, multiplexer and de-multiplexer, Encoder and decoder, Code converters, Implementation of combinational logic using standard logic gates and multiplexers.

UNIT– III

Binary arithmetic and circuits: Half and Full adder, Subtractor and Magnitude comparator, Number complements, Two's complement arithmetic, Carry look ahead adder, Decimal numbers and their codes, BCD and Excess-3 arithmetic.

UNIT – IV

Synchronous Sequential Circuits: Basic latch circuit, Debouncing switch SR, JK, D and T flip-flops, Truth table and excitation table, Ripple and synchronous counters up/down counter, General BCD counter, Counter decoding, Shift registers, Ring counters.

UNIT – V

Design of Digital Systems: Concept of state, State diagram, Design of counters Sequence detector and generators, Design procedure, Synthesis' using D, JK, T flip-flops, Applications of registers, Concepts of programmable, LogicPROM, PLA, PAL.

Text Books:

1. Morris Mano M. -Digital Design, Prentice Hall of India,3rd edition, 2002.
2. Donald Pleach / Albert Paul Malvino / Goutamsaba "Digital Principles and Applications " McGraw- Hill, 6th edition, 2006.

Suggested Reading:

1.Tocci&Widmer, Digital Systems, Principles and applications,10th edition, Pearson prentice Hall,2009.
2. B. Somnath Nair, Digital Electronics and Logic Design, Prentice Hall of India, Eastern economy edition,2006.

CE228

SOLID MECHANICS
(EEE)

Instruction	4L Periods per week
Duration of University Examination	3 Hours
University Examination	75 Marks
Sessionals	25 Marks
Credits	3

Course Objectives:

1. To enable the student understand the basic concepts of stresses and strains in various engineering materials, with a special focus on electrical engineering materials.
2. To enable the student appreciate the applications of the subject to electrical engineering context.
3. To motivate the student pursue the extension of the concepts of 'Solid Mechanics' at higher level education and research and make proper interpretation in the relevant electrical engineering topics.

Course Outcomes:

1. To apply the fundamental concepts of simple stress, strain and temperature stresses.
2. To analyze different beams like cantilever, simply supported, overhanging subjected to concentrated and uniformly distributed loads.
3. To determine bending stresses and shear stresses in different sections of beams.
4. To evaluate slope and deflections of beams subjected to different load systems.
5. To understand the transmission of power in circular shafts and strain energy in springs.

UNIT-I

Simple Stresses and Strains: Definitions, types of stresses and strains.Hooke's law, stress-strain diagrams for engineering materials. Modulus of elasticity, Poisson's ratio, volumetric strain, and relationship between elastic constants.Compound bars, and temperature stresses.

UNIT-II

Shear Force and Bending Moment: Shear force and bending momentdiagrams for cantilever, simply supported beams and beams with overhangs under point loads and uniformly distributed loads. Relationship between intensity of load, shear force and bending moment.

UNIT-III

Theory of Simple Bending: Assumptions and derivation. Modulus of section,moment of resistance, and determination of flexural stresses.Direct and bending stresses on rectangular, circular and standard structural sections.Distribution of shear stresses on rectangular, circular, I-, T-, standard steel and hollow sections.

UNIT-IV

Deflections: Slope and deflections by the method of double integration incantilever, simply supported beams, and simple beams with overhangs under point loads and uniformly distributed loads.
Strain Energy: Concepts and applications. Stresses and deformations in barsdue to gradually applied loads, sudden and impact loads.

UNIT-V

Torsion: Theory of torsion, and derivation of basic equation. Solid and hollowcircular shafts, strain energy, transmission of power; combined bending and torsion.
Springs: Close coiled helical springs subjected to axial loads and couples,strain energy in springs.

Text Books:

1. D. S. PrakashRao, Strength of Materials _A Practical Approach, Universities Press. Hyderabad. 1999.
2. S.S. BhaviKatti , Strength of materials, Vikas publications, 2003.

Suggested Reading:

1. G H. Ryder, Strength of Materials, Third Edition in SI units. Macmillan India Limited. Delhi. 2002.
2. A. Pytel and F. L. Singer, Strength of Materials, Harper & Row, Fourth Edition. New York. 1987.
3. Timoshenko &young "Strength of Materials", 3rd edition 2012. TI

EC 228

ELECTRONIC ENGINEERING LAB – II
(EEE)

Instruction	3 Periods per week
Duration of University Examination	3 Hours
University Examination	50 Marks
Sessionals	25 Marks
Credits	2

Course Objectives:

1. To understand the working and frequency response of different negative feedback amplifiers
2. To give hands on experience of working with different oscillators
3. To give hands on experience of working with different linear and non linear wave shaping circuits.
4. To understand the working of power amplifiers
5. To learn applications of different transistor circuits.
6. To understand practical issues in Electronic Engineering lab

Course Outcomes: The student will be able to

1. Analyze the circuit behavior for various required characteristics.
2. Understand the working and frequency response of different negative and positive feedback circuits
3. Get hands on experience on power amplifier circuits.
4. Get hands on experience on different analog processing circuits.
5. Understand practical issues in Electronic Engineering lab

List of Experiments:

1. Voltage series feedback amplifier
2. Voltage shunt feedback amplifier
3. Current series feedback amplifier.
4. Current shunt feedback amplifier
5. Hartley Oscillator
6. Colpitt's oscillator
7. RC Phase shift oscillator
8. Wien Bridge Oscillator
9. Linear wave shaping -Integrator & Differentiator
10. Nonlinear wave shaping -Clipping
11. Class-B Power Amplifiers
12. Clamping Circuits(Diode)
13. Difference Amplifier (Op. Amp)
14. Voltage Comparators (Op. Amp)

Suggested Reading:

1. Paul B. Zbar, Albert P. Malvino, Michael A. Miller, "Basic Electronics, A Text -Lab Manual", 7th Edition, TMH, 1994.
2. Paul B. Zbar, "Industrial Electronics- A Text -Lab Manual", 3rd Edition, TMH,1983.

General Note:

i. There should not be more than 2 students per batch while performing any of the lab experiment.
ii. Mini project cum design exercise:
   a) The students must design, rig-up, and test the circuits wherever possible and should carry out the experiments individually.
   b) This exercise carries sessional marks of 10 out of 25, while the remaining 15 marks are for the remaining lab exercise.

ME 225

MECHANICAL ENGINEERING LAB
(EEE)

Instruction	3 Periods per week
Duration of University Examination	3 Hours
University Examination	50 Marks
Sessionals	25 Marks
Credits	2

Course Objectives:
Student will acquire knowledge in evaluating the performance of IC engines, hydraulic turbines, pumps and can determine thermal conductivity of solids.

Course Outcomes: The student will be able to
1. Evaluate the performance of petrol and diesel engines.
2. Evaluate the fluid parameters using laws of fluid mechanics
3. Evaluate the properties of the fuel used in I.C.Engines for evaluating the performance of an engine with test fuels.
4. Understand the concepts of thermal insulation with laws of heat transfer
5. Understand the difference between free convection heat transfer and forcedconvection heat transfer.
6. Evaluate the performance of multi-stage air compressor and understand the importance over single stage air compressor

List of Experiments:

1. Performance test on multi cylinder petrol or diesel engine
2. Measurement of discharge by venturimeter
3. Measurement of velocity by pitot tube
4. Measurement of discharge by orifice meter/ rotameter
5. Determination of flash and fire point of lubricants.
6. Determination of thermal conductivity of composite wall
7. Determination of heat transfer coefficient under natural convection phenomenon
8. Determination of volumetric efficiency of multi stage reciprocating air compressor
9. Study of construction details of a gear box
10. Performance of (a) Francis (b) Kaplan (c) Pelton Wheel turbines
11. Performance characteristics of reciprocating and centrifugal pumps

EG 221

SOFT SKILLS AND EMPLOYABILITY ENHANCEMENT

Instruction	2 Periods per week
Duration of University Examination	3 Hours
University Examination	50 Marks
Sessionals	25 Marks
Credits	1

Course Objectives: To help the students

1. Participate in group discussions with confidence and to make effective presentations. Also to learn the art of communication.
2. With- resume packaging, preparing and facing interviews.
3. Build an impressive personality through effective time management & goal setting, self confidence and assertiveness.
4. Understand what constitutes proper grooming and etiquette in a professional environment. Also to understand academic ethics and value systems.

Course Outcomes: The students will be able to

1. Students will learn the art of communication and different Indianisms
2. Students will participate in group discussions with confidence.
3. Students will make individual presentations using PowerPoint.
4. Students will learn resume packaging and face interviews.
5. Students will learn effective time management and goal setting. They will also know about grooming and etiquette; academic ethics and values.
6. Students will do live mini projects through field work.

Exercise 1

Communicative Competence – The Art of Communication, basic grammar, Indianisms, Effective listening skills, using English in different situations

Exercise 2

Group Discussion – dynamics of group discussion, intervention, summarizing, modulation of voice, body language, relevance, fluency and coherence

Elements of effective presentation – Structure of presentation – Presentation tools – Body language

Creating an effective PPT

Exercise 3

Interview Skills – Resume' writing – structure and presentation, planning, defining the career objective, projecting ones strengths and skill-sets

Interview Skills – concept and process, pre-interview planning, opening strategies, answering strategies, mock interviews

Exercise 4

Personality Development – Effective Time Management, setting realistic goals, self confidence and assertiveness, stress management, moral values.

Exercise 5

Corporate Culture – Grooming and etiquette, communication media etiquette

Academic ethics and integrity

Suggested Reading:

1. MadhaviApte, "A Course in English communication", Prentice-Hall of India, 2007
2. LeenaSen , "Communication Skills", Prentice-Hall of India, 2005
3. Dr. ShaliniVerma, "Body Language- Your Success Mantra", S Chand, 2006
4. Edgar Thorpe and Showick Thorpe , "Objective English", 2nd edition, Pearson Education, 2007
5. Ramesh, Gopalswamy, and Mahadevan Ramesh, "The ACE of Soft Skills", New Delhi: Pearson, 2010
6. Gulati and Sarvesh, " Corporate Soft Skills", New Delhi: Rupa and Co. , 2006
7. Van Emden, Joan, and Lucinda Becker, "Presentation Skills for Students", New York: Palgrave Macmillan, 2004
8. Covey and Stephen R, "The Habits of Highly Effective People", New York: Free Press, 1989

EE 225

ELECTRICAL CIRCUITS AND MACHINES
(BE 2/4 Mech. &Prod.II-SEM)

Instruction	4 Periods per week
Duration of University Examination	3 Hours
University Examination	75 Marks
Sessionals	25 Marks
Credits	3

Course Objectives:

1. To understand DC circuits and AC circuits.
2. To understand 3Φ AC circuits and single phase transforms
3. To understand DC motors and generators
4. To get complete knowledge of Induction motors.

Course Outcomes: The student will be able to

1. Analyze AC and DC circuits
2. Analyze 3Φ AC circuits and obtain performance of single phase transforms efficiency and regulation.
3. Distinguish between DC generators and DC motors
4. Analyze the performance of 3Φ IM
5. Distinguish between 1Φ IM and special motors.

UNIT-I

DC & AC Circuits: Analysis of circuits using loop current methods, Thevenin's and Norton's theorems, Sinusoidal sources, Phasor representation of sinusoidal quantities, Average and RMS values, Active power, Reactive power, Energy stored in inductor and capacitor, Mutual inductance, Dot convention, Analysis of simple coupled circuits.

UNIT-II

Poly Phase Systems: Production of 3-phase voltages, Analysis of 3-phase balanced circuits, 3-phase power measurement by two wattmeter method.

Transformers: Construction, Working principle, EMF equation, Ideal transformer, Equivalent circuit of transformer on no load and on load, Efficiency and regulation of transformer, OC and SC tests, Introduction to auto transformer.

UNIT-III

D.C. Generators: Constructional details, Simple lap & wave windings, Methods of excitation, Induced EMF, Armature reaction, Characteristics of shunt, series and compound generators and their applications.

DC Motors: Significance of back EMF, Torque developed in motors, Three point starter, Characteristics of shunt, series and compound motors, Speed control of DC motors.

UNIT-IV

Induction Motors: Production of rotating magnetic field, construction and principle of operation of induction motors, speed-torque characteristics, Methods of starting, Speed control of 3-phase induction motors.

UNIT-V

Single Phase & Special Motors: Various types of single phase motors, Split phase, Capacitor start and capacitor run motors, Basic features of Stepper motor and BLDC motor.

Text Books:

1. Kothari and Nagrath, Basic Electrical Engineering, Tata McGraw Hill Publications, 2nd edition,2007.
2. V.K.Mehta, principles of Electrical Engineering, S.Chand& Co,1st edition,2003.

Suggested Reading:

2. B. L.Theraja –A Text book of Electrical Technology, S.Chand& Co, 24th revised edition,2007.
3. M.S.Naidu and Kamakshiah – Electrical Technology –TMH Publications,1st edition,2007

EE 226

ELECTRICAL AND MECHANICAL TECHNOLOGY
(BE 2/4 Civil II-SEM)
PART-A
ELECTRICAL TECHNOLOGY

Instruction	2 Periods per week
Duration of University Examination	1 ½ Hours
University Examination	38 Marks
Sessionals	12 Marks
Credits	1 ½

Course Objectives:

1. To identify parts of the electrical machine.
2. To understand the concepts of DC & AC circuits
3. To comprehend the need of AC machines.
4. To know the features of measuring instruments and illumination.
5. To understand principle of working of AC and DC machines.

Course Outcomes: The student will be able to

1. Distinguish between DC & AC circuits in respect of its analysis.
2. Identify the compatibility of AC machines for a given application.
3. Recognize the principles of measuring instruments and illumination.
4. Formulate parameters of motor & Induction motors
5. To calculate the energy requirement for given application

UNIT-I

Introduction: SI units, and practical units of current, voltage, power and energy Conversion of mechanical and heat units to electrical units and vice versa.

D.C.Circuits: Ohm's Law, Kirchhoff's Laws, resistance networks; series, parallel and series–parallel circuits with D.C. Sources, Power loss in resistive elements. Measurement of direct current and voltage.

Alternating Currents: Principles of production of AC wave form, frequency, effective value and form factor. Measurement of effective value of currents and voltages, vector representation, behavior of pure inductance, capacitance, and resistance with A.C sinusoidal sources, Impedance and admittance, simple A.C. network with R.L.C. elements under steady state; circuits under balanced conditions. Star-delta connections Power in balance three–phase circuit.

UNIT-II

Measurement: Working principle of ammeter, voltmeter, wattmeter and energy meters. Measurementof power in 3-phase circuits.

Transformers: Ideal transformers, principle of transformation, working of actual transformer – under no load and local conditions. Approximate equivalent circuit, principle and use of auto transformers.

UNIT-III

Induction Motors: Production of rotating magnetic field – synchronous speed, torque production, slip and speed of motor, slip-torque characteristics .Power factor on load condition. Starting of induction motors . Basic ideas of single phase induction motors and applications.

Illumination: Nature and production of light. Units of light measurement.Coefficient of utilization and depreciation. Polar curves, Calculations of street lighting.

Text Books:

1. V.K. Mehta, Principles of Electrical Engineering and Electronics, S. Chand&Co.,Multicolour illustrative edition, 2006
2. H. Cotton, Electrical Technology,CBS Publications, 7th edition,2005.

Suggested Reading

1. M.S. Naidu and S. Kamakshaiah, Introduction to Electrical Engineering, Tata McGraw – Hill publishing Co., 12th reprint,2007.

EE227

ELECTRICAL CIRCUITS & MACHINES LAB
(BE 2/4 Mech. & Prod. II-SEM)

Instruction	3 Periods per week
Duration of University Examination	3 Hours
University Examination	50 Marks
Sessionals	25 Marks
Credits	2

Course Objectives:

1. To understand the basic technique of measuring various circuit parameters.
2. To practically understand the theorems
3. To comprehend various characteristics of DC machines.
4. To understand the characteristics of different AC machines.
5. To understand the basic construction of an electrical machine.

Course Outcomes: The student will be able to

1. Know the right instrument and its usage for the given circuit.
2. Identify the suitable machine for required application.
3. Measure various parameters of the circuit
4. To determine various characteristics of AC machine
5. To determine various characteristics of DC machine

List of Experiments:

1. Verification of Thevenin's& Norton's Theorems.
2. Study of three phase balanced and unbalanced circuits.
3. Measurement of three-phase power by two wattmeter method.
4. Study of single phase circuits.
5. Study of self and mutual inductance of coils and their inter connections, study of capacitor and their inter connections.
6. To determine the Magnetization curve of a separately excited DC generator.
7. To determine the load characteristics of a shunt generator.
8. To determine the performance characteristics of a shunt motor.
9. To determine the performance characteristics of a compound motor.
10. Speed control of DC shunt motor.
11. O.C. and S.C. tests on single phase transformer.
12. Load test on a three phase induction motor.
13. Regulation of alternator.
14. Speed control methods of induction motor.
15. To determine the load characteristics of a DC series motor.

Note: At least **10**Experiments should be conducted in the semester

CHAITANYA BHARATHI INSTITUTE OF TECHNOLOGY
SCHEME OF INSTRUCTIONS- Dept. of EEE

III YEAR (2015-16 Academic year)

I SEMESTER

THEORY						
S.No	**Code**	**Subject**	**L**	**T**	**P**	**Credits**
1	EE 311	Power Systems – II	4	0	0	3
2	EE 312	Electrical Machinery – II	4	1	0	3
3	EE 313	Linear Control Systems	4	1	0	3
4	EE 314	Power Electronics	4	1	0	3
5	EE 315	Linear Integrated Circuits	4	0	0	3
6	CE 444	Human Values and Professional Ethics	2*	0	0	0
PRACTICALS						
7	EE 316	Electrical Machinery – I Lab	0	0	3	2
8	EE 317	Control Systems Lab	0	0	3	2
9	EE 318	Linear Integrated Circuits Lab	0	0	3	2
		TOTAL	**22**	**03**	**09**	**21**

*21 Periods per semester

II Semester

THEORY						
S.No	**Code**	**Subject**	**L**	**T**	**P**	**Credits**
1	EE 321	Electrical Machinery - III	4	1	0	3
2	EE 322	Switch Gear & Protection	4	0	0	3
3	EE 323	Microprocessor & Microcontrollers	4	0	0	3
4	EE 324	Digital Signal Processing	4	1	0	3
5	EE 351	Elective – I 1. Electrical Engineering	4	0	0	3

	EE 352 EE 353 EE 354	Materials 2. Optimization Techniques 3. Advanced Control System 4. Renewable Energy Systems				
PRACTICALS						
6	EE 325	Power Electronics Lab	0	0	3	2
7	EE 326	Microprocessor & Microcontrollers Lab	0	0	3	2
8	EE 327	Electrical Machinery – II Lab	0	0	3	2
9	EE 328	Mini Project *	0	0	0	1
10		Industry Visit *	0	0	0	Grade
		TOTAL	**20**	**02**	**09**	**22**

* Only internal evaluation

SEM-I

With effect from the academic year 2015-2016

EE 311 **POWER SYSTEMS - II**

Instruction	4 Periods per week
Duration of University Examination	3 Hours
University Examination	75 Marks
Sessional	25 Marks
Credits	3

Course Objectives

1. *To understand Inductance and capacitance calculations for different line configurations*
2. *To understand per unit system representation in power systems.*
3. *To understand the importance of transmission line representation in terms of short, medium and long lines in finding performance of lines*
4. *To understand the importance of symmetrical and un-symmetrical faults in power systems.*
5. *To study the causes of over voltages and bewley lattice diagram.*

Course Outcomes: The student will be able to

1. *Acquire knowledge in calculation of inductance and capacitance of lines*
2. *Acquire knowledge to represent the power system data in per unit and consider appropriate line models to find the performance of transmission lines*
3. *Acquire the concepts of corona and effect of corona in power system.*
4. *Acquire knowledge to study different types of faults, and its relevance in relay settings.*
5. *Acquire knowledge in finding the transmission line wave equation and able to find various*

coefficients of lines and draw the Bewley Lattice diagram.

UNIT-I

Line Parameter Calculations: Calculating Inductance & Capacitance of Transmission Lines, single phase and three phase symmetrical composite conductors, GMD, GMR, Transposition of conductors, Bundled conductors, effect of earth capacitance.

UNIT-II

Modeling of Transmission Lines: Short, medium, long lines, Line calculations, Tuned Lines, Surge impedance loading.

Corona: Causes, Disruptive and Visual Critical Voltages, Power loss, minimization of Corona effects.

UNIT-III

Per Unit System of Representation: Use of per unit quantities in power systems, Advantages of per unit system.

Symmetrical Faults: Short Circuit Currents, Reactance of Synchronous Machines, fault Calculations, Short circuit capacity of a bus.

UNIT-IV

Unsymmetrical Faults: Symmetrical components of unsymmetrical Phasors, Power in terms of symmetrical components, sequence impedance and sequence networks. Sequence networks of unloaded generators, Sequence impedances of circuit elements, Single line to ground, line-to-line and double line to ground faults on unloaded generator, Unsymmetrical faults of power systems.

UNIT-V

Transients in Power Systems: Causes of over voltages. Travelling Wave Theory, Wave equation, Reflection and refraction Coefficients, Junction of Cable and overhead lines, Junction of three lines of different natural impedances, Bewley Lattice diagram.

Text Books

1. C.L. Wadhwa, Electrical Power Systems, Wiley Eastern Ltd., 4dtEdition, 2006
2. I.J. Nagrath & D.P.Kothari Modern Power Systems Analysis, TMH Edition, 2003.

Suggested Reading

1. John J. Grainger William D.Stevenson Jr. Power System Analysis, Tata McGraw Hill Edn. 2003
2.A.Chakrabarti, M.L.Soni, P. V.Gupta, U.S.Bhatnagar, A Text book on Power System, Dhanpat Rai & Co (P) Ltd -1999.

With effect from the academic year 2015-2016

EE 312 **ELECTRICAL MACHINERY-II**

Instruction	4L+1T Periods per week
Duration of University Examination	3 Hours
University Examination	75 Marks
Sessional	25 Marks
Credits	3

Course Objectives:

1. To study the principles of tap changing, tests and auto-transformer.
2. To understand different types of three phase induction motors.
3. To discuss about speed control and starting methods of three phase induction motors.
4. To analyze unbalanced operation of three phase induction motors and three phase transformers.
5. To familiarize the construction details, principle of operation, prediction of performance of single phase induction motors.

Course Outcomes: The student will be able to:

1. Apply basic principles of tap changing and auto-transformer.
2. Acquire knowledge about operation and performance analysis of three phase induction motors.
3. Obtain the concepts of speed control and starting methods of three phase induction motors.
4. Analyze unbalanced operation of three phase induction motors and three phase transformers.
5. Acquire the concept of single phase induction motors.

UNIT-I

Transformers: Cooling arrangement in Transformers. Testing of Transformers, Routine Tests and Special tests, Measurement of Voltage ratio and check for voltage vector relationship. Measurement of Insulation resistance. Maintenance of Transformers. Tap changer on transformers, No-load tap changer, On-load tap changer. Third harmonic voltages and tertiary winding in three phase transformers, Auto Transformer, Comparison with two winding transformers, Conversion of two winding transformer to auto transformer.

UNIT-II

Three-phase Induction Motor: Constructional features, Rotating Magnetic field theory, Principle of operation of squirrel cage and slip ring motors, Vector Diagram, Equivalent circuit, Expression for torque, Starting torque, Maximum torque, Slip/Torque characteristics, Performance characteristics, Equivalent circuits from test, Current loci circle diagram, Predetermination of characteristics of Induction Motors.

UNIT-III

Starting methods of Induction motors: Modes of operation, torque and power limits of Induction motors, Speed control methods, Resistance Control, Voltage control, pole changing, Cascading, variable frequency control, Slip power recovery schemes Kramer drive. Scherbius drive, Double cage Induction motors, Induction generator, Doubly fed Induction Generator.

UNIT-IV

Unbalanced Operation: Voltage Unbalance, Unbalanced Operation of 3-phase Induction Motor, Per Phase Equivalent Circuits, Single Phasing, Unbalanced Operation of 3-Phase Transformers, Single-phase load on Three-phase transformers Single Phasing in 3-phase transformers- Delta /Star and Star/Delta transformers.

UNIT-V

Single Phase motors: Single phase motors, Theory and operation of single phase motors, Shaded pole, Split phase and capacitor motors, Compensated and uncompensated series and repulsion motors. Linear Induction motors.

Text Books:

1. P.S. Bhimbra Electrical machinery, Khanna Publications, 7th edition, 2003.
2. Nagrath I.J & Kothari D.P, Electrical Machines, Tata McGraw Hill Publications, Sigma series, 2006. 3. H.Cotton, Advanced Electrical Technology, Wheeler & Co,7th edition, CBS publishers,2005. 4. Theory and performance of electrical machines by J.B Gupta ,S.K. Kataria & Sons,14th edition,2014.

Suggested Reading:

1. Juha Pyrho¨ nen, Tapani Jokinen and Valeria Hrabovcova, Design of rotating electricalmachines, John Wiley & Sons, Ltd. 2008.
2. Fitzgerald, Kingsley, Umans, Electric Machinery, Tata Mc-Graw Hill Publications, 6th edition, 2002.
3. Electrical machines by Ashfaq husain, Danpatrai and sons, 3nd edition, 2012

EE 313 LINEAR CONTROL SYSTEMS

Instruction	4L + 1T Periods per week
Duration of Semester Examination	3Hours
Semester Examination	75Marks
Sessional	25Marks
Credits	3

Course Objectives:

1. To understand different types of linear control systems and their mathematical modeling.
2. To study the transfer functions of control system components
3. To study Stability analysis, both in time and frequency domains
4. To study the concepts of State space representation of Linear Time invariant systems (LTI)

Course Outcomes: The student will be able to:

1. Build different mathematical models for any LTI physical /electrical systems
2. Derive the transfer function of components used in feedback control systems
3. Apply the concepts of stability analysis in time and frequency domains, which is essential to analyze any system performance.
4. Apply the concepts of state space controls
5. Design conventional controllers and compensators used for closed loop performance.

UNIT I

Introduction: Concepts of control systems- Open loop and closed loop control systems and their differences, Different examples of control systems, Classification of control systems, Feedback Characteristics, Effects of feedback. Mathematical models, Differential equations, Impulse Response and transfer functions, Translational and Rotational mechanical systems, Analogous systems.

UNIT –II

Transfer Function Representation: Two Phase Serve motor characteristics, Transfer Function of DC and AC Servo motor, Potentiometers, Synchro transmitter and Receiver, Tacho generator, Stepper Motor characteristics, Block diagram algebra, signal flow graphs and problems.

UNIT –III

Time Response Analysis: Standard test signals, Time response of first/second order systems, Transient response of second order system for step input. Time domain specifications, Types of systems, static error coefficients, Routh-Hurwitz criterion of stability, Root locus technique, Typical systems analyzed by root locus technique, Effect of location of roots on system response, PID Controllers.

UNIT IV

Frequency Response Analysis: Introduction, Frequency domain specifications for a second order system, Bode plots, Stability Analysis from Bode plots. Polar plots, Nyquist criterion for stability. Compensation techniques, Lag, Lead, Lead-Lag Controllers design in frequency domain.

UNIT V

State Space Representation: Concept of state, state variable, state models of linear time invariant systems, Derivation for state models from transfer functions and differential equations, State transition matrix-solution of state equations by time domain method. Obsevability and Controllability, Introduction to discrete control systems.

TEXT BOOKS:

1. I.J.Nagrath, M.Gopal, Control System Engineering, New Age International (P) Limited Publishers, 5th Edition, 2008.
2. B.C. Kuo, Automatic Control Systems, John wiley and son's Publishers, 9th edition, 2009
3. K.Ogata, Modern Control Systems, 5th Edition.PHI publication, 2010.
4. A. Anand Kumar, Control Systems, 2nd Edition, PHI publications, 2014.

Suggested Reading:

1. M.Gopal, Control Systems Principles and Design- Tata McGraw Hill, 2nd Edition, 2003.
2. N.C Jagan-control Systems, 2nd Edition, BS Publications, 2008
3. N. Nise, Control Systems Engineering, 6th edition, Willey Publications, 2011.
4. Linear Control System analysis and design with MATLAB, Taylor & Francis D'Azzo- Control Systems, 2009

With effect from the academic year 2015-2016

EE 314 **POWER ELECTRONICS**

Instruction	4L+1T Periods per week
Duration of University Examination	3 Hours
University Examination	75 Marks
Sessional	25 Marks
Credits	3

Course Objective: The objective of the course is to

1. Introduce the characteristics of various power semiconductor switches and their applications.

2. Make acquainted with the operating principles of AC-DC, DC-DC, AC-AC and DC-AC converters, methods of voltage control and converters applications.

Course Outcomes: The student will be able to:

1. *Gain knowledge of basic operation of various power semiconductor devices and to compare their characteristics.*
2. *Design protection circuit and control circuits for SCR.*
3. *Acquaint with the principles of phase controlled converters.*
4. *Analyze the operation principles of different DC-DC, AC-AC converters.*
5. *Identify different topologies of DC-AC converters.*

UNIT-I

Power Diodes and Transistors: Power diode, characteristics, Recovery characteristics, Types of power diodes, General purpose diodes, Fast recovery diodes, their applications. Bipolar Junction Transistors(BJT), Power MOSFETs, IGBTs-Basic structure and working, Steady state and switching characteristics, Comparison of BJT, MOSFET and IGBT, Their applications.

UNIT-II

Silicon Controlled Rectifier (SCR): SCR-Static characteristics, Two transistor analogy, Protection of SCRs, Dynamic characteristics, Series and parallel operation of SCRs, SCR trigger circuits-R, RC and UJT triggering circuits, Commutation methods of SCR.

UNIT-III

Principles of phase controlled converters: Study of Single-phase and three-phase half wave and full wave controlled rectifiers with R, RL, RLE loads, significance of freewheeling diode, Effect of source inductance, Dual converters - circulating and non circulating current modes.

UNIT-IV

DC-DC Converters: Principles of Step-down, Step-up, Step UP/Down choppers, Time ratio control and current limit control, Types of choppers Type- A, B, C, D and E, Introduction to Buck, Boost and Buck-Boost regulators.

AC-AC Converters:

Principle of operation of Single phase Cyclo-converters and their applications. Single-phase AC Voltage Controllers with R and RL loads.

UNIT-V

Inverters: Principle of operation of Single-phase Inverters, Voltage control methods, Single pulse width modulation, Multiple pulse width modulation, Sinusoidal pulse width modulation, Comparison of Voltage Source Inverters and Current Source Inverters, Three-phase bridge Inverters, 180^0 & 120^0 modes of operation.

Text Books:

1. Singh.M.D and Khanchandani.K.B,Power Electronics, Tata McGraw Hill, 2nd Edition, 2006.
2. Rashid.M.H. Power Electronics Circuits Devices and Applications. Prentice Hall of India, 2003
3. Bimbra.P.S, Power Electronics, Third Edition, Khanna Publishers, 2013

Suggested Reading:

1. Mohan, Undeland , Robbins, Power Electronics, John Wiley, 1996.
2. P.C.Sen, Power Electronics, Tata Mc-Graw Hill, 1st Edition, 2001.

With effect from the academic year 2015-2016

EE 315 LINEAR INTEGRATED CIRCUITS

Instruction	4 Periods per week
Duration of University Examination	3 Hours
University Examination	75 Marks
Sessional	25 Marks
Credits	3

Course Objectives:

1. To study the characteristics of operational amplifiers, stability, basic applications such as integrator, differentiator etc.,
2. To study the different applications of operational amplifiers in voltage limiter, Schmitt trigger, instrumentation circuits.
3. To study the concepts of waveform generation, sine, square, triangular using op-amps.
4. To study the operation of 555 timer as a monostable and an astable multivibrator.
5. To study different types of voltage regulator, Filters and their characteristics.

Course Outcomes: The student will be able to:

1. Understand the basic characteristics of op-amps and their significance.
2. Analyze a typical op-amp equivalent circuit by calculating its voltage gain and input resistance.
3. Define stability for a amplifier circuit.
4. Analyze an instrumentation amplifier circuit and discuss its applications.
5. Analyze higher order filter circuits and explain their significance.
6. Analyze and design voltage regulators (Fixed voltage and adjustable voltage).

UNIT-I

Operational Amplifiers Characteristics: open loop voltage gain, output impedance, input impedance, common mode rejection ratio, Offset balancing techniques, Slew rate, Frequency response, Stability, frequency compensation of Op-amp.

Basic OP-Amp Applications: inverter summer, analog integrator, differentiator, current to voltage converter, voltage to current converter, voltage follower, ac amplifier.

UNIT-II

OP-Amp Applications: Voltage limiter, clipper & clamper, precision rectifier, full wave and half wave, peak detector, comparator, zero crossing detector, Schmitt trigger, monostable, astable, bistable multiplier, divider, difference amplifier instrumentation amplifier circuits using Op-amps.

UNIT-III

Waveform Generation using Op-Amps: Sine, Square, Triangular and Quadrature oscillators, voltage controlled oscillator / multi vibrator, voltage to frequency converter, 555 timer functional diagram, operation as monostable and astable. phase locked loop, A/D and D/ A converters.

UNIT-IV

Voltage Regulators: Series voltage regulator using Op-amp, shunt regulators using Op-amp, switching regulators using Op-amp, dual voltage regulator, fixed voltage regulators, dual tracking regulators, hybrid regulator, current sensing and current feedback protection.

UNIT-V

Filters: RC active filters, low pass, high band pass, band reject, notch, first order, second order transformation, state variable filter, switched capacitor filter, universal filter, Balanced modulator/ demodulator.

Text Books:

1. D.Roy Choudhury, Linear Integrated Circuits, Shail B.Jain, 3rd Edition, New Age International(P) Ltd., 2007.
2. Malvino Albert Paul, Electronic Principles, 7th Edition, Tata McGraw Hill, 2006
3. Coughlin and Driscoll, Operational Amplifiers and Linear integrated Circuits, 6th Edition, Prentice hall of India 2003.

Suggested Reading:

1. Gayakwad R.A. Op-Amps and Linear Integrated Circuits, 4th Edition, Prentice Hall of India, 2002.
2. David A. Bell, Operational Amplifiers and Linear IC s, PHI, 2003.

CE 444 HUMAN VALUES AND PROFESSIONAL ETHICS

Instructions	: 21 Periods per semester (7*3)
Duration of University Examination	: 2 Hours
University Examination	: 50 Marks
Sessional	: Nil
Credits	: Nil

Course Objectives:

1. To develop the critical ability among students to distinguish between what is of value and what is superficial in life
2. To enable the students understand the values, the need for value adoption and prepare them meet the challenges
3. To enable the students develop the potential to adopt values, develop a good character and personality and lead a happy life
4. To motivate the students practice the values in life and contribute for the society around them and for the development of the institutions /organisation around they are in.
5. To make the students understand the professional ethics and their applications to engineering profession

Course Outcomes

1. Students develop the capability of shaping themselves into outstanding personalities, through a value based life.
2. Students turn themselves into champions of their lives.
3. Students take things positively, convert everything into happiness and contribute for the happiness of others.
4. Students become potential sources for contributing to the development of the society around them and institutions / organisations they work in.
5. Students shape themselves into valuable professionals, follow professional ethics and are able to solve their ethical dilemmas.

UNIT-1 Concepts and Classification of Values –Need and challenges for value Adoption

Definition of Values – Concept of Values – Classification of Values – Hierarchy of Values – Types of Values –Espoused and Applied Values – Value judgement based on Culture – Value judgement based on Tradition – Interdependence of Values

Need for value education – Findings of Commissions and Committees - Corruption and illegal practices – Science and Technology without values- Exploitation of nature – Increasing use of violence and intoxicants – Lack of education in values – Implications of education in values – Vision for a better India

Challenges for Value adoption – Cultural, Social, Religious, Intellectual and Personal challenges

UNIT – 2: Personal Development and Values in Life

Personal Development: Enlightened self-interest – Accountability and responsibility – Desires and weaknesses – Character development – Good relationships, self-restraint, Spirituality and Purity – The quest for Character – Tests of Character – The key to good character

Values in Life: Building an ethical policy – Integrating values in everyday life – Archaic Social Values – Parenting practices – Critical Thinking - Analyzing and Prioritizing values – Practicing Yoga and Meditation

UNIT – 3: Practicing Values for the development of Society

Resentment Management and Self-analysis – Positive Thinking and Emotional Maturity – The importance of Women , Children and Taking care of them – Helping the poor and needy – Fighting against addictions and atrocities – Environmental awareness – Working for the Sustainable development of the society

Values in Education system: Present Scenario- Engineering education –Current trends- Need for quality improvement- Adoption of value education – Principles of Integrity-Institutional Development.

UNIT – 4: Basic Concepts of Professional Ethics

Ethics, Morals and Human life , Types of Ethics, Personal Ethics, Professional ethics, Ethical dilemmas, Indian and Global thoughts on ethics, Profession, Professional and Professionalism, Ethical role of a professional Basic ethical principles, Some basic ethical theories, use of ethical theories.

Science, Religion Ethics, Genders and ethics, Media and ethics, Computer Ethics, Case Studies on Professional Ethics, Exemplary life sketches of prominent Indian personalities

UNIT-5: **Ethics in engineering profession**

Engineering profession-Technology and Society-Engineering as Social Experimentation-Engineering ethics-Ethical obligations of Engineering Professionals-Role of Engineers-Engineers as Managers-Professional responsibilities of Engineers- Engineers Responsibility for Safety- A few Case Studies on Risk management

Conflicts of Interest- Occupational Crimes- Plagiarism-Self plagiarism-Ethics Audit-Consideration for ethics audit-Ethics Standards and Bench Marking

Text Books:

1. Subramanian R., " Professional Ethics " , Oxford University Press , 2013
2. Nagarajan R.S., " A Text Book on Human Values and Professional Ethics " New Age Publications , 2007
3. Dinesh Babu S., " Professional Ethics and Human Values " , Laxmi Publications , 2007

Reference Books:

4. SantoshAjmera and Nanda Kishore Reddy " Ethics , Integrity and Aptitude " ,McGrawhill Education Private Limited , 2014
5. GovindaRajan M., Natarajan S., Senthil Kumar V.S." Professional Ethics and Human Values " Prentice Hall India Private Limited ,2012
6. Course Material for Post Graduate Diploma In "Value Education & Spirituality " Prepared by Annamalai University in Collaboration with Brahma Kumaris , 2010

EE 316 ELECTRICAL MACHINES -I LAB

Instruction	3 Periods per week
Duration of University Examination	3 Hours
University Examination	50 Marks
Sessional	25 Marks
Credits	2

Course Objectives:

1. To understand the performance & Load characteristics of different types of DC generators & Motors.
2. To understand the procedure to separate core losses in a single phase transformer, perform OC and SC test on transformer and conduct Sumpner's test on two identical transformers.
3. To understand the procedure to estimate the efficiency of DC machine by Hopkinson test.
4. To understand the control procedure and vary speed of DC shunt motor.
5. To understand the process of dynamic braking.

Course Outcomes: The student will be able to:

1. Acquire requisite knowledge to evaluate and compare the characteristics and performance aspects of different types DC generators and motors by conducting suitable tests.
2. Acquire knowledge to analyze the single phase transformer by performing the suitable tests.
3. Gain practical knowledge to know different losses and efficiency in DC machine and their dependence on other parameters such as speed, field current etc., and also calculate efficiency at different loads.
4. Gain knowledge to perform speed control of DC shunt motor
5. Calculate moment of inertia of DC machine through retardation curve.

List of Experiments:

1. Magnetization characteristics and the speed verses voltage curve of separately and self excited D.C. generator
2. Load characteristics of separately excited and self excited Shunt Generators
3. Load characteristics of DC Compound generator
4. Performance characteristics of Series Motor
5. Swinburne's Test & Performance characteristics of D.C. shunt motor.
6. Performance characteristics of DC Compound motor
7. Separation of iron and friction losses and estimation of parameters in D.C. machines.
8. Speed control of D.C. shunt motor by shunt field control and armature resistance control
9. Separation of core losses in a Single Phase transformer
10. Open circuit and short circuit tests on a Single Phase transformer
11. Sumpner's test on two identical transformers
12. Estimation of efficiency of DC Machine by Hopkinson test.
13. Retardation Test, Dynamic Braking of DC Shunt Motors.

Note: ATLEAST 10 EXPERIMENTS SHOULD BE CONDUCTED IN THE SEMESTER

EE 317 CONTROL SYSTEMS LAB

Instruction	3 Periods per week
Duration of Semester Examination	3 Hours
Semester Examination	50Marks
Sessional	25Marks
Credits	2

Course Objectives:

1. To understand the characteristics of DC, AC Servo Motors and synchro pair.
2. To understand the frequency response of compensating networks.
3. To study the closed loop performance for given plant using
   i) P, PI and PID controllers ii) ON/OFF controller.

Course Outcomes: The student will be able to

1. Obtain DC, AC Servo Motors and Synchro pair characteristics.
2. Design, Analyze and Simulate performance of a given second order plant from frequency and time response point of view.
3. Gain knowledge in visualizing the designing, functioning and simulation of compensators in improving the stability of the system.
4. Determine the time and frequency domain specifications of second order system
5. Acquire knowledge in analyzing the performance of P, PI, PID and ON/OFF controller and to distinguish the merits and de-merits of different types of controllers in closed loop environment.

List of Experiments:

PART A

Any Eight of the following experiments are to be conducted

1. Characteristics of D.C Servo motor.
2. Characteristics of A.C. Servo motor.
3. Characteristics of Synchro Pair.
4. Step response of second order system.
5. Frequency response of compensating networks.
6. Closed loop P, PI and PID Controller for temperature of a given plant.
7. Step response and Frequency response of a given plant.
8. Level Control system.
9. Temperature control system - ON/OFF Control.
10. a) Characteristics of magnetic amplifier.
    b) Step angle measurement for Stepper motor.
11. System simulator.

PART B

Any Two of the following simulation experiments are to be conducted using MATLAB

1. Stability Analysis (Root locus, Bode and Nyquist) for Linear Time Invariant systems.
2. a) Determining the Time Domain specifications for a second order system.
   b) Determining the Frequency Domain specifications for a second order system.
3. State space model for a given classical transfer function and its verification.
4. Compensator design (lag, lead and lag-lead).

With effect from the academic year 2015-2016

EE 318

LINEAR INTEGRATED CIRCUITS LAB

Instruction	3 Periods per week
Duration of University Examination	3 Hours
University Examination	50 Marks
Sessional	25 Marks
Credits	2

Course Objectives:

After completing the lab course, the students will be able to

1. Analyze and design various applications of Op-Amp
2. Design and construct waveform generation circuits
3. Design and implement timer and analog and digital circuits using op amps.
4. Design and implement combinational logic circuits using digital IC's
5. Design and implement Active Filters, such as Low pass, High Pass, Band Pass for various cut off frequencies.

Course Outcomes:

The student will be able to:

1. Design and conduct experiments using op-amps, as well as analyze and interpret result.
2. Design basic application circuits using op-amp.
3. Analyze circuits for inverting and non-inverting amplifiers, diff. amps and comparators.
4. Recognize and make use of the DC & AC limitations of OP-AMPS.
5. Understand and implements the working of basic digital circuits.

LIST OF EXPERIMENTS:

PART – A

I. Generation of triangular, sine and square wave using IC's.
2. PLL (Phase locked loop).
3. Design of astable multi-vibrator using 555 timer.
4. Active filters.
5. Instrumentation amplifier-Sample and hold circuit.
6. Design of integrator and differentiator using Op-Amp.
7. Clippers and clampers using Op-Amps.
8. Monostable operation using IC's.
9. Boot-strap sweep circuit using Op-Amp.

PART – B

1. Multiplexer-application for logic realization and parallel to serial Conversions.
2. Synchronous counters. .
3. Asynchronous counters.
4. Half adder, full adder and subtractor and realization of combinational logic.
5. A/D converters.
6. D/ A converters.

Note: At least **SIX experiments** from **PART-A** and **FOUR** from **PART-B** should be conducted in the semester.

SEM-II

With effect from the academic year 2015-2016

EE 321

ELECTRICAL MACHINERY-III

Instruction	4L+1T Periods per week
Duration of University Examination	3 Hours
University Examination	75 Marks
Sessional	25 Marks
Credits	3

Course Objectives:

1. To study the principles of synchronous machines
2. To understand different types of alternator regulation methods for wound rotor, salient pole types and about their parallel operation.
3. To discuss about synchronous motor performance and its starting methods.
4. Impart knowledge about transient behavior of synchronous machines and their stability
5. To familiarize the construction details, principle of operation, prediction of performance of Electrical special machines

Course Outcomes: The student will be able to:

1. Apply basic principles of synchronous machines
2. Acquire the concepts of synchronous machine design.
3. Acquire knowledge about operation, regulation and parallel operation of alternators
4. Obtain the concepts of synchronous motor and stability analysis of synchronous machines
5. Acquire the concept of Electrical permanent magnet and special machines such as permanent magnet motors, switched reluctance motors, Hysteresis motors, stepper motor and BLDC motor.

UNIT-I

Synchronous Machines: Constructional Details, Types of windings, Winding factors, e.m.f. equation, Fractional pitch and fractional slot windings, Suppression of harmonics and tooth ripple, Armature reaction and reactance, Synchronous impedance.

UNIT-II

Synchronous Machine Design: Output equation, Main dimensions, short Circuit Ratio (SCR). Length of air gap calculation, selection of armature slots, design of field system and design of turbo alternators.

UNIT-III

Synchronous Generator: Voltage Regulation, Phasor diagram of alternator with nonsalient poles, O.C. and S.C characteristics, Synchronous impedance, Ampere turn, ZPF methods for finding regulation, Principle of two reaction theory and its application for the salient pole synchronous machine analysis, Synchronism and parallel operation.

UNIT-IV

Synchronous Motor: Theory of operation, Vector diagram, Variation of current and power factor with excitation, Hunting and its prevention, Current and power diagram Predetermination of performance, Methods of Starting and Synchronizing. Synchronizing Power, Synchronous Condenser.

UNIT-V

Special Machines: Permanent Magnet Motors, Switched Reluctance Motors, Hysteresis Motors, Stepper motor and BLDC motor.

Text Books:

1. P.S. Bhimbra Electrical machinery, Khanna Publications, 7th edition, 2003.
2. Nagrath I.J & Kothari D.P, Electrical Machines,Tata McGraw Hill Publications, Sigma series, 2006
3. H.Cotton, Advanced Electrical Technology, Wheeler & Co,7th edition, CBS publishers,2005. 4. J.B Gupta ,S.K. Kataria & Sons, Theory & performance of electrical machines,14th edition, 2014.

Suggested Reading:

1. Juha Pyrho¨ nen, Tapani Jokinen and Valeria Hrabovcova, Design of rotating electrical machines, John Wiley & Sons, Ltd. 2008
2. Fitzgerald, Kingsley, Umans, Electric Machinery, Tata Mc-Graw Hill Publications, 6th edition, 2002
3. Ashfaq husain, Danpatrai and sons, Electrical machines, 3nd edition, 2012

With effect from the academic year 2015-2016

EE322 SWITCHGEAR AND PROTECTION

Instruction	4 Periods per week
Duration of University Examination	3 Hours
University Examination	75 Marks
Sessional	25 Marks
Credits	3

Course Objectives:

1. To analyze principles of operation of the different types of relays.
2. To comprehend the different principles of protective schemes in power system.
3. To understand the principles of operation of the different types of circuit breakers.
4. To be acquainted with different lightning arrestors and the appropriate circuit for the protection of the various components of power system

Course Outcomes: The student will be able to

1. Understand various components used in relays.
2. Analyze and Design the relay settings of over current and distance relays.
3. Differentiate between non-unit and unit protection schemes, and how the various associated parameters affect them.
4. Understand arc initiation and quenching mechanisms used in different circuit breakers.
5. Explain the causes, effects of over voltages and various protecting methods of the power system against over voltages.

Unit – I

Protective relays: Need for protection, Backup protection, Zones of protection, Definitions of relay pickup, dropout and reset values, Classification of relays, Operating principles and construction of electromagnetic and induction relays, Over current, Over voltage and Power relays, Directional features, Universal relay torque equation. Over current protection for radial feeders and ring mains, Protection of parallel lines, Relay settings for over Current relays, Earth fault and phase fault protection.

Unit – II

Static phase and Amplitude comparators: Characteristics of Dual input comparators, Distance protection, 3-step Distance relays, Characteristics Distance relays on the RX diagram, Sampling comparator, static over current relay, Microprocessor based over current relaying, Need of numerical relays, Advantages of numerical relays over solid state relays, Fundamentals of numerical relays, Functional block diagram of numerical relay.

Unit – III

Transformer and generator protection: Differential relays, Percentage differential relays, Protection of generator and transformer using percentage differential relays, Split phase, Inter turn protection, Overheating, Loss of excitation, Protection of generators, Protection of transformers against magnetizing inrush, Buchholz relay, Protection of earthing transformers, Generator transformer unit protection.

Unit – IV

Circuit breakers: Need for circuit breakers, Arc Properties, Principles of arc quenching theories, Recovery and Restriking voltages, Definitions in circuit breakers, Rated symmetrical and restricting asymmetrical breaking current, Rated making current, Rated capacity, Voltage and Frequency of circuit breakers, Current chopping,

Resistance switching, Derivations of RRRV, Maximum RRRV etc., Circuit breaker calculations, Types of circuit breakers, Oil, Poor oil, Air, Air blast, SF6 and Vacuum circuit breakers, Testing of circuit breakers.

Unit – V

Over voltage protection: Protection of transmission lines against direct lightening strokes, Ground wires, Protection angle, Protection zones, Height of ground wire, Conductor clearances. Conductor heights, Tower footing resistance and its effects, Equipment protection assuming rod gaps, Arcing horns, Different types of lightening arrestors, Their construction, Surge absorbers, Peterson coil, Insulation coordination.

Text Books:

1. C.L. Wadhwa, Electrical Power System, Wiley Eastern Ltd., 2nd Edition, 2013
2. Badriram & Viswakarma, Power System Protection and Switchgear, Tata McGraw Hill, 2011.
3. Sunil S. Rao Switchgear and Protection, Khanna Publications, 2008
4. J.B. Gupta, Switchgear and protection, S.K. Kataria& Sons, 3rd Edition, 2014.

Suggested Reading:

1 B. Ravindranath, M. Chander , Power System Protection and Switchgear, New Age International, 2011.
2 OZA, Power System Protection and Switchgear, Tata McGraw Hill, 2010.

With effect from the academic year 2015-2016

EE 323 MICROPROCESSORS AND MICROCONTROLLERS

Instruction	4 Periods per week
Duration of University Examination	3 Hours
University Examination	75 Marks
Sessional	25 Marks
Credits	3

Course Objectives:

1. To understand the Fundamentals of 8086 Microprocessors and its Programming.
2. To study the Interfacing of 8086 microprocessors using its various ports.
3. Fundamentals of 8051 Microcontroller, programming and its interfacing.
4. To know about the data converters and their interfacing with 8086 Microprocessor
5. To make students know about the various day-to-day applications of Microcontroller.

Course Outcomes: The student will be able to:

1. Understand the internal Architecture of both 8086 processor and 8051 microcontroller
2. Write assembly language programs on his own after gaining through knowledge of Instruction set.
3. Know how to establish communication between the processor/controller and peripheral devices.
4. Distinguish well between a Microprocessor and Microcontroller.
5. Write programs in assembly language with ease and co-relate them with high level language programs.

UNIT I

Introduction to Microprocessor and 8086 Microprocessor: Fundamentals of a microprocessor and its evolution, Architecture of 8086 Microprocessor- Segmented memory, Addressing modes, Instruction set, Pin diagram, Minimum and Maximum mode operations.

UNIT –II

Programming using 8086 Microprocessor: Assembly language programming (i.e. machine language programming), Assembler directives, simple programs using Assembler directives, strings, procedures, and Macros Timing.

UNIT –III

Interfacing with 8086 Microprocessor: Memory and I/O interfacing, A/D and D/A interfacing, 8255(PPI), Programmable Internal Timer (8253), Keyboard and display interface 8279, interrupts of 8086.

UNIT IV

Introduction to 8051 Microcontroller and its Programming: 8051 Microcontroller and its Architecture, I/O ports, Instruction set, Assembly language programming, connecting External memory.

UNIT V

Interfacing with 8051 Microcontroller, interrupts and special function registers: Interrupts, serial I/O, Timers, Counters, Applications of microcontrollers-Interfacing LEDs, Seven Segment display, Keyboard Interfacing, Induction to PIC Microcontroller.

Text Books:

1. A.K.Ray and K.M.Burchandi**,** 'Advanced Microprocessors and peripherals' - Tata McGraw Hill Co., 2006
2. Mohammad Ali Mazidi and Janice Gillespie Mazidi"- The 8051 Microcontroller and Embedded Systems" using assembly and 'c'—prentice hall of India, 2008

Suggested Reading:

1. Douglas. V.Hall- Microprocessors and Interfacing – Tata McGraw Hill- revised edition,2006.
2. Krishna Kant – Microprocessors and Microcontrollers-Architecture, Programming and System Design 8085, 8086, 8051, 8096, Prentice – Hall India- 2007.
3. Kenneth.J. Ayala – "The 8051 Microcontroller Architecture, Programming and Applications ", Thomson publishers, 2nd edition.

With effect from the academic year 2015-2016

EE 324 **DIGITAL SIGNAL PROCESSING**

Instruction	4 Periods per week
Duration of University Examination	3 Hours
University Examination	75 Marks
Sessional	25 Marks
Credits	3

Course Objectives:

1. To introduce basic concepts of signals and systems and representation of digital system.
2. To discuss DFT, DTFT, FFT, IFFT and Z transformation for the digital system analysis.
3. To make students familiar about design concepts of FIR and IIR filters.
4. To introduce digital signal processor.

Course Outcomes: The student will be able to:

1. Identify the digital system and find its response.
2. Compute and distinguish the DFT, DTFT, FFT and DFS of discrete systems.
3. Compute the Z transforms of discrete systems
4. Design FIR and IIR filter.
5. Be familiar with architecture and features of TMS 320F/2047 DSP.

UNIT-I

Introduction to Digital Signal Processing: Classification of Signals & Systems. Linear shift invariant systems, stability and causality, Sampling of Continuous signals, Signal Reconstruction, quantizing & encoding, linear constant co-efficient difference equations, properties of discrete system- linearity.

UNIT-II

Fourier Analysis: Distinguishing Fourier transform of discrete singular & discrete Fourier transform, Discrete Fourier series, Phase and amplitude spectra, Properties of Discrete Fourier Transform, Linear Convolution of sequence using DFT, Frequency domain representation of discrete time system DTFT and DFT, Computation of DFT. Fast Fourier transform: Radix-2 decimation in time and decimation in frequency FFT algorithms, Inverse FFT.

UNIT-III

Z- Transform: Application of Z- Transforms for solution of difference equations of digital filters system function, stability criterion, Realization of filters, direct, canonic. Cascade and parallel form, linear phase realization, Introduction to Cosine Transform and Wavelet Transform.

UNIT-IV

IIR Filters: Design of Butterworth Chebyshev filters, IIR. filter design by impulse invariant bilinear transformation, impulse invariance method, step invariance method

UNIT-V

FIR Filters: Characteristics of FIR Digital Filters. Frequency response, comparison of FIR, IIR filters, Window techniques, Design of these filters using Rectangular, Hamming, Bartlet, Kaiser windows, Architecture and features of TMS 320F/2047 and ADSP signal processing chips, Applications of DSP.

Text Books:

1. P. VenkataRamani, M.Bhaskar, "Digital Signal Processo1; Architecture, Programming & Application ", TataMcGrawHill-2004
2. Avatar Singh, S.Srinivasan, "Digital Signal Processing, Thomson Publication, 2004.
3. Lafley," DSP Processing. fundamentals. architecture & features. S.Chand publishers & Co. 2000.
4. Johan G Peoahis, Dimitris G Manolakis, Digital signal processing, 5th eidition, Pearson prentice Hall, 2007

Suggested Reading:

1. Jackson L.B. Digital Filters and Signal Processing. Second edition, Kluwer Academic Publishers , 1989.
2. Oppenheim A V, and Schafer R. W. Digital Signal Processing –Prentice Hall Inc. 1975.
3. Tarun Kumar Rawat Digital Signal Processing first edition Oxford higher education, 2015
4. Anand kumar A, Digital Signal Processing, Second edition PHI learing, 2015.

EE 325 **POWER ELECTRONICS LAB**

Instruction	3 Periods per week
Duration of University Examination	3 Hours
University Examination	50 Marks
Sessional	25 Marks
Credits	2

Course Objectives:

1. To obtain and plot the characteristics of different static switches.
2. To design the triggering and commutation circuits for SCR.
3. To observe the effect of freewheeling in converters.
4. To familiarize the conversion principle of AC-DC, DC-DC, DC-AC and AC-AC conversion circuits and their applications.
5. To be acquainted with simulation of different power converters.

Course Outcomes: The student will be able to

1. Analyze the effects of control signals on static switches.
2. Distinguish the characteristics of different controlled switches and their applications.
3. Demonstrate the effects of freewheeling.
4. Acquainted with the conversion principles of AC-DC, DC-DC, DC-AC and AC-AC converters
5. Know how to use the simulation software to design different power electronic circuits.

PART-A

1. S.C.R. Characteristics
2. BJT, MOSFET and IGBT Characteristics
3. Gate triggering circuits for SCR using R, RC and UJT.
4. Single phase step down Cycloconverter with R and RL loads.
5. A.C voltage controllers with R and RL loads.
6. Study of forced commutation techniques.
7. Two quadrant D.C drive.
8. Single phase fully controlled bridge rectifier with R and RL loads.
9. Single phase half controlled bridge rectifier with R and RL loads.
10. Buck and Boost choppers.
11. Study of 1 kVA UPS and SMPS for variable voltage with constant load, Constant voltage with variable load.
12. V/f control of AC drive.
13. Single phase inverter with R and RL Loads.

PART-B

1. Simulation of Single phase Full converter and Semi converter.
2. Simulation of Three phase Full converter and Semi converter.
3. Simulation of Single phase Inverter.
4. Simulation of Three phase Inverter.
5. Simulation of Single phase AC voltage controller.
6. Simulation of Single phase Cycloconverter.
7. Simulation of Single phase Inverter with single, multiple and sinusoidal pulse width modulations.

Note: At least **SEVEN experiments** from **PART-A** and **THREE** from **PART-B** should be conducted in the semester.

With effect from the academic year 2015-2016

EE 326 MICROPROCESSORS & MICROCONTROLLERS LAB

Instruction	3 Periods per week
Duration of University Examination	3 Hours
University Examination	50 Marks
Sessional	25 Marks
Credits	2

Course Objectives:

1. To write and execute simple programs using MASM software tool.
2. To get the students acquainted with the processor kit and improve their Programming skills
3. To make the students work with controller and understand how to program and get the desired output in different platforms.

Course Outcomes: The student will be able to:

1. Have command over basic assembly language programming.
2. Get familiarized with different assembly language software tools.
3. Know how a processor/controller will communicate with the External world
4. Do some mini projects.
5. understand other advanced Microcontrollers with basics of this basic Microcontroller

List of Experiments

For 8086Microprocessor:

Section 1: Using MASM/TASM (**Any 3 of** the below mentioned Expts. are to be conducted in this Section)

1. Programs for signed/unsigned multiplication and division.
2. Programs for finding average of N 16-bit numbers.
3. Programs for finding the largest number in an array.
4. Programs for code conversion like BCD numbers to 7-Segment.
5. Programs for computing factorial of a positive integer number.

Section 2: Using 8086 Kit(Interfacing) (**Any 2 of** the below mentioned Expts. are to be conducted in this Section)

1. 8255-PPI: Write ALP's to generate triangular, saw-tooth and square waveforms using DAC.
2. 8279-Keyboard Display: Write a small program to display a string of characters.
3. Write an ALP to display some alpha-numeric characters on a seven-segment display module.
4. Traffic Signal Controller.

For 8051 Microcontroller:

Section 3: Using 8051 Kit (**Any 3 of** the below mentioned Expts. are to be conducted in this section)

1. Data Transfer - Block move, Exchange, sorting, Finding largest element in an array.
2. Arithmetic Instructions :Multi byte operations
3. Boolean & Logical Instructions (Bit manipulations)
4. Use of JUMP and CALL instructions.
5. Programs to generate delay and programs using serial port and on chip timer/counter.

Section 4: Program Development using 'c' cross compiler for 8051 (**Any 2 of** the below mentioned Expts. are to be conducted in this section).

1. DAC interfacing for Generation of Sinusoidal Waveform.
2. Stepper motor control(clockwise and anticlockwise directions)
3. Interfacing of Keyboard and 7-segment Display Module.
4. ADC interfacing for temperature monitoring.

Major Equipment required for the LAB:

1. 8086 Microprocessor trainer kit(s) with in-built assembler/disassembler
2. 8051 Microcontroller trainer kit(s)
3. Interfacing Modules for both 8086 and 8051.
4. MASM Software and Kiel/Ride Cross-'c' compiler Software.

With effect from the academic year 2015-2016

EE 327 ELECTRICAL MACHINES -II LAB

Instruction		3 Periods per week Duration of
University Examination	3 Hours	
University Examination		50 Marks
Sessionals		25 Marks
Credits		2

Course Objectives:

1. To understand thoroughly Scott connection
2. To comprehend principles of regulation of alternator
3. To become familiar in operating the induction motor with various speed control methods.
4. To analyze the performance of three phase induction motor
5. To analyze the performance of synchronous motor.

Course Outcomes: The student will be able to:

1. Convert 3 supply to single phase supply
2. Synchronize alternator with grid.
3. Conclude better regulation method of synchronous generator.
4. Control the speed of 3Φ induction motor
5. Compensate reactive power of 3Φ induction motor.

List of Experiments:

1. Three phase to Two-phase conversion (Scott connection).
2. Heat run test on Three-phase transformer.
3. No-load test blocked rotor test and load test on 3-phase Induction motor.
4. Speed control of Three-phase Induction motor by any three of the following.
   a. Cascade connection b. Rotor impedance control c. Pole changing
   d. Rotor slip recovery, Kramer drive e. V/f control.
5. Parallel operation of Alternators.
6. Performance characteristics of Single-phase Induction motor.
7. Voltage regulation of Alternator by

a. Synchronous impedance method b. Ampere-turn method. c. Z.P.F. Method.

8. Regulation of Alternator by slip test.
9. Determination of V curves and inverted V curves of synchronous motor. 10. Power angle characteristics of a synchronous motor. 11. Load characteristics of Induction Generator.
12. P.F Improvement of Induction motor using capacitors.

Note: ATLEAST 10 EXPERIMENTS SHOULD BE CONDUCTED IN THE SEMESTER

With effect from the academic year 2015-2016

EE 351 ELECTRICAL ENGINEERING MATERIALS

(Elective -I)

Instruction	4 Periods per week
Duration of University Examination	3 Hours
University Examination	75 Marks
Sessional	25 Marks
Credits	3

Course Objectives: After the completion of the course the students should be able to:

1. Analyze the mechanical, magnetic and the electrical properties of materials.
2. Select materials for various engineering application.
3. Establish how failures occur in materials and how to prevent them.

Course Outcomes: The student will be able to

1. Classify the given material based on its properties.
2. Select a proper material for a given application.
3. Experiment on materials in order to test its adaptability
4. Investigate the suitability of material for the latest technological requirement
5. Compare and contrast the characteristics of the materials.

UNIT I:

Conducting Materials: Electrical conducting Materials, High conductivity materials, Materials of High Resistivity, Materials used for precision work, rheostats; heating devices, Super conductivity, Special types of alloys, Applications & Properties of semiconductors, Silicon wafers, integration techniques, Large and very large scale integration techniques (VLSI).

UNIT II:

Insulating Materials: Classification of Insulting materials, temperature rise, electrical properties of insulating materials used for wires-laminations- machines and their applications, Ceramics, Plastics, DC electrical properties, AC electrical properties, Dielectric properties of insulators, Dielectric materials used for various electrical applications, suitability.

UNIT III:

Magnetic Materials: Magnetic parameters, the three types of magnetic material, measuring magnetic materials, Application of soft magnetic materials, Magnetic recording media, Hard (permanent) magnets, Ferrites, Samarium, Cobalt alloys, Neodymium Iron Boron (Nd Fe B).

UNIT IV:

Optical properties of materials: EM Radiation Spectrum, Optical properties in materials, photo electric emission, Photo conductivity, Lasers, Optical fibres, Fibre cables.

UNIT V:

Materials for direct energy conversion devices: Solar cells, equivalent circuit of a solar cell, fuel cell, MHD generators, storage of hydrogen, thermoelectric generators, Nano applications in Electrical Engineering.

Text Books:

1. G.K Benergy; Electrical and Electronic engineering materials, PHI, 2014
2. Ian P. Jones; materials science for Electrical and Electronic Engineers, Oxford university press, 2008.

3. R. K Sukhla: Electrical Engineering Materials, MC Graw Hill Education, 2013.

Suggested Readings:

1. Dhir: Electronic components & materials, MC Graw Hill education, 2012.
2. TTTI Mardras: Electrical Engineering materials, MC Graw Hill education, 2014.

With effect from the academic year 2015-2016

EE 352

OPTIMIZATION TECHNIQUES
(Elective -I)

Instruction	4 Periods per week
Duration of University Examination	3 Hours
University Examination	75 Marks
Sessional	25 Marks
Credits	3

Course Objectives:

1. *To study about classical optimization techniques which include single variable and multi variable optimization with equality constraints.*
2. *To study about – linear programming.*
3. *To study non linear programming with gradient methods and direct search methods.*
4. *To study dynamic programming.*
5. *To study about Genetic algorithms, particle swarm optimization etc.*

Course Outcomes: The student will be able to :

1. *Acquire the knowledge of obtaining solution for classical optimization problems.*
2. *Acquire the concepts to formulate linear programming problem and get the solution with simplex method, Graphical method, Big-M method etc.*
3. *Acquire the knowledge to solve the nonlinear programming problems with various methods such as gradient methods, direct search methods, Fibonacci method and golden section method.*
4. *Acquire the knowledge to obtain the solution for dynamic programming problems.*
5. *Know the different selection mechanisms in Genetic algorithms, preliminary idea of particle swarm optimization and their application to economic load dispatch.*

UNIT I

Introduction: Classical optimization techniques: Statement of optimization problem, Objective function, Classification of optimization problems, Single-variable & Multi-variable Optimization without constraints. Multi-variable optimization with equality Constraints. Lagrange multiplier method, Multi-variable optimization with inequality constraints, Kuhn- Tucker conditions.

UNIT II

Linear programming: Standard form, Formulation of the LPP, Solution of simultaneous equations by Pivotal condensation, Graphical method, Simplex algorithm, Big M method,

UNIT III

Non-Linear Programming: One dimensional Search method: Fibonacci method, Golden Section method.
Direct Search method: Uni-variate Search and Pattern Search methods,
Gradient method: Steepest Descent, Conjugate Gradient and Quasi- Newton method,

UNIT IV

Dynamic Programming: Multistage design process, Types, Principle of optimality, Computational procedure in Dynamic programming, Examples using Calculus method and Tabular method of solutions.

UNIT-V

Metaheuristic Techniques :Introduction to Genetic Algorithms, Encoding, Fitness Function, Basic Operators, Section Tournament Selection, Introduction to Particle Swarm Optimization (PSO), variations of PSO, Differential Evolution, Function optimization Formulation, DE fundamentals, Application to Economic load dispatch.

Text Books:

1. S.S.Rao, Engineering Optimization Theory and Applications, New Age International, 3rdEdition, 1998.
2.Jasbir S.Arora, Introduction to Optimum Design, McGraw Hill International Edition,1989.

Suggested Reading:

1.Kalyamoy, Deb, Multi objective optimization using evolutionary algorithms, Wiley publications.
2. S. Rajasekharam, G.A. Vijaya Lakshmi, Neural networks, Fuzzy logic and Genetic algorithms – Synthesis and Applications, PHI publications.

With effect from the academic year 2015-2016

EE 353 ADVANCED CONTROL SYSTEMS
(Elective -I)

Instruction	4 Periods per week
Duration of University Examination	3 Hours
University Examination	75 Marks
Sessional	25 Marks
Credits	3

Course Objectives: The objective of the course is to:

1. *Understand the method of representing continuous time systems and obtain solution. Transfer function from state model, state-transitions matrix and solution of state equation for discrete systems.*
2. *Understand the concepts of controllability and observability tests for continuous time, Discrete - time and time invariant systems. Also, study SISO system., Pole Placement by state Feedback.*
3. *Understand the importance of response of non-linear systems and construction of phase plane trajectories.*
4. *Understand the procedures to perform stability study using Lyapunov's criteria and construction of Lyapunov function.*
5. *Understand the procedure to formulate the optimal control problem and variational calculus using Hamitonian method.*

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

1. *Represent continuous time systems and obtain solution. Transfer function from state model, solution of state equation and state transition matrix for discrete time systems.*
2. *Follow the concepts of controllability and observability - tests for continuous time, discrete-time and time invariant systems. More importantly can carryout analysis of SOSO system. Pole placement by state feedback.*
3. *Analysis the response of non-linear systems and construction of phase plane trajectories.*
4. *Carryout the stability study through Lyapunov's criteria and construction of Lyapunov function.*
5. *Formulate the optimal control problem and variational calculus using Hamiltonian method.*

UNIT-I

Review of state-space: representation of continuous time systems and their solution, state models for discrete time systems described as difference Equations and transfer functions, Transfer function from State model, State - Transition matrix and solution of state equations for discrete time systems.

UNIT--II

Controllability and Observability: Concepts of Controllability and Observability, Controllability tests for continuous time, discrete-time, time-invariant systems. Observability tests for continuous time, discrete - time, time-invariant systems. And Controllability and Observability modes in State. Jordan's canonical form, Controllable and Observable companion forms for single input single output Systems, pole placement by State feedback.

UNIT-III

Nonlinear systems: Behavior of Nonlinear systems, jump resonance, Sub-harmonic oscillation, Limit cycles, common physical non-linearities, Singular points, phase plane-method, Construction of phase plane trajectories, Isoclines method, Delta method, Computation of time.

UNIT-IV

Stability: Lyapunov's stability criteria, Theorems, Direct method of Lyapunov For linear systems, Non-Linear Systems, Methods of constructing Lyapunov function, Krasovki's Method, Variable gradient method.

UNIT-V

Optimal Control: Formulation of optimal control problem, calculus of variations, Minimization of functional. Formulation of variational calculus using Hamiltonian method.

Text Books:

1. Gopal.M., Modern Control System Theory, Wiley Eastern Limited, 2004.
2. Schulz D.G., Melsa J.L., State Functions Linear Control Systems, McGraw Hill.

Suggested Readings:

1. M. Gopal, Digital Control and State Variable Methods, Tata Mcgraw Hill, 2/e, 2003.
2. Ogata .K "Discrete Time control Systems", 2nd Edition, PHI publications, 1995

With effect from the academic year 2015-2016

EE 354 **RENEWABLE ENERGY SYSTEMS**
(Elective-1)

Instruction	4 Periods per week
Duration of University Examination	3 Hours
University Examination	75 Marks
Sessional	25 Marks
Credits	3

Course Objectives: The objective of the course is to:

1. *Understand procedures and importance of Energy Planning, co-generation, Alternative energy sources, Energy Scenario in India in terms of percentage of different sources of energy.*
2. *Understand the importance Non-convential energy sources such as wind and solar in the context of power generation from these sources and plans of power sector as well as thrust given.*
3. *Understand the technical parameter of PV systems - stand alone as grid connected schemes also its advantages and limitations.*
4. *Understand the technical parameter of solar thermal energy systems, solar cooking systems as heating systems covering its maintenance.*
5. *Understand the importance of importance of wind energy in the context of power shortage and to identify possible location for installation, design aspects of wind turbine systems and energy derived from wind turbine.*

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

1. *Acquire knowledge required for Energy planning, importance of co-generation. Alternative energy sources and Energy scenario in India indicates in terms percentage of different sources of energy.*
2. *Significance and importance of non-convential energy source such as wind and solar in the context to generate more power from reviewable energy sources and the thrust the India power sector is giving.*
3. *Importance of solar PV systems – stand alone and grid connected scheme. Also advantages and limitations of solar PV technology.*
4. *Importance solar thermal energy systems. Solar cooking system and solar heating systems including maintenance aspect.*
5. *Importance of wind energy in the context of power shortage in Indian power sector, design aspects of wind turbine systems and energy designed for wind turbine – wind power generation installations.*

UNIT-I

Basics of Energy: Energy and Power, Estimation of Energy Bill, Characteristics of energy, Energy parameters, Energy planning, cogeneration, classification of energy, Energy Resources, Alternative energy sources, Energy scenario in Indian context.

UNIT-II

Introduction to Energy Sources :Significance of non-conventional energy sources, solar energy, wind energy, energy from biomass and biogas, ocean energy, wave energy, Tidal energy, Geo thermal energy, fuel cell, MHD.

UNIT-III

Solar photovoltaic technologies: Solar spectrum, extraterrestrial radiation, solar radiation at a given location, Advantages and limitations of solar PV technology, PV Technology, Basics of Technology, The amount of power generated, the rated power and actual power from a module, Generating more power using solar PV, Generating more power using solar PV – Protection of solar cells., Solar PV systems and their components, Solar PV lantern, Stand – alone PV systems, Home lighting and other usage, solar PV water pumping system.

UNIT-IV

Solar thermal technologies: Solar Thermal Energy Systems, Absorption and Radiation, Solar Cooking systems, Principle of Cooking, Cooking by Boiling, speed of cooking, Types of Solar Cooker, Solar Distillation System, Operation of Solar Distillation, Solar Heating Systems (Hot water), Principle of Conversion, Applications, Types of Heating systems, design and costing of solar heating systems., Maintenance.

UNIT-V

Wind Energy: Wind Flow, Motion of wind, vertical wind speed variation, distribution of wind speeds, Power in the wind, conversion of wind power- wind turbine, Worldwide wind Installations, Wind Turbine Sizing and systems design, energy derived from a wind turbine, annual energy production- approximate and accurate, estimation of required wind turbine power rating.

Text Books:

1. Chetan singh solanki: Renewable Energy Technology, PHI, 2009 A practical guide for begineers.
2. B H Khan: Non conventional Enginery & Resources, MC Graw Hill education, 2012.
3. Er. R.K.Rajput: Non-Conventional Energy Sources and Utilization, S.Chand Publishing, 2014.

Suggested Readings:

1. Garg & prakash: Solar Energy" Fundamentals & Applications, MC Graw Hill education 2012.
2. DP Kothari: Singal & Ranjan Renewable Energy Sources & Emerging Technologies, PHI 2014.
3. G.S.Sawhney: Non-Conventional Energy Resources, PHI learning pvt ltd., edition 2012.

EE 328 **MINI PROJECTS**

Instruction	21 Periods
Duration of University Examination	3 Hours
University Examination	0 Marks
Sessional	25 Marks
Credits	1

Course Objectives: The objective of the course is to:

1. *Understand the methods to carryout mini project in the area pertaining to Electrical and Electronics Engineering.*
2. *Understand the procedures/ methods to formulate the project scope of work and collect required literature.*
3. *Familiarizing the way to problem formulation and identify suitable techniques to solve.*
4. *Summarize the results and draw the conclusions.*
5. *To get exposure in report writing and discuss the application aspect of the project.*

Course Outcomes: After completion of the course the student will be able to:

1. *Identify scope to carryout mini project in the area pertaining to Electrical and Electronics Engineering.*
2. *Formulate project scope and collect required information as literature survey.*
3. *Formulate problem to apply suitable techniques to solve.*
4. *Discuss the results and draw the conclusions*
5. *Discuss the aspect of suitable applications and also get exposure in report writing.*

Mini Project is a course that a student has to undergo during his/her academic term, which involves the student to explore in a discipline that belongs to their research interest within their program area. It is a credit based course. The Mini Project shall be carried out during 6th semester along with other lab courses by having regular weekly slots. Students will take mini project batch wise and the batches will be divided as per the guidelines. The topic of mini project should be so selected enabling the students to complete the work in the stipulated time with the available resources in the respective laboratories. The scope of the mini project could be handling part of the consultancy work, maintenance of the existing equipment, development of new experiment setup or can be a prelude to the main project with a specific outcome.

With effect from the academic year 2015-2016

EE 329 **INDUSTRY VISIT**

Least 3 days in semester	3 x 8 =24 hours
Sessional /Examination	*Grade

Course Objectives: The objective of the course is to:

1. *Physically see the process of manufacturing procedure and steps involved.*
2. *Collect the information in respect of materials, sources of supply.*
3. *Understand the sequential stages involved in manufacturing process.*
4. *Understand the procedure to write the 'industry visit' technical report by compiling all the information collected during the visit.*
5. *Understand the safety procedures and pre-cautions followed in Industry, confidentiality of the process and the man power required.*

Course Outcomes: After completion of the course the student will be able to:

1. *Know the importance of visiting an engineering industry from the point of view of process of manufactory procedures and set-up.*
2. *Summarize the required information with regard to materials, source of supply in respect of a product.*
3. *Know the stages in manufactory of a product*
4. *Prepare the 'industry visit' technical report covering the details of visit and it importance.*
5. *Visualize the safety precautions to be follow in industry, confidentiality of the product processing as the man power required.*

Students are expected to visit at least two industries during the semester and submit a detailed technical report on the study -visits to the Department. The Department should evaluate the reports through a Committee consisting of Head of the Department and two more faculty members to award the Grades *.

*Excellent /Very Good/Good /Satisfactory /Unsatisfactory.

CHAITANYA BHARATHI INSTITUTE OF TECHNOLOGY
SCHEME OF INSTRUCTIONS- Dept. of EEE

III YEAR (2015-16 Academic year)

I SEMESTER

THEORY						
S.No	**Code**	**Subject**	**L**	**T**	**P**	**Credits**
1	EE 311	Power Systems – II	4	0	0	3
2	EE 312	Electrical Machinery – II	4	1	0	3
3	EE 313	Linear Control Systems	4	1	0	3
4	EE 314	Power Electronics	4	1	0	3
5	EE 315	Linear Integrated Circuits	4	0	0	3
6	CE 444	Human Values and Professional Ethics	2*	0	0	0
PRACTICALS						
7	EE 316	Electrical Machinery – I Lab	0	0	3	2
8	EE 317	Control Systems Lab	0	0	3	2
9	EE 318	Linear Integrated Circuits Lab	0	0	3	2
		TOTAL	**22**	**03**	**09**	**21**

*21 Periods per semester

II Semester

THEORY						
S.No	**Code**	**Subject**	**L**	**T**	**P**	**Credits**
1	EE 321	Electrical Machinery - III	4	1	0	3
2	EE 322	Switch Gear & Protection	4	0	0	3
3	EE 323	Microprocessor & Microcontrollers	4	0	0	3
4	EE 324	Digital Signal Processing	4	1	0	3
5	EE 351 EE 352 EE 353 EE 354	Elective – I 1. Electrical Engineering Materials 2. Optimization Techniques 3. Advanced Control System 4. Renewable Energy Systems	4	0	0	3
PRACTICALS						
6	EE 325	Power Electronics Lab	0	0	3	2
7	EE 326	Microprocessor & Microcontrollers Lab	0	0	3	2
8	EE 327	Electrical Machinery – II Lab	0	0	3	2
9	EE 328	Mini Project *	0	0	0	1
10		Industry Visit *	0	0	0	Grade
		TOTAL	**20**	**02**	**09**	**22**

* Only internal evaluation

SEM-I

EE 311 **POWER SYSTEMS - II**

Instruction	4 Periods per week
Duration of University Examination	3 Hours
University Examination	75 Marks
Sessional	25 Marks
Credits	3

Course Objectives

1. *To understand Inductance and capacitance calculations for different line configurations*
2. *To understand per unit system representation in power systems.*
3. *To understand the importance of transmission line representation in terms of short, medium and long lines in finding performance of lines*
4. *To understand the importance of symmetrical and un-symmetrical faults in power systems.*
5. *To study the causes of over voltages and bewley lattice diagram.*

Course Outcomes: The student will be able to

1. *Acquire knowledge in calculation of inductance and capacitance of lines*
2. *Acquire knowledge to represent the power system data in per unit and consider appropriate line models to find the performance of transmission lines*
3. *Acquire the concepts of corona and effect of corona in power system.*
4. *Acquire knowledge to study different types of faults, and its relevance in relay settings.*
5. *Acquire knowledge in finding the transmission line wave equation and able to find various coefficients of lines and draw the Bewley Lattice diagram.*

UNIT-I

Line Parameter Calculations: Calculating Inductance & Capacitance of Transmission Lines, single phase and three phase symmetrical composite conductors, GMD, GMR, Transposition of conductors, Bundled conductors, effect of earth capacitance.

UNIT-II

Modeling of Transmission Lines: Short, medium, long lines, Line calculations, Tuned Lines, Surge impedance loading.

Corona: Causes, Disruptive and Visual Critical Voltages, Power loss, minimization of Corona effects.

UNIT-III

Per Unit System of Representation: Use of per unit quantities in power systems, Advantages of per unit system.

Symmetrical Faults: Short Circuit Currents, Reactance of Synchronous Machines, fault Calculations, Short circuit capacity of a bus.

UNIT-IV

Unsymmetrical Faults: Symmetrical components of unsymmetrical Phasors, Power in terms of symmetrical components, sequence impedance and sequence networks. Sequence networks of unloaded generators, Sequence impedances of circuit elements, Single line to ground, line-to-line and double line to ground faults on unloaded generator, Unsymmetrical faults of power systems.

UNIT-V

Transients in Power Systems: Causes of over voltages. Travelling Wave Theory, Wave equation, Reflection and refraction Coefficients, Junction of Cable and overhead lines, Junction of three lines of different natural impedances, Bewley Lattice diagram.

Text Books

1. C.L. Wadhwa, Electrical Power Systems, Wiley Eastern Ltd., 4dtEdition, 2006
2. I.J. Nagrath & D.P.Kothari Modern Power Systems Analysis, TMH Edition, 2003.

Suggested Reading

1. John J. Grainger William D.Stevenson Jr. Power System Analysis, Tata McGraw Hill Edn. 2003
2.A.Chakrabarti, M.L.Soni, P. V.Gupta, U.S.Bhatnagar, A Text book on Power System, Dhanpat Rai & Co (P) Ltd -1999.

EE 312 **ELECTRICAL MACHINERY-II**

Instruction	4L+1T Periods per week
Duration of University Examination	3 Hours
University Examination	75 Marks
Sessional	25 Marks
Credits	3

Course Objectives:

1. To study the principles of tap changing, tests and auto-transformer.
2. To understand different types of three phase induction motors.
3. To discuss about speed control and starting methods of three phase induction motors.
4. To analyze unbalanced operation of three phase induction motors and three phase transformers.
5. To familiarize the construction details, principle of operation, prediction of performance of single phase induction motors.

Course Outcomes: The student will be able to:

1. Apply basic principles of tap changing and auto-transformer.
2. Acquire knowledge about operation and performance analysis of three phase induction motors.
3. Obtain the concepts of speed control and starting methods of three phase induction motors.
4. Analyze unbalanced operation of three phase induction motors and three phase transformers.
5. Acquire the concept of single phase induction motors.

UNIT-I

Transformers: Cooling arrangement in Transformers. Testing of Transformers, Routine Tests and Special tests, Measurement of Voltage ratio and check for voltage vector relationship. Measurement of Insulation resistance. Maintenance of Transformers. Tap changer on transformers, No-load tap changer, On-load tap changer. Third harmonic voltages and tertiary winding in three phase transformers, Auto Transformer, Comparison with two winding transformers, Conversion of two winding transformer to auto transformer.

UNIT-II

Three-phase Induction Motor: Constructional features, Rotating Magnetic field theory, Principle of operation of squirrel cage and slip ring motors, Vector Diagram, Equivalent circuit, Expression for torque, Starting torque, Maximum torque, Slip/Torque characteristics, Performance characteristics, Equivalent circuits from test, Current loci circle diagram, Predetermination of characteristics of Induction Motors.

UNIT-III

Starting methods of Induction motors: Modes of operation, torque and power limits of Induction motors, Speed control methods, Resistance Control, Voltage control, pole changing, Cascading, variable frequency control, Slip power recovery schemes Kramer drive. Scherbius drive, Double cage Induction motors, Induction generator, Doubly fed Induction Generator.

UNIT-IV

Unbalanced Operation: Voltage Unbalance, Unbalanced Operation of 3-phase Induction Motor, Per Phase Equivalent Circuits, Single Phasing, Unbalanced Operation of 3-Phase Transformers, Single-phase load on Three-phase transformers Single Phasing in 3-phase transformers- Delta /Star and Star/Delta transformers.

UNIT-V

Single Phase motors: Single phase motors, Theory and operation of single phase motors, Shaded pole, Split phase and capacitor motors, Compensated and uncompensated series and repulsion motors. Linear Induction motors.

Text Books:

1. P.S. Bhimbra Electrical machinery, Khanna Publications, 7th edition, 2003.
2. Nagrath I.J & Kothari D.P, Electrical Machines, Tata McGraw Hill Publications, Sigma series, 2006.
3. H.Cotton, Advanced Electrical Technology, Wheeler & Co,7th edition, CBS publishers,2005.
4. Theory and performance of electrical machines by J.B Gupta ,S.K. Kataria & Sons,14th edition,2014.

Suggested Reading:

1. Juha Pyrho¨ nen, Tapani Jokinen and Valeria Hrabovcova, Design of rotating electricalmachines, John Wiley & Sons, Ltd. 2008.
2. Fitzgerald, Kingsley, Umans, Electric Machinery, Tata Mc-Graw Hill Publications, 6th edition, 2002.
3. Electrical machines by Ashfaq husain, Danpatrai and sons, 3nd edition, 2012

EE 313 LINEAR CONTROL SYSTEMS

Instruction	4L + 1T Periods per week
Duration of Semester Examination	3Hours
Semester Examination	75Marks
Sessional	25Marks
Credits	3

Course Objectives:

1. To understand different types of linear control systems and their mathematical modeling.
2. To study the transfer functions of control system components
3. To study Stability analysis, both in time and frequency domains
4. To study the concepts of State space representation of Linear Time invariant systems (LTI)

Course Outcomes: The student will be able to:

1. Build different mathematical models for any LTI physical /electrical systems
2. Derive the transfer function of components used in feedback control systems
3. Apply the concepts of stability analysis in time and frequency domains, which is essential to analyze any system performance.
4. Apply the concepts of state space controls
5. Design conventional controllers and compensators used for closed loop performance.

UNIT I

Introduction: Concepts of control systems- Open loop and closed loop control systems and their differences, Different examples of control systems, Classification of control systems, Feedback Characteristics, Effects of feedback. Mathematical models, Differential equations, Impulse Response and transfer functions, Translational and Rotational mechanical systems, Analogous systems.

UNIT –II

Transfer Function Representation: Two Phase Serve motor characteristics, Transfer Function of DC and AC Servo motor, Potentiometers, Synchro transmitter and Receiver, Tacho generator, Stepper Motor characteristics, Block diagram algebra, signal flow graphs and problems.

UNIT –III

Time Response Analysis: Standard test signals, Time response of first/second order systems, Transient response of second order system for step input. Time domain specifications, Types of systems, static error coefficients, Routh-Hurwitz criterion of stability, Root locus technique, Typical systems analyzed by root locus technique, Effect of location of roots on system response, PID Controllers.

UNIT IV

Frequency Response Analysis: Introduction, Frequency domain specifications for a second order system, Bode plots, Stability Analysis from Bode plots. Polar plots, Nyquist criterion for stability. Compensation techniques, Lag, Lead, Lead-Lag Controllers design in frequency domain.

UNIT V

State Space Representation: Concept of state, state variable, state models of linear time invariant systems, Derivation for state models from transfer functions and differential equations, State transition matrix-solution of state equations by time domain method. Obsevability and Controllability, Introduction to discrete control systems.

TEXT BOOKS:

1. I.J.Nagrath, M.Gopal, Control System Engineering, New Age International (P) Limited Publishers, 5th Edition, 2008.
2. B.C. Kuo, Automatic Control Systems, John wiley and son's Publishers, 9th edition, 2009
3. K.Ogata, Modern Control Systems, 5th Edition.PHI publication, 2010.
4. A. Anand Kumar, Control Systems, 2nd Edition, PHI publications, 2014.

Suggested Reading:

1. M.Gopal, Control Systems Principles and Design- Tata McGraw Hill, 2nd Edition, 2003.
2. N.C Jagan-control Systems, 2nd Edition, BS Publications, 2008
3. N. Nise, Control Systems Engineering, 6th edition, Willey Publications, 2011.
4. Linear Control System analysis and design with MATLAB, Taylor & Francis D'Azzo- Control Systems, 2009

EE 314 **POWER ELECTRONICS**

Instruction	4L+1T Periods per week
Duration of University Examination	3 Hours
University Examination	75 Marks
Sessional	25 Marks
Credits	3

Course Objective: The objective of the course is to

1. Introduce the characteristics of various power semiconductor switches and their applications.

2. Make acquainted with the operating principles of AC-DC, DC-DC, AC-AC and DC-AC converters, methods of voltage control and converters applications.

Course Outcomes: The student will be able to:

1. *Gain knowledge of basic operation of various power semiconductor devices and to compare their characteristics.*
2. *Design protection circuit and control circuits for SCR.*
3. *Acquaint with the principles of phase controlled converters.*
4. *Analyze the operation principles of different DC-DC, AC-AC converters.*
5. *Identify different topologies of DC-AC converters.*

UNIT-I

Power Diodes and Transistors: Power diode, characteristics, Recovery characteristics, Types of power diodes, General purpose diodes, Fast recovery diodes, their applications. Bipolar Junction Transistors(BJT), Power MOSFETs, IGBTs-Basic structure and working, Steady state and switching characteristics, Comparison of BJT, MOSFET and IGBT, Their applications.

UNIT-II

Silicon Controlled Rectifier (SCR): SCR-Static characteristics, Two transistor analogy, Protection of SCRs, Dynamic characteristics, Series and parallel operation of SCRs, SCR trigger circuits-R, RC and UJT triggering circuits, Commutation methods of SCR.

UNIT-III

Principles of phase controlled converters: Study of Single-phase and three-phase half wave and full wave controlled rectifiers with R, RL, RLE loads, significance of freewheeling diode, Effect of source inductance, Dual converters - circulating and non circulating current modes.

UNIT-IV

DC-DC Converters: Principles of Step-down, Step-up, Step UP/Down choppers, Time ratio control and current limit control, Types of choppers Type- A, B, C, D and E, Introduction to Buck, Boost and Buck-Boost regulators.

AC-AC Converters:

Principle of operation of Single phase Cyclo-converters and their applications. Single-phase AC Voltage Controllers with R and RL loads.

UNIT-V

Inverters: Principle of operation of Single-phase Inverters, Voltage control methods, Single pulse width modulation, Multiple pulse width modulation, Sinusoidal pulse width modulation, Comparison of Voltage Source Inverters and Current Source Inverters, Three-phase bridge Inverters, 180^0 & 120^0 modes of operation.

Text Books:

1. Singh.M.D and Khanchandani.K.B,Power Electronics, Tata McGraw Hill, 2nd Edition, 2006.
2. Rashid.M.H. Power Electronics Circuits Devices and Applications. Prentice Hall of India, 2003
3. Bimbra.P.S, Power Electronics, Third Edition, Khanna Publishers, 2013

Suggested Reading:

1. Mohan, Undeland , Robbins, Power Electronics, John Wiley, 1996.
2. P.C.Sen, Power Electronics, Tata Mc-Graw Hill, 1st Edition, 2001.

EE 315 **LINEAR INTEGRATED CIRCUITS**

Instruction	4 Periods per week
Duration of University Examination	3 Hours
University Examination	75 Marks
Sessional	25 Marks
Credits	3

Course Objectives:

1. To study the characteristics of operational amplifiers, stability, basic applications such as integrator, differentiator etc.,
2. To study the different applications of operational amplifiers in voltage limiter, Schmitt trigger, instrumentation circuits.
3. To study the concepts of waveform generation, sine, square, triangular using op-amps.
4. To study the operation of 555 timer as a monostable and an astable multivibrator.
5. To study different types of voltage regulator, Filters and their characteristics.

Course Outcomes: The student will be able to:

1. Understand the basic characteristics of op-amps and their significance.
2. Analyze a typical op-amp equivalent circuit by calculating its voltage gain and input resistance.
3. Define stability for a amplifier circuit.
4. Analyze an instrumentation amplifier circuit and discuss its applications.
5. Analyze higher order filter circuits and explain their significance.
6. Analyze and design voltage regulators (Fixed voltage and adjustable voltage).

UNIT-I

Operational Amplifiers Characteristics: open loop voltage gain, output impedance, input impedance, common mode rejection ratio, Offset balancing techniques, Slew rate, Frequency response, Stability, frequency compensation of Op-amp.

Basic OP-Amp Applications: inverter summer, analog integrator, differentiator, current to voltage converter, voltage to current converter, voltage follower, ac amplifier.

UNIT-II

OP-Amp Applications: Voltage limiter, clipper & clamper, precision rectifier, full wave and half wave, peak detector, comparator, zero crossing detector, Schmitt trigger, monostable, astable, bistable multiplier, divider, difference amplifier instrumentation amplifier circuits using Op-amps.

UNIT-III

Waveform Generation using Op-Amps: Sine, Square, Triangular and Quadrature oscillators, voltage controlled oscillator / multi vibrator, voltage to frequency converter, 555 timer functional diagram, operation as monostable and astable. phase locked loop, A/D and D/ A converters.

UNIT-IV

Voltage Regulators: Series voltage regulator using Op-amp, shunt regulators using Op-amp, switching regulators using Op-amp, dual voltage regulator, fixed voltage regulators, dual tracking regulators, hybrid regulator, current sensing and current feedback protection.

UNIT-V

Filters: RC active filters, low pass, high band pass, band reject, notch, first order, second order transformation, state variable filter, switched capacitor filter, universal filter, Balanced modulator/ demodulator.

Text Books:

1. D.Roy Choudhury, Linear Integrated Circuits, Shail B.Jain, 3rd Edition, New Age International(P) Ltd., 2007.
2. Malvino Albert Paul, Electronic Principles, 7th Edition, Tata McGraw Hill, 2006
3. Coughlin and Driscoll, Operational Amplifiers and Linear integrated Circuits, 6th Edition, Prentice hall of India 2003.

Suggested Reading:

1. Gayakwad R.A. Op-Amps and Linear Integrated Circuits, 4th Edition, Prentice Hall of India, 2002.
2. David A. Bell, Operational Amplifiers and Linear IC s, PHI, 2003.

CE 444 HUMAN VALUES AND PROFESSIONAL ETHICS

Instructions	: 21 Periods per semester (7*3)
Duration of University Examination	: 2 Hours
University Examination	: 50 Marks
Sessional	: Nil
Credits	: Nil

Course Objectives:

1. To develop the critical ability among students to distinguish between what is of value and what is superficial in life
2. To enable the students understand the values, the need for value adoption and prepare them meet the challenges
3. To enable the students develop the potential to adopt values, develop a good character and personality and lead a happy life
4. To motivate the students practice the values in life and contribute for the society around them and for the development of the institutions /organisation around they are in.
5. To make the students understand the professional ethics and their applications to engineering profession

Course Outcomes

1. Students develop the capability of shaping themselves into outstanding personalities, through a value based life.
2. Students turn themselves into champions of their lives.
3. Students take things positively, convert everything into happiness and contribute for the happiness of others.
4. Students become potential sources for contributing to the development of the society around them and institutions / organisations they work in.
5. Students shape themselves into valuable professionals, follow professional ethics and are able to solve their ethical dilemmas.

UNIT-1 Concepts and Classification of Values –Need and challenges for value Adoption

Definition of Values – Concept of Values – Classification of Values – Hierarchy of Values – Types of Values –Espoused and Applied Values – Value judgement based on Culture – Value judgement based on Tradition – Interdependence of Values

Need for value education – Findings of Commissions and Committees - Corruption and illegal practices – Science and Technology without values- Exploitation of nature – Increasing use of violence and intoxicants – Lack of education in values – Implications of education in values – Vision for a better India

Challenges for Value adoption – Cultural, Social, Religious, Intellectual and Personal challenges

UNIT – 2: Personal Development and Values in Life

Personal Development: Enlightened self-interest – Accountability and responsibility – Desires and weaknesses – Character development – Good relationships, self-restraint, Spirituality and Purity – The quest for Character – Tests of Character – The key to good character

Values in Life: Building an ethical policy – Integrating values in everyday life – Archaic Social Values – Parenting practices – Critical Thinking - Analyzing and Prioritizing values – Practicing Yoga and Meditation

UNIT – 3: Practicing Values for the development of Society

Resentment Management and Self-analysis – Positive Thinking and Emotional Maturity – The importance of Women , Children and Taking care of them – Helping the poor and needy – Fighting against addictions and atrocities – Environmental awareness – Working for the Sustainable development of the society

Values in Education system: Present Scenario- Engineering education –Current trends- Need for quality improvement- Adoption of value education – Principles of Integrity-Institutional Development.

UNIT – 4: Basic Concepts of Professional Ethics

Ethics, Morals and Human life , Types of Ethics, Personal Ethics, Professional ethics, Ethical dilemmas, Indian and Global thoughts on ethics, Profession, Professional and Professionalism, Ethical role of a professional Basic ethical principles, Some basic ethical theories, use of ethical theories.

Science, Religion Ethics, Genders and ethics, Media and ethics, Computer Ethics, Case Studies on Professional Ethics, Exemplary life sketches of prominent Indian personalities

UNIT-5: **Ethics in engineering profession**

Engineering profession-Technology and Society-Engineering as Social Experimentation-Engineering ethics-Ethical obligations of Engineering Professionals-Role of Engineers-Engineers as Managers-Professional responsibilities of Engineers- Engineers Responsibility for Safety- A few Case Studies on Risk management

Conflicts of Interest- Occupational Crimes- Plagiarism-Self plagiarism-Ethics Audit-Consideration for ethics audit-Ethics Standards and Bench Marking

Text Books:

1. Subramanian R., " Professional Ethics " , Oxford University Press , 2013
2. Nagarajan R.S., " A Text Book on Human Values and Professional Ethics " New Age Publications , 2007
3. Dinesh Babu S., " Professional Ethics and Human Values " , Laxmi Publications , 2007

Reference Books:

4. SantoshAjmera and Nanda Kishore Reddy " Ethics , Integrity and Aptitude " ,McGrawhill Education Private Limited , 2014
5. GovindaRajan M., Natarajan S., Senthil Kumar V.S." Professional Ethics and Human Values " Prentice Hall India Private Limited ,2012
6. Course Material for Post Graduate Diploma In "Value Education & Spirituality " Prepared by Annamalai University in Collaboration with Brahma Kumaris , 2010

EE 316 **ELECTRICAL MACHINES -I LAB**

Instruction	3 Periods per week
Duration of University Examination	3 Hours
University Examination	50 Marks
Sessional	25 Marks
Credits	2

Course Objectives:

1. To understand the performance & Load characteristics of different types of DC generators & Motors.
2. To understand the procedure to separate core losses in a single phase transformer, perform OC and SC test on transformer and conduct Sumpner's test on two identical transformers.
3. To understand the procedure to estimate the efficiency of DC machine by Hopkinson test.
4. To understand the control procedure and vary speed of DC shunt motor.
5. To understand the process of dynamic braking.

Course Outcomes: The student will be able to:

1. Acquire requisite knowledge to evaluate and compare the characteristics and performance aspects of different types DC generators and motors by conducting suitable tests.
2. Acquire knowledge to analyze the single phase transformer by performing the suitable tests.
3. Gain practical knowledge to know different losses and efficiency in DC machine and their dependence on other parameters such as speed, field current etc., and also calculate efficiency at different loads.
4. Gain knowledge to perform speed control of DC shunt motor
5. Calculate moment of inertia of DC machine through retardation curve.

List of Experiments:

1. Magnetization characteristics and the speed verses voltage curve of separately and self excited D.C. generator
2. Load characteristics of separately excited and self excited Shunt Generators
3. Load characteristics of DC Compound generator

4. Performance characteristics of Series Motor
5. Swinburne's Test & Performance characteristics of D.C. shunt motor.
6. Performance characteristics of DC Compound motor

7. Separation of iron and friction losses and estimation of parameters in D.C. machines.
8. Speed control of D.C. shunt motor by shunt field control and armature resistance control
9. Separation of core losses in a Single Phase transformer

10. Open circuit and short circuit tests on a Single Phase transformer

11. Sumpner's test on two identical transformers
12. Estimation of efficiency of DC Machine by Hopkinson test.
13. Retardation Test, Dynamic Braking of DC Shunt Motors.

Note: ATLEAST 10 EXPERIMENTS SHOULD BE CONDUCTED IN THE SEMESTER

EE 317 CONTROL SYSTEMS LAB

Instruction	3 Periods per week
Duration of Semester Examination	3 Hours
Semester Examination	50Marks
Sessional	25Marks
Credits	2

Course Objectives:

1. To understand the characteristics of DC, AC Servo Motors and synchro pair.
2. To understand the frequency response of compensating networks.
3. To study the closed loop performance for given plant using
   i) P, PI and PID controllers ii) ON/OFF controller.

Course Outcomes: The student will be able to

1. Obtain DC, AC Servo Motors and Synchro pair characteristics.
2. Design, Analyze and Simulate performance of a given second order plant from frequency and time response point of view.
3. Gain knowledge in visualizing the designing, functioning and simulation of compensators in improving the stability of the system.
4. Determine the time and frequency domain specifications of second order system
5. Acquire knowledge in analyzing the performance of P, PI, PID and ON/OFF controller and to distinguish the merits and de-merits of different types of controllers in closed loop environment.

List of Experiments:

PART A

Any Eight of the following experiments are to be conducted

1. Characteristics of D.C Servo motor.
2. Characteristics of A.C. Servo motor.
3. Characteristics of Synchro Pair.
4. Step response of second order system.
5. Frequency response of compensating networks.
6. Closed loop P, PI and PID Controller for temperature of a given plant.
7. Step response and Frequency response of a given plant.
8. Level Control system.
9. Temperature control system - ON/OFF Control.
10. a) Characteristics of magnetic amplifier.
    b) Step angle measurement for Stepper motor.
11. System simulator.

PART B

Any Two of the following simulation experiments are to be conducted using MATLAB

1. Stability Analysis (Root locus, Bode and Nyquist) for Linear Time Invariant systems.
2. a) Determining the Time Domain specifications for a second order system.
   b) Determining the Frequency Domain specifications for a second order system.
3. State space model for a given classical transfer function and its verification.
4. Compensator design (lag, lead and lag-lead).

EE 318

LINEAR INTEGRATED CIRCUITS LAB

Instruction	3 Periods per week
Duration of University Examination	3 Hours
University Examination	50 Marks
Sessional	25 Marks
Credits	2

Course Objectives:

After completing the lab course, the students will be able to

1. Analyze and design various applications of Op-Amp
2. Design and construct waveform generation circuits
3. Design and implement timer and analog and digital circuits using op amps.
4. Design and implement combinational logic circuits using digital IC's
5. Design and implement Active Filters, such as Low pass, High Pass, Band Pass for various cut off frequencies.

Course Outcomes:

The student will be able to:

1. Design and conduct experiments using op-amps, as well as analyze and interpret result.
2. Design basic application circuits using op-amp.
3. Analyze circuits for inverting and non-inverting amplifiers, diff. amps and comparators.
4. Recognize and make use of the DC & AC limitations of OP-AMPS.
5. Understand and implements the working of basic digital circuits.

LIST OF EXPERIMENTS:

PART – A

I. Generation of triangular, sine and square wave using IC's.
2. PLL (Phase locked loop).
3. Design of astable multi-vibrator using 555 timer.
4. Active filters.
5. Instrumentation amplifier-Sample and hold circuit.
6. Design of integrator and differentiator using Op-Amp.
7. Clippers and clampers using Op-Amps.
8. Monostable operation using IC's.
9. Boot-strap sweep circuit using Op-Amp.

PART – B

1. Multiplexer-application for logic realization and parallel to serial Conversions.
2. Synchronous counters. .
3. Asynchronous counters.
4. Half adder, full adder and subtractor and realization of combinational logic.
5. A/D converters.
6. D/ A converters.

Note: At least **SIX experiments** from **PART-A** and **FOUR** from **PART-B** should be conducted in the semester.

SEM-II

EE 321

ELECTRICAL MACHINERY-III

Instruction	4L+1T Periods per week
Duration of University Examination	3 Hours
University Examination	75 Marks
Sessional	25 Marks
Credits	3

Course Objectives:

1. To study the principles of synchronous machines
2. To understand different types of alternator regulation methods for wound rotor, salient pole types and about their parallel operation.
3. To discuss about synchronous motor performance and its starting methods.
4. Impart knowledge about transient behavior of synchronous machines and their stability
5. To familiarize the construction details, principle of operation, prediction of performance of Electrical special machines

Course Outcomes: The student will be able to:

1. Apply basic principles of synchronous machines
2. Acquire the concepts of synchronous machine design.
3. Acquire knowledge about operation, regulation and parallel operation of alternators
4. Obtain the concepts of synchronous motor and stability analysis of synchronous machines
5. Acquire the concept of Electrical permanent magnet and special machines such as permanent magnet motors, switched reluctance motors, Hysteresis motors, stepper motor and BLDC motor.

UNIT-I

Synchronous Machines: Constructional Details, Types of windings, Winding factors, e.m.f. equation, Fractional pitch and fractional slot windings, Suppression of harmonics and tooth ripple, Armature reaction and reactance, Synchronous impedance.

UNIT-II

Synchronous Machine Design: Output equation, Main dimensions, short Circuit Ratio (SCR). Length of air gap calculation, selection of armature slots, design of field system and design of turbo alternators.

UNIT-III

Synchronous Generator: Voltage Regulation, Phasor diagram of alternator with nonsalient poles, O.C. and S.C characteristics, Synchronous impedance, Ampere turn, ZPF methods for finding regulation, Principle of two reaction theory and its application for the salient pole synchronous machine analysis, Synchronism and parallel operation.

UNIT-IV

Synchronous Motor: Theory of operation, Vector diagram, Variation of current and power factor with excitation, Hunting and its prevention, Current and power diagram Predetermination of performance, Methods of Starting and Synchronizing. Synchronizing Power, Synchronous Condenser.

UNIT-V

Special Machines: Permanent Magnet Motors, Switched Reluctance Motors, Hysteresis Motors, Stepper motor and BLDC motor.

Text Books:

1. P.S. Bhimbra Electrical machinery, Khanna Publications, 7th edition, 2003.
2. Nagrath I.J & Kothari D.P, Electrical Machines,Tata McGraw Hill Publications, Sigma series, 2006
3. H.Cotton, Advanced Electrical Technology, Wheeler & Co,7th edition, CBS publishers,2005.
4. J.B Gupta ,S.K. Kataria & Sons, Theory & performance of electrical machines,14th edition, 2014.

Suggested Reading:

1. Juha Pyrho¨ nen, Tapani Jokinen and Valeria Hrabovcova, Design of rotating electrical machines, John Wiley & Sons, Ltd. 2008
2. Fitzgerald, Kingsley, Umans, Electric Machinery, Tata Mc-Graw Hill Publications, 6th edition, 2002
3. Ashfaq husain, Danpatrai and sons, Electrical machines, 3nd edition, 2012

EE322 **SWITCHGEAR AND PROTECTION**

Instruction	4 Periods per week
Duration of University Examination	3 Hours
University Examination	75 Marks
Sessional	25 Marks
Credits	3

Course Objectives:

1. To analyze principles of operation of the different types of relays.
2. To comprehend the different principles of protective schemes in power system.
3. To understand the principles of operation of the different types of circuit breakers.
4. To be acquainted with different lightning arrestors and the appropriate circuit for the protection of the various components of power system

Course Outcomes: The student will be able to

1. Understand various components used in relays.
2. Analyze and Design the relay settings of over current and distance relays.
3. Differentiate between non-unit and unit protection schemes, and how the various associated parameters affect them.
4. Understand arc initiation and quenching mechanisms used in different circuit breakers.
5. Explain the causes, effects of over voltages and various protecting methods of the power system against over voltages.

Unit – I

Protective relays: Need for protection, Backup protection, Zones of protection, Definitions of relay pickup, dropout and reset values, Classification of relays, Operating principles and construction of electromagnetic and induction relays, Over current, Over voltage and Power relays, Directional features, Universal relay torque equation. Over current protection for radial feeders and ring mains, Protection of parallel lines, Relay settings for over Current relays, Earth fault and phase fault protection.

Unit – II

Static phase and Amplitude comparators: Characteristics of Dual input comparators, Distance protection, 3-step Distance relays, Characteristics Distance relays on the RX diagram, Sampling comparator, static over current relay, Microprocessor based over current relaying, Need of numerical relays, Advantages of numerical relays over solid state relays, Fundamentals of numerical relays, Functional block diagram of numerical relay.

Unit – III

Transformer and generator protection: Differential relays, Percentage differential relays, Protection of generator and transformer using percentage differential relays, Split phase, Inter turn protection, Overheating, Loss of excitation, Protection of generators, Protection of transformers against magnetizing inrush, Buchholz relay, Protection of earthing transformers, Generator transformer unit protection.

Unit – IV

Circuit breakers: Need for circuit breakers, Arc Properties, Principles of arc quenching theories, Recovery and Restriking voltages, Definitions in circuit breakers, Rated symmetrical and restricting asymmetrical breaking current, Rated making current, Rated capacity, Voltage and Frequency of circuit breakers, Current chopping, Resistance switching, Derivations of RRRV, Maximum RRRV etc., Circuit breaker calculations, Types of circuit breakers, Oil, Poor oil, Air, Air blast, SF6 and Vacuum circuit breakers, Testing of circuit breakers.

Unit – V

Over voltage protection: Protection of transmission lines against direct lightening strokes, Ground wires, Protection angle, Protection zones, Height of ground wire, Conductor clearances. Conductor heights, Tower footing resistance and its effects, Equipment protection assuming rod gaps, Arcing horns, Different types of lightening arrestors, Their construction, Surge absorbers, Peterson coil, Insulation coordination.

Text Books:

1. C.L. Wadhwa, Electrical Power System, Wiley Eastern Ltd., 2nd Edition, 2013
2. Badriram & Viswakarma, Power System Protection and Switchgear, Tata McGraw Hill, 2011.
3. Sunil S. Rao Switchgear and Protection, Khanna Publications, 2008
4. J.B. Gupta, Switchgear and protection, S.K. Kataria& Sons, 3rd Edition, 2014.

Suggested Reading:

1 B. Ravindranath, M. Chander , Power System Protection and Switchgear, New Age International, 2011.

2 OZA, Power System Protection and Switchgear, Tata McGraw Hill, 2010.

EE 323 MICROPROCESSORS AND MICROCONTROLLERS

Instruction	4 Periods per week
Duration of University Examination	3 Hours
University Examination	75 Marks
Sessional	25 Marks
Credits	3

Course Objectives:

1. To understand the Fundamentals of 8086 Microprocessors and its Programming.
2. To study the Interfacing of 8086 microprocessors using its various ports.
3. Fundamentals of 8051 Microcontroller, programming and its interfacing.
4. To know about the data converters and their interfacing with 8086 Microprocessor
5. To make students know about the various day-to-day applications of Microcontroller.

Course Outcomes: The student will be able to:

1. Understand the internal Architecture of both 8086 processor and 8051 microcontroller
2. Write assembly language programs on his own after gaining through knowledge of Instruction set.
3. Know how to establish communication between the processor/controller and peripheral devices.
4. Distinguish well between a Microprocessor and Microcontroller.
5. Write programs in assembly language with ease and co-relate them with high level language programs.

UNIT I

Introduction to Microprocessor and 8086 Microprocessor: Fundamentals of a microprocessor and its evolution, Architecture of 8086 Microprocessor- Segmented memory, Addressing modes, Instruction set, Pin diagram, Minimum and Maximum mode operations.

UNIT –II

Programming using 8086 Microprocessor: Assembly language programming (i.e. machine language programming), Assembler directives, simple programs using Assembler directives, strings, procedures, and Macros Timing.

UNIT –III

Interfacing with 8086 Microprocessor: Memory and I/O interfacing, A/D and D/A interfacing, 8255(PPI), Programmable Internal Timer (8253), Keyboard and display interface 8279, interrupts of 8086.

UNIT IV

Introduction to 8051 Microcontroller and its Programming: 8051 Microcontroller and its Architecture, I/O ports, Instruction set, Assembly language programming, connecting External memory.

UNIT V

Interfacing with 8051 Microcontroller, interrupts and special function registers: Interrupts, serial I/O, Timers, Counters, Applications of microcontrollers-Interfacing LEDs, Seven Segment display, Keyboard Interfacing, Induction to PIC Microcontroller.

Text Books:

1. A.K.Ray and K.M.Burchandi**,** 'Advanced Microprocessors and peripherals' - Tata McGraw Hill Co., 2006

2. Mohammad Ali Mazidi and Janice Gillespie Mazidi"- The 8051 Microcontroller and Embedded Systems"
using assembly and 'c'—prentice hall of India, 2008

Suggested Reading:

1. Douglas. V.Hall- Microprocessors and Interfacing – Tata McGraw Hill- revised edition,2006.
2. Krishna Kant – Microprocessors and Microcontrollers-Architecture, Programming and System Design 8085, 8086, 8051, 8096, Prentice – Hall India- 2007.
3. Kenneth.J. Ayala – "The 8051 Microcontroller Architecture, Programming and Applications ", Thomson publishers, 2nd edition.

With effect from the academic year 2015-2016

EE 324 **DIGITAL SIGNAL PROCESSING**

Instruction	4 Periods per week
Duration of University Examination	3 Hours
University Examination	75 Marks
Sessional	25 Marks
Credits	3

Course Objectives:

1. To introduce basic concepts of signals and systems and representation of digital system.
2. To discuss DFT, DTFT, FFT, IFFT and Z transformation for the digital system analysis.
3. To make students familiar about design concepts of FIR and IIR filters.
4. To introduce digital signal processor.

Course Outcomes: The student will be able to:

1. Identify the digital system and find its response.
2. Compute and distinguish the DFT, DTFT, FFT and DFS of discrete systems.
3. Compute the Z transforms of discrete systems
4. Design FIR and IIR filter.
5. Be familiar with architecture and features of TMS 320F/2047 DSP.

UNIT-I

Introduction to Digital Signal Processing: Classification of Signals & Systems. Linear shift invariant systems, stability and causality, Sampling of Continuous signals, Signal Reconstruction, quantizing & encoding, linear constant co-efficient difference equations, properties of discrete system- linearity.

UNIT-II

Fourier Analysis: Distinguishing Fourier transform of discrete singular & discrete Fourier transform, Discrete Fourier series, Phase and amplitude spectra, Properties of Discrete Fourier Transform, Linear Convolution of sequence using DFT, Frequency domain representation of discrete time system DTFT and DFT, Computation of DFT. Fast Fourier transform: Radix-2 decimation in time and decimation in frequency FFT algorithms, Inverse FFT.

UNIT-III

Z- Transform: Application of Z- Transforms for solution of difference equations of digital filters system function, stability criterion, Realization of filters, direct, canonic. Cascade and parallel form, linear phase realization, Introduction to Cosine Transform and Wavelet Transform.

UNIT-IV

IIR Filters: Design of Butterworth Chebyshev filters, IIR. filter design by impulse invariant bilinear transformation, impulse invariance method, step invariance method

UNIT-V

FIR Filters: Characteristics of FIR Digital Filters. Frequency response, comparison of FIR, IIR filters, Window techniques, Design of these filters using Rectangular, Hamming, Bartlet, Kaiser windows, Architecture and features of TMS 320F/2047 and ADSP signal processing chips, Applications of DSP.

Text Books:

1. P. VenkataRamani, M.Bhaskar, "Digital Signal Processo1; Architecture, Programming & Application ", TataMcGrawHill-2004
2. Avatar Singh, S.Srinivasan, "Digital Signal Processing, Thomson Publication, 2004.
3. Lafley," DSP Processing. fundamentals. architecture & features. S.Chand publishers & Co. 2000.
4. Johan G Peoahis, Dimitris G Manolakis, Digital signal processing, 5th eidition, Pearson prentice Hall, 2007

Suggested Reading:

1. Jackson L.B. Digital Filters and Signal Processing. Second edition, Kluwer Academic Publishers, 1989.
2. Oppenheim A V, and Schafer R. W. Digital Signal Processing –Prentice Hall Inc. 1975.
3. Tarun Kumar Rawat Digital Signal Processing first edition Oxford higher education, 2015
4. Anand kumar A, Digital Signal Processing, Second edition PHI learing, 2015.

EE 325 **POWER ELECTRONICS LAB**

Instruction	3 Periods per week
Duration of University Examination	3 Hours
University Examination	50 Marks
Sessional	25 Marks
Credits	2

Course Objectives:

1. To obtain and plot the characteristics of different static switches.
2. To design the triggering and commutation circuits for SCR.
3. To observe the effect of freewheeling in converters.
4. To familiarize the conversion principle of AC-DC, DC-DC, DC-AC and AC-AC conversion circuits and their applications.
5. To be acquainted with simulation of different power converters.

Course Outcomes: The student will be able to

1. Analyze the effects of control signals on static switches.
2. Distinguish the characteristics of different controlled switches and their applications.
3. Demonstrate the effects of freewheeling.
4. Acquainted with the conversion principles of AC-DC, DC-DC, DC-AC and AC-AC converters
5. Know how to use the simulation software to design different power electronic circuits.

PART-A

1. S.C.R. Characteristics
2. BJT, MOSFET and IGBT Characteristics
3. Gate triggering circuits for SCR using R, RC and UJT.
4. Single phase step down Cycloconverter with R and RL loads.
5. A.C voltage controllers with R and RL loads.
6. Study of forced commutation techniques.
7. Two quadrant D.C drive.
8. Single phase fully controlled bridge rectifier with R and RL loads.
9. Single phase half controlled bridge rectifier with R and RL loads.
10. Buck and Boost choppers.
11. Study of 1 kVA UPS and SMPS for variable voltage with constant load, Constant voltage with variable load.
12. V/f control of AC drive.
13. Single phase inverter with R and RL Loads.

PART-B

1. Simulation of Single phase Full converter and Semi converter.
2. Simulation of Three phase Full converter and Semi converter.
3. Simulation of Single phase Inverter.
4. Simulation of Three phase Inverter.
5. Simulation of Single phase AC voltage controller.
6. Simulation of Single phase Cycloconverter.
7. Simulation of Single phase Inverter with single, multiple and sinusoidal pulse width modulations.

Note: At least **SEVEN experiments** from **PART-A** and **THREE** from **PART-B** should be conducted in the semester.

EE 326 MICROPROCESSORS & MICROCONTROLLERS LAB

Instruction	3 Periods per week
Duration of University Examination	3 Hours
University Examination	50 Marks
Sessional	25 Marks
Credits	2

Course Objectives:

1. To write and execute simple programs using MASM software tool.
2. To get the students acquainted with the processor kit and improve their Programming skills
3. To make the students work with controller and understand how to program and get the desired output in different platforms.

Course Outcomes: The student will be able to:

1. Have command over basic assembly language programming.
2. Get familiarized with different assembly language software tools.
3. Know how a processor/controller will communicate with the External world
4. Do some mini projects.
5. understand other advanced Microcontrollers with basics of this basic Microcontroller

List of Experiments

For 8086Microprocessor:

Section 1: Using MASM/TASM (**Any 3 of** the below mentioned Expts. are to be conducted in this Section)

1. Programs for signed/unsigned multiplication and division.
2. Programs for finding average of N 16-bit numbers.
3. Programs for finding the largest number in an array.
4. Programs for code conversion like BCD numbers to 7-Segment.
5. Programs for computing factorial of a positive integer number.

Section 2: Using 8086 Kit(Interfacing) (**Any 2 of** the below mentioned Expts. are to be conducted in this Section)

1. 8255-PPI: Write ALP's to generate triangular, saw-tooth and square waveforms using DAC.
2. 8279-Keyboard Display: Write a small program to display a string of characters.
3. Write an ALP to display some alpha-numeric characters on a seven-segment display module.
4. Traffic Signal Controller.

For 8051 Microcontroller:

Section 3: Using 8051 Kit (**Any 3 of** the below mentioned Expts. are to be conducted in this section)

1. Data Transfer - Block move, Exchange, sorting, Finding largest element in an array.
2. Arithmetic Instructions :Multi byte operations
3. Boolean & Logical Instructions (Bit manipulations)
4. Use of JUMP and CALL instructions.
5. Programs to generate delay and programs using serial port and on chip timer/counter.

Section 4: Program Development using 'c' cross compiler for 8051 (**Any 2 of** the below mentioned Expts. are to be conducted in this section).

1. DAC interfacing for Generation of Sinusoidal Waveform.
2. Stepper motor control(clockwise and anticlockwise directions)
3. Interfacing of Keyboard and 7-segment Display Module.
4. ADC interfacing for temperature monitoring.

Major Equipment required for the LAB:

1. 8086 Microprocessor trainer kit(s) with in-built assembler/disassembler
2. 8051 Microcontroller trainer kit(s)
3. Interfacing Modules for both 8086 and 8051.
4. MASM Software and Kiel/Ride Cross-'c' compiler Software.

EE 327 ELECTRICAL MACHINES -II LAB

Instruction	3 Periods per week
Duration of University Examination	3 Hours
University Examination	50 Marks
Sessionals	25 Marks
Credits	2

Course Objectives:

1. To understand thoroughly Scott connection
2. To comprehend principles of regulation of alternator
3. To become familiar in operating the induction motor with various speed control methods.
4. To analyze the performance of three phase induction motor
5. To analyze the performance of synchronous motor.

Course Outcomes: The student will be able to:

1. Convert 3 supply to single phase supply
2. Synchronize alternator with grid.
3. Conclude better regulation method of synchronous generator.
4. Control the speed of 3Φ induction motor
5. Compensate reactive power of 3Φ induction motor.

List of Experiments:

1. Three phase to Two-phase conversion (Scott connection).
2. Heat run test on Three-phase transformer.
3. No-load test blocked rotor test and load test on 3-phase Induction motor.
4. Speed control of Three-phase Induction motor by any three of the following.
   a. Cascade connection b. Rotor impedance control c. Pole changing
   d. Rotor slip recovery, Kramer drive e. V/f control.
5. Parallel operation of Alternators.
6. Performance characteristics of Single-phase Induction motor.
7. Voltage regulation of Alternator by

a. Synchronous impedance method b. Ampere-turn method. c. Z.P.F. Method.

8. Regulation of Alternator by slip test.
9. Determination of V curves and inverted V curves of synchronous motor.
10. Power angle characteristics of a synchronous motor.
11. Load characteristics of Induction Generator.
12. P.F Improvement of Induction motor using capacitors.

Note: ATLEAST 10 EXPERIMENTS SHOULD BE CONDUCTED IN THE SEMESTER

EE 351 ELECTRICAL ENGINEERING MATERIALS
(Elective -I)

Instruction	4 Periods per week
Duration of University Examination	3 Hours
University Examination	75 Marks
Sessional	25 Marks
Credits	3

Course Objectives: After the completion of the course the students should be able to:
1. Analyze the mechanical, magnetic and the electrical properties of materials.
2. Select materials for various engineering application.
3. Establish how failures occur in materials and how to prevent them.

Course Outcomes: The student will be able to
1. Classify the given material based on its properties.
2. Select a proper material for a given application.
3. Experiment on materials in order to test its adaptability
4. Investigate the suitability of material for the latest technological requirement
5. Compare and contrast the characteristics of the materials.

UNIT I:
Conducting Materials: Electrical conducting Materials, High conductivity materials, Materials of High Resistivity, Materials used for precision work, rheostats; heating devices, Super conductivity, Special types of alloys, Applications & Properties of semiconductors, Silicon wafers, integration techniques, Large and very large scale integration techniques (VLSI).

UNIT II:
Insulating Materials: Classification of Insulting materials, temperature rise, electrical properties of insulating materials used for wires-laminations- machines and their applications, Ceramics, Plastics, DC electrical properties, AC electrical properties, Dielectric properties of insulators, Dielectric materials used for various electrical applications, suitability.

UNIT III:
Magnetic Materials: Magnetic parameters, the three types of magnetic material, measuring magnetic materials, Application of soft magnetic materials, Magnetic recording media, Hard (permanent) magnets, Ferrites, Samarium, Cobalt alloys, Neodymium Iron Boron (Nd Fe B).

UNIT IV:
Optical properties of materials: EM Radiation Spectrum, Optical properties in materials, photo electric emission, Photo conductivity, Lasers, Optical fibres, Fibre cables.

UNIT V:
Materials for direct energy conversion devices: Solar cells, equivalent circuit of a solar cell, fuel cell, MHD generators, storage of hydrogen, thermoelectric generators, Nano applications in Electrical Engineering.

Text Books:
1. G.K Benergy; Electrical and Electronic engineering materials, PHI, 2014
2. Ian P. Jones; materials science for Electrical and Electronic Engineers, Oxford university press, 2008.
3. R. K Sukhla: Electrical Engineering Materials, MC Graw Hill Education, 2013.

Suggested Readings:
1. Dhir: Electronic components & materials, MC Graw Hill education, 2012.
2. TTTI Mardras: Electrical Engineering materials, MC Graw Hill education, 2014.

EE 352

OPTIMIZATION TECHNIQUES
(Elective -I)

Instruction	4 Periods per week
Duration of University Examination	3 Hours
University Examination	75 Marks
Sessional	25 Marks
Credits	3

Course Objectives:

1. *To study about classical optimization techniques which include single variable and multi variable optimization with equality constraints.*
2. *To study about – linear programming.*
3. *To study non linear programming with gradient methods and direct search methods.*
4. *To study dynamic programming.*
5. *To study about Genetic algorithms, particle swarm optimization etc.*

Course Outcomes: The student will be able to :

1. *Acquire the knowledge of obtaining solution for classical optimization problems.*
2. *Acquire the concepts to formulate linear programming problem and get the solution with simplex method, Graphical method, Big-M method etc.*
3. *Acquire the knowledge to solve the nonlinear programming problems with various methods such as gradient methods, direct search methods, Fibonacci method and golden section method.*
4. *Acquire the knowledge to obtain the solution for dynamic programming problems.*
5. *Know the different selection mechanisms in Genetic algorithms, preliminary idea of particle swarm optimization and their application to economic load dispatch.*

UNIT I

Introduction: Classical optimization techniques: Statement of optimization problem, Objective function, Classification of optimization problems, Single-variable & Multi-variable Optimization without constraints. Multi-variable optimization with equality Constraints. Lagrange multiplier method, Multi-variable optimization with inequality constraints, Kuhn- Tucker conditions.

UNIT II

Linear programming: Standard form, Formulation of the LPP, Solution of simultaneous equations by Pivotal condensation, Graphical method, Simplex algorithm, Big M method,

UNIT III

Non-Linear Programming: One dimensional Search method: Fibonacci method, Golden Section method.
Direct Search method: Uni-variate Search and Pattern Search methods,
Gradient method: Steepest Descent, Conjugate Gradient and Quasi- Newton method,

UNIT IV

Dynamic Programming: Multistage design process, Types, Principle of optimality, Computational procedure in Dynamic programming, Examples using Calculus method and Tabular method of solutions.

UNIT-V

Metaheuristic Techniques :Introduction to Genetic Algorithms, Encoding, Fitness Function, Basic Operators, Section Tournament Selection, Introduction to Particle Swarm Optimization (PSO), variations of PSO, Differential Evolution, Function optimization Formulation, DE fundamentals, Application to Economic load dispatch.

Text Books:

1. S.S.Rao, Engineering Optimization Theory and Applications, New Age International, 3rdEdition, 1998.
2.Jasbir S.Arora, Introduction to Optimum Design, McGraw Hill International Edition,1989.

Suggested Reading:

1.Kalyamoy, Deb, Multi objective optimization using evolutionary algorithms, Wiley publications.
2. S. Rajasekharam, G.A. Vijaya Lakshmi, Neural networks, Fuzzy logic and Genetic algorithms – Synthesis and Applications, PHI publications.

EE 353 **ADVANCED CONTROL SYSTEMS**
(Elective -I)

Instruction	4 Periods per week
Duration of University Examination	3 Hours
University Examination	75 Marks
Sessional	25 Marks
Credits	3

Course Objectives: The objective of the course is to:

1. *Understand the method of representing continuous time systems and obtain solution. Transfer function from state model, state-transitions matrix and solution of state equation for discrete systems.*
2. *Understand the concepts of controllability and observability tests for continuous time, Discrete - time and time invariant systems. Also, study SISO system., Pole Placement by state Feedback.*
3. *Understand the importance of response of non-linear systems and construction of phase plane trajectories.*
4. *Understand the procedures to perform stability study using Lyapunov's criteria and construction of Lyapunov function.*
5. *Understand the procedure to formulate the optimal control problem and variational calculus using Hamitonian method.*

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

1. *Represent continuous time systems and obtain solution. Transfer function from state model, solution of state equation and state transition matrix for discrete time systems.*
2. *Follow the concepts of controllability and observability - tests for continuous time, discrete-time and time invariant systems. More importantly can carryout analysis of SOSO system. Pole placement by state feedback.*
3. *Analysis the response of non-linear systems and construction of phase plane trajectories.*
4. *Carryout the stability study through Lyapunov's criteria and construction of Lyapunov function.*
5. *Formulate the optimal control problem and variational calculus using Hamiltonian method.*

UNIT-I

Review of state-space: representation of continuous time systems and their solution, state models for discrete time systems described as difference Equations and transfer functions, Transfer function from State model, State-Transition matrix and solution of state equations for discrete time systems.

UNIT--II

Controllability and Observability: Concepts of Controllability and Observability, Controllability tests for continuous time, discrete-time, time-invariant systems. Observability tests for continuous time, discrete- time, time-invariant systems. And Controllability and Observability modes in State. Jordan's canonical form, Controllable and Observable companion forms for single input single output Systems, pole placement by State feedback.

UNIT-III

Nonlinear systems: Behavior of Nonlinear systems, jump resonance, Sub-harmonic oscillation, Limit cycles, common physical non-linearities, Singular points, phase plane-method, Construction of phase plane trajectories, Isoclines method, Delta method, Computation of time.

UNIT-IV

Stability: Lyapunov's stability criteria, Theorems, Direct method of Lyapunov For linear systems, Non-Linear Systems, Methods of constructing Lyapunov function, Krasovki's Method, Variable gradient method.

UNIT-V

Optimal Control: Formulation of optimal control problem, calculus of variations, Minimization of functional. Formulation of variational calculus using Hamiltonian method.

Text Books:

1. Gopal.M., Modern Control System Theory, Wiley Eastern Limited, 2004.
2. Schulz D.G., Melsa J.L., State Functions Linear Control Systems, McGraw Hill.

Suggested Readings:

1. M. Gopal, Digital Control and State Variable Methods, Tata Mcgraw Hill, 2/e, 2003.
2. Ogata .K "Discrete Time control Systems", 2nd Edition, PHI publications, 1995

EE 354 **RENEWABLE ENERGY SYSTEMS**
(Elective-1)

Instruction	4 Periods per week
Duration of University Examination	3 Hours
University Examination	75 Marks
Sessional	25 Marks
Credits	3

Course Objectives: The objective of the course is to:

1. *Understand procedures and importance of Energy Planning, co-generation, Alternative energy sources, Energy Scenario in India in terms of percentage of different sources of energy.*
2. *Understand the importance Non-convential energy sources such as wind and solar in the context of power generation from these sources and plans of power sector as well as thrust given.*
3. *Understand the technical parameter of PV systems - stand alone as grid connected schemes also its advantages and limitations.*
4. *Understand the technical parameter of solar thermal energy systems, solar cooking systems as heating systems covering its maintenance.*
5. *Understand the importance of importance of wind energy in the context of power shortage and to identify possible location for installation, design aspects of wind turbine systems and energy derived from wind turbine.*

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

1. *Acquire knowledge required for Energy planning, importance of co-generation. Alternative energy sources and Energy scenario in India indicates in terms percentage of different sources of energy.*
2. *Significance and importance of non-convential energy source such as wind and solar in the context to generate more power from reviewable energy sources and the thrust the India power sector is giving.*
3. *Importance of solar PV systems – stand alone and grid connected scheme. Also advantages and limitations of solar PV technology.*
4. *Importance solar thermal energy systems. Solar cooking system and solar heating systems including maintenance aspect.*
5. *Importance of wind energy in the context of power shortage in Indian power sector, design aspects of wind turbine systems and energy designed for wind turbine – wind power generation installations.*

UNIT-I

Basics of Energy: Energy and Power, Estimation of Energy Bill, Characteristics of energy, Energy parameters, Energy planning, cogeneration, classification of energy, Energy Resources, Alternative energy sources, Energy scenario in Indian context.

UNIT-II

Introduction to Energy Sources :Significance of non-conventional energy sources, solar energy, wind energy, energy from biomass and biogas, ocean energy, wave energy, Tidal energy, Geo thermal energy, fuel cell, MHD.

UNIT-III

Solar photovoltaic technologies: Solar spectrum, extraterrestrial radiation, solar radiation at a given location, Advantages and limitations of solar PV technology, PV Technology, Basics of Technology, The amount of power generated, the rated power and actual power from a module, Generating more power using solar PV, Generating more power using solar PV – Protection of solar cells., Solar PV systems and their components, Solar PV lantern, Stand – alone PV systems, Home lighting and other usage, solar PV water pumping system.

UNIT-IV

Solar thermal technologies: Solar Thermal Energy Systems, Absorption and Radiation, Solar Cooking systems, Principle of Cooking, Cooking by Boiling, speed of cooking, Types of Solar Cooker, Solar Distillation System, Operation of Solar Distillation, Solar Heating Systems (Hot water), Principle of Conversion, Applications, Types of Heating systems, design and costing of solar heating systems., Maintenance.

UNIT-V

Wind Energy: Wind Flow, Motion of wind, vertical wind speed variation, distribution of wind speeds, Power in the wind, conversion of wind power- wind turbine, Worldwide wind

Installations, Wind Turbine Sizing and systems design, energy derived from a wind turbine, annual energy production- approximate and accurate, estimation of required wind turbine power rating.

Text Books:

1. Chetan singh solanki: Renewable Energy Technology, PHI, 2009 A practical guide for begineers.
2. B H Khan: Non conventional Enginery & Resources, MC Graw Hill education, 2012.
3. Er. R.K.Rajput: Non-Conventional Energy Sources and Utilization, S.Chand Publishing, 2014.

Suggested Readings:

1. Garg & prakash: Solar Energy" Fundamentals & Applications, MC Graw Hill education 2012.
2. DP Kothari: Singal & Ranjan Renewable Energy Sources & Emerging Technologies, PHI 2014.
3. G.S.Sawhney: Non-Conventional Energy Resources, PHI learning pvt ltd., edition 2012.

EE 328 **MINI PROJECTS**

Instruction	21 Periods
Duration of University Examination	3 Hours
University Examination	0 Marks
Sessional	25 Marks
Credits	1

Course Objectives: The objective of the course is to:

1. *Understand the methods to carryout mini project in the area pertaining to Electrical and Electronics Engineering.*
2. *Understand the procedures/ methods to formulate the project scope of work and collect required literature.*
3. *Familiarizing the way to problem formulation and identify suitable techniques to solve.*
4. *Summarize the results and draw the conclusions.*
5. *To get exposure in report writing and discuss the application aspect of the project.*

Course Outcomes: After completion of the course the student will be able to:

1. *Identify scope to carryout mini project in the area pertaining to Electrical and Electronics Engineering.*
2. *Formulate project scope and collect required information as literature survey.*
3. *Formulate problem to apply suitable techniques to solve.*
4. *Discuss the results and draw the conclusions*
5. *Discuss the aspect of suitable applications and also get exposure in report writing.*

Mini Project is a course that a student has to undergo during his/her academic term, which involves the student to explore in a discipline that belongs to their research interest within their program area. It is a credit based course. The Mini Project shall be carried out during 6th semester along with other lab courses by having regular weekly slots. Students will take mini project batch wise and the batches will be divided as per the guidelines. The topic of mini project should be so selected enabling the students to complete the work in the stipulated time with the available resources in the respective laboratories. The scope of the mini project could be handling part of the consultancy work, maintenance of the existing equipment, development of new experiment setup or can be a prelude to the main project with a specific outcome.

EE 329 **INDUSTRY VISIT**

Least 3 days in semester	3 x 8 =24 hours
Sessional /Examination	*Grade

Course Objectives: The objective of the course is to:

1. *Physically see the process of manufacturing procedure and steps involved.*
2. *Collect the information in respect of materials, sources of supply.*
3. *Understand the sequential stages involved in manufacturing process.*
4. *Understand the procedure to write the 'industry visit' technical report by compiling all the information collected during the visit.*
5. *Understand the safety procedures and pre-cautions followed in Industry, confidentiality of the process and the man power required.*

Course Outcomes: After completion of the course the student will be able to:

1. *Know the importance of visiting an engineering industry from the point of view of process of manufactory procedures and set-up.*
2. *Summarize the required information with regard to materials, source of supply in respect of a product.*
3. *Know the stages in manufactory of a product*
4. *Prepare the 'industry visit' technical report covering the details of visit and it importance.*
5. *Visualize the safety precautions to be follow in industry, confidentiality of the product processing as the man power required.*

Students are expected to visit at least two industries during the semester and submit a detailed technical report on the study -visits to the Department. The Department should evaluate the reports through a Committee consisting of Head of the Department and two more faculty members to award the Grades *.

*Excellent /Very Good/Good /Satisfactory /Unsatisfactory.

With effect from the academic year 2016-2017

Dept. of ELECTRICAL & ELECTRONICS ENGINEERING

CHAITANYA BHARATHI INSTITUTE OF TECHNOLOGY (A)

B.E. 4th YEAR SYLLABUS

For the Academic Year 2016-17

June 2016

With effect from the academic year 2016-2017

Semester- I

With effect from the academic year 2016-2017

SCHEME OF INSTRUCTION AND EXAMINATION
4/4 B.E.
ELECTRICAL & ELECTRONICS ENGINEERING

I-SEMESTER

S.No	Code	Subject	Scheme of Instruction			Scheme of Examination			
			Periods per week			Duration in Hours	Maximum Marks		Credits
			L	T	P		End Exam	Sessionals	
1	EE 411	Power System Operation & Control	4	-	-	3	75	25	3
2	EE 412	Power Semiconductor Drives	4	-	-	3	75	25	3
3	EE 413	HVDC & FACTS	4		-	3	75	25	3
4	MB214	Managerial Economics & Accountancy	4			3	75	25	3
5		Elective –II	4	-	-	3	75	25	3
6	EE 414	Digital Signal Processing Lab	-	-	3	3	50	25	2
7	EE 415	Power Systems Lab	-	-	3	3	50	25	2
8	EE 416	Project Seminar	-	-	3	3	-	25	1
TOTAL			**20**	**-**	**9**	**24**	**475**	**200**	**20**

L: Lecture, T: Tutorial, P: Practical

S.No	CODE	ELECTIVE-II
1	EE 461	Electrical Machine Design
2	EE 462	Artificial Intelligence Techniques in Electrical Engineering
3	EE 463	Principles of Embedded Systems
4	EE 464	Basic VLSI Design
5	EG 451	Technical Writing & Presentation Skills
6	ME 464	Entrepreneurship

EE 411 **POWER SYSTEM OPERATION AND CONTROL**

Instruction	4 Periods per week
Duration of Semester Examination	3 Hours
Semester Examination	75 Marks
Sessionals	25 Marks
Credits	3

Course Objectives:

1. *Understand the formulation of Load-Flow problems applying different methods and carryout load-flow studies and compare.*
2. *Understand the importance of Economic Operation of Power Systems including losses*
3. *Understand the importance of Load Frequency Control in the operation of power systems.*
4. *Understand the basic definitions of and classification of power system stability, stability analysis of Single Machine Connected to Infinite Bus (SMIB) system, and voltage stability analysis.*
5. *Understand the importance of reactive power and FACTS devices for stable operation of Power systems.*

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

1. *Acquire knowledge in assessing the importance of load flow studies in power system operation. Carryout Load-Flow studies with different methods compare and interpret the results.*
2. *Acquire knowledge in conducting Economic operation of power system without and with losses*
3. *Acquire knowledge in conducting Load Frequency Control for single and two area systems and also distinguish between different control methods.*
4. *Acquire knowledge in analyzing the Stability aspects of power system.*
5. *Acquire knowledge in assessing the system improvement through reactive power control and FACTS controllers.*

UNIT-I: Load Flow Studies

Formulation of Y bus for a system, modeling of tap changing and phase shifting transformer, Formulation of load flow problem, Solution of load flow by Gauss Seidel, Newton- Raphson, Decoupled and Fast Decoupled methods, comparison of different load flow methods.

UNIT-II: Economic Operation of Power System

Input-Output curves, Heat rates and incremental cost curves, Equal Incremental cost criterion Neglecting transmission losses with and without generator limits, Bmm Coefficients, Economic operation including transmission losses.

UNIT-III: Load Frequency Control

Governor Characteristics, Regulation of two generators, coherency, concept of control area, Incremental power Balance of a control area, Single area control, Flat frequency control, Flat tie-line frequency control, Tie-line bias control, Advantages of pool Operation, Development of model for two- area control.

UNIT-IV: Power System Stability

Definitions Steady state stability and Transient stability, Steady state stability of a synchronous machine connected to infinite bus, calculation of steady state stability limit, synchronous machine models with and without saliency, Equal area criterion, Application of equal area criterion, Swing equation, Step by step solution of Swing equation, factors effecting transient stability, Auto Reclosures, mathematical formulation of voltage stability problem.

UNIT-V: Reactive Power Control

Reactive power generation by synchronous generators, Automatic voltage regulators, FACTS Controllers, SVC, TCSC, STATCOM, UPFC.

Text Books:

1. *I. J. Nagrath and D.P. Kothari, 'Modern Power System Analysis',4th Edition TMH Publication,2011*
2. *CL Wadhwa, 'Electrical Power Systems', 3rd Edition, New Age International Publications, 2014*
3. *O. Elgard, 'Electric Energy Systems Theory', 2nd Edition. TMH Publication,2001*

Suggested Reading:

1. *A. Chakrabarthy and S. Halder, 'Power System Analysis Operation and control', 3rd Edition PHI Publications, 2010*
2. *D. Das, 'Electrical Power System' 1st Edition, New Age International Publications, 2010.*
3. *S. Sivanagaraju, and G. Srinivas, 'Power system, Operation and Control', Pearson publications.2010*

EE 412 POWER SEMICONDUCTOR DRIVES

Instruction	4 Periods per week
Duration of Semester Examination	3 Hours
Semester Examination	75 Marks
Sessionals	25 Marks
Credits	3

Course Objectives:

1. *Understand the fundamental torque, speed, conventions for a given drive.*
2. *Comprehend D.C drive concepts and applications.*
3. *Assimilate the concepts and applications of A.C drives.*
4. *Know the suitability of a particular drive for a given application.*

Course Outcomes: The student will be able to

1. *Select a particular drive for a given application.*
2. *Design a proper controller for a D.C motor drive with the given detailed specifications.*
3. *Acquire knowledge in various speed control techniques of induction motor drives.*
4. *Acquire knowledge in various speed control techniques of synchronous motor drives.*
5. *Identify the adaptability of a particular drive (synchronous motor, BLDC, stepper motors and SRM) for given load requirements.*

UNIT- I: Electrical Drives

Introduction: Advantages of Electrical Drives, Parts of Electrical Drives, Choice of Electrical Drives.

Dynamics of Electrical Drives: Fundamental Torque Equations, Speed Torque Conventions and Multi-quadrant Operation, Equivalent Values of Drives Parameters, Components of Load Torques, Nature and Classification of Load Torques, Calculation of Time and Energy, Loss in Transient Operations, Steady State Stability, Load Equalization.

Selection of Motor Power Rating: Thermal Model of Motor for Heating and Cooling, Classes of Motor Duty, Determination of Motor Rating.

UNIT- II: DC Motor Drives

DC Motors and Their Performance, Starting, Braking, Controlled Rectifier Fed dc Drives, Single-Phase Fully-Controlled Rectifier Control of dc Separately Excited Motor, Single- Phase Half-Controlled Rectifier Control of dc Separately Excited Motor, Three- Phase Fully-Controlled Rectifier Control of dc Separately Excited Motor, Three-Phase Half-Controlled Rectifier Control of dc Separately Excited Motor, Multi-quadrant Operation of dc separately Excited Motor Fed from Fully-controlled Rectifier, Supply Harmonics, Power Factor and Ripple in Motor Current, Chopper Controlled dc Drivers, Chopper control of separately Excited dc motors, Chopper control of series motor, Source current harmonics in Choppers, Converter ratings and closed-loop control.

UNIT- III: Induction Motor Drives

Soft start using saturable reactor starter, unbalanced starting scheme for soft start, Part winding starting.

Braking: Regenerative braking, Plugging or reverse voltage braking, Dynamic (or rheostatic) braking, Transient Analysis, Stator Voltage Control, variable Frequency control from Voltage sources, Voltage Source Inverter (VSI) Control, Cycloconverter control, Closed loop speed control and converter Rating for VSI and Cycloconverter, Induction Motor Drives, Variable Frequency Control from a Current Source, Rotor Resistance control, Slip Power Recovery, Static Kramer drive , Static Scherbius

drive, Variable Speed constant Frequency Generation, Single- phase Induction Motors, Braking of single-phase induction motors, Speed control of single-phase induction motors.

UNIT- IV: Synchronous Motor Drives

Operations from Fixed Frequency Supply, Synchronous Motor variable speed drives, Variable frequency control of Multiple Synchronous Motors, Self–controlled Synchronous Motor Drive Employing Load Commutated Thyristor Inverter, Starting Large Synchronous Machines, Self-controlled Synchronous Motor Drive Employing a Cyclo-converter, Permanent Magnet ac Motor Drives, Brushless dc Drives.

UNIT- V: Special machines & Drives

Linear Induction Motor and its control, Stepper(or Stepping) Motors, Variable reluctance, permanent magnet, Important features of stepper motors, Torque versus stepping(or pulsing) rate characteristics, Drive circuits for stepper motors, Switched (or variable) Reluctance Motor, Operation and control requirements, Converter circuits, Modes of operation.

Text Books:

1. G.K.Dubey, 'Fundamentals of Electric Drives', *2nd Edition* Narosa Publishing House, 2016
2. S.K.Pillai, 'A course in Electric Drives', *3rd Edition* New Age International, 2015

Suggested Reading:

1. Vedam Subrahmanyam, 'Electric Drives-Concepts and Applications', *2nd Edition* TMH, 2010
2. N.K.De and P.K. Sen, 'Electrical Drives', 1st Edition, PHI, 2006.

EE 413 **HVDC & FACTS**

Instruction	4 Periods / Week
Duration of Semester Examination	3 Hours
Semester Examination	75 Marks
Sessionals	25 Marks
Credits	3

Course Objectives:

1. *Understand operating principles of HVDC systems and control aspects.*
2. *Understand the difference between AC and DC transmission and analysis the HVDC converter*
3. *Understand the concepts of HVDC system control and analyse the power flow in DC systems*
4. Understand and identify the problems and constraints with stability of large interconnected system.
5. Understand the concepts of shunt and series controllers

Course Outcomes: The student will be able to

1. *Acquire the knowledge to compare AC and HVDC systems in terms of power transmission and stability.*
2. *Will be able to compare AC and DC transmission systems and analyse the HVDC converter circuit*
3. *Will be able to acquire the knowledge about HVDC system control methods and power flow in DC systems*
4. Classify various types of FACTS devices/ controllers and *Identify and select the suitable FACTS device for specific application*
5. Acquire the knowledge of about shunt and series FACTS controllers and modelling aspects
6. *Acquire knowledge in improving the stability of the power system by applying FACTS controllers.*

UNIT-I: Comparison of AC and DC Transmission System

Applications of DC Transmission, Types of DC links, Analysis of HVDC Converters, Pulse number, analysis with and without overlap, Equivalent circuit of Rectifier and Inverter, Converter bridge characteristics.

UNIT-II: HVDC System Control

Principles of dc link control, Starting and stopping of dc link, Power control, Harmonics & filters, Introduction and generation of harmonics, Types of ac filters, Power flow analysis in ac/dc systems, General modeling of dc links, Solutions of ac- dc power flow.

UNIT-III: Flexible AC Transmission Systems (FACTS)

Concept of FACTS, Flow of power in an AC system, Dynamic stability consideration, Basic types of FACTS controllers.

UNIT-IV: Static Shunt Compensators

SVC & STATCOM, Objectives of shunt compensation, Methods of controllable VAr generation, Switching converter type VAr generators, Basic operating principle and control approaches.

UNIT-V: Static Series Compensators

GCSC, TSSC, TCSC & SSSC, Objectives of series compensator, Variable impedance type series compensators, Basic operating control schemes, Power angle characteristics, Control range and VA rating, External control, Combined compensators.

Text Books:

1. K.R. Padiyar, 'HVDC Power Transmission System', 3rd Edition, New Age International, 2015.
2. N.G. Hingorani and L.Gyugyi: 'Understanding FACTS', Wiley IEEE Press, 2000

Suggested Reading:

1. Arrillaga J., '*High Voltage Direct Current Transmission', 2nd Edition, the Institution of Electrical Engineers,* London, 1998.

MB 214 **MANAGERIAL ECONOMICS AND ACCOUNTANCY**

Instruction	4 Periods per week
Duration of Semester Examination	3 Hours
Semester Examination	75 Marks
Sessionals	25 Marks
Credits	3

Course Objectives: TheObjectives of the course are:

1. To introduce managerial economics and demonstrate its importance in managerial decision making.
2. To develop an understanding of demand and relevance of it's forecasting in the business.
3. To provide the basics of market structure and the concept of equilibrium in different market structures.
4. To examine the economic analysis of production process, types of inputs and to explain different costs and their relationship with the output.
5. To understand the importance of project evaluation in achieving a firm's objective.
6. To explain the concept of Accountancy and provided knowledge on preparation & analysis of Final accounts.

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

1. To apply fundamental knowledge of Managerial economics' concepts and tools
2. To understand various aspects of demand analysis and forecasting
3. To understand price determination for different markets
4. To study production theory and analyze various costs & benefits involved in it so as to make best use of resources available.
5. Helps to analyze different opportunities and come out with best feasible capital investment decisions
6. Allow students to study in detail about accountancy concepts and conventions, Final accounts and financial analysis

UNIT-I: Introduction to Managerial Economics

Introduction to Economics and its evolution - Managerial Economics -its scope, importance and its usefulness to engineers-Basic concepts of Managerial economics.

UNIT-II: Demands Analysis

DemandsAnalysis-Conceptofdemand,determinants,Lawofdemand,itsassumptions, Elasticity of demand, price, income and cross elasticity, Demand Forecasting - Markets Competitive structures, price-output determination under perfect competition and Monopoly. (Theory questions and small numerical problems can be asked).

UNIT-III: Production and Cost Analysis

TheoryofProduction-FirmandIndustry-Productionfunction-input-outrelations- law sofreturns-internal and external economies of scale. Cost Analysis: Cost concepts- fixedandvariablecosts-explicitandimplicitcosts-outofpocketcostsandimputed costs - Opportunity cost - Cost output relationship - Break-even analysis. (Theory and problems).

UNIT-IV: Capital Management

Capital Management, its significance, determinants and estimation of fixed and working capital requirements, sources of capital - Introduction to capital budgeting, methods of payback and discounted cash flow method swith problems.

(Theoryquestionsarenumericalproblemsonestimatingworkingcapitalrequirements and evaluation of capital budgeting opportunities can be asked).

UNIT-V: Accountancy

Book-keeping, principles and significance of double entry book keeping, Journal, Subsidiary books, Ledger accounts, Trial Balance concept and preparation of Final Accounts with simple adjustments.

(Theory questions and numerical problems on preparation of final accounts, cashbook, petty cash book, bank reconciliation statement).

Text Books

1. MehtaP.L., 'Managerial Economics–Analysis, Problems and Cases', Sulthan Chand & Son's Educational publishers, 2011.

2. Maheswari S.N. 'Introduction to Accountancy', Vikas Publishing House, 2005.

3. PandayI.M. 'FinancialManagement', VikasPublishing House, 2009.

Suggested Readings:

1. Varshney and KL Maheswari, 'Managerial Economics', Sultan Chand, 2001.
2. M. Kasi Reddy and S.Saraswathi, 'Managerial Economics and Financial Accounting', Prentice Hall of India Pvt Ltd, 2007.
2. J C Pappas and E F Brigham, 'Managerial Economics',

EE 461 ELECTRICAL MACHINE DESIGN (Elective-II)

Instruction	4 Periods per week
Duration of Semester Examination	3 Hours
Semester Examination	75 Marks
Sessionals	25 Marks
Credits	3

Course Objectives:

1. *To understand the nature of various Electrical Engineering Materials.*
2. *To understand the Specifications of various A.C. and D.C. machines.*
3. *To know the importance of magnetic and thermal circuit calculations in the design aspect.*
4. *To know the various design features of Electrical machines.*

Course Outcomes: The student will be able to

1. *Select a suitable material for a given application.*
2. *Identify the need and required pre-requisites for machine design*
3. *Distinguish the appropriate design procedure for a given DC/AC machine*
4. *Determine the main dimensions of a given DC/AC machine.*
5. *Design a proper cooling system for a given machine*

UNIT -I: Basic Considerations in Machine Design

Principles of Design: Introduction-Types of Electrical Machines, Specifications, Limitations in Design-O/P Co-efficient, Importance of specific loadings-effects of materials on design, General design procedure.

Electrical Materials: Conducting Materials and their properties, Classification, Applications Insulating Materials and their properties, Classification, Applications, Magnetic Materials and their properties, Classification, Applications.

UNIT-II: Design of Magnetic circuit and Thermal Circuit.

Magnetic Circuit Design: Magnetic circuits of Electrical machines. Laws of magnetic circuits. Ampere turns for magnetic circuit. Calculation of Magnetic circuit of D.C.Machine and Induction Motor.

Thermal circuit Design: Temperature rise in Electrical machines-Standard ratings of electrical machines-Modes of heat dissipated-Quantity of Cooling Medium required.

UNIT-III: Design of DC Machines

Important features of DC Machines, Output equation. Selection of Specific magnetic and electrical loadings-factors effecting selection of no. of poles-Selection of core length and Diameter, Calculation of length of air gap. Design of shunt field system. Design of armature winding only.

UNIT-IV: Design of Transformers

Introduction. Output Equation (both 1φ & 3φ), E.M.F./turn, Different dimensions of Transformer, Steps to design a Transformer, Design of Main dimensions of Transformer Tank.

UNIT-V: Design of AC Rotating Machines

Design of 3φ Induction Motor: Introduction-O/P Equation-Estimation of main Dimensions, air gap length of Induction Motor.

Design of 3φ Alternators: Introduction-O/P Equation, Estimation of main dimensions, length of air gap, Estimation of turns /phase, Design of tooth and slot.

Text Books:

1 K.G.Upadhyay,'Design of Electrical Machines', New Age Intl. Publishers, NewDelhi,2013.
2 Dr. V.N.Mittle and A.Mittal,'Design of Electrical Machines',5th Reprint Edition, Standard Publishers Distributors, New Delhi,2013.

Suggested Reading :

1. A.K.Sawhney,'A Course in Electrical Machine Design', 6th Edition, Dhanpat Rai & Co, Pvt Ltd, New Delhi, 2014.
2. R.K.Agarwal, 'Principles of Electrical Machine Design',5th Edition, S.K.Kataria & Sons, Delhi, 2014.
3. M.G.Say, 'The Performance and Design of Alternating Current Machines',3rd Edition, CBS Publishers & Distributors, New Delhi ,2002

EE 462 AI TECHNIQUES IN ELECTRICAL ENGINEERING (Elective-II)

Instruction	4 Periods per week
Duration of Semester Examination	3 Hours
Semester Examination	75 Marks
Sessional	25 Marks
Credits	3

Course Objectives:

1. *To understand basics of ANN and FUZZY Logic.*
2. *To understand basics of advanced optimization algorithms such as Genetic algorithms.*
3. *To understand the techniques to apply to power system problems such as Economic load dispatch, load frequency control, Reactive power control etc.*

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

1. *Acquire knowledge of Different ANN algorithms.*
2. *Acquire knowledge of membership function fuzzification and Defuzzification*
3. *Understand different selection mechanisms in genetic algorithm.*
4. *Apply AI techniques in Electrical Engineering applications such as Economic load dispatches and reactive power control etc.*
5. *Apply AI techniques for speed control of ac & dc motors.*

UNIT – I: Artificial Neural Networks

Introduction, Models of Neural Network, Architectures, Knowledge representation, Artificial Intelligence and Neural networks, Learning process, Error correction learning, Hebbian learning, Competitive learning, Boltzman learning, Supervised learning, Unsupervised learning, Reinforcement learning, learning tasks.

UNIT- II: ANN Paradigms

Multilayer perception using Back propagation Algorithm, Self organizing Map, Radial Basis Function Network, Functional link, network, Hopfield Network.

UNIT – III: Fuzzy Logic

Introduction, Fuzzy versus crisp, Fuzzy sets, Membership function, Basic Fuzzy set operations, Properties of Fuzzy sets, Fuzzy cartesion Product, Operations on Fuzzy relations, Fuzzy logic, Fuzzy Quantifiers, Fuzzy Inference, Fuzzy Rule based system, Defuzzification methods.

UNIT – IV: Genetic Algorithms

Introduction, Encoding, Fitness Function, Reproduction operators, Genetic Modeling, Genetic operators, Crossover, Single, site crossover, Two point crossover, Multi point crossover, Uniform crossover, Matrix crossover, Crossover Rate, Inversion & Deletion, Mutation operator, Mutation, Mutation Rate, Bit, wise operators, Generational cycle, convergence of Genetic Algorithm.

UNIT–V: Applications of AI Techniques

Economic load dispatch, Load frequency control, Single area system and two area system, Reactive power control, speed control of DC and AC Motors.

Text Books:

1. S.Rajasekaran and G.A.V.Pai, "Neural Networks, Fuzzy Logic & Genetic Algorithms"- PHI, New Delhi, 2010.
2. D.E.Goldberg," Genetic Algorithms", 4th Impression, Pearson Education Inc., 2009.
3. IEEE Journals.

Suggested Reading:

1. P.D.Wasserman,Van Nostrand Reinhold,"Neural Computing Theory & Practice", New York,1989.
2. Bart Kosko,"Neural Network & Fuzzy System" Prentice Hall, 1992.
3. Kalyanmoy Deb, "Multi objective optimization using evolutionary algorithms", Wiley Publications, 2013.

EE 463 PRINCIPLES OF EMBEDDED SYSTEMS (Elective-II)

Instruction	4 Periods per week -
Duration of Semester Examination	3 Hours
Semester Examination	75 Marks
Sessional	25 Marks
Credits	3

Course Objectives:

1. *To understand the basic structure of 8051 Microcontroller.*
2. *To understand the concepts of 8051programming*
3. *To understand the concept of Real time operating systems.*
4. *To have a basic idea of advanced embedded processors*
5. *To understand a basic embedded architecture*

Course Outcomes: student will be able to:

1. *Acquire the knowledge on elements of microcontroller*
2. *Have knowledge on programming using 8051 microcontroller*
3. *Have basic knowledge on real time operations of system.*
4. *Have basic knowledge on advanced embedded processors*
5. *have basic knowledge on embedded programming*

UNIT-I: Embedded Computing

Introduction, Complex Systems and Microprocessor, Embedded System Design Process, Formalisms for System Design, Design Examples, the 8051 Architecture: Introduction, 8051 Micro controller Hardware, Input / Output Ports and Circuits, External Memory, Counter and Timers. Serial data Input / Output, Interrupts.

UNIT-II: Basic Assembly Language Programming Concepts

Assembly Language Programming Process, Programming Tools and Techniques, Programming the 8051, Data Transfer and Logical Instructions. Arithmetic Operations, Decimal Arithmetic, Jump and Call Instructions, Further Details on Interrupts.

UNIT-III: Applications

Interfacing with Keyboards, Displays, D/A and NO Conversions, Multiple Interrupts, Serial Data Communication, Introduction to Real-Time Operating Systems: Tasks and Task States, Tasks and Data, Semaphores, Shared Data, Message Queues, Mailboxes and Pipes, Timer Functions, Events, Memory Management, Interrupt Routines in an RTOS Environment.

UNIT-IV: Basic Design Using a Real-Time Operating System

Principles, Semaphores and Queues, Hard Real-Time ,Scheduling Considerations, Saving Memory and Power, An example RTOS like uC-OS (Open Source).

Embedded Software Development Tools: Host and Target machines, Linker/Locators for Embedded Software, Getting Embedded Software into the Target System, Debugging Techniques: Testing on Host Machine, Using Laboratory Tools, An Example System.

UNIT- V: Introduction to advanced architectures

ARM and SHARC, Processor And memory organization and Instruction level parallelism, Net advanced embedded systems: Bus protocols, 12C bus and CAN bus, Internet- Enabled Systems, Design Example-Elevator Controller.

Text Book:

1. Wayne Wolf, "Computers as Components - Principles of Embedded Computer System Design", Morgan Kaufmann Publisher, 2006.

Suggested Reading:

1. David E-Simon, "An Embedded Software Primer", Pearson Education, 2007.
2. K.V.K.K.Prasad, "Embedded Real-Time Systems: Concepts, Design & Programming", Dreamtech Press, 2005.
3. Tim Wilmshurst, "An Introduction to the Design of Small Scale Embedded Systems", Pal Grave Publisher, 2004.
4. Sriram V Iyer, and Pankaj Gupta, "Embedded Real Time Systems Programming", Tata McGraw Hill, 2004.
5. Tammy Noergaard, "Embedded Systems Architecture", Elsevier, 2006.

EE 464 BASIC VLSI DESIGN (ELECTIVE-II)

Instruction	4 Periods per week
Duration of Semester Examination	3 Hours
Semester Examination	75 Marks
Sessional	25 Marks
Credits	3

Course Objectives:

1. *To understand the MOSFET structures and operations*
2. *To learn to design logic circuits using pMOS and nMOS*
3. *To learn to design concepts of CMOs and Bi-CMOs.*
4. *To Learn the bi-polar circuit designs*
5. *To learn HDL Programming.*

Course Outcomes: student will be able to:

1. *To design logic circuits using pMOS and nMOS technologies*
2. *To design cMOS and Bi-cMOS logic circuits.*
3. *To simulate logical circuits using HDL programming*
4. *To understand different modeling strategies*
5. *To understand FPGA design strategies*

UNIT I: MOS CIRCUIT DESIGN PROCESS

Introduction of MOSFET: Symbols, Enhancement mode-Depletion mode transistor operation – Threshold voltage derivation – body effect – Drain current Vs voltage derivation – channel length modulation. NMOS and CMOS inverter – Determination of pull up to pull down ratio –Stick diagrams – VLSI Circuit Design Flow.

UNIT II: MOS TECHNOLOGY

Chip Design Hierarchy – IC Layers – Photolithography and Pattern Transfers – Basic MOS Transistors – CMOS Fabrication: n-well – p-well – twin tub – Latch up and prevention (SOI) – Submicron CMOS Process-Masks and Layout - CMOS Design Rules: Lambda based layout – Types of rules- SCMOS Design Rule set II.

UNIT III: CMOS LOGIC GATES & OTHER COMPLEX GATES

Gate delays – Logical Effort - CMOS Static Logic – Transmission Gate Logic – Tri-State Logic – Pass Transistor Logic – Dynamic CMOS Logic – Domino CMOS Logic, NORA CMOS Logic, Differential Cascade Voltage Switch (DCVS) Logic, True Single Phase Clock (TSPC) Dynamic Logic.

UNIT IV: VERILOG HDL

Hierarchical modeling concepts – Basic concepts: Lexical conventions – Data types – Modules and ports. Gate level modeling – Dataflow modeling – Behavioral modeling – Design examples of Combinational and Sequential circuits – Switch level modeling

UNIT V: VLSI IMPLEMENTATION STRATEGIES

Introduction – Design of Adders: carry look ahead-carry select-carry save. Design of multipliers: Array – Braun array – Baugh-Wooley Array. Introduction to FPGA – Full custom and Semi custom design, Standard cell design and cell libraries, FPGA building block architectures.

Text Books:

1. Douglas A. Pucknell and Kamran Eshraghian," Basic VLSI Design ", 3rd Edition, Prentice Hall India, 2001.
2. Wayne Wolf, "Modern VLSI Design: System -on-chip design", Pearson Education, 3rd Edition, 2002.

Suggested Reading:

1. David A. Johns and Ken Martin, "Analog Integrated Circuit Design", John Wiley & Sons, 2004.
2. Neil. H.E. Weste and Kamran Eshraghian," principles of CMOS VLSI Design: 'A systems perspective', 2nd Edition, Pearson Education, 2004.

EG 451 TECHNICAL WRITING & PRESENTATION SKILLS

Instruction	4 Periods per week
Duration of Semester Examination	3 Hours
Semester Examination	75 Marks
Sessional	25 Marks
Credits	3

Course Objectives: Students must be able to:

1. *Understand communication as a process and channels of it in general and technical writing in particular.*
2. *Learn Technical Writing including sentence structure and be able to understand and use technology specific words.*
3. *Write business letters and technical articles.*
4. *Write technical reports and technical proposals.*
5. *Learnt to write agenda, record minutes of a meeting, draft memos. Understand how to make technical presentations.*

Course Outcomes:

1. *Students will communicate effectively, without barriers*
2. *Students will write error free sentences using technology specific words*
3. *Students will correspond effectively*
4. *Students will draft technical reports, proposals and articles.*
5. *Students will make effective technical presentations*

Unit I: Communication

Channels of Communication: Nature and process. – Downward, upward and horizontal communication. Barriers to communication.

Technical Communication – Definition, oral and written communication. Importance and need for Technical communication. Nature of Technical Communication aspects and forms of Technical communication. Technical communication Skills – Listening, Speaking, Reading & Writing.

Unit II: Technical Writing

Techniques of writing. Selection of words and phrases in technical writing. Differences between technical writing and general writing.Abstract and specific words.Sentence structure and requisites of sentence construction.Paragraph length and structure.

Unit III: Business correspondence

Sales letters, letters of Quotation, Claim and Adjustment letters.

Technical Articles : Nature and significance, types. Journal articles and Conference papers, elements of technical articles.

Unit IV: Technical Reports

Types, significance, structure, style and writing of reports. Routine reports, Project reports.

Technical Proposals: Definition, types, characteristics, structure and significance.

Unit V: Meetings

Preparation of agenda, participation, chairing and writing minutes of a meeting. Memorandum.Seminars, workshops and conferences.

Technical Presentations : Defining purpose, audience and locale, organizing content, preparing an outline, use of Audio Visual Aids, nuances of delivery, importance of body language and voice dynamics.

References:

1.M Ashraf Rizvi, **"**Effective Technical Communication**",** Tata McGraw Hill Education Pvt Ltd, 2012.
2.KavitaTyagi and Padma Misra, **"**Basic Technical Communication**",** PHI Learning Pvt Ltd, 2012.
3.Meenakshi Raman &Sangeeta Sharma, **"**Technical Communications-Principles and Practice**",** Oxford Semester Press, Second Edition, 2012.
4.Sharon J Gerson and Steven M Gerson**, "**Technical Writing**"** Pearson Education Inc., 2013.
5. Edgar Thorpe and Showick Thorpe**,"** Objective English**",** Pearson Education, 2nd Edition, New Delhi, 2007.
6.R.C Sharma and Krishna Mohan, **"**Business Correspondence and Report Writing**",** Tata McGraw Hill, 2003
7.Prakash P**,'**Verbal and Non-Verbal Reasoning**',** Macmillan India Ltd., 2nd Edition, New Delhi, 2004.

ME 464

Entrepreneurship (Elective – II)
(for Mech, Prod, Civil, EEE & CSE)

Instruction	4 Periods per week
Duration of End Examination	3 Hours
End examination	75 Marks
Sessionals	25 Marks
Credits	3

Course Objectives:

1. *To understand the essence of Entrepreneurship*
2. *To know the environment of industry and related opportunities and challenges*
3. *To know the concept a procedure of idea generation*
4. *To understand the elements of business plan and its procedure*
5. *To understand project management and its techniques*
6. *To know behavioral issues and Time management*

Course Outcomes: After completing this course, students will be able to:

1. *Apply the entrepreneurial process*
2. *Analyze the feasibility of a new business plan and preparation of Business plan*
3. *Evaluate entrepreneurial tendency and attitude*
4. *Brainstorm ideas for new and innovative products or services*
5. *Use project management techniques like PERT and CPM*
6. *Analyze behavioural aspects and use time management matrix*

UNIT-I: Indian Industrial Environment

Competence, Opportunities and Challenges, Entrepreneurship and Economic growth, Small Scale Industry in India, Objectives, Linkage among small, medium and heavy industries, Types of enterprises, Corporate Social Responsibility.

UNIT-II: Identification and Characteristics of Entrepreneurs

First generation entrepreneurs, environmental influence and women entrepreneurs, Conception and evaluation of ideas and their sources, Selection of Technology, Collaborative interaction for Technology development.

UNIT-III: Business plan

Introduction, Elements of Business Plan and its salient features, Technical Analysis, Profitability and Financial Analysis, Marketing Analysis, Feasibility studies, Executive Summary.

UNIT-IV: Project Management

During construction phase, project organization, project planning and control using CPM, PERT techniques, Human aspects of project management, Assessment of tax burden

UNIT-V: Behavioral aspects of Entrepreneurs:

Personality, determinants, attributes and models, Leadership concepts and models, Values and attitudes, Motivation aspects, Change behavior

Time Management: Approaches of time management, their strengths and weaknesses. Time management matrix and the urgency addiction

Text Books:

1. Vasant Desai, "Dynamics of Entrepreneurial Development and Management", Himalaya Publishing House, 1997.
2. Prasanna Chandra, "Project-Planning, Analysis, Selection, Implementation and Review", Tata Mcgraw-Hill Publishing Company Ltd. 1995.
3. S.S. Khanka, "Entrepreneurial Development", S. Chand & Co. Pvt. Ltd., New Delhi

Suggested Reading:

1. Robert D. Hisrich, Michael P. Peters, "Entrepreneurship", Tata Me Graw Hill Publishing Company Ltd., 5lh Ed., 2005
2. Stephen R. Covey and A. Roger Merrill, "First Things First", Simon and Schuster Publication, 1994.
3. Sudha G.S., "Organizational Behavior", National Publishing House, 1996.

EE 414 **DIGITAL SIGNAL PROCESSING LAB**

Instruction	3 Periods per week
Duration of Semester Examination	3 Hours
Semester Examination	50 Marks
Sessional	25 Marks
Credits	2

Course Objectives:

1. *To understand fundamental concepts of Digital signal processing*
2. *To learn applications of various signal processing techniques using MATLAB*
3. *To learn to analyze signal using DSP*
4. *To learn to synthesize signal using DSP*
5. *To acquire knowledge on digital control of electrical appliances*

Course Outcomes: Students will be able to

1. *Simulate various signal transformations using MATLAB*
2. *Design filters using window techniques*
3. *Control AC machines using DSP*
4. *Control DC machines using DSP*
5. *To simulate control signals using MATLAB*

List of Experiments:

PART-A

1. Waveform generation -Square, Triangular and Trapezoidal.
2. Verification of Convolution Theorem-comparison Circular and Linear Convolutions.
3. Computation of DFT,IDFT using Direct and FFT methods.
4. Verification of Sampling Theorem
5. Design of Butterworth LP & HP filters.
6. Design of Chebyshev LP & HP filters
7. Design of FIR and IIR filters.
8. 16 bit Addition, Integer and fractional multiplication on 2407 DSP Trainer kit.
9. Generation of sine wave and square wave using DSP trainer kit.
10. Response of Low pass and High pass filters using DSP trainer kit.
11. Linear convolution using DSP trainer kit.
12. PWM Generation on DSP trainer kit.
13. Key pad interfacing with DSP.
14. LED interfacing with DSP.

PART-B

1. Stepper Motor Control using DSP.
2. DC Motor 4 - quadrant speed control using DSP.
3. Three phase IM speed control using DSP.
4. Brushless DC Motor Control.

Note: Any **EIGHT** experiments from **PART-A** and **TWO** from **PART-B** should be conducted in the semester.

EE 415 **POWER SYSTEMS LAB**

Instruction	3 Periods per week
Duration of Semester Examination	3 Hours
Semester Examination	50 Marks
Sessional	25 Marks
Credits	2

Course Objectives:

1. *To determine regulation & efficiency of short, medium and long transmission lines and to calculate A, B, C, D constants.*
2. *To understand the importance of protective relays in power system such as different protection of transformer DMT Characteristics of over current relay, Buchholz relay and static relays.*
3. *To understand the procedure to determine sequence parameters of transformer and alternator.*

Course Outcomes: After completion of the course: the student will be able to:

1. *Determine ABCD constants of transmission lines and evaluate regulation, efficiency.*
2. *Acquire knowledge in relay setting for safe operating of power system.*
3. *Determine sequence parameters of transformer and alternator and draw its importance.*
4. *Determine the time constant of an alternator.*
5. *Determine the dielectric strength of oil and calculate the efficiency of string insulators.*

List of Experiments:

1. Determination of regulation & efficiency of Short, Medium and Long transmission lines.
2. IDMT characteristics of Over-current relay.
3. Determination of A, B, C, D constants of Short, Medium, Long lines & circle diagrams.
4. Differential protection of transformer.
5. Sequence impedance of 3-Phase Alternators.
6. Determination of positive, negative and zero-sequence reactance of 3 -Phase transformers using sequence current excitation fault calculation.
7. Synchronous machine reactance and time constant from 3-Phase S.C test.
8. Characteristics of Static relays.
9. Static excitation of Synchronous Generator.
10. Determination of dielectric strength of oil & Study of Buchholz relay.
11. Parallel operation of Alternators.
12. Measurement of capacitance of 3-core cables.
13. Fault location of Underground cables.
14. Simulation of string of insulators for determination of Voltage distribution and String efficiency.

At least **TEN** experiments should be completed in the semester.

With effect from the academic year 2016-2017

EE 416 **PROJECT SEMINAR**

Instruction	3 Periods per week
Sessionals	25 Marks
Credits	1

Course Outcomes: After completion of the course: the student will be able to:

1. *Develop the skills of analyzing a problem, solving it by different approaches, building interactions with the other organizations.*
2. *Develop the skills of presenting a concept, independent learning and addressing the societal issues, economical outlay.*
3. *Acquire knowledge in conducting systematic literature survey and preparing the summary on the chosen topic.*
4. *Acquire knowledge in preparing the notes for presentation which exhibit the level of understands on the subject and further improvement.*
5. *Acquire knowledge in prepare project report, which will help in preparing such report while taking up the jobs/ project works.*

Dealing with a real time problem should be the focus of under graduate project. Faculty members should prepare project briefs (giving scope and references) well in advance, which should be made available to the students in the department. The project may be classified as hardware / software modeling / simulation. It may comprise any or all elements such as analysis, design and synthesis.

The department should appoint a project coordinator who will coordinate the following.

- Grouping of students (a maximum of 3 in group)
- Allotment of projects and project guides
- Project monitoring at regular intervals.

All project allotment is to be completed by the 3rd week of IV–Year, I-Semester, so that the students get sufficient time for completion of the project by the end of II-semester. Efforts be made the some of the projects are carried out in reputed industries / research organizations with the help of industry coordinators. Problems can also be invited from the industries to be worked out through undergraduate projects. Oral presentation is an important aspect of engineering education. The students have to deliver a seminar on the 'Project' they have chosen or allotted by the department, on the advice and approval from the faculty members. Students are exposed to the following aspects for seminar presentation.

- Literature Survey
- Organization of the material
- Power point presentation
- Technical writing

Each student project batch is required to:

1. Submit a one-page synopsis before the seminar talk for display on the notice board.
2. Give a 20-30 minutes presentation through power point presentation.
3. Submit a report on the project with list of references and slides used.

Project Seminars are to be scheduled from the 4th week of the I-semester to the last week of the I-semester.

For award of Sessional marks students are judged by the project coordinator and guide on the basis of an oral and written presentation as well as their involvement in the discussions.

With effect from the academic year 2016-2017

Semester- II

With effect from the academic year 2016-2017

SCHEME OF INSTRUCTION AND EXAMINATION
4/4 B.E.
ELECTRICAL & ELECTRONICS ENGINEERING

II-SEMESTER

S.No	Code	Subject	L	T	P	Scheme of Examination			
						Duration in Hours	Maximum Marks		Credits
							Univ. Exam	Sessionals	
1	EE 421	Utilization of Electrical Energy	4	-	-	3	75	25	3
2	ME419	Industrial Administration & Financial Management	4	-	-	3	75	25	3
3	-	Elective –III	4		-	3	75	25	3
4	-	Open Elective/ Elective –IV	4	-	-	3	75	25	3
5	EE 422	Electrical Simulation Lab	-	-	3	3	50	25	2
6	EE 423	General Seminar	-	-	3	-	-	25	1
7	EE 901	Project	-	-	6	viva	100	50	9
		TOTAL	**16**	**-**	**12**	**15**	**450**	**200**	**24**

S.No	CODE	ELECTIVE-III
1	EE 471	High Voltage Engineering
2	EE 472	Computer Methods in Power System
3	EE 473	Power System Operation & Deregulation
4	EE 474	Power Quality Engineering
5	EE 475	Electrical Distribution Systems
6	EE 476	Power System Reliability

S.No	CODE	ELECTIVE-IV
1	EE 481	Electronic Instrumentation
2	ME 472	Intellectual Property Rights
3	EC 475	Digital Image Processing
4	CE 422	Disaster Mitigation & Management
5	IT 429	Open Elective from other departments (Internet of things)
6	IT 428	Open Elective from other departments (Network Security)

EE 421 **UTILIZATION OF ELECTRICAL ENERGY**

Instruction	4 Periods per week
Duration of Semester Examination	3 Hours
Semester Examination	75 Marks
Sessional	25 Marks
Credits	3

Course Objectives:

1. *Understand the adaptability of heating and welding concepts for a given application*
2. *Know the necessity of illumination and batteries for specified requirement*
3. *Know selection of proper traction system and its corresponding drive for industrial applications*

Course outcomes: Students will able to

1. *Distinguish the adaptability of heating and welding concepts for a given application*
2. *Identify the necessity of illumination for specified requirement*
3. *Select proper traction system and its corresponding drive for industrial applications*
4. *Select the proper furnace System for a given requirement*
5. *Identify proper battery which suits the requirement*

UNIT-I: Electric Heating

Introduction, Classification of electric heating, Electric Resistance Heating, Resistance Ovens, Properties of good heating material, Different types of heating material, Causes of failure of heating element, Design of heating element- Numerical Problems.

Arc Furnaces or ovens: Direct Arc Furnace, Indirect Arc Furnace, Induction Heating, Direct Core-type Induction Furnace, Vertical Core-Type Induction Furnace, Indirect Core-Type Induction Furnace, Coreless Induction Furnace, High Frequency Eddy-current Heating, Dielectric Heating- Numerical Problems.

UNIT-II: Electric Welding

Introduction, Classification of Welding Processes, Formation and Characteristics of Electric Arc, Effect of Arc Length, Electrodes for Metal Arc Welding, Advantages of Coated Electrodes, Types of Joints - Welding Transformer-**Electric arc welding:** Carbon Arc Welding, Submerged Arc Welding, Atomic Hydrogen Welding-**Resistance Welding:** Spot Welding, Seam Welding, Projection Welding, Butt Welding, Flash Butt Welding, Upset Welding, Electron Beam Welding, Laser Welding - Numerical Problems

Unit-III: Illumination

Introduction, Terms used in illumination, laws of illumination, Polar Curves of C.P. Distribution – Determination of M.S.C.P. and M.H.C.P. from Polar Diagrams- Rousseau's construction, Lighting Schemes- Design of Lighting Schemes- Application to factory lighting, Street lighting and Flood lighting- **Electric Lamps:** Incandescent Lamps, Discharge lamps, Sodium vapour lamps, Mercury vapour lamps, Fluorescent lamps, CFL Lamp, LED Lamp, Stroboscopic effects- Numerical Problems

Unit-IV: Electric Traction-I:

Introduction, Systems of electric traction and track electrification- DC system, single phase and 3-phase low frequency and high frequency system, composite system, kando system, comparison between AC and DC systems- Train Movement-Typical Speed/Time Curve - Factors affecting scheduled speed - Simplified Speed/Time Curve - Average and Schedule Speed -Tractive Effort for Propulsion of a Train - Power Output from Driving Axles - Energy Output from Driving Axles - Numerical Problems

Unit-V: Electric Traction-II:

Specific Energy Output - Evaluation of Specific Energy Output -Energy Consumption - Specific Energy Consumption-Adhesive Weight - Coefficient of Adhesion - Mechanism of Train Movement - Numerical Problems

Batteries: Classification, Construction and maintenance, Charging and rating of Lead acid batteries and SMF batteries

Text Books:

1. C L Wadhwa, 'Generation, Distribution and Utilization of Electrical Energy', 3rd Edition New Age International Publishers, 2015.
2. B.L. Theraja, 'A Textbook of Electrical Technology' Volume-III, Transmission and Distribution. S. Chand and Company, 23rd Edition, 2013.
3. Partab H, 'Art and Science of Utilization of Electric Power', Dhanpatrai & Sons, 2014

Suggested Reading:

1. J B Gupta, 'Utilization of Electric Power and Electric Traction', S.K.KATARIA & SONS, 2013.
2. R K Rajput, 'Utilization of Electrical Power' R K. Rajput, 2nd Edition, Laxmi Publications (P)Ltd, 2016.

ME 419

Industrial Administration and Financial Management (for ECE and EEE)

Instruction	4 Periods per week
Duration of Semester Examination	3 Hours
Semester Examination	75 Marks
Sessionals	25 Marks
Credits	3

Objectives: Students able to learn

1. The roll importance and functions of Management in Industrial Organization
2. Various types of business organizations and organization structures.
3. Importance of plant location and plant layout
4. Importance of industrial engineering like method study and work measurement.
5. The importance of project management techniques
6. The total cost of a product based on elements of cost

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

1. Understand the role and importance of management and its principles.
2. Understand the need and importance of various types of layouts used in manufacturing industries
3. Apply the techniques of method study and work measurement in industry to enhance productivity
4. Apply the techniques of project management in industry
5. Understand the importance of quality control and plot the control charts
6. Calculate the total cost of the product based on its elements.

UNIT-I: Industrial Organization

Definition of an organization, types of various business organizations, organization structures and their relative merits and demerits, functions of management.

Plant location and layouts: Factors affecting the location of plant and layout, types of layouts and their merits and demerits.

UNIT-II: Work Study

Definitions, objectives of method study and time study, steps in conducting method study, symbols and charts used in method study, principles of motion economy, calculation of standard time by time study and work sampling, performance rating factor, types of ratings, jobs evaluation and performance appraisal, wages, incentives, bonus, wage payment plans

UNIT-III: Inspection and Quality Control

Types and objectives of inspection. S.Q.C., its principles. Quality control chart and sampling plans, quality circles. Introduction to ISO.

Production planning and control: Types of manufacture, types of production, principles of PPC and its function, production control charts.

UNIT-IV: Optimization

Introduction to linear programming and graphical solutions, assignment problems.

Project Management: Introduction to CPM and PERT, determination of critical path.

Material Management: Classification of materials, materials planning, duties of purchase manager, determination of economic ordering quantities, types of materials purchase.

UNIT-V: Cost accounting

Elements of cost, various costs, types of overheads, break even analysis and its applications, depreciation, methods of calculating depreciation fund, nature of financial management, time value of money, techniques of capital budgeting and methods, cost of capital, financial leverage.

Text Books:

1. Pandey I.M, '*Elements of Financial Management'*, Vikas Publishing. House, New Delhi, 1994
2. James C Van Horne, and John M Wachowicz, Jr., *Fundamentals of Financial Management*, 13th Edition, Prentice Hall Financial Times
3. Khanna O.P, '*Industrial Engineering and Managemen't*, Dhanapat Rai & Sons

Suggested Reading:

1. S.N. Chary, '*Production and Operations Management'*, Tata McGraw Hill, 3rd Edition, 2006.
2. Paneer Selvam, *'Production and Operations Management'*, Pearson Education, 2007.
3. Joseph Monk, '*Operations Management'*, TMH Publishers, New Delhi, 2004.
4. Buffa Elwood S, '*Modern Production /Operations Management'*, John Wiley Publishers, Singapore, 2002
5. Everrete E. Adama and Ronald J. Ebert, '*Production & Operations Management'*, Prentice

EE 471 HIGH VOLTAGE ENGINEERING (Elective -III)

Instruction	4 Periods per week
Duration of Semester Examination	3 Hours
Semester Examination	75 Marks
Sessional	25 Marks
Credits	3

Course Objectives

1. *Understand the breakdown mechanism in gases, liquids and solid dielectrics.*
2. *Understand the methods of generation and measurement of high voltages and currents.*
3. *Understand the procedure for testing of high voltage equipment.*

Course Outcomes After completion of the course the student will:

1. *Acquire knowledge in breakdown mechanism in Gases and specially pertaining to high voltage engineering and in importance.*
2. *Acquire knowledge in different aspects of breakdown mechanism in liquids and solids specifically pertaining to high voltage aspect.*
3. *Acquire knowledge in respect of generation of High Voltages and currents, generation of impulse voltage and currents. To Analyze multistage impulse generation of impulses voltages and current generation.*
4. *Acquire knowledge relating to measurement of high AC currents, High DC currents measurement of impulse currents and associated measuring equipment.*
5. *Acquire knowledge in testing of high voltage electrical equipment such as power capacitor, power transforms, circuit breaker, insulator, bushings, cables, surge arresters etc.*

UNIT-I: Breakdown mechanism in Gases

Mechanism of breakdown, Types of collisions, Ionization processes, Townsend's First and second Ionization coefficients, Townsend's breakdown mechanism, Time lags for breakdown, Streamer theory of breakdown, Paschen's Law, Penning effect, Corona discharges.

UNIT II: Breakdown mechanism in liquids and solids

Breakdown in liquid dielectrics: Classification of liquid dielectrics, Pure liquids and commercial liquids, conduction and breakdown in pure liquids and commercial liquids. Testing of transformer oil. Breakdown in solid dielectrics: Intrinsic breakdown, Electro-mechanical breakdown, Thermal breakdown, Breakdown due to treeing and tracking, Breakdown due to internal discharges.

UNIT-III: Generation of High Voltages and Currents

Generation of Hugh DC voltages: Half and full wave rectifier circuits, Voltage doubler circuits, Cockroft Walton voltage multiplier circuit. Generation of Hugh AC voltages: Electrostatic generator, Van de Graf generator, Cascaded transformers, Series resonant circuit. Generation of Impulse Voltages and Currents: Analysis of impulse generator circuit, Multistage Impulse generator circuit, Impulse current generation.

UNIT-IV: Measurement of High Voltage and Currents

Sphere gap, Uniform field spark gap, Rod gap, electrostatic voltmeter, Generating voltmeter, Chubb Fortescue method, Impulse voltage measurement using voltage dividers. Measurement of high D.C currents using Hall generators, Measurement of high A.C currents using current transformer and electro-optical system. Measurement of Impulse currents: Resistive shunts, Rogouuski coils, Faraday generator.

UNIT-V: Testing of High Voltage Equipment

Testing of Power capacitors. Testing of power transformers. Testing of circuit breaker. Testing of Insulators and bushings. Testing of Cables. Testing of Surge Arresters.

Text Books

1. M.S.Naidu and V.Kamaraju, High Voltage Engineering, 4th Edition, Tata McGraw Hill 2009.
2. C.L. Wadhwa, High Voltage Engineering, Wiley Eastern Ltd.., 2007.

Suggested Reading:

1. E.Kuffel and W.S. Zaengl, High Voltage Engineering, 3rd Edition, Pergamon Press, 2016.

EE472 COMPUTER METHODS IN POWER SYSTEMS (Elective -III)

Instruction	4 Periods per week
Duration of Semester Examination	3 Hours
Semester Examination	75 Marks
Sessional	25 Marks
Credits	3

Course Objectives:

1. *To study the formulation of various incidence matrices*
2. *To study the formulation of network matrices such as Y_{BUS}, Y_{BR} and Z_{loop}.*
3. *To know about the formation of Z_{BUS} for given power system network.*
4. *To understand the calculation of fault currents using Z_{BUS} in three phase power system network.*

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

1. *Draw the graph and find the network metrics for the given power system network.*
2. *Modify the Z_{bus} for changes in the network structure.*
3. *Determine the fault currents in three-phase power system for different faults*
4. *Acquire the knowledge of different transformation techniques*
5. *Find the ZBUS for given three-phase network.*

UNIT –I: Graph Theory

Definitions, Incidence Matrices, Element node incidence matrix, Bus incidence matrix, Branch path incidence matrix, Basic and Augmented cut set incidence matrices, Basic and Augmented branch incidence matrices, Basic and Augmented loop incidence matrices, Construction of Primitive network element.

UNIT – II: Formulation of Network Matrices

Formation of Y_{bus}, Y_{BR} and Z_{loop} by Singular Transformation Method, Derivation of Y_{BR}, Y_{loop}, Z_{bus} and Y_{bus} from non-singular transformation method.

UNIT –III: Z_{bus} Algorithm

Formation of Z_{Bus}: Partial network, Algorithm for the Modification of Z_{Bus} Matrix for addition element for the following cases: Addition of element from a new bus to reference, Addition of element from a new bus to an old bus, Addition of element between an old bus to reference and Addition of element between two old busses Modification of Z_{Bus} for the changes in network.

UNIT –IV: Three-phase Networks

Representation and performance equation of 3-phase network elements ,Three phase network elements with balanced and unbalanced excitation, Transformation matrices, Symmetrical and Clarke's components, Algorithm for formation of 3-phase bus impedance matrix, Modification of three phase Z_{BUS} for changes in network

UNIT – V: Short Circuit Studies

Basic assumption in short circuit studies, System representation, General equations for short circuit study in phase variables and Symmetrical components for fault current and node voltage, Short circuit calculations for balanced three phase network using Z_{BUS}, Fault impedance and admittance matrices, Analysis of 3-phase line to ground and double line to ground faults, Flow chart for short circuit study.

Text Books:

1. Stagg and El-Abiad, 'Computer methods in Power System Analysis', 9th Edition, Tata McGraw Hill, 1983.
2. M.A.Pai, 'Computer techniques in Power System Analysis', 3rd Edition, Tata McGraw Hill, 2014.

Suggested Reading:

1. L.P. Singh, 'Advanced Power System Analysis and Dynamics', 6th Edition, New Age International Publishers, 2014
2. Kusic Gearge L, 'Computer Aided Power System Analysis', 2nd Edition, CRC Press, 2008.

EE 473 POWER SYSTEM OPERATION AND DEREGULATION
(Elective-III)

Instruction	4 Periods per week
Duration of Semester Examination	3 Hours
Semester Examination	75 Marks
Sessional	25 Marks
Credits	3

Course Objectives

1. *To understand the importance of optimal power flow in power system operation*
2. *To know how to operate power system as securely as possible*
3. *To understand various methods of state estimation*
4. *To discuss about power system deregulation*
5. *To calculate the available transfer capability of the lines*

Course Outcomes

1. *Able to calculate the optimal power flows for the given power system*
2. *Able to carry out contingency analysis*
3. *Able to determine the state estimation of the system and difference between ***nvential LF and SE.*
4. *Able to understand the benefits of deregulation*
5. *Able to determine the available transfer capability of a line and know the various pricing methods in deregulated power system*

UNIT- I: Optimal Power Flow

Introduction, OPF formulation, OPF solution technique, Linear programming OPF, Interior point method, unit commitment solution methods, priority list method, dynamic programming method

UNIT-II: Power System Security

Introduction, Factors affecting power system security, Contingency analysis, AC power flow security analysis with contingency case selection, concentric relaxation, Bounding area method

UNIT-III: State Estimation

Introduction, Power system state estimation, Methods of Least squares, Maximum likelihood Weighted Least squares estimation, Matrix formulation, State estimation by orthogonal decomposition, detection and identification of Bad measurements, Network observability and pseudo measurements

UNIT-IV: Power System Restructuring

Introduction, Motivation for restructuring of power system, Electricity market entities and model, benefits of deregulation, terminology, deregulation in Indian power sector, Operations in power markets, power pools, transmission networks and electricity markets.

UNIT-V: ATC, Transmission Open Access& Pricing

Introduction, definitions, methods of determination of ATC, ATC calculation considering the effect of contingency analysis, Transmission open access, types of services, cost components of transmission system, transmission pricing methods, Incremental cost based transmission pricing.

Text Books:

1. A. J. Wood and B.F.Woollenberg- Power Generation, Operation and Control, 3rd Edition. John Wiley, 2013.
2. P. Venkatesh, B. V. Manikandan, S. Charles Raja and A. Srinivasan, "Electrical Power Systems Analysis, Security, Deregulation"– PHI 2012.
3. K.Bhattacharya, M. Bollen and J.E. Daalder Operation of Restructured Power Systems, 1st Edition Springer Publishers 2012.

Suggested Reading:

1. Md Shahidephpour and M. Alomoush, 'Restructured Electrical Power Systems', Marcel Dekker Inc, 2001.
2. T.K.Nagsarkar, M.S.Sukhija, Power System Analysis, Illustrated Edition, Oxford publications, 2007

EE 474 POWER QUALITY ENGINEERING (Elective-III)

Instruction	4 Periods / week
Duration of Semester Examination	3 Hours
Semester Examination	75 Marks
Sessional	25 Marks
Credits	3

Course Objectives:

1. *Understand the theoretical concepts and standards of Power Quality (PQ), and methods to calculate and analyse voltage sag in distribution systems.*
2. *Understand PQ issues and sources in Industrial systems and its mitigation*
3. *Understand the presence and sources of harmonics in industrial and commercial loads.*
4. *To know about devices for controlling and mitigating the harmonics.*

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

1. *Have the knowledge of theoretical concepts and standards of Power Quality and issues in industrial systems*
2. *Have the knowledge to calculate and analyze voltage sag in distribution systems*
3. *Acquire knowledge in identifying sources of harmonic.*
4. *Acquire the knowledge in mitigation of harmonics in industrial and commercial loads systems*
5. *Acquire the knowledge in measurement of PQ problems.*

UNIT I: Introduction

Power Quality (PQ), PQ problems, Sags, Swells, Transients, Harmonics, Interruptions, Flicker, Voltage fluctuations, Notch. PQ Issues, **Transient Over-voltages:** Sources of Transient Over-voltages, Wiring and Grounding, Reasons for Grounding, Typical wiring and grounding problems, Solutions to wiring and grounding problems.

UNIT II: Voltage Sag Analysis:

Voltage sag characteristics, Methodology for computation of voltage sag magnitude and occurrence, Accuracy of sag analysis, Duration & frequency of sags, Faults behind transformers, Effect of pre-fault voltage, Voltage dip problems, Fast assessment methods for voltage sags in distribution systems.

UNIT III: PQ Consideration in Industrial Power Systems

Adjustable speed drive (ASD) systems and applications, Sources of power system harmonics, Mitigation of harmonics, Characterization of voltage sags experienced by three-phase ASD systems, Types of sags and phase angle jumps, Effects of momentary voltage dips on the operation of induction and synchronous motors .

UNIT IV: Harmonics

Harmonic distortion, Voltage versus current distortion, Harmonics versus Transients, Harmonic Indices, Harmonic sources from commercial loads, Harmonic sources from industrial loads, Locating Harmonic sources, Effects of Harmonic distortion, Inter harmonics, Devices for controlling harmonic distortion.

UNIT V: Assessing PQ

Remedies, Customer side of meter, Utility side of the meter, Power quality monitoring, Monitoring considerations, PQ measurement equipment, PQ monitoring standards.

Text Book

1. C.Sankaran, 'Power Quality', CRC Press, 2001
2. R.Sastry Vedam, M.Sarma, "Power Quality- VAr Compensation in Power Systems ", CRC Press, 2009

Suggested Reading:

1. Math H.J. Bollen, 'Understanding Power Quality Problems', IEEE Press, 2000.

2. Roger C.Dugan, Mark F.McGranaghan, Surya Santoso, H.Wayne Beaty, 'Electrical Power Systems Quality', 3rd Edition, Tata McGraw Hill, 2012.

EE 475 ELECTRICAL DISTRIBUTION SYSTEMS (Elective-III)

Instruction	4 Periods per week
Duration of Semester Examination	3 Hours
Semester Examination	75 Marks
Sessional	25 Marks
Credits	3

Course Objectives:

1. *To Study the load characteristics and application of distribution transformers.*
2. *To understand the substation schemes, voltage drop calculation of different service areas.*
3. *To know about primary and secondary distribution systems and their characteristics.*
4. *To study the application of capacitors in distribution systems and distribution automation control functions.*

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

1. *Find the load factors, diversity factor etc. for different systems.*
2. *Acquire the knowledge of substation bus schemes and calculation of rating of substation.*
3. *Find voltage drop and power loss calculations of primary and secondary distribution systems.*
4. *Competent to calculate respective power requirement of distribution systems and requirement of distribution automation system.*
5. *Acquire the knowledge of voltage control methods.*

UNIT-I: Load Characteristics

Demand, demand curve, load duration curve, Diversified demand, Non-coincident Demand, Coincidence factor, Contribution factor problems, Relationship between load and loss factors load growth, Rate structure, Customer billing, Application of distribution transformers, Types of distribution transformers.

UNIT-II: Sub transmission lines and Substations

Types of sub-transmission lines, Distribution substations, Substation bus schemes, Rating of distribution substation, Service area with multiple feeders, Substation application curves, Percent voltage drop calculations.

UNIT-III: Primary and Secondary Feeders

Types of primary systems, Radial type, Loop type and Primary network, Primary feeder loading, Radial feeder with uniformly distributed load, Secondary voltage levels, Secondary banking, Secondary networks, Economic design of secondary's, unbalanced load and voltages.

UNIT-IV: Voltage drop and Power loss calculations

Voltage drop and power loss calculations, 3-phase, Non 3-phase primary lines, Single phase two-wire laterals with ungrounded neutral, Single phase two wire unigrounded laterals, Two phase plus neutral lateral, Method to analyze distribution costs, Voltage control methods, Feeder voltage regulators.

UNIT-V: Application of capacitors to Distribution Systems

Effects of series and shunt capacitors, Power factor correction, Economic justification for capacitors, Location and sizing of capacitors in distribution system.

Distribution System Automation: Definitions, control functions, Level of penetration of DA, Types of communication systems, Supervisory control and data acquisition, Advanced SCADA concepts.

Text Books:

1. Turan Gonen, 'Electric Power Distribution Engineering', 3rd *Edition* TMH, 2016.
2. A.S.Pabla, 'Electric Power Distribution', 6th Edition, TMH, 2012.

Suggested Reading:

1. William Kersting, Distribution System Modeling & Analysis, 3rd *Edition* CRC Press, 2015.
2. S.Sivanagaraju, and V.Sanker, 'Electric power distribution and Automation', Dhanpat Rai & Co, 2012.

EE 476 POWER SYSTEM RELIABLITY (Elective-III)

Instruction	4 Periods per week
Duration of Semester Examination	3 Hours
Semester Examination	75 Marks
Sessional	25 Marks
Credits	3

Course Objectives:

1. *To understand probability theory and distributions*
2. *To Understand component reliability types and causes of failures ,reliability logic diagram for different configuration.*
3. *To Understand discrete Markov chains and continuous Markov process and the importance of reliability evaluation of repairable systems*

Course Outcomes: After completion of the course the student will be able to:

1. *Acquire knowledge and to apply probability theory and distribution functions to engineering applications.*
2. *Acquire knowledge to study and to classify types of causes of failures, reliability logic diagram for different configurations.*
3. *Acquire knowledge to study discrete and continuous Markov chains and process and give thrust to reliability evaluation of repairable systems.*
4. *Evaluate various load models*
5. *Apply reliability analysis on a given distribution system.*

UNIT –I: Elements of probability theory

Probability distributions: Random variables, density and distribution functions, Mathematical expectation-Mean and Variance, Binominal distribution, Poisson distribution, Normal .distribution, Exponential distribution, Weibull distribution.

UNIT-II: Reliability

Definition, Component reliability, Hazard rate, derivation of the reliability function in terms of the hazarad rate. Causes of failures, types of failures. Bath tub curve, MTTR, MTBF. Reliability logic diagrams for series, parallel, series-parallel, non series-parallel configurations. Minimal cut-set and decomposition methods.

UNIT-III: Discrete Markov Chains

General modeling concepts, stochastic transitional probability matrix, time dependent probability evaluation and limiting state probability evaluation. Absorbing states. Continuous Markov Processes: Modeling concepts, State space diagrams, Stochastic Transitional Probability Matrix, Evaluating limiting state Probabilities. Reliability evaluation of repairable systems.

UNIT-IV: Generating System Reliability Analysis

Generation system model- capacity outage probability tables -Recursive relation for capacitive model building '- sequential addition method -unit removal- Evaluation of loss of load and energy indices. Evaluation of equivalent transitional rates of identical and nonidentical units -Evaluation of cumulative probability and cumulative frequency of nonidentical generating units -2'-level daily load representation - merging generation and load models

UNIT-V:

Distribution System Reliabiliry Analysis

Radial networks –Evaluation of Basic reliability indices, performance indices -load point and system reliability indices - customer oriented, loss and energy oriented indices. Parallel networks- inclusion of bus bar failures, scheduled maintenance -temporary and transient failures -weather effects - common mode failures -Evaluation of various indices.

Text Books:

1. Roy Billinton and Ronald N. Aallan "Reliability Evaluation of Engineering Systems", Concepts and Techniques, 2nd Edition Springer International Edition, 1992
2. Roy Billinton and Ronald N. Aallan "Reliability Evaluation of Power Systems", 2nd Edition BS Publicaitons, 1996.
3.

Suggested Reading:

J. Endrenyi, " Reliability Modeling in Electrical Power Systems", Wiley Inter science publications.1978

EE 481 ELECTRONIC INSTRUMENTATION SYSTEMS (Elective -IV)

Instruction	4 Periods per week
Duration of Semester Examination	3 Hours
Semester Examination	75 Marks
Sessional	25 Marks
Credits	3

Course objectives:

1. To understand the concept of transducers.
2. To know the features of data converters.
3. To understand construction and working details of different signal generators, signal analyzers and CRO.

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

1. *To know the effectiveness of data converters.*
2. Know the applications of various transducers.
3. Know the suitable signal analyzer which suits for a particular application.
4. Understands how different signal generators can be used.
5. know how to work on CRO for different applications.

UNIT-I: Analog and Digital Measuring Systems

Interfacing Active and Passive Transducers. Amplifiers: Instrumentation amplifiers (Fixed and Programmable gain types and its specifications), Isolation amplifiers (Types and its specifications).

Digital to Analog Converters: R-2R ladder and Inverted ladder DACs. Main DAC specifications. Analog to Digital Converter: R-2R Ladder and Inverted Ladder DACs, Main DAC specifications, Analog to Digital Converters: Parallel (or Flash) ADC successive approximation, ADC Microprocessor compatibility, Dual slope ADC, Principal specifications of an ADC.

UNIT-II: Digital Voltmeters and Multimeters

Simple D.C Voltage attenuator, Current toVoltage converter, Resistance to Voltage Converter, Automatic ranging and Automatic zeroing RMS detector in DMM and RMS and True RMS, Digital Frequency and Time measurements, Frequency Measurements, frequency ratio Time Interval and Pulse width measurements, Scaling and Checking modes. Counting errors, Input signal conditioning, Trigger level, Hysteresis.

UNIT-III: Signal Analysis

Wave Analyzers: Signal analysis and wave Analyzer: Type and Applications. Harmonic Distortion Analyzers: harmonic Distortion, heterodyne harmonic Analyzer or Wave meter, Tuned circuit, Fundamental Suppression. Spectrum Analysis: Block Diagram, Phase locked circuit for the local oscillator, Successive Limiting type of Log IF amplifier.

UNIT-IV: Signal Generators

Fixed and variable Audio frequency oscillator, Audio frequency sine and square wave generator, function generator, square wave pulse generator, random noise generator, TV sweep generator, marker generator and beat frequency oscillator(BFO). synchronized signal generator interfaced with 488 Bus, relay switched attenuator, IEE 488 Electrical interface.

UNIT-V: Cathode ray Oscilloscope

Block Diagram, Basic Concepts, Vertical amplifier, Time Base, Trigger Delay line and their role in a CRO, Digital storage Oscilloscope, Magnetic Re orders, Digital Interface for Programmable Instrumentation, Description and Sample examples of Automatic Instrumentation.

Text books:

1. H .S. Kalsi, "Electronic Instrumentation", 2nd Edition, TMH publications, 2007.
2.A.K.Sawhney-" A Course in Electrical and Electronics Measurements and Instrumentation", 4th Edition Dhanpat Rai & Sons, New Delhi, 2012.

Suggested reading:

1. E.W Golding **"Electrical** Measurements and measuring Instruments". TMH publications, 2011.
2. Helfrick, Albert D. Cooper, William D, "Modern Electronic Instruments and Measuring Instruments ". Prentice Hall of India, 1992.

With effect from the academic year 2016-2017

ME 472 **Intellectual Property Rights (Elective – IV)**
(for Mech, Prod, Civil, ECE, EEE, CSE, IT)

Instruction	4 Periods per week
Duration of End Examination	3 Hours
End examination	75 Marks
Sessionals	25 Marks
Credits	3

Objectives:

1. *To introduce fundamental aspects of IP*
2. *Introducing all aspects of IPR acts.*
3. *Creating awareness of multi disciplinary audience*
4. *Creating awareness for innovation and its importance*
5. *Exposing to the changes in IPR culture*
6. *Awareness about techno-business aspects of IPR*

Outcomes: At the end of the course, a student

1. *Will respect intellectual property of others*
2. *Learn the art of understanding IPR*
3. *Develop the capability of searching the stage of innovations.*
4. *Capable of filing a patent document independently.*
5. *Completely understand the techno-legal business angle of IP. .*
6. *Capable of converting creativity into IP and effectively protect it.*

UNIT-I: Overview of Intellectual Property

Introduction and the need for intellectual property right (IPR), IPR in India – Genesis and Development, IPR abroad, Some important examples of IPR. Importance of WTO, TRIPS agreement, International Conventions and PCT

Patents: Macro economic impact of the patent system, Patent and kind of inventions protected by a patent, Patent document, How to protect your inventions. Granting of patent, Rights of a patent, how extensive is patent protection. Why protect inventions by patents. Searching a patent, Drafting of a patent, Filing of a patent, the different layers of the international patent system, (national, regional and international options), compulsory licensing and licensers of right & revocation, Utility models, Differences between a utility model and a patent. Trade secrets and know-how agreements

UNIT-II: Industrial Designs

What is an industrial design. How can industrial designs be protected? What kind of protection is provided by industrial designs? How long does the protection last? Why protect industrial designs?

UNIT-III: Trademarks

What is a trademark, Rights of trademark? What kind of signs can be used as trademarks. Types of trademark, function does a trademark perform, How is a trademark protected? How is a trademark registered. How long is a registered trademark protected for? How extensive is trademark protection. What are well-known marks and how are they protected? Domain name and how does it relate to trademarks? Trademark infringement and passing off.

UNIT-IV: Copyright

What is copyright. What is covered by copyright. How long does copyright last? Why protect copyright? Related Rights: what are related rights. Distinction between related rights and copyright. Rights covered by copyright? Copy rights in computer programming.

UNIT-V: Enforcement of Intellectual Property Rights

Infringement of intellectual property rights Enforcement Measures Emerging issues in Intellectual property protection. Case studies of patents and IP Protection.

Unfair Competition: What is unfair competition. Relationship between unfair competition and intellectual property laws.

Text Books:

1. Ajit Parulekar and Sarita D' Souza, Indian Patents Law – Legal & Business Implications; Macmillan India ltd , 2006
2. B. L.Wadehra; Law Relating to Patents, Trade Marks, Copyright, Designs & Geographical Indications; Universal law Publishing Pvt. Ltd., India 2000
3. P. Narayanan; Law of Copyright and Industrial Designs; Eastern law House, Delhi 2010

Suggested Reading:

1. Cronish W.R1 Intellectual Property; Patents, copyright, Trad and Allied rights, Sweet & Maxwell, 1993.
2. P. Narayanan, Intellectual Property Law, Eastern Law Edn., 1997.
3. Robin Jacob and Daniel Alexander, A Guide Book to Intellectual Property Patents, Trademarks, Copy rights and designs, Sweet, Maxwell 4th Edition.

EC 475 DIGITAL IMAGE PROCESSING (ELECTIVE - IV)

Instruction	4 Periods per week
Duration of End Examination	3 Hours
End examination	75 Marks
Sessionals	25 Marks
Credits	3

Course Objectives:

1. To Understand the formation of images are formed and represent digitally.
2. To study transform-domain representation of images.
3. To know the principles of image compression and enhancement .
4. Students would be able to solve the problems related to image restoration.
5. To learn lossy and lossless Compression techniques.

Course Outcomes: Student will be able to:

1. Understand how images are formed, sampled, quantized and represented digitally.
2. Learn the properties and applications of transforms like Fourier, DCT, Haar, DWT and WHT.
3. Use the principles of image compression, enhancement and segmentation for practical applications.
4. Implement the image restoration techniques on the given image.
5. Remove the redundancy in an image.
6. Implement algorithms of image processing using MATLAB in real time systems.

UNIT – I

Elements of Digital Image Processing Systems, Digital image representation, elements of visual perception, Image sampling and Quantization, Basic Relationships between pixels.

UNIT – II

Properties and Applications of Fourier transform: FFT, Discrete cosine transform, Hadamard transform, Haar transform, Slant transform, DWT and Hotelling transform.

UNIT – III

Spatial enhancement techniques: Histogram equalization, direct histogram specification, Local enhancement. W.e.f. the Academic Year 2016-17 43 Frequency domain techniques : Low pass, High pass and Homomorphic Filtering, Image Zooming Techniques.

UNIT – IV

Image Degradation model, Algebraic approach to restoration, inverse filtering, Least mean square filter, Constrained least square restoration and interactive restoration. Speckle noise and its removal techniques.

UNIT – V

Redundancies for image compression, Huffman Coding, Arithmetic coding, Bit-plane coding, loss less and lossy predictive coding. Transform coding techniques: Zonal coding and Threshold coding.

Text Books:

1. Gonzalez R.C. and Woods R.E., "Digital Image Processing" 2/e, PHI, 2005.
2. A.K.Jain, " Fundamentals of Digital Image processing", PHI, 1989.

Suggested Reading:

1. Madhuri A, Joshi, "Digital Image Processing: An algorithmic Approach", PHI, 2006.
2. U Qidwai, C.H.Chen, "Digital Image Processing," First Indian Reprint 2013, CRC Press, (Taylor &Francis), Yesdee Publications.

CE 422 DISASTER MITIGATION AND MANAGEMENT
(Elective - IV)

Instruction	4 Periods per week
Duration of Main Examination	3 Hours
Main Examination	75 Marks
Sessionals	25 Marks
Credits	3

Course Objectives:

1. *To equip the students with the basic knowledge of hazards, disasters, risks and vulnerabilities including natural, climatic and human induced factors and associated impacts.*
2. *To impart knowledge in students about the nature, mechanism causes, consequences and mitigation measures of the various natural disasters including hydro metrological and geological based disasters.*
3. *To enable the students to understand risks, vulnerabilities and human errors associated with human induced disasters including chemical, biological and nuclear warfare agents.*
4. *To equip the students with the knowledge of various chronological phases in the disaster management cycle.*
5. *To create awareness about the disaster management framework and legislations in the context of national and global conventions.*
6. *To enable students to understand the applications of geospatial technologies like remote sensing and geographical information systems in disaster management.*

Course Outcomes:

1. *Ability to analyse and critically examine existing programs in disaster management regarding vulnerability, risk and capacity at local level*
2. *Ability to choose the appropriate activities and tools and set up priorities to build a coherent and adapted disaster management plan.*
3. *Ability to understand various mechanisms and consequences of natural and human induced disasters for the participatory role of engineers in disaster management.*
4. *Develop an awareness of the chronological phases of disaster preparedness, response and relief operations for formulating effective disaster management plans*
5. *Ability to understand various participatory approaches/strategies and their application in disaster management*
6. *Ability to understand the concepts of remote sensing and geographical information systems for their effective application in disaster management.*

UNIT-I: Introduction to Natural, human induced and human made disasters

Meaning, nature, types and effects; International decade of natural disaster reduction (IDNDR); International strategy of natural disaster reduction (ISDR)

UNIT-II: Natural Disasters

Hydro meteorological disasters: Causes, impacts, Early warning systems, structural and non-structural measures for floods, drought and cyclones; Tropical cyclones: Overview, cyclogenesis, drought monitoring and management.; Geographical based disasters: Earthquakes and Tsunami- Overview, causes, impacts, zoning, structural and non-structural mitigation measures; Tsunami generation; Landslides and avalanches: Overview, causes, impacts, zoning and mitigation measures. Case studies related to various hydro meteorological and geographical based disasters.

UNIT III: **Human induced hazards**

Risks and control measures in a chemical industry**,** Causes, impacts and mitigation measures for chemical accidents, chemical disaster management, current status and perspectives; Case studies related to various chemical industrial hazards eg: Bhopal gas tragedy; Management of chemical terrorism disasters and biological disasters; Radiological Emergencies and case studies; Case studies related to major power break downs, fire accidents and traffic accidents .

UNIT IV: Use of remote sensing and GIS in disaster mitigation and management

Scope of application of ICST (Information, communication and space technologies in disaster management, Critical applications& Infrastructure; Potential application of Remote sensing and GIS in disaster management and in various disastrous conditions like earthquakes, drought, Floods, landslides etc.

UNIT V: Concept of disaster management

Introduction to disaster management, Relationship between Risk, vulnerability and a disaster, Disaster management cycle, Principles of disaster mitigation: Hazard identification and vulnerability analysis, Early warning systems and forecasting; Infrastructure and development in disaster management; Disaster management in India: National disaster management framework at central, state, district and local levels. Community based disaster management.

Text Books:

1. Rajib, S and Krishna Murthy, R.R (2012), “Disaster Management Global Challenges and Local Solutions" Universities Press Hyderabad.
2. Notes / Reading material published by National Disaster Management Institute, Ministry of Home Affairs, Govt. of India.

Suggested Reading:

1. Navele, P & Raja, C.K. (2009), Earth and Atmospheric Disasters Management, Natural and Manmade. B.S. Publications, Hyderabad.
2. Fearn-Banks, K (2011), Crises computations approach: A case book approach. Route ledge Publishers, Special Indian Education, New York & London.
3. Battacharya, T. (2012), Disaster Science and Management. Tata McGraw Hill Company, New Delhi.

IT 429

INTERNET OF THINGS
(for ECE & EEE)

Instruction	4 L periods per week
Duration of Semester Examination	3 Hours
Semester Examination	75 Marks
Sessional	25 Marks
Credits	3

Course Prerequisites: Programming and Problem Solving, Basic Electronics, Computer Organization

Course Objectives:

1. *To provide an overview of Internet of Things, building blocks of IoT and the real-world applications*
2. *To introduce Rasberry Pi device, its interfaces and Django Framework*.

Course Outcomes:

After successful completion of the course, student will be able to

1. *Understand the terminology, enabling technologies and applications of IoT*
2. *Learn the concept of M2M (machine to machine) and describe the differences between M2M and IoT.*
3. *Understand the basics of Python Scripting Language which is used in many IoT devices*
4. *Describe the steps involved in IoT system design methodology*
5. *Design simple IoT systemsusing the understanding of the Rasberry Pi board and interfacing sensors and actuators with Rasberry Pi*
6. *Develop web applications using python based web application framework called Django.*

Unit I: Introduction & Concepts

Introduction to Internet of Things- Definitions & Characteristics of IoT, Physical Design of IOT-Things in IoT, IoT Protocols, Logical Design of IOT-IoT Functional Blocks, IoT Communication Models, IoT Communication APIs, IOT Enabling Technologies-Wireless Sensor Networks, Cloud Computing, Big Data Analytics, Communication Protocols, Embedded Systems, IOT Levels & Deployment Templates.

Unit II: Domain Specific IoTs

IoT applications for Home Automation, Cities, Environment, Energy, Retail, Logistics, Agriculture, Industry, health and Lifestyle

IoT and M2M – Introduction, M2M, Differences between IoT and M2M, Software Defined Networking, Network Function Virtualization,

Unit III: Introduction to Python

Motivation for using Python for designing IoT systems, Language features of Python, Data types-Numbers, Strings, Lists, Tuples, Dictionaries, Type Conversions, Data Structures: Control of flow-if, for, while, range, break/continue, pass, functions, modules, packaging, file handling, data/time operations, classes, Exception handling, Python packages of Interest for IoT - JSON, XML, HTTPLib, URLLib, SMTPLib

Unit IV: IoT Platforms Design Methodology

Introduction, IoT Design Methodology Steps-Purpose and Requirements Specification, Process Specification, Domain Model Specification, Information Model Specification, Service Specifications, IoT Level Specification, Functional View Specification, Operational View Specification, Device and Component Integration, Application Development, Case Study on IoT System for Weather Monitoring.

Unit V: IoT Physical Devices and End Points

Basic building blocks of an IoT device, Rasberry Pi-About theRasberry Pi board, Rasberry Pi interfaces-Serial, SPI,I2C, Other IoT Devices-pcDuino, BeagleBone Black, Cubieboard

IoT Physical Servers and Cloud Offerings- Introduction to cloud storage models and Communication APIs, WAMP-AutoBahn for IoT, Xivelycloud for IoT

Python Web Application Framework: Django Framework-Roles of Model, Template and View

Text Books:

1. ArshdeepBahga and Vijay Madisetti, "Internet of Things - A Hands-on Approach, Universities Press, 2015.

Suggested Reading:

1. Francis daCosta, "Rethinking the Internet of Things: A Scalable Approach to Connecting Everything", 1st Edition, Apress Publications, 2013
2. Getting Started with Raspberry Pi, Matt Richardson & Shawn Wallace, O'Reilly (SPD), 2014.

IT 428 NETWORK SECURITY (for ECE&EEE)

Instruction	4 Periods per week
Duration of End Examination	3 Hours
End Examination	75 Marks
Sessional	25 Marks
Credits	3

Course Prerequisites: Data Communications,Computer Networks

Course Objectives:

1. *To introduce the basics of network security*
2. *To familiarize with key distribution and security in the transport layer*
3. *To present wireless network protocols and email security*
4. *To discuss about Internet protocol security and Intruder detection*
5. *To impart knowledge about malicious software and firewalls*

Course Outcomes:

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

1. *Understand the basics of network security and apply related concepts for ensuring security*
2. *Understand the principles of encryption, cryptography and message authentication*
3. *Understand the key distribution and security considerations in the transport layer*
4. *Apply wireless network security protocols and email security*
5. *Understand IP security and Intrusion detection*
6. *Detect malicious software and configure a firewall*

UNIT –I: Introduction

Computer Security Concepts, The OSI Security Architecture, Security Attacks, Security Services, Security Mechanisms, A Model for Network Security, Standards, **Symmetric Encryption and Message Confidentiality:** Symmetric Encryption Principles, **Public-Key Cryptography and Message Authentication:** Approaches to Message Authentication, Secure Hash Functions, Message Authentication Codes, Public-Key Cryptography Principles, Public-Key Cryptography Algorithms, Digital Signatures

UNIT – II: Key Distribution and User Authentication

Symmetric Key Distribution using Symmetric Encryption, Kerberos, Key Distribution Using Asymmetric Encryption, X.509 Certificates, Public-Key Infrastructure,**Transport-Level Security:** Web Security Considerations, Secure Socket Layer and Transport Layer Security, Transport Layer Security, HTTPS, Secure Shell (SSH)

UNIT – III: Wireless Network Security

IEEE 802.11 Wireless LAN Overview, IEEE 802.11i Wireless LAN Security, Wireless Application Protocol Overview, Wireless Transport Layer Security, WAP End-to-End Security, **Electronic Mail Security:** Pretty Good Privacy, S/MIME, Domain Keys Identified Mail

UNIT – IV: IP Security

IP Security Overview, IP Security Policy, Encapsulating Security Payload, Combining Security Associations, Internet Key Exchange, **Intruders:** Intruders, Intrusion Detection, Password Management

UNIT – V: Malicious Software

Types of Malicious Software, Viruses, Virus Countermeasures, Worms, Distributed Denial of Service Attacks, **Firewalls:**The Need for Firewalls, Firewall Characteristics, Types of Firewalls, Firewall Basing, Firewall Location and Configurations

Text Books:

1. William Stallings, Network Security Essentials: Applications and Standards, Fourth Edition, Pearson, 2011.
2. William Stallings, Cryptography and Network Security: Principles and Practice, Sixth edition, Pearson, 2013.

Suggested Reading:

1. Eric Maiwald, "Fundamentals of Network Security", Tata McGraw Hill, 2011.
2. PallapaVenkataram, "Wireless and Mobile Network Security", Tata McGraw Hill, 2010.

Web Resources:

1. http://www.cisco.com/cisco/web/solutions/small_business/resource_center/articles/secure_my_business/what_is_network_security/index.html?referring_site=smartnavRD

2. http://ocw.mit.edu/courses/electrical-engineering-and-computer-science/6-857-network-and-computer-security-spring-2014/lecture-notes-and-readings/

EE 422 **ELECTRICAL SIMULATION LAB**

Instruction	3 Periods per week
Duration of Semester Examination	3 Hours
Semester Examination	50 Marks
Sessional	25 Marks
Credits	2

Course Objectives:

1. *Understand the load flows in power system transient stability economic power scheduling to load frequency control.*
2. *To simulate power system fault analysis.*
3. *To practice programming using embedded processor*
4. *To learn to interface various electrical equipments to embedded controller*
5. *To simulate out put sequence using embedded system.*

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

1. *Acquire knowledge to conduct Load frequency studies and study the power systems under transient state .importance of economic optimization of power system and relevance of LFC to maintain constant torque*
2. *Program using embedded processor*
3. *Acquire knowledge in simulation of load flow and transient stability studies.*
4. *To generate the output sequence using micro controller.*
5. *Control the operation of different equipments to embedded controller*

List of Experiments

Part A

1. Simulation of Load Flow Studies.
2. Simulation of Fault Analysis.
3. Simulation of Transient stability studies.
4. Simulation of Economic power scheduling.
5. Simulation of Load Frequency control of one area system.
6. Simulation of Load Frequency control of two area system

Part B

1. Simulation of switching sequence for relay operations.
2. Simulation of switching sequence with time delay.
3. Simulation of relay operations using different ports.
4. Interfacing 7 segment display using SPI through microcontroller.
5. Interfacing ADC through microcontroller.
6. Interfacing DAC through microcontroller.
7. Interfacing stepper Motors through microcontroller.

Note: At least **FIVE** experiments from **PART-A** and **PART-B** should be conducted in the semester.

EE 423 **GENERAL SEMINAR**

Instruction	3L Periods per week
Sessionals	25 Marks
Credits	1

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

1. *Acquire knowledge in systematic way of carrying out literate survey and select the topic for seminar.*
2. *Acquire knowledge in preparing details summary on the select topic and refer cross reference to gain in depth knowledge on the chosen topic.*
3. *Acquire knowledge in preparing summary highlights the direction in which work has progressed and the gaps.*
4. *Acquire knowledge to fill gaps in highlighting the method of solution.*
5. *Acquire knowledge in summarizing and highlighting the affrication aspects.*

Oral presentation is an important aspect of engineering education. The objective of the seminar is to prepare the student for a systematic and independent study of the state of the art topics in a broad area of the specialization.

Seminar topics may be chosen by the student with advice and approval from the faculty members. Students are to be exposed to the following aspects of seminar presentation.

- Literature Survey
- Consolidation of available information
- Power point presentation
- Technical writing

Each student is required to:

1. Submit a one-page synopsis before the seminar talk for display on the notice board.
2. Give a 20 minutes presentation through power point followed by a 10 minutes discussion.
3. Submit a report on the seminar topic with list of references.

Seminars are to be scheduled from the 3rd week of to the last week of the II-semester.

For award of Sessional marks students are judged on the basis of an oral and written presentation as well as their involvement in the discussions by at least two faculty members.

EE 901 **PROJECT**

Instruction	6L Periods per week
Semester Examination	Viva-voce
Semester Examination	100 Marks
Sessionals	50 Marks
Credits	9

Course Outcomes: After completion of the course the student will be able to:

1. *Acquire knowledge in conducting systematic way the literature Survey by referring to reputed journals/ textbooks etc.*
2. *Acquire knowledge in segregating /Classifying the literature survey paper : Design, Analysis, experimental etc.*
3. *Able to prepare a detailed summary of the paper as per the classification and choose the area and topic fitting in to the classification such as simulation studies, experimentation, preparing prototype etc.*
4. *Acquire knowledge to conduct simulation studies/ experimental studies and tabulate the results and compare the perform and chose the design parameter to improve the performance etc.*
5. *Acquire knowledge in writing the project work report in different chapters: Introduction, back ground, description, problem formulation, Analysis, Discussion, results and suggestions for further studies and conclusions.*

Dealing with a real time problem should be the focus of under graduate project.

All projects will be monitored at least four times in the II-semester through individual presentations (Project batch wise).

Every student should maintain a project dairy, wherein he/she needs to record the progress of his/her work and get it signed at least once in a week by the guide(s). If working outside and college campus, both the external and internal guides should sign the same.

Problems can also be invited from the industries to be worked out through undergraduate projects. Efforts may be made such that the projects may be carried out in reputed industries/ research organizations/PSUs.

Sessional marks should be based on the marks, awarded by a monitoring project committee of faculty members as well as the marks given by the guide.

Common norms should be established for final documentation of the project report by the respective department on the following lines:

1. The project little should be task oriented for example "Analysis and Modeling of ……."
2. Objectives of the project should be identified clearly and each student of the project batch should fulfill at least one of the objectives identified. The chapters of the project report should reflect the objectives achieved.
3. Contents of the report should include the following
    a. Title page
    b. Certificate
    c. Acknowledgements
    d. Abstract (limited to one/two paragraphs, page no.1 should start from this)
    e. Contents (Ch. No. Title of the chapter/section Page No.)
    f. List figures (Fig. No. caption of the figure Page No.)
    g. List of Tables (Table. No. Caption of the table Page No.)
    h. List of Symbols (ex. C: Velocity of light 3×10^8 m/s)
    i. Chapter I should be introduction . This should contain sections as objectives of the project, technical approach, literature survey, the importance of the project and organization of the report.
    j. The remaining chapters should include regarding the implementation of the project, results with discussions and conclusions. Students are expected to write about future scope of the project.
    k. References should be indicated as per IEEE or standard format, which should be duly referred in the report.
    l. The algorithms related to the software developed should be thoroughly discussed in Appendices etc..

4. The project reports should be hard bound.

The project report should be evaluated for 100 Marks by the External Examiner.

The project work, if found inadequate in the external examination, the candidate should repeat the project work with a new problem or improve the quality of work and report it again.