SYLLABUS IN ELECTRICAL AND ELECTRONICS ENGINEERING
(1st YEAR & 2nd YEAR TO 4th YEAR)

Department of Electrical and Electronics Engineering
Andhra University College of Engineering (Autonomous)
Visakhapatnam-530 003
Andhra Pradesh, India.

ANDHRA UNIVERSITY
VISAKHAPATNAM

COMMON SCHEME OF INSTRUCTION & EXAMINATION

I/IV B.E/B.TECH (FOUR YEAR COURSE) - **SEMESTER SYSTEM**
(With effect from **2006-2007** admitted batch onwards)

I & II SEMESTERS

CODE NO.	COURSE	Credits	Periods L/T/Lab	Exam Hours	Sessional Marks	Exam Marks	Total Marks
ENG 1001	English	2	2+1	3	30	70	100
ENG 1002	Mathematics – I	4	3	3	30	70	100
ENG 1003	Mathematics – II	4	3	3	30	70	100
ENG 1004	Physics Theory	4	3	3	30	70	100
ENG 1005	Chemistry Theory	4	3	3	30	70	100
ENG 1006	History of Science And Technology	2	3	3	30	70	100
ENG 1007	Comp. Prog. And Num. Met4	4	3	3	30	70	100
ENG 1008	Engineering Graphics	5	2+4	3	30	70	100
ENG 1009	Physics Laboratory	2	3	3	50	50	100
ENG 1010	Chemistry Laboratory	2	3	3	50	50	100
ENG 1011	Workshop	2	3	3	50	50	100
ENG 1012	Programming Laboratory	2	3	3	50	50	100
Total		**37**	**39**		**440**	**760**	**1200**

ENG 1001 English

The emphasis on English Language is enormously increasing as an effective medium of communication in all sectors the World over. As a consequence of this, the acquisition of effective communication skills in English has become most important to the students to flourish in their careers. In this connection there is a need to train the students to equip themselves with the necessary skills required for effective communication in English thereby enabling them to get a good placement immediately after the completion of their undergraduate courses. To meet the objectives of developing proficiency in English communication skills and developing Listening, Speaking, Reading and Writing (LSRW) skills. The following curriculum is designed for favorable consideration.

CURRICULUM : THEORY AND PRACTICE (LANGUAGE LAB)

1. A TEXT WITH FOCUS ON SKILLS APPROACH

Intended to develop the language skills of Listening. Speaking, Reading and Writing.

2. VOCABULARY :

a) One – Word Substitutes.
b) Words often Confused – Pairs of Words.
c) Synonyms and Antonyms.
d) Foreign Phrases.
e) Phrasal verbs derived from the following dynamic verbs_Go, Get, Run, Take, Look, Hold, Put, Stand Etc.
f) Idioms and phrases.

3. GRAMMAR :

a) Error Analysis
- Correction of Errors in a given sentence – errors in the use of words – errors of indianisms – use of slang – errors in punctuation

b) Concord
c) Articles, Prepositions and words followed by prepositions.
d) Tenses.

4. Writing skills :

1. Précis writing
2. Note Making
3. Letter writing.
4. Technical Report Writing.
5. Preparation of C.V and Resume writing.
6. Reading Comprehension.
7. Memo.
8. Notices/Circulars Agenda and Minutes of a Meeting.
9. E-Mail etiquette
10. Essay writing.

Text Book Prescribed :

In order to improve the proficiency of the student in the acquisition of the above mention skills, the following texts and course content is prescribed.

- **LEARNING ENGLISH :** A Communicative Approach, Hyderabad: Orient Long man. (selected lessons)

The following lessons are prescribed from the above Text:

i) Astronomy (1)
ii) Travel and Transport (3)
iii) Humour (4)
iv) Environment (6)
v) Inspiration (7)
vi) Human Interest (8)

Reference Books Prescribed :

1. Sharma, G.V.L.N., **English for Engineering Students**.
2. Margaret M Maison, **Examine your English**, Orient Longman
3. Krishnaswami,N and Sriraman, T., **Current English for Colleges**, Macmillan.
4. Krishnaswami, N. and Sriraman, T., **Creative English for Communication**, Macmillan.
5. Rizvi, M Ashraf. **Effective Technical Communication.** McGraw – Hill.
6. English for Technical Communication K.R Lakshminarayana, SCITECH.

ENG 1002 Mathematics-I

Lectures/week = 3 Sessional Marks =30
Exam=3 Hrs, Exam. Marks = 70

Partial Differentiation and its applications:
Functions of Two or More Variables, Partial Derivatives, Homogeneous Functions- Euler's Theorem, Total Derivative. Differentiation of Implicit Functions, Geometrical Interpretation-Tangent Plane and Normal to a surface. Change of Variables, Jacobians, Taylor's Theorem for functions of two variables. Jacobians, Taylor's Theorem for functions of two variables. Errors and approximations. Total Differential, Maxima and Minima of functions two variables. Lagrange's method of undetermined multiples, Differentiation under the integral sign – Leibnitz Rule. Involutes and evolutes.

Multiple integrals and their applications:
Double integrals. Change of order of integration. Double integrals in Polar Co-ordinates, Areas enclosed by plane curves. Triple integrals. Volume of solids. Change of variables. Area of a curve of a curved surface. Calculation of Mass, Center of gravity, Center of pressure, Moment of inertia. Product of inertia. Principle Axes. Beta function, Gamma function. Relation between Beta and Gamma functions. Error function or Probability integral.

Solid geometry (Vector Treatment):
Equation of a plane. Equations of Straight line. Condition for a line to lie in a plane. Coplanar lines. Shortest distance between two lines. Interaction of three planes. Equation of Sphere, Tangent plane to a sphere. Cone, cylinder, Quadric surfaces.

Infinite series:
Definitions. Convergence, Divergence and oscillation of a series, General properties, series of Positive terms, comparison tests, Integral test. D'Alembert's ratio test. Raabe's test. Logarithmic test. Cauchy's Root test. Alternating series- Leibnitz's rule, Series of positive or negative terms. Power series. Convergence of exponential. Logerithmic and Bionomial series. Uniform convergence. Weirstrass M-test. Properties of uniformly convergent series.

Fourier series:
Euler's formulae, Conditions for a Fourier expansion, Functions having points of discontinuity, Change of interval, Odd and even functions – Expansions of odd or even periodic function. Half range series. Parsevel formula, Practical Harmonic analysis.

Text Books:
1. Higher Engineering Mathematics by B.S.Grewal
2. Mathematics for Engineering by Chandrica Prasad.

Reference Books:
1. Higher Engineering Mathematics by M.K.Venkatraman.
2. Advanced Engineering Mathematics by Erwin Kreyszig.

ENG 1003 Mathematics-II

Lectures/week = 3 Sessional Marks =30
Exam=3 Hrs, Exam. Marks = 70

Linear Algebra:
Rank of a Matrix. Eigen values Eigen vectors of a Matrix. Cayley Hamilton Theorem. Consistency of equations. Matrix Invertion, Gaussian Elimination Scheme. Cholesky factorization. Jacobi and Gauss-Seidal Iterative Methods for solving simultaneous equations. Eigen Value solution using forward iteration. Inverse itrration. Hermitian and skew Hermitian forms. Unitary Matrix, Functions of a Matrix. Quadratic forms and Conical forms.

Differential Equations Of First Order And Its Applications:
Formation of differential equation. Solution of a differential equation. Geometrical meaning. Equations the first order and first degree. Variables separable, Homogeneous equations. Linear equations. Bernoulli's equation. Exact equations. Equation reducible to exact equations. Equations of the first order and higher degree. Calirut's equation. Geometric applications. Orthogonal trajectories, Physical applications. Simple Electric circuits. Heat flow, Chemical applications. Newton's law of cooling.

Linear Differential Equations:
Higher order linear differential equations with constant Coefficients. Deflection of beams. Simple harmonic motion. Oscillatory Electric circuits.

Series solutions of differential equations:
Frobenis method, Special function as solution from series. Bessel equation, Bessel functions of first and second kind. Equation reducible to Bessel's equations. Legender's equations, Legender Polynomial, Rodrigues formula, Generating functions. Recurrence relation. Orthonogolity relation for Bessel functions and Legendre Polynomial.

Laplace transforms:
Transforms of elementary functions. Properties of Laplace Transforms, Existence conditions, Inverse transforms, Transform of derivatives, Transform of Integrals. Multiplication's by 't'-division by 't'. Convolution theorem. Application to ordinary differential equations and simultaneous linear equations with constant coefficients. Unit step function, Impulse functions and periodic functions.

Text Books:

1. Theory of Matrices by Shantinarayanan.
2. Higher Engineering Mathematics by B.S. Grewal
3. Adv. Math for Engg students, vol. 2 by Narayana, Manieavachgon Pillay, Ramanaiah

Reference Books:

1. Higher Engineering Mathematics by M.K.Venkataraman.
2. Advanced Engineering Mathematics by Erwin Kreyozig.
3. Engineering Mathematics by P.P. Gupta.
4. A text book on Engg Mathematics by N.P.Bali.

ENG. 1004 Physics

Lectures/week = 3 Sessional Marks =30
Exam=3 Hrs, Exam. Marks = 70

Thermodynamics
Heat and Work, First law of thermodynamics and applications, Reversible and Irreversible process, Carnot cycle and Efficiency, Entropy, Second law of thermodynamics, Entropy and disorder, Entropy and Probability, Third law of thermodynamics. Thermography and its Applications.

Electromagnetism
Concept of electric field – Point charge in electric field, dipole in an electric field. Gauss law, some applications, electric potential and field strength, potential due to a point charge and dipole.

Magnetic field – magnetic force on current, torque on current loop, Hall effect, Ampere's law, B near a long wire, B for a solenoid and Toroid. The Biot-Savart,s Law. B for a circular Current loop.

Faraday's law of induction. Lenz's law, Calculation of Inductance. L-R Circuit. Energy stored in Magnetic field. Induced magnetic fields, Displacement current. Energy density in Electric and Magnetic fields, Poynting Vector S.

Maxwells equations and Electromagnetic waves (Both differential and Integral forms). Magnetic properties of materials. Paramagnetism, Diamagnetism, Ferromagnetism, Ferrites and its applications.

Optics
Interference – Principles of superposition – Young's Experiment – Coherence – Interference of thin films, Wedge shaped film, Newtons Rings, Michelson Interferometer and its applications.

Diffraction – Single slit (Qualitative and quantitative treatment).

Polarisation – Polarisation by reflection, refraction and double refraction in uniaxial crystals, Nicol prism, Quarter and Half wave plate, circular and elliptical polarization and detection.

Lasers and Fibre Optics
Spontaneous and stimulated emissions, population inversions, Ruby laser, Gas laser, Semiconductor laser, Applications of lasers.

Fibre Optics, Optical Fibre and Total Internal Reflection, Acceptance Angle and cone of a fibre, Fibre optics in communications, Optical parts in Fibre. Fibre Optic Sensors.

Ultrasonics
Production of Ultrasonics by Magnetostriction and Piezoelectric effects – Ultrasonics and diffraction pattern, Applications of Ultrasonics.

Modern Physics
The quantization of energy, Photoelectric effect, De Broglie concept of matter waves, uncertainty principle, Schrodinger wave equation, application to a particle in a box.

Elementary concepts of Maxwell-Boltzman, Bose-Einstein's and Fermi Dirac Statistics. Fermi Dirac Distribution function (no derivations).

Free electron theory of metals, Band theory of solids, Kronig Penny Model, Metals, Insulators and Semiconductors. Ferroelectrics and their applications

Super conductivity, Meisner Effect, Types of Superconductors and Applications of Superconductors.

Nanophase materials – Synthesis, characterization of nanostructured materials, properties and applications.

Renewable energies – Solar, wind and tidal – Applications

Books Recommended

1. Engineering Physics by R.K. Gaur and S.D. Gupta
2. Physics by David Halliday and Robert Resnick – Part I and Part II
3. Modern Engineering Physics by A.S. Vadudeva
4. University Physics by Young and Freedman
5. Materials Science by V. Rajendra and A. Marikani
6. Nonconventional Energy by Ashoke V. Desai

ENG 1005 Chemistry

Lectures/week = 3 Sessional Marks =30
Exam=3 Hrs, Exam. Marks = 70

1. Water Chemistry and pollution:

Water Chemistry: Sources of water - impurities – Hardness and its determination – W.H.O. limits. Boiler troubles and their removal. Water softening methods – Lime Soda, Zeolite and Ion exchange. Municipal water treatment – Break point chlorination. Desalination of Sea Water - Electrodialysis and Reverse osmosis methods.
Water pollution: Source – BOD – COD – Sewage treatment - preliminary, primary, secondary and tertiary.
Air Pollution: Source – Air pollutants – CO , SOx , NOx , Hydrocarbons and particulates. Acid rain – Green House effect – control of Air pollution (General).

2. Solid State Chemistry:
Classification of Solids – Types of Crystals – Properties - imperfections in crystals. Band theory of solids. Chemistry of Semiconductors - Intrinsic, extrinsic, compound and defect. Organic semiconductors and superconductivity. Purification of solids by zone refining - Single crystal growth – epitaxial growth. Elementary ideas on liquid crystals.

3. Energy Sources:
Thermal Energy: Coal- Ranking of coal - analysis (proximate and ultimate) Calorific value and determination (Bomb calorimeter method) – COKE – Manufacture – Otto Hoffmann's process – Applications.
Chemical Energy: Electrode potential – Calomel electrode – Galvanic cells – primary secondary – Acid and alkaline cells – fuel cells.
Nuclear Energy : Fission and fusion – power rectors – Atomic pile applications .
Solar Energy : Methods of utilization – thermal conversion – Liquid Flat – Plate collector – Photovoltaic conversion - solar cell - Applications.

4. Corrosion Chemistry :
Origin and theories of corrosion – Types of corrosion - Factors affecting corrosion – corrosion control methods . Protective coatings –Metallic coatings – Chemical conversion coatings - phosphate , chromate , Anodized . Organic Coating – paints – special paints – Varnishes and lacquers.

5. Fuels and Lubricants:
Petroleum – refining - Motor fuels – Petrol and Diesel Oil - Knocking – Octane number - Cetane number. Synthetic petrol – Fisher - Tropsch and Bergius methods. LPG and CNG - Applications. Rocket fuels -Propellants - Classification.
Lubricants: Classification - mechanism - properties of lubricating oils - Selection of lubricants for Engineering applications.

6. Polymers and Plastics:
Definition – Types of polymerization – Mechanism of addition polymerization. Effect of polymer sructure on properties. Plastics – Thermoplastic resins and Thermosetting resins - Compounding of plastics – Fabrication of plastics. Preparation and properties of cellulose derivatives - Vinyl resins-Nylon(6,6)- bakelites – polycarbonates - epoxy resins. Reinforced plastics. Conducting polymers. Engineering applications of polymers.

7. Building Materials:

Portland Cement: Manufacture - Dry and Wet process. Setting and hardening of cement - Cement concrete - RCC - Decay of concrete - special cements.

Refractories: Classifications - properties - Engineering applications.

Ceramics: Classification - Properties - uses.

Prescribed Text Books

1. Engineering Chemistry, P.C. Jain and M. Jain - Dhanapathi Rai & Sons, Delhi
2. A text book of Engineering Chemistry, S.S. Dara - S. Chand & Co. New Delhi
3. Engineering Chemistry, B.K. Sharma - Krishna Prakashan, Meerut
4. A text book of Engineering Chemistry, - Allied Publishers Balasubramanian et.al.,
5. Material Science and Engineering V. Raghavan - Prentice-Hall India Ltd.,

ENG 1006 History of Science and Technology

Lectures/week = 3 Sessional Marks =30
Exam=3 Hrs, Exam. Marks = 70

1. Historical Perspective :
The Nature of Science and Technology , Roots of Science and Technology in India , Science and Society , Scientists and Society , Science and Faith and The Rise of Applied Sciences.

2. Polices and Plans After Independence :
Nehru's vision of Science for Independent India, Science and Technology Developments in the New Era Science and Technology Developments during the Five Year Plan Periods and Science and Technology Policy Resolutions.

3. Research and Development (R&D) in India :
Expenditure in R&D, Science and Technology Education, Research Activities and Promotion of Technology Development, Technology Mission, Programms Aimed at Technological self Reliance, Activities of Council of Scientific and Industrial Research (CSIR).

4. Science and Technological Developments in Major Areas :
Space – Objectives of Space Programms, Geostationary Satellite Services – INSAT System and INSAT Services Remote Sensing Applications, Launch Vehicle Technology
Ocean Development – Objectives of Ocean Development, Biological and Mineral Resources, Marine Research and Capacity Building;
Defense Research --- Spin –off Technologies for Civilian Use;
Biotechnology--Applications of Biotechnology in – Medicine, Biocatalysts, Agriculture, Food, Fuel and Fodder, Development of Biosensors and Animal Husbandry;
Energy – Research and Development in Conservation of Energy , India's Nuclear Energy Programme –Technology Spin –offs.

5. Nexus Between Technology Transfer and Development :
Transfer of Technology—Types, Methods, Mechanisms, Process, Channels and Techniques: Appropriate Technology, Technology Assessment, Technological Forecasting, Technological Innovations and Barriers of Technological Change.

Test Books :
1. Kalpana Rajaram , **Science and Technology in India,** Published and Distributed by Spectrum Books (P) Ltd., New Delhi-58.
2. Srinivasan, M., Management of Science and Technology (Problems & Prospects), East – West Press (P) Ltd., New Delhi.

Reference Books :
1. Ramasamy , K. A. and Seshagiri Rao, K.,(Eds**.) Science, Technology and Education for Development,** K., Nayudamma Memorial Science Foundation, Channai-8.
2. Kohili, G. R., **The Role and impact of Science and Technology in The development of India,** Surjeet Publications.
3. Government of India, **Five Year Plans**, Planning Commission, New Delhi. Sharma, K. D. and Quresh M. A., **Science, Technology and Development**, Sterling Publications (p) Ltd. New Delhi.

ENG 1007 Computer Programming and Numerical Methods

Lectures/week = 3 Sessional Marks =30
Exam=3 Hrs, Exam. Marks = 70

Objectives:
To make the student familiar with programming in C and enable the student to implement the numerical methods described in this course using C as Programming Language

Section A

Computer Programming in C
Basics: Variables – Constants – Expressions – Operators and their precedence and associativity. Basic input and output statements. Control structures. Simple programs in C using all the operators and control structure.
Functions: Concept of a function – Parameters and how they are passed – Automatic Variables – Recursion – Scope and extent of variables. Writing programs using recursive and non-recursive functions.
Arrays and Strings: Single and multidimensional arrays-Character array as a string-Functions on strings. Writing C Programmes using arrays and for string manipulation.
Structures: Declaring and using structures-Operations on structures – Arrays of structures-User defined data types-Pointers to using files.
Files: Introduction –file structure- File handing functions- file types- Files- Error handing- C Programming examples for using files.

Section B

Computer Oriented Numerical Methods
1. Basic Concepts: Preliminary Concepts of Algorithms-Flow Charts and their execution traces- A Simplified Model of a Computer.
2. Representation for Characters and Numbers: Representation for integer and real numbers. Effect of finite representation on arthimatic operations for example overflow, underflow, associativity and normalization. Some elementary methods for overcoming these limitations.
3. Numerical Methods: Notation of round-off and truncation errors, numerical methods of finding roots of an algebraic equation of one variable. Successive bisection method, False position method, Newton Raphson method and Secant method.
4. Solutions of simultaneous Algebraic Equations; Gauss elimination method and Gauss Seidal methods.
5. Interpolation: Lagrange's Interpolation and difference table methods.
6. Numerical integration: Simpson's rule, Gaussian Quadrature Formula.
7. Numerical Solution of Differential Equation: Euler's method, Taylor's seriesmethod and Runge-Kutta method.

Books:
1. Section A: Programming with C by K.R.Venugopal& Sudeep R Prasad
2. Section B: Introduction to Numerical Methods by S.S Sastry
3. Elementary Numerical Methods by S.D.Conte

Reference:
1. C Programming Language by Kerningham & Ritchie

ENG 1008 Engineering Graphics

Lectures/week = 2+4 Sessional Marks =30
Exam=3 Hrs, Exam. Marks = 70

Introduction:
Drawing Instruments and uses. Lettering scales in common use.

Curves:
Curves used in Engineering Practice, conic sections, construction of conics by different methods, rectangular-hyperbola, cycloidal curves, trochoids, epi and hypo-cycloids. involutes and Archemedian spiral.

Orthographic Projections:
Projection of points, projection of straight lines, traces of a line, projection of planes and projection on auxiliary planes.

Solids and Developments:
Projection of solids in simple positions, projection of solids with axis inclined to one of the reference planes and parallel to the other, projection of solids with axis inclined to both the reference planes. Projection of spheres. Development of surfaces of solids. Development of transition piece connecting a square and circular pipe. Helices and screw threads.

Sections and Intersections:
Sections of different solids and true shape of sections. Intersection of surfaces-simple problems with cylinders, prisms and cones.

Isometric and Perspective Projections:
Isometric projection and conversion of orthographic projection into isometric projection. Perspective projection. Theory of visual ray method and vanishing point method. Simple problems involving regular geometrical solids.

Textbook:
1. Elements of Engineering Drawing by N.D. Bhatt

Reference:
1. Engineering Graphics by K.L. Narayana and P. Kannaiah

ENG 1009 Physics Laboratory

Practicals/week = 3 Sessional Marks =50
Exam=3 Hrs, Exam. Marks = 50

12 of the following experiments must be completed:

1. Lee's method- determination of coefficient of thermal conductivity of a bad conductor
2. Melde's experiment-determination of the frequency of an electrically maintained tuning fork.
3. Newton's rings – determination of radius of curvature of a convex lens.
4. Diffraction grating-determination of wavelengths in mercury line spectrum-using spectrometer
5. Determination of Cauchy's constants using Spectrometer and mercury light.
6. Wedge method-det. of thickness of a paper by forming parallel interference fringes.
7. Michelson's interferometer- a) det. of wavelength of light b) Resolution of spectral lines.
8. Det. of using calcite crystal.
9. Optical Bench – a) Young's double slit b) Lloyd's mirror c) biprism d) diffraction at an edge e) Thickness of wire
10. Ultrasonic Diffraction – Velocity of ultrasonic waves in liquids.
11. Variation of magnetic field along the axis of current carrying circular coil – Stewart and Gee's apparatus
12. Calibration of voltmeter using potentiometer
13. Carey Foster's bridge a) laws of resistance b) temperature coefficient of resistance
14. B-H curves – determination of hysterisis loss
15. Calendar and Barnes method – determination of specific heat of water
16. Hall effect – a) Determination of hall coefficient B) determination of charge density
17. Photoelectric effect – a) characteristics of photoelectric cell b) det. of Planck's const.
18. Determination of Rydberg constant using hydrogen discharge tube
19. Determination of e/m of am electron – Thomson's method
20. Determination of band gap of semi conductor.

ENG 1010 Chemistry Laboratory

Practicals/week = 3 Sessional Marks =50
Exam=3 Hrs, Exam. Marks = 50

List of Experiments:

01. Determination of Sodium Carbonate.
02. Determination of Sulfuric acid using a strong base.
03. Estimation of Iron (II) using Potassium Permanganate.
04. Estimation of Oxalic Acid using Potassium Permanganate.
05. Determination of volume strength of Hydrogen Peroxide.
06. Estimation of Calcium in a sample of Portland cement.
07. Estimation of Chromium (VI) using Ferrous Ammonium Sulphate.
08. Estimation of Copper (II) using Sodium thiosulphate.
09. Analysis of Bleaching powder for Chlorine content.
10. Estimation of Zinc by EDTA method.
11. Determination of hardness of a water sample (EDTA Method).
12. Determination of alkalinity of a water sample.

Demonstration Experiments:

13. Determination of Viscosity of a Lubricating oil.
14. Preparation of Copper pigment.
15. Preparation of Phenol-Formaldehyde resin.
16. Digital pH meter.
17. Digital potentiometer.
18. D.O. Analyser.

ENG 1011 Workshop

Practicals/week = 3 Sessional Marks =50
Exam=3 Hrs, Exam. Marks = 50

1. Carpentry:

Bench work, tools used in carpentry.
Jobs for class work – half lap joint, mortise and tenon joint, half –lap dovetail joint, corner dovetail joint, bridle joint.

2. Sheet Metal:

Tools used in sheet metal work. Laying developments of sheet metal jobs, soldering.
Jobs for class work – square tray, taper side tray, funnel, elbow pipe.

3. Fitting:

Tools used in fitting work. Different files, chisels, hammers and bench vice.
Jobs for class work – hexagon, rectangular, circular and triangular fits. External and internal threads with dies and taps.

Reference

1. Elements of Workshop technology, Vol.1 by S.K. and H.K. Hajra Choudary

ENG 1012 Programming Laboratory

Practicals/week = 3 Sessional Marks =50
Exam=3 Hrs, Exam. Marks = 50

1. Write a program to read x,y coordinates of 3 points and then calculate the area of a triangle formed by them and print the coordinates of the three points and the area of the triangle. What will be the output from your program if the three given points are in a straight line?
2. Write a program, which generates 100 random integers in the range of 1 to 100. Store them in an array and then print the arrays. Write 3 versions of the program using different loop constructs. (e.g. for, while, and do while)
3. Write a set of string manipulation functions e.g. for getting a sub-string from a given position, Copying one string to another, Reversing a string, adding one string to another.
4. Write a program which determines the largest and the smallest number that can be stored in different data types like short, int., long, float and double. What happens when you add 1 to the largest possible integer number that can be stored?
5. Write a program, which generates 100 random real numbers in the range of 10.0 to 20.0, and sort them in descending order.
6. Write a function for transposing a square matrix in place (in place means that you are not allowed to have full temporary matrix).
7. First use an editor to create a file with some integer numbers. Now write a program, which reads these numbers and determines their mean and standard deviation.
8. Given two points on the surface of the sphere, Write a program to determine the smallest arc length between them.
9. Implement bisection method to find the square root of a given number to a given accuracy.
10. Implement Newton Raphson method to det. a root of polynomial equation.
11. Given a table of x and corresponding f(x) values, write a program which will determine f(x) value at an intermediate x value using Lagrange's interpolation.
12. Write a function which will invert a matrix.
13. Implement Simpson's rule for numerical integration.
14. Implement Gaussian quadrature for numerical integration.
15. Write a program to solve a set of linear algebraic equations.

2/4 B.E.(EEE) 2006 ADMITTED BATCH ONWARDS
SCHEME OF INSTRUCTIONS

SECOND YEAR

FIRST SEMESTER

CODE	SUBJECT	INSTRUCTION Periods per Week	UNIVERSITY EXAMINATION		SESSIONAL MARKS	TOTAL MARKS	Credits
			DURATION (HOURS)	MARKS			
EEE211	MATHEMATICS-III (Common with ECE)	4	3	70	30	100	4
EEE212	ENGG. MECHANICS &STRENGTH OF MATERIALS (Common with ECE & Met. Engg.)	5	3	70	30	100	4
EEE213	NETWORK THEORY (Common with ECE)	4	3	70	30	100	4
EEE214	ELECTROMAGNETICS	4	3	70	30	100	4
EEE215	ELECTRONIC DEVICES &CIRCUITS (Common with ECE)	4	3	70	30	100	4
EEE216	Electrical Measurements	4	3	70	30	100	4
EEE217	NETWORKS & MEASUREMENTS LABORATORY	3	3	50	50	100	2
EEE218	ELECTRONIC DEVICES& CIRCUITS LABORATORY	3	3	50	50	100	2
	TOTAL	31		520	280	800	28

2/4 B.E.(EEE) 2006 ADMITTED BATCH ONWARDS
SCHEME OF INSTRUCTIONS

SECOND YEAR

SECOND SEMESTER

CODE	SUBJECT	INSTRUCTION Periods per Week	UNIVERSITY EXAMINATION		SESSIONAL MARKS	TOTAL MARKS	Credits
			DURATION (HOURS)	MARKS			
EEE221	MATHEMATICS-IV (Common with ECE)	4	3	70	30	100	4
EEE222	PERFORMANCE AND DESIGN OF ELECTRICAL MACHINES - I	4	3	70	30	100	4
EEE223	ANALOG ELECTRONIC CIRCUITS (Common with ECE)	4	3	70	30	100	4
EEE224	THERMAL PRIME MOVERS	5	3	70	30	100	4
EEE225	SIGNALS & SYSTEMS (Common with ECE)	4	3	70	30	100	4
EEE226	ENVIRONMENTAL SCIENCE	4	3	70	30	100	2
EEE227	THERMAL PRIME MOVERS LABORATORY	3	3	50	50	100	2
EEE228	ANALOG ELECTRONIC CIRCUITS LABORATORY	3	3	50	50	100	2
	TOTAL	31		520	280	800	26

3/4 B.E.(EEE) 2006 ADMITTED BATCH ONWARDS
SCHEME OF INSTRUCTIONS

THIRD YEAR

FIRST SEMESTER

CODE	SUBJECT	INSTRUCTION Periods per Week	UNIVERSITY EXAMINATION		SESSIONAL MARKS	TOTAL MARKS	Credits
			DURATION (HOURS)	MARKS			
EEE311	PULSE & DIGITAL CIRCUITS (Common with ECE)	4	3	70	30	100	4
EEE312	LINEAR I.C.s & APPLICATIONS (Common with ECE)	4	3	70	30	100	4
EEE313	LOGIC DESIGN & MICROPROCESSORS	4	3	70	30	100	4
EEE314	PERFORMANCE & DESIGN OF ELECTRICAL MACHINES-II	4	3	70	30	100	4
EEE315	COMPUTER ARCHITECTURE AND ORGANISATION	4	3	70	30	100	4
EEE316	FLUID MECHANICS & HYDRAULIC MACHINERY	4	3	70	30	100	4
EEE317	ELECTRICAL MACHINES LABORATORY-I	3	3	50	50	100	2
EEE318	L.I.C.s & PULSE CIRCUITS LABORATORY	3	3	50	50	100	2
EEE319	SOFT SKILLS LABORATORY	3			100	100	1
	TOTAL	33		520	380	9800	29

3/4 B.E.(EEE) 2006 ADMITTED BATCH ONWARDS
SCHEME OF INSTRUCTIONS

THIRD YEAR

SECOND SEMESTER

CODE	SUBJECT	INSTRUC-TION Periods per Week	UNIVERSITY EXAMINATION		SESSIONAL MARKS	TOTAL MARKS	Credits
			DURATIO (HOURS)	MARKS			
EEE321	CONTROL SYSTEMS (Common with ECE)	4	3	70	30	100	4
EEE322	ADVANCED NETWORK THEORY	4	3	70	30	100	4
EEE323	POWER ELECTRONICS	4	3	70	30	100	4
EEE324	TRANSMISSION AND DISTRIBUTION	4	3	70	30	100	4
EEE325	ELECTRICAL POWER GENERATION AND UTILIZATION	4	3	70	30	100	4
EEE326	PERFORMANCE & DESIGN OF ELECTRICAL MACHINES-III	4	3	70	30	100	4
EEE327	DIGITAL ELECTRONICS & MICROPROCESSORS LABORATORY	3	3	50	50	100	2
EEE328	FLUID MECHANICS & HYDRAULIC MACHINES LABORATORY	3	3	50	50	100	2
	INDUSTRIAL TRAINING*						
	TOTAL	30		520	280	800	28

*** Industrial Training (Evaluated in 4th Year Ist Semester.)**

4/4 B.E.(EEE) 2006 ADMITTED BATCH ONWARDS
SCHEME OF INSTRUCTIONS

FOURTH YEAR

FIRST SEMESTER

CODE	SUBJECT	INSTRUCTION Periods per Week	UNIVERSITY EXAMINATION		TOTAL MARKS	SESSIONAL MARKS	Credits
			DURATION (HOURS)	MARKS			
EEE411	ELECTIVE-I	4	3	70	30	100	4
EEE412	POWER SYSTEM ANALYSIS & STABILITY	4	3	70	30	100	4
EEE413	ELECTRIC DRIVES & TRACTION	4	3	70	30	100	4
EEE414	POWER SYSTEM PROTECTION	4	3	70	30	100	4
EEE415	DIGITAL CONTROL SYSTEMS	4	3	70	30	100	4
EEE 416	ADVANCED CONTROL SYSTEMS	4	3	70	30	100	4
EEE417	POWER ELECTRONICS LABORATORY	3	3	50	50	100	2
EEE418	ELECTRICAL MACHINES LABORATORY-II	4	3	50	50	100	2
EEE419	INDUSTRIAL TRAINING					100	2
	TOTAL	31		520	280	900	30

Subjects offered under ELECTIVE – I :

1. Digital Signal Processing **; 2.** Instrumentation **; 3.** Operation Research **;**

4/4 B.E.(EEE) 2006 ADMITTED BATCH ONWARDS
SCHEME OF INSTRUCTIONS

FOURTH YEAR

SECOND SEMESTER

CODE	SUBJECT	INSTRUCTI-ON Periods per Week	Univ. Exam.		SESSIONAL MARKS	TOTAL MARKS	Credits
			DURATIO (HOURS)	MARKS			
EEE421	**ENGINEERING ECONOMICS & MANAGEMENT** (Common with ECE)	**4**	**3**	**70**	**30**	**100**	**4**
EEE422	**POWER SYSTEM OPERATION AND CONTROL.**	**4**	**3**	**70**	**30**	**100**	**4**
EEE423	**ELECTIVE-II**	**4**	**3**	**70**	**30**	**100**	**4**
EEE424	**POWER SYSTEM SIMULATION LAB**	**3**	**3**	**50**	**50**	**100**	**4**
EEE425	**CONTROL SYSTEMS LABORATORY**	**3**	**3**	**50**	**50**	**100**	**2**
EEE426	**PROJECT WORK**	**6**	**3**	**50**	**50**	**100**	**8**
	TOTAL	**24**		**360**	**240**	**600**	**26**

Subjects offered under ELECTIVE – II:

1.High Voltage Engineering ; **2**. E H V A.C & D.C Transmission ; **3.** Non Conventional Energy Sources
4. Data structures

E 211 MATHEMATICS-III
(COMMON WITH ECE)

INSTRUCTION	**: 4 Periods per Week**
UNIVERSITY EXAMINATION	**: 3 Hours**
UNIVERSITY EXAMINATION MARKS	**: 70**
SESSIONAL MARKS	**: 30**
CREDITS	**: 4**

VECTOR CALCULUS : SCALAR, VECTOR FIELDS, GRADIENT, DIVERGENCE, CURL, DIRECTIONAL DERIVATIVE, IDENTITIES, IRROTATIONAL SOLENOIDAL VECTOR FIELDS, LINE INTEGRAL, SURFACE INTEGRAL AND VOLUME INTEGRAL, INTRODUCTION OF ORTHOGONAL CURVILLINEAR CO-ORDINATES-CYLINDRICAL,SPHERICAL AND POLAR CO-ORDINATES.

PARTIAL DIFFERENTIAL EQUATIONS AND APPLICATIONS: ELEMENTARY TREATMENT OF PARTIAL DIFFERENTIAL EQUATIONS, METHOD OF SEPARATION OF VARIABLES, VIBRATIONS OF A STRETCHED STRING WAVE EQUATION, ONE DIMENSIONAL AND TWO DIMENSIONAL HEAD FLOW EQUATIONS, SOLUTION OF LAPLACE EQUATION, LAPLACE EQUATION IN POLAR CO-ORDINATES, TRANSMISSION LINES.

STATISTICS : REVIEW OF PROBABILITY DISTRIBUTIONS, SAMPLING THEORY, SAMPLING DISTRIBUTION, STANDARD ERROR, TESTING OF HYPOTHESIS, LEVEL OF SIGNIFICANCE, CONFIDENCE LIMITS, SIMPLE SAMPLING OF ATTRIBUTES, SAMPLING OF VARIABLES-LARGE SAMPLES AND SMALL SAMPLES, STUDENT'S T-DISTRIBUTION, X-DISTRIBUTION, F-DISTRIBUTION, FISHER'S Z-DISTRIBUTION.

INTEGRAL TRANSFORMS : INTRODUCTION, DEFINITION, FOURIER INTEGRAL, SINE AND COSINE INTEGRALS, COMPLEX FORMS OF FOURIER INTEGRALS, FOURIER TRANSFORM, FOURIER AND COSINE TRANSFORMS, FINITE FOURIER SINE AND COSINE TRANSFORMS. PROPERTIES OF F-TRANSFORMS, CONVOLUTION THEOREM FOR F-TRANSFORMS, PARSEVAL'S IDENTITY FOR F-TRANSFORMS, FOURIER TRANSFORMS OF A DERIVATIVE OF A FUNCTION, APPLICATIONS TO BOUNDARY VALUE PROBLEMS USING INVERSE FOURIER TRANSFORMS ONLY.

TEXT BOOK:

HIGHER ENGINEERING MATHEMATICS BY Dr. B.S. GREWAL, KHANNA PUBLISHER, NEWDELHI, 34th EDITION, 1998.

REFERENCE BOOKS:

A TEXT BOOK ON ENGINEERING MATHEMATICS BY N.P.BALI ETAL, LAXMI PUB.(P) Ltd. NEWDELHI
HIGHER ENGINEERING MATHEMATICS BY Dr. M.K. VENKATARAMAN, NATIONAL PUB. Co. MADRAS
ADVANCED ENGINEERING MATHEMATICS BY ERWIN KREYSZIG, WILEY EASTERN Pvt. NEWDELHI.

EEE 212 – ENGINEERING MECHANICS & STRENGTH OF MATERIALS
(Common With ECE Branch)

INSTRUCTION : 5 Periods per Week
UNIVERSITY EXAMINATION : 3 Hours
UNIVERSITY EXAMINATION MARKS: 70
SESSIONAL MARKS : 30
CREDITS : 4

ENGINEERING MECHANICS:CONCURRENT AND PARALLEL FORCES IN A PLANE ANDTHEIR EQUIVILIBRIUM, CENTROIDS OF COMPOSITE PLANE FIGURES, GENERAL CASE OF FORCES IN A PLANE.

MOMENT OF INERTIA OF PLANE FIGURES, PARALLEL AXIS THEOREM, POLAR M.I., CONCEPT OF MASS M.I., RECTILINEAR TRANSLATION, KINEMATICS, PRINCIPLE OF DYNAMICS, MOTION OF A PARTICLE UNDER CONSTANT FORCE, FORCE PROPORTIONAL TO DISPLACEMENT AND FREE VIBRATIONS (SHM), D'ALAMBERT'S PRINCIPLE, MOMENTUM, IMPULSE-WORK AND ENERGY.

ROTATION OF A RIGID BODY ABOUT A FIXED AXIS: KINEMATICS, EQUATION OF MOTION OF A RIGID BODY ABOUT A FIXED AXIS, ROTATION UNDER CONSTANT MOMENT, TORSIONAL VIBRATION.

STRENGTH OF MATERIALS:SIMPLE STRESSES AND STRAINS, STRESSES ON INCLINED PLANE, 2-DIMENSIONAL STRESS SYSTEMS, PRINCIPAL STRESS AND PRINCIPAL PLANES, MOHR'S CIRCLE..SHEARING FORCE AND BENDING MOMENT, TYPES OF LOADS, TYPES OF SUPPORTS, S.F. AND B.M. DIAGRAMS FOR CANTILEVER AND SIMPLY SUPPORTED BEAMS UNDER CONCENTRATED LOADS AND UNDER U.D.L.FLEXURE FORMULA, BENDING STRESSES IN THE ABOVE TYPES OF BEAMS WITH RECTANGULAR AND CIRCULAR SECTIONS, TORSION OF CIRCULAR SHAFTS, DETERMINATION OF SHEAR STRESS.

TEXT BOOKS:

ENGINEERING MECHANICS BY S. TIMO SHENKO (relevant sections only)
ELEMENTS OF STRENGTH OF MATERIALS BY S. TIMO SHANKO (relevant sections

EEE 213 – NETWORK THEORY
(COMMON WITH ECE)

INSTRUCTION : 4 Periods per Week
UNIVERSITY EXAMINATION :3 Hours
UNIVERSITY EXAMINATION MARKS: 70
SESSIONAL MARKS : 30
CREDITS : 4

ANALYSIS OF DC CIRCUITS : ACTIVE ELEMENT, PASSIVE ELEMENT, REFERENCE DIRECTIONS FOR CURRENT AND VOLTAGE, KIRCHOFF'S LAWS, VOLTAGE AND CURRENT DIVISION, NODAL ANALYSIS, MESH ANALYSIS, LINEARITY AND SUPERPOSITION, THEVININ'S AND NORTON'S THEOREMS, SOURCE TRANSFORMATION.

DC TRANSIENTS : INDUCTOR, CAPACITOR, SOURCE FREE RL, RC & RLC RESPONSE, EVALUATION OF INITIAL CONDITIONS, APPLICATION OF UNIT-STEP FUNCTION TO RL, RC & RLC CIRCUITS, CONCEPTS OF NATURAL, FORCED AND COMPLETE RESPONSE.
SINUSOIDAL STEADY-STATE ANALYSIS : THE SINUSOIDAL FORCING FUNCTION, PHASOR CONCEPT, AVERAGE AND EFFECTIVE VALUES OF VOLTAGE AND CURRENT, INSTANTANEOUS AND AVERAGE POWER, COMPLEX POWER, STEADY STATE ANALYSIS USING MESH AND NODAL ANALYSIS, APPLICATION OF NETWORK THEOREMS TO A.C. CIRCUITS, BALANCED THREE PHASE CIRCUITS, RESONANCE, CONCEPT OF DUALITY.
COUPLED CIRCUITS : MAGNETICALLY COUPLED CIRCUITS, DOT CONVENTION, Y,Z,H,T PARAMETERS OF TWO PORT NETWORKS, RECIPROCITY THEOREM.

LAPLACE TRANSFORM TECHNIQUES : TRANSFORMS OF TYPICAL SIGNALS, RESPONSE OF SIMPLE CIRCUITS TO UNIT STEP, RAMP & IMPULSE FUNCTIONS, INITIAL AND FINAL VALUE THEOREM, CONVOLUTION INTEGRAL, TIME SHIFT AND PERIODIC FUNCTIONS, TRANSFER FUNCTION.
TEXT BOOKS:

1. ENGINEERING CIRCUIT ANALYSIS BY W.H. HAYT Jr & J.E. KEMMERLY, 5Th ED., Mc.Graw Hill Pub.

2. NETWORK ANALYSIS BY M.E. VAN VALKUNBERG, 3Rd ED., PHI/EEE Pub.

EEE 214-ELECTRO MAGNETICS

INSTRUCTION : 4 Periods per Week
UNIVERSITY EXAMINATION : 3 Hours
UNIVERSITY EXAMINATION MARKS: 70
SESSIONAL MARKS : 30
CREDITS : 4

GENERAL: RECTANGULAR,CYLINDRICAL AND SPHERICAL COORDINATE SYSTEMS.

ELECTROSTATICS: SUPERPOSITION, COULOMB'S LAW, ELECTRIC FIELD OF DIFFERENT CHARGE CONFIGURATIONS USING COULOMB'S LAW AND SUPERPOSITION, FLUX OF A VECTOR, FIELD LINES, GAUSS'S LAW INTERMS OF E(INTEGRAL FORM AND POINT FORM), APPLICATIONS, CURL OF THE ELECTRIC FIELD, ELECTRIC POTENTIAL, CALCULATION OF ELECTRIC FIELD THROUGH ELECTRIC POTENTIAL FOR GIVEN CHARGE CONFIGURATION, ELECTROSTATIC ENERGY.

ELECTOSTATIC BOUNDARY CONDITIONS AT A CHARGED SURFACE(ASSUMING NO DIELECTRIC POLARIZATION), BASIC PROPERTIES OF CONDUCTORS IN ELECTROSTATIC FIELDS, CAPACITANCE, POISSON'S AND LAPLACE'S EQUATIONS, PROPERTIES OF THE SOLUTIONS OF LAPLACE'S EQUATIONS, UNIQUENESS THEOREMS, METHODS OF IMAGES, ELECTRIC DIPOLES, POLARIZATION OF DIELECTRICS, BOUND CHARGES AND THEIR PHYSICAL INTERPRETATION, THE DISPLACEMENT VECTOR D, COMMENTS ABOUT THE CURL OF D IN ELECTROSTATICS, LINEAR DIELECTRICS, DETERMINATION OF ELECTRIC FIELDS IN THE PRESENCE OF LINEAR DIELECTRICS BY FINDING D.

MAGNETIC FIELDS AND LORENTZ FORCE LAW: THE MAGNETIC FIELD VECTOR B, STEADY LINE,SURFACE AND VOLUME CURRENTS, BIOT-SAVART'S LAW, DETERMINATION OF MAGNETIC FIELD DUE TO STEADY CURRENT CONFIGURATION, THE CONTINUITY EQUATION, DIVERGENCE AND CURL OF B, AMPERE'S LAW IN INTEGRAL AND DIFFERENTIAL FORM, APPLICATIONS, THE VECTOR MAGNETIC POTENTIAL AND CALCULATION OF MAGNETIC FIELD THROUGH THE VECTOR MAGNETIC POTENTIAL FOR GIVEN STEADY CURRENT CONFIGURATIONS, COMPARISON OF ELECTROSTATICS AND MAGNETOSTATICS, MAGNETOSTATIC BOUNDARY CONDITIONS(ASSUMING NO MAGNETIC POLARIZATIONS)

THE MAGNETIC DIPOLE: DIAMAGNETISM, PARAMAGNETISM & FERROMAGNETISM, TORQUES AND FORCES ON MAGNETIC DIPOLES, MAGNETIZATION, BOUND CURRENT, PHYSICAL INTERPRETATION OF BOUND CURRENTS, THE H VECTOR, THE DIVERGENCE AND CURL OF H , LINEAR MAGNETIC MATERIALS, DETERMINATION OF MAGNETIC FIELDS IN THE PRESENCE OF MAGNETIC MATERIALS BY FINDING H, EMF, OHM'S LAW, MOTIONAL EMF, FARADAY'S LAWS, LENZ'S LAW, QUASISTATIC FIELDS, INDUCTANCE AND ENERGY IN MAGNETIC FIELDS.

TIME VARYING FIELDS AND MAXWELL'S EQUATIONS: MAXWELL'S MODIFICATION OF AMPERE'S LAW, MAXWELL'S EQUATIONS IN ANY MEDIUM IN TERMS OF E & B AND INTERMS OF D,E,B & H, GENERAL BOUNDARY CONDITIONS, THE UNIFORM PLANE WAVE, MAXWELL'S EQUATIONS IN FREE SPACE, PLANE WAVE PROPOGATION, PHASE VELOCITY AND WAVELENGTH, INTRINSIC IMPEDANCE, PERFECT DIELECTRICS, ATTENUATION, PHASE AND PROPOGATION CONSTANTS, THE POYINTING VECTOR AND POWER CONSIDERATIONS.

TEXT BOOKS:
1. INTRODUCTION TO ELECTRO DYNAMICS BY D.J. GRIFFITHS, Mc Graw Hill Pub.
2. ENGINEERING ELECTROMAGNETICS BY WILLIAM H. HAYT Jr., Mc Graw Hill Pub.

EEE215 ELECTRONICS DEVICES AND CIRCUITS
(COMMON WITH ECE)

INSTRUCTION : 4 Periods per Week
UNIVERSITY EXAMINATION : 3 Hours
UNIVERSITY EXAMINATION MARKS: 70
SESSIONAL MARKS : 30
CREDITS :4

ENERGY BAND THEORY OF SOLIDS:INTRINSIC AND EXTRINSIC SEMICONDUCTORS DOPING, DOPING MATERIALS, CARRIER MOBILITY, CONDUCTIVITY, DIFFUSION AND CONTINUITY EQUATION, HALL – EFFECT AND ITS APPLICATION.

SEMICONDUCTOR DIODES:BAND STRUCTURE OF PN JUNCTION, QUANTITATIVE THEORY OF PN DIODE, VOLT – AMP. CHARACTERISTICS, TEMPERATURE DEPENDENCE, TRANSITION AND DIFFUSION CAPACITANCE OF PN JUNCTION, ZENER AND AVALANCHE BREAKDOWNS, TUNNEL DIODE, LED, SCHOTTKY BARRIER DIODE, VARACTOR DIODE, PHOTO DIODE, PIN DIODE, POINT CONTACT DIODE.

DIODE RECTIFIERS:HALF-WAVE, FULL-WAVE AND BRIDGE RECTIFIERS WITH AND WITHOUT FILTERS, RIPPLE FACTOR AND REGULATION CHARACTERISTICS.

BIPOLAR JUNCTION DIODE:NPN AND PNP JUNCTION TRANSISTOR, CHARACTERISTICS OF CURRENT FLOW ACROSS THE BASE REGIONS, MINORITY AND MAJORITY CARRIER PROFILES, CB, CE & CC CONFIGURATIONS AND THEIR INPUT AND OUTPUT CHARACTERISTICS. COMPARISON OF CE, CB & CC CONFIGURATIONS. JNS BIASING FOR SATURATION, CUTOFF AND ACTIVE REGION, α AND β PARAMETERS AND THE RELATION BETWEEN THEM.

JFET:JFET AND ITS CHARACTERISTICS, PINCH OFF VOLTAGE, DRAIN SATURATION CURRENT, MOSFET – ENHANCEMENT AND DEPLETION MODES, SMALL SIGNAL MODELS OF FET.

TRANSISTOR BIASING CIRCUITS:VARIOUS BIASING CIRCUITS AND STABILIZATION, THERMAL RUNAWAY, THERMAL STABILITY, BIASING OF FETS.

SMALL SIGNAL – LOW FREQUENCY TRANSISTOR BIASING CIRCUITS:TRANSISTOR AS AN AMPLIFIER, H – PARAMETER MODEL, ANALYSIS OF TRANSISTOR AMPLIFIER CIRCUITS USING H – PARAMETERS. CB, CE & CC AMPLIFIER CONFIGURATIONS AND PERFORMANCE FACTORS. ANALYSIS OF SINGLE STAGE AMPLIFIER, RC COUPLED AMPLIFIERS. EFFECTS OF BYPASS AND COUPLING CAPACITORS. FREQUENCY RESPONSE OF CE AMPLIFIER, EMITTER – FOLLOWER, CASCADED AMPLIFIER, HIGH FREQUENCY MODEL OF TRANSISTOR.

TEXT BOOKS:
INTEGRATED ELECTRONICS ANALOG DIGITAL CIRCUITS, JACOB MILLMAN & D. HALKIAS, MCGRAW HILL.
ELECTRONIC DEVICES AND CIRCUITS THEORY, NASHALKY.

EEE 216 ELECTRICAL MEASUREMENTS

INSTRUCTION : 4 Periods per Week
UNIVERSITY EXAMINATION : 3 Hours
UNIVERSITY EXAMINATION MARKS: 70
SESSIONAL MARKS : 30
CREDITS : 4

INSTRUMENTS: OBJECTIVES OF MEASUREMENTS, ANALOG VERSUS DIGITAL MEASUREMENTS, ACCURACY, PRECISION AND UNCERTAINTY, SOURCES OF MEASYREMENT ERROR, STANARD CELL AND STANDARD RESISTANCE. BASIC CHARACTERSTICS OF MEASURING INSTRUMENTS WITH A MOVING ELEMENT,INSTRUMENTS: AMMETER, VOLTMETER, EXPRESSION FOR TORQUE OF MOVING COIL, MOVING IRON, DYNAMOMETER, INDUCTION AND ELECTROSTATIC INSTRUMENTS. EXTENSION OF RANGE OF INSTRUMENTS. WATTMETERS, TORQUE EXPRESSION FOR DYNAMOMETER INSTRUMENTS. REACTIVE POWER MEASUREMENT, ENERGY METERS SINGLE PHASE AND POLY PHASE, DRIVING TORQUE AND BRAKING TORQUE EQUATIONS. ERRORS AND TESTING, COMPENSATION, MAXIMUM DEMAND INDICATOR, POWER FACTOR METERS, FREQUENCY METERS, ELECTRICAL RESONANCE AND WESTON TYPE OF SYNCHRO SCOPE.

BRIDGE METHODS: MEASUREMENT OF INDUCTANCE, CAPACITANCE & RESISTANCE USING BRIDGES. MAXWELL'S, ANDERSON'S, WEIN'S HEAVE-SIDE & CAMPBELL'S, DESAUTY'S, SCHERING'S BRIDGES, KELVIN'S DOUBLE BRIDGE, PRICE GUARD WIRE BRIDGE, LOSS OF CHARGE METHOD, MEGGER, WAGNER'S EARTHING DEVICE.

MAGNETIC MEASUREMENTS: BALLASTIC GALVANOMETER, CALIBRATION OF HIBBERT'S MAGNETIC STANDARD FLUX METER, LLOYDFISCHER SQUARE FOR MEASURING IRON LOSS. TESTING OF RING AND BAR SPECIMENS, DETERMINATION OF B-H CURVE AND HYSTERESIS LOOP USING CRO, DETERMINATION OF LEAKAGE FACTOR.

POTENTIOMETERS & INSTRUMENT TRANSFORMERS: CROMPTON'S D.C. POTENTIO METER, A.C. POLAR AND CO-ORDINATE TYPE POTENTIO METERS.APPLICATIONS-MEASUREMENT OF IMPEDANCE, CALIBRATION OF AMMETERS, VOLTMETERS AND WATTMETERS. USE OF OSCILLOSCOPE IN FREQUENCY, PHASE AND AMPLITUDE MEASUREMENTS, INDIAN STANDARD SPECIFICATIONS FOR VOLTMETERS, AMMETERS, ENERGY METERS, INSTURMNET TRANSFORMERS –RATION AND PHASE ANGLE ERRORS AND THEIR REDUCTION.

TEXT BOOK :

1. ELECTRIC AND ELECTRONIC INSTRUMENTATION BY A.K. SAWHNEY, DHANPAT RAI & SONS, DELHI, 11 th EDITION, 1995.

REFERENCE BOOKS :

1. ELECTRICAL & ELECTRONIC INSTRUMENTATION BY UMESH SINHA, SATYA PRAKASHAN, NEWDELHI,1998

2. ELECTRICAL MEASUREMENTS BY E.W.GOLDING. & WIDDIS, 5^{TH} EDITION, WHEELER PUBLISHING.

EEE217 – NETWORKS & MEASUREMENTS LABORATORY

INSTRUCTION : 3 Periods per Week
UNIVERSITY EXAMINATION : 3 Hours
UNIVERSITY EXAMINATION MARKS: 50
SESSIONAL MARKS : 50
CREDITS : 3

TEN EXPERIMENTS BASED ON E213 & EEE214 SYLLABI

EEE 218 ELECTRONIC DEVICES AND CIRCUITS LABORATORY
(COMMON WITH ECE)

INSTRUCTION : 3 Periods per Week
UNIVERSITY EXAMINATION : 3 Hours
UNIVERSITY EXAMINATION MARKS: 50
SESSIONAL MARKS : 50
CREDITS : 3

CHARACTERISTICS OF DIODES:
SEMICONDUCTOR PN JUNCTION DIODE, ZENER DIODE, LED, TUNNEL DIODE, VARACTOR DIODE ETC.

DIODE AS A CIRCUIT ELEMENT:
RECTIFIERS – HALF-WAVE, FULL-WAVE, BRIDGE, WITH RC FILTERS.

I/P AND O/P CHARACTERISTICS OF BJT:
CB, CE & CC CONFIGURATIONS
DRAIN AND TRANSFER CHARACTERISTICS OF JFET/MOSFET.
CHARACTERISTICS OF UJT/SCR, SCS.
CHARACTERISTICS OF PHOTO DIODE AND PHOTO TRANSISTOR.
STUDY OF CRO AND ITS APPLICATIONS.
SWITCHING CHARACTERISTICS OF BJT, UJT.
MEASUREMENT OF H – PARAMETERS, TRANSISTOR AS AN AMPLIFIER.
EMITTER FOLLOWER CHARACTERISTICS.
FREQUENCY RESPONSE OF (CC-CE) TWO STAGE TRANSISTOR/JFET AMPLIFIER.
BIAS STABILIZATION AND COMPENSATION.
PERFORMANCE OF RC, RL FILTERS, FULL-WAVE AND HALF-WAVE RECTIFIERS

EEE 221 MATHEMATICS – IV
(COMMON WITH ECE)

INSTRUCTION : 4 Periods per Week
UNIVERSITY EXAMINATION : 3 Hours
UNIVERSITY EXAMINATION MARKS: 70
SESSIONAL MARKS : 30
CREDITS : 4

FUNCTIONS OF A COMPLEX VARIABLES:
CONTINUITY CONCEPT OF F(Z), DERIVATIVE OF F(Z), CAUCHY - RIEMANN EQUATIONS, ANALYTIC FUNCTIONS, HARMONIC FUNCTIONS, ORTHOGONAL SYSTEMS, APPLICATIONS TO FLOW PROBLEMS, INTEGRATION OF COMPLEX FUNCTIONS, CAUCHY'S THEOREM, CAUCHY'S INTEGRAL FORMULA, STATEMENTS OF TAYLOR'S AND LAURENT'S SERIES WITHOUT PROOFS, SINGULAR POINTS, RESIDUES AND RESIDUE THEOREM, CALCULATIONS OF RESIDUES, EVALUATION OF REAL DEFINITE INTEGRALS, GEOMETRIC REPRESENTATION OF F(Z), CONFORMAL TRANSFORMATION, SOME STANDARD TRANSFORMATIONS:- (1) $W = Z+C$, (2) $W = CZ$, (3) $W = 1/Z$, (4) $W = (AZ+B)/(CZ+D)$, (5) $W = Z^2$, (6) $W = E^2$.

DIFFERENCE EQUATIONS IN Z-TRANSFORMS:
Z-TRANSFORMS - DEFINITION, SOME STANDARD Z-TRANSFORMS, LINEAR PROPERTY, SAMPLING RULE, SOME STANDARD RESULTS, SHIFTING RULES, INITIAL AND FINAL VALUE THEOREMS, DEFINITION, ORDER AND SOLUTION OF DIFFERENCE EQUATIONS, FORMATION OF DIFFERENCE EQUATIONS, LINEAR DIFFERENCE EQUATIONS. RULES FOR FINDING C.F. RULE FOR FINDING P.I. DIFFERENCE EQUATIONS REDUCIBLE TO LINEAR FORM, SIMULTANEOUS DIFFERENCE EQUATIONS WITH CONSTANT COEFFICIENTS, APPLICATION TO DEFLECTION OF A LOADED STRING. APPLICATIONS OF Z-TRANSFORM TO DIFFERENCE EQUATIONS.

ORDER RELATIONS AND STRUCTURES:
PARTIALLY ORDERED SETS, EXTERNAL ELEMENTS OF PARTIALLY ORDERED SETS, LATTICES, FINITE BOOLEAN ALGEBRAS, FUNCTION OF BOOLEAN ALGEBRAS, BOOLEAN FUNCTIONS AS BOOLEAN POLYNOMIALS.

TEXT BOOKS (SCOPE AS GIVEN IN):
HIGHER ENGINEERING MATHEMATICS, DR. B. S. GREWAL, KHANNA PUBLISHER - N. DELHI, 34^{TH} EDITION, 1998.
DISCRETE MATHEMATICAL STRUCTURES, BERNARD KOLMAN, ROBERT C. BUSBY, SHARON ROSS PUBLISHER PHI PVT. LTD.- N. DELHI.

REFERENCE BOOKS:
HIGHER ENGINEERING MATHEMATICS, DR. M. K. VENKATARAMAN, NATIONAL PUB. & CO. - MADRAS.
ADVANCED ENGINEERING MATHEMATICS, ERWIN KREYSZIG, WILEY EASTERN PVT. - N. DELHI.
DISCRETE MATHEMATICAL STRUCTURES WITH APPLICATIONS TO COMPUTER SCIENCE, J. P. TREMBLAY AND R. MONOHAR, MCGRAW HILL BOOK CO. - USA.

EEE 222 PERFORMANCE AND DESIGN OF ELECTRICAL MACHINES –I

INSTRUCTION : 4 Periods per Week
UNIVERSITY EXAMINATION : 3 Hours
UNIVERSITY EXAMINATION MARKS: 70
SESSIONAL MARKS : 30
CREDITS : 4

ELECTROMECHANICAL ENERGY CONVERSION: PRINCIPLES, FORCES AND TORQUES IN MAGNETIC FIELD SYSTEMS, ENERGY BALANCE, ENERGY AND FORCE IN SINGLY EXCITED MAGNETIC FIELD SYSTEM, COENERGY, MULTIPLY EXCITED MAGNETIG FIELD SYSTEMS.

DIRECT CURRENT MACHINES: PRINCIPLES OF OPERATION, CONSTRUCTIONAL FEATURES, GENERATED E.M.F., VOLTAGE INDUCED IN D.C. MACHINE, TORQUE EXPRESSION, COLLECTION AND FLOW OF CURRENT FROM ARMATURE, COMMUTATION PROCESS AND INTERPOLES, ARMATURE REACTION AND EFECT ON MAIN FLUX AND COMMUTATION, COMPENSATING WINDING.

D.C.GENERATORS: METHODS OF EXCITATION, OPEN CIRCUIT CHARACTERISTICS, EXTERNAL CHARACTERISTICS OF GENERATORS, PARALLEL OPERATION.

D.C. MOTORS: TORQUE AND SPEED EQUATIONS, CHARACTERISTICS OF DIFFERENT MOTORS, SPEED CONTROL OF D.C. MOTORS, STARTING AND STARTERS, D.C. SERVOMOTOR AND STEPPER MOTOR

TESTING: LOSSES AND EFFICIENCY, BRAKE TEST, SWINBURNE'S TEST, HOPKINSON'S TEST, RETARDATION TEST, FIELD'S TEST, SEPARATION OF LOSSES.

GROSSFIELD MACHINES: METADYNE AND AMPLIDYNE:

DESIGN: RATINGS, TEMPERATURE RISE, ESTIMATION OF SHORT TIME RATING, MAIN DIMENSIONS OF D.C. MACHINES, DESIGN OF ARMATURE WINDING, AND FIELD WINDING, DESIGN OF ARMATURE SLOTS.

TEXT BOOKS:

"ELECTROMECHANICAL ENERGY CONVERSION WITH DYNAMICS OF MACHINES" BY R.D. BEGAMUDRE.
New Age India Ltd.,
2. " PERFORAMANCE AND DESIGN OF DIRECT CURRENT MACHINES " BY CLAYTON.
3. "ELCTRICAL MACHINES" BY S.K. BHATTACHARYA, TMH, 1998

EEE 223 ANALOG ELECTRONIC CIRCUITS
(COMMON WITH ECE)

INSTRUCTION : 4 Periods per Week
UNIVERSITY EXAMINATION : 3 Hours
UNIVERSITY EXAMINATION MARKS: 70
SESSIONAL MARKS : 30
CREDITS : 4

MULTISTAGE AMPLIFIERS:
BJT AND FET RC COUPLED AMPLIFIERS – FREQUENCY RESPONSE. CASCADED AMPLIFIERS. CALCULATION OF BAND WIDTH OF SINGLE AND MULTISTAGE AMPLIFIERS CONCEPT OF GAIN BANDWIDTH PRODUCT.

FEED BACK AMPLIFIERS:
CONCEPT OF FEEDBACK AMPLIFIERS – EFFECT OF NEGATIVE FEED BACK ON THE AMPLIFIER CHARACTERISTICS. FOUR FEEDBACK AMPLIFIER TOPOLOGIES. METHOD OF ANALYSIS OF VOLTAGE SERIES, CURRENT SERIES, VOLTAGE SHUNT AND CURRENT SHUNT FEEDBACK AMPLIFIERS.

SINUSOIDAL OSCILLATORS:
CONDITION FOR OSCILLATIONS –LC OSCILLATORS – HARTLEY, COLPITTS, CLAPP AND TUNED COLLECTOR OSCILLATORS – FREQUENCY AND AMPLITUDE STABILITY OF OSCILLATORS – CRYSTAL OSCILLATORS – RC OSCILLATORS RC PHASE SHIFT AND WEINBRIDGE OSCILLATORS.

POWER AMPLIFIERS:
CLASSIFICATION OF POWER AMPLIFIERS – CLASS A, CLASS B AND CLASS AB POWER AMPLIFIERS. SERIES FED, SINGLE ENDED TRANSFORMER COUPLED AND PUSH PULL CLASS A POWER AMPLIFIERS. CROSS-OVER DISTORTION IN PURE CLASS B POWER AMPLIFIER, CLASS AB POWER AMPLIFIER – COMPLEMENTARY PUSH PULL AMPLIFIER WITH TRICKLE BIAS, DERATING FACTOR – HEAT SINKS.

TUNED VOLTAGE AMPLIFIERS:
SINGLE TUNED AND STAGGER TUNED AMPLIFIERS – ANALYSIS – DOUBLE TUNED AMPLIFIER – BANDWIDTH CALCULATION.

OPERATIONAL AMPLIFIERS:
CONCEPT OF DIRECT COUPLED AMPLIFIERS. IDEAL CHARACTERISTICS OF AN OPERATIONAL AMPLIFIER – DIFFERENTIAL AMPLIFIER - CALCULATION OF COMMON MODE REJECTION RATIO – DIFFERENTIAL AMPLIFIERS SUPPLIED WITH A CONSTANT CURRENT – NORMALISED TRANSFER CHARACTERISTICS OF A DIFFERENTIAL AMPLIFIER – APPLICATIONS OF OP-AMP AS AN INVERTING AND NON-INVERTING AMPLIFIER, INTEGRATOR, DIFFERENTIATOR SUMMING AND SUBTRACTING AMPLIFIER – LOGARITHMIC AMPLIFIER. PARAMETERS OF AN OP-AMP, MEASUREMENT OF OP-AMP PARAMETERS.

BOOKS:
1.INTEGRATED ELECTRONICS – MILLMAN AND HALKIAS, TMH
2. ELECTRONIC DEVICES AND CIRCUITS – MOTTERSHEAD
3. OP-AMPS AND LINEAR INTEGRATED CIRCUITS – GAYAKWAD, PHI

EEE224 – THERMAL PRIME MOVERS

INSTRUCTION : 5 Periods per Week
UNIVERSITY EXAMINATION : 3 Hours
UNIVERSITY EXAMINATION MARKS: 70
SESSIONAL MARKS : 30
CREDITS : 4

PROPOSED AND MODIFIED SYLLABUS:

1. LAWS OF THERMODYNAMICS (STATEMENTS ONLY), GAS LAWS, RELATION BETWEEN GAS CONSTANT AND SPECIFIC HEAT AT CONSTANT PRESSURE AND CONSTANT VOLUME. THERMOODYNAMIC PROCESSES OF PERFECT GASES AND ENTROPY.

2. PROPERTIES OF STEAM AND USE OF STEAM TABLES. EXTENT WORK AND INTERNAL ENERGY. THERMODYNAMIC PROCESSES OF VAPOUR AND ENTROPY OF STEAM.

3. **BOILERS:** CLASSIFICATION, SIMPLE VERTICAL, COCHRON, LANCSHIRE, AND BABCOCK&WILCOX BOILERS.

4. **I C ENGINES :** CLASSIFICATION, OTTO CYCLE, DIESEL CYCLE AND DUEL COMBUSTION CYCLE. WORKING OF 2-STROKE AND 4-STROKE ENGINES. PETROL ENGINES AND DIESEL ENGINES. POWER AND EFFICIENCY OF IC ENGINES.

5. **STEAM NOZZLES:** FLOW THROUGH STEAM NOZZLES CRITICAL PRESSURE RATIO, EFFECT OF FRICTION AND SUPER SATURATION.

6. **STEEAM TURBINES:** IMPULSE AND REAACTIOON TURBINES, AND VELOCITY-DIAGRAMS. METHODS OF REDUCTION OF ROTOR SPEED.

7. **GAS TURBINES:** INTRODUCTION, CLASSIFICATION OF GAS TURBINES. ANALYSIS OF CONSTANT PREESSURE CLOSED CYCLE GAS TURBINES, OPEN CYCLE GAS TURBINES. METHODS TO IMPROVE THE THERMAL EFFIENCY OF GAS TURBINES.

TEXT BOOKS:

1.THERMAL ENGINEERING BY R.S. KHURMI AND J.K. GUPTA, S.CHAND & CO LTD.

2.ELEMENTS OF HEAT ENGINES, VOLS. I & II BY R.C. PATEL AND C.J. KARAM CHANDANI, ACHARYA BOOK DEPOT, BARODA.

EEE225 – SIGNALS AND SYSTEMS
(COMMON WITH ECE)

INSTRUCTION :4 Periods per Week
UNIVERSITY EXAMINATION : 3 Hours
UNIVERSITY EXAMINATION MARKS: 70
SESSIONAL MARKS : 30
CREDITS : 4

SIGNALS, TRANSFORMATIONS OF INDEPENDENT VARIABLES, BASIC CONTINUOUS TIME SIGNALS, BASIC DISCRETE TIME SIGNALS, SYSTEMS, PROPERTIES OF SYSTEMS, LINEAR TIME – INVARIANT SYSTEMS.

LINEAR TIME – INVARIANT (LTI) SYSTEMS:
REPRESENTATION OF SIGNALS IN TERMS OF IMPULSES, DISCRETE TIME LTI SYSTEMS, THE CONVOLUTION SUM, CONTINUOUS TIME LTI SYSTEMS, THE CONVOLUTION INTEGRAL. PROPERTIES OF LTI SYSTEMS, SYSTEMS DESCRIBED BY DIFFERENTIAL AND DIFFERENCE EQUATIONS. BLOCK DIAGRAM REPRESENTATION OF LTI SYSTEMS DESCRIBED BY DIFFERENTIAL EQUATIONS AND, SINGULARITY FUNCTIONS.

ANALOGY BETWEEN VECTORS AND SIGNALS, ORTHOGONAL VECTOR AND SIGNAL SPACES. APPROXIMATION OF A FUNCTION BY A SET OF MUTUALLY ORTHOGONAL FUNCTIONS, FOURIER ANALYSIS OF CONTINUOUS TIME SIGNALS AND SYSTEMS. THE RESPONSE OF CONTINUOUS TIME LTI SYSTEMS TO COMPLEX EXPONENTIALS, THE CONTINUOUS TIME FOURIER SERIES. CONVERGENCE OF FOURIER SERIES, A-PERIODIC SIGNALS AND CONTINUOUS FOURIER TRANSFORM. PERIODIC SIGNALS AND CONTINUOUS FOURIER TRANSFORM. CONVOLUTION AND MODULATION PROPERTY. POLAR REPRESENTATION OF CONTINUOUS FOURIER TRANSFORM. FREQUENCY RESPONSE CHARACTERIZED BY LINEAR CONSTANT COEFFICIENT DIFFERENTIAL EQUATIONS. FIRST-ORDER AND SECOND-ORDER SYSTEMS.

FOURIER ANALYSIS OF DISCRETE TIME SIGNALS AND SYSTEMS RESPONSE OF DISCRETE TIME LTI SYSTEMS TO COMPLEX EXPONENTIAL. FOURIER SERIES, DTFT, PERIODIC SIGNALS AND DTFT, PROPERTIES OF DTFT, CONVOLUTION, MODULATION AND DUALITY PROPERTY. POLAR REPRESENTATION OF DTFT, FIRST-ORDER AND SECOND-ORDER SYSTEMS.

CONCEPT OF Z:
SAMPLING THEOREM, RECONSTRUCTION OF A SIGNAL FROM SAMPLES, THE EFFECT OF UNDER-SAMPLING, DISCRETE TIME PROCESSING OF CONTINUOUS TIME SIGNALS. SAMPLING IN FREQUENCY DOMAIN, SAMPLING OF DISCRETE TIME SIGNALS. Z-TRANSFORM OF A DISCRETE SEQUENCE, REGION OF CONVERGENCE FOR THE Z-TRANSFORM. INVERSE Z-TRANSFORM, PROPERTIES OF Z-TRANSFORM, RELATION BETWEEN Z AND FOURIER TRANSFORM.

TEXT BOOK:
SIGNALS AND SYSTEMS, ALAN V. OPPENHEIM, ALAN S. WILLSKY AND IAN T. YOUNG, PHI.

REFERENCES:

1. COMMUNICATION SYSTEMS, B. P. LATHI.
2. SIGNALS AND SYSTEMS, B. P. LATHI.

EEE 226 - PRINCIPLES OF ENVIRONMENTAL STUDIES

(COMMON WITH ALL ENGINEERING BRANCHS)
(NON-CREDIT AUDIT COURSE)

INSTRUCTION :4 Periods per Week

UNIVERSITY EXAMINATION : 3 Hours

UNIVERSITY EXAMINATION MARKS: 70

SESSIONAL MARKS : 30

CREDITS : 4

UNIT-1 :
INTRODUCTION TO ENVIRONMENTAL SCIENCES – IMPORTANCE - TYPES OF ECOSYSTEMS – LAKE – RIVER – MARINE – FOREST – DESERT – BIO-DEVERSITY.

UNIT-2:
RESOURCES NATURAL – WATER – MINERAL – FOOD – FOREST – ENERGY – LAND – USE AND EXPLOITATION - ENVIRONMENTAL DEGRADATION - REMEDIAL MEASURES.

UNIT-3:
ENVIRONMENTAL POLLUTION CAUSES, EFFECTS, STANDARDS AND CONTROL OF (A) AIR POLLUTION; (B) WATER POLLUTION; (C) SOIL POLLUTION; (D) MARINE POLLUTION; (E) NOISE POLLUTION.

UNIT-4 :
LEGAL ASPECTS OF POLLUTION

(A) AIR (PREVENTION AND CONTROL OF PLLUTION) ACT.
(B) WATER (PREVENTION AND CONTROL OF POLLUTION) ACT.
(C) ENVIRONMENTAL PROTECTION (19860 act.
(D) FOREST CONSERVATION ACT.

UNIT-5:
ROLE OF PEOPLE TO PROTECT ENVVIRONMENT – ROLE OF NGOS.

A. GLOBAL ISSUES.
B. GREEN HOUSEEFFECT
C. GLOBAL WARMING
D. NUCLEAR ACCIDENTS

A. LOCAL ISSUES. CAUSES AND ACTION
B. AIR POLLUTION DUE TO INDUSTRIES
C. AUTOMOBILES
C. PUBLIC INTEREST LITIGATION CASE STUDIES – SUCCESS STORIES
LEATHER INDUSTRIES
TAAJ & MATHURA REFINERY
SILENT VALLEY

RECOMMENDEDTEXT BOOKS:

(A) INTRODUCTION TO ENVIRONMENTAL SCIENCES – TURK & TURK AND WITTIES &WITTIES.
(B) ENVIRONMENTAL SCIENCES – P.D.SARMA

EEE 227-THERMAL PRIME MOVERS LABORATORY

INSTRUCTION : 3 Periods per Week
UNIVERSITY EXAMINATION : 3 Hours
UNIVERSITY EXAMINATION MARKS: 50
SESSIONAL MARKS : 50
CREDITS : 3

TEN EXPERIMENTS BASED ON EEE-224 SYLLABUS

EEE 228-ANALOG ELECTRONIC CIRCUITS LABORATORY

INSTRUCTION : 3 Periods per Week
UNIVERSITY EXAMINATION : 3 Hours
UNIVERSITY EXAMINATION MARKS: 50
SESSIONAL MARKS : 50
CREDITS : 3

TEN EXPERIMENTS BASED ON E223 SYLLABUS

EEE 311-PULSE AND DIGITAL CIRCUITS
(COMMON WITH ECE)

INSTRUCTION : 4 Periods per Week
UNIVERSITY EXAMINATION : 3 Hours
UNIVERSITY EXAMINATION MARKS: 70
SESSIONAL MARKS : 30
CREDITS : 4

LINEAR WAVE SHAPING:
HIGH PASS AND LOW PASS RC CIRCUITS AND THEIR RESPONSE FOR SINUSOIDAL, STEP VOLTAGE, PULSE, SQUARE WAVE AND RAMP INPUTS. HIGH PASS RC CIRCUIT AS A DIFFERENTIATOR. LOW PASS RC CIRCUIT AS AN INTEGRATOR. ATTENUATORS AND THEIR APPLICATION AS CRO PROBE. RL AND RLC CIRCUITS AND THEIR RESPONSE FOR STEP INPUT. RINGING CIRCUIT.

NON-LINEAR WAVE SHAPING:
DIODE CLIPPERS. TRANSISTOR CLIPPERS. CLIPPING AT TWO INDEPENDENT LEVELS. COMPARATOR – APPLICATIONS OF VOLTAGE COMPARATORS – DIODE COMPARATOR. CLAMPING OPERATION. CLAMPING CIRCUITS USING DIODE WITH DIFFERENT INPUTS. CLAMPING CIRCUIT THEOREM. PRACTICAL CLAMPING CIRCUITS. EFFECT OF DIODE CHARACTERISTICS ON CLAMPING VOLTAGE.

MULTIVIBRATORS:
TRANSISTOR AS A SWITCH - SWITCHING TIMES OF A TRANSISTOR. ASTABLE, MONOSTABLE AND TRISTABLE MULTIVIBRATORS USING TRANSISTORS, RESOLUTION TIME OF A BINARY. METHODS OF IMPROVING RESOLUTION TIME – METHODS OF TRIGGERING A BINARY. SCHMITT TRIGGER.

SWEEP CIRCUITS:
VOLTAGE SWEEP SIMPLE EXPONENTIAL SWEEP GENERATOR. ERRORS THAT DEFINE DEVIATION FROM LINEARITY, UJT RELAXATION OSCILLATOR – METHODS OF LINEARISING A VOLTAGE SWEEP - BOOTSTRAP AND MILLER CIRCUITS – CURRENT SWEEP – LINEARISING A CURRENT SWEEP BY ADJUSTING THE DRIVING WAVEFORM.

SYNCHRONISATION AND FREQUENCY DIVISION:
PRINCIPLES OF SYNCHRONISATION – SYNCHROISATION OF ASTABLE MULTIVIBRATORS. SYNCHRONISATION OF SWEEP CIRCUITS WITH SYMMETRICAL SIGNALS.

LOGIC GATES:
IC FAMILIES, TTL, CMOS, ECL, FFS AND CIRCUITS.

BLOCKING OSCILLATOR:
BASE TIMING. EMITTER TIMING, AND ASTABLE BLOCKING OSCILLATOR.

TEXT BOOKS:

1. PULSE, DIGITAL AND SWITCHING WAVEFORMS – MILLMAN & TAUB, TMH PUB.
2. WAVE GENERATION AND SHAPING – L. STRAUSS.

EEE 312-LINEAR ICS AND APPLICATIONS

(COMMON WITH ECE)

INSTRUCTION : 4 Periods per Week
UNIVERSITY EXAMINATION : 3 Hours
UNIVERSITY EXAMINATION MARKS: 70
SESSIONAL MARKS : 30
CREDITS : 4

OPERATIONAL AMPLIFIERS:

DESIGN ASPECTS OF MONOLITHIC OP-AMPS, IDEAL CHARACTERISTICS, SPECIFICATIONS, OFFSET VOLTAGES AND CURRENTS, FREQUENCY COMPENSATION TECHNIQUES, MEASUREMENT OF OP-AMP PARAMETERS, APPLICATIONS OF OP-AMPS, INVERTING AND NON-INVERTING AMPLIFIERS, INTEGRATORS, FUNCTION GENERATORS, LOGARITHMIC AMPLIFIERS, INSTRUMENTATION AMPLIFIERS, SIGNAL CONDITIONING CIRCUITS, MULTIVIBRATORS, SQUARE WAVE GENERATORS, RECTIFIERS, PEAK DETECTION AND VOLTAGE REGULATION.

555 TIMERS, 556 FUNCTION GENERATOR ICS AND THEIR APPLICATIONS. THREE TERMINAL IC REGULATORS, IC 1496 (BALANCED MODULATOR), IC 565 PLL AND ITS APPLICATIONS.

ACTIVE FILTERS – LPF, HPF, BPF, BEF, ALL-PASS FILTERS, HIGHER ORDER FILTERS AND THEIR COMPARISON. OP-AMP PHASE SHIFT, WEIN-BRIDGE AND QUDRATURE OSCILLATOR, VOLTAGE CONTROLLED OSCILLATORS, VOLTAGE TO FREQUENCY AND FREQUENCY TO VOLTAGE CONVERTERS, VOLTAGE TO CURRENT AND CURRENT TO VOLTAGE CONVERTERS. SWITCHED CAPACITANCE FILTERS, ANALOG MULTIPLEXERS, SAMPLE AND HOLD CIRCUITS.

BOOKS:

1.MICROELECTRONICS, JACOB MILLMAN, TMH INC.
2. OP-AMPS AND LINEAR ICS, RAMAKANTH GAYAKWAD, PEARSON EDUCATION
3. INTEGRATED CIRCUITS, BOTKAR, KHANNA PUBLICATIONS.
4. APPLICATIONS OF LINEAR ICS, CLAYTON.

EEE 313-LOGIC DESIGN AND MICROPROCESSORS

INSTRUCTION : 4 Periods per Week
UNIVERSITY EXAMINATION : 3 Hours
UNIVERSITY EXAMINATION MARKS: 70
SESSIONAL MARKS : 30
CREDITS : 4

PART-A: LOGIC DESIGN

NUMBER SYSTEMS: BINARY, DECIMAL, OCTAL AND HEXADECIMAL-BINARY ARITHMATIC-BINARY CODES

BOOLEAN ALGEBRA AND COMBINATIONAL CIRCUIT DESIGN: TRUTH FUNCTIONS-OPERATORS-LAWS OF BOOLEAN ALGEBRA-BOOLEAN EXPRESSIONS-LOGIC DIAGRAMS-UNIVERSAL BUILDING BLOCKS-MAP METHOD OF SIMPLIFICATION FOR POS AND SOP FORMS (ONLY UPTO 4 VARIABLES)-WIRED OR AND WIRED AND GATES-PLAs AND PALs.

SEQUENTIAL CIRCUITS AND DESIGN: SEQUENTIAL LOGIC-FLIP-FLOPS-DIGITAL COUNTERS-RIPPLE COUNTER DESIGN, SYNCHRONOUS COUNTER DESIGN WITH T,D AND J.K. FLIPFLOPS. SHIFT REGISTERS AND OPERATION MODES.

PART-B: MICROPROCESSORS

MICROPROCESSORS: INTRODUCTION, INTERNAL ARCHITECTURE AND FUNCTIONAL DESCRIPTION OF 8085 PROCESSOR-INSTRUCTION SET AND TIMING DIAGRAMS.

MEMORIES: RAM, ROM, PROM, STATIC AND DYNAMIC MEMORIES-MEMORY ADDRESSING-INTERFACING MEMORY TO CPU.

PERIPHERAL ICs: PIO-8255A (PPI) BLOCK DIAGRAM AND OPERATING MODES, SIO-8251 (USART) BLOCK DIAGRAM AND FUNCTIONS OF EACH BLOCK. TIMER-8253 BLOCK DIAGRAM AND MODES OF OPERATION.

KEY BOARD/DISPLAY DEVICE: 8279 BLOCK DIAGRAM AND ITS OPERATION.

DATA CONVERTERS: VARIOUS TYPES OF D/A AND A/D CONVERTERS.

TEXT BOOKS:

1. T.C. BARTEE: DIGITAL COMPUTER FUNDAMENTALS, TMH Pub.
2. MICROPROCESSORS & ITS APPLICATIONS BY THEAGARAJAN, R., DHANPAL, S. & DHANASETURAN, S., New Age India Ltd., 1998.
3. R.S. GAONKAR: MICROPROCESSOR ARCHITECTURE, PROGRAMMING AND APPLICATIONS WITH THE 8085/8080A, WILEY EASTERN Ltd.

EEE 314 - PERFORMANCE AND DESIGN OF ELECTRICAL MACHINES – II

INSTRUCTION : 4 Periods per Week
UNIVERSITY EXAMINATION : 3 Hours
UNIVERSITY EXAMINATION MARKS: 70
SESSIONAL MARKS : 30
CREDITS : 4

TRANSFORMERS: PRINCIPLES OF OPERATION, CONSTRUCTIONAL FEATURES, EQUIVALENT CIRCUIT, VECTOR DIAGRAM, VOLTAGE REGULATION AND EFFICIENCY, PARALLEL OPERATION AND LOAD SHARING, THREE WINDING TRANSFORMERS, POLY PHASE CONNECTIONS AND SCOTT CONNECTION, TAP CHANGING, COOLING METHODS AND TRANSFORMER OIL.

INDUCTION MOTOR: PRINCIPLES OF OPERATION OF THREE PHASE INDUCTION MOTOR, ROTATING MAGNETIC FIELD, TYPES OF ROTOR, TORQUE EXPRESSION, VECTOR DIAGRAM, EQUIVALENT CIRCUIT AND PERFORMANCE EQUATIONS AND CALCULATIONS, SLIP-TORQUE CHARACTERISTIC , CIRCLE DIAGRAM AND PERFORMANCE CALCULATIONS.
STARTING OF INDUCTION MOTORS, CRAWLING AND COGGING, DOUBLE SQUIRREL CAGE INDUCTION MOTOR AND EQUIVALENT CIRCUIT, METHODS OF SPEED CONTROL OF INDUCTION MOTORS, INDUCTION GENERATOR AND PRINCIPLE OF OPERATION, SELF EXCITATION OF INDUCTION GENERATOR, SCHRAGE MOTOR, TWO PHASE MOTORS.

SINGLE PHASE INDUCTION MOTORS: TYPES, DOUBLE REVOLVING FIELD THEORY, EQUIVALENT CIRCUIT, PERFORMANCE ANALYSIS AND CHARACTERISTICS OF CAPACITOR START MOTORS, SHADED POLE, REPULSION TYPE, RELUCTANCE, HYSTERISIS AND AC SERIES MOTORS.

DESIGN OF TRANSFORMERS: MAIN DIMENSIONS, SINGLE PHASE AND THREE PHASE TRANSFORMERS, WINDING AND ARRANGMENT OF COILS, NO LOAD CURRENT ESTIMATION FOR SINGLE PHASE AND THREE PHASE TRANSFORMERS. TEMPERATURE RISE And DESIGN OF TANK AND COOLING TUBES. DESIGN OF WELDING TRANSFORMERS.

TEXT BOOKS:

1. " ELECTROMECHANICAL ENERGY CONVERSION WITH DYNAMICS OF MACHINES. " BY R. D. BEGAMUDRE.

2." PERFORMANCE AND DESIGN OF ALTERNATING CURRENT MACHINES " BY M. G. SAY

3. " ELECTRICAL MACHINES" BY S.K. BHATTACHARYA, TMH, 1998.

EEE 315 –COMPUTER ARCHITECTURE AND ORGANIZATION

(COMMON WITH ECE)

INSTRUCTION : 4 Periods per Week
UNIVERSITY EXAMINATION : 3 Hours
UNIVERSITY EXAMINATION MARKS: 70
SESSIONAL MARKS : 30
CREDITS : 4

1. **REGISTER TRANSFER AND MICRO OPERATIONS:**
   REGISTER TRANSFER LANGUAGE, REGISTER TRANSFER, BUS AND MEMORY TRANSFERS, ARITHMETIC MICRO OPERATIONS, LOGIC MICRO OPERATIONS, SHIFT MICRO OPERATIONS, ARITHMETIC LOGIC SHIFT UNIT.

2. **BASIC COMPUTER ORGANIZATION**:
   INSTRUCTION CODES, COMPUTER REGISTERS, COMPUTER INSTRUCTIONS, TIMING AND CONTROL, INSTRUCTION CYCLE, MEMORY REFERENCE INSTRUCTIONS, INPUT - OUTPUT AND INTERRUPT, COMPLETE COMPUTER DESCRIPTION.

3. **CPU ORGANIZATION**:
   INTRODUCTION, GENERAL REGISTER ORGANIZATION, INSTRUCTION FORMATS, ADDRESSING MODES, DATA TRANSFER AND MANIPULATION, PROGRAM CONTROL, REDUCED INSTRUCTION SET COMPUTER (RISC), STACK ORGANIZATION.

4. **MICRO PROGRAMMED CONTROL:**
   CONTROL MEMORY, ADDRESS SEQUENCING, MICROINSTRUCTION FORMATS, MICRO PROGRAM EXAMPLE, DESIGN OF CONTROL UNIT.

5. **MEMORY ORGANIZATION:**
   MEMORY HIERARCHY, MAIN MEMORY, AUXILIARY MEMORY, ASSOCIATIVE MEMORY, CACHE MEMORY, VIRTUAL MEMORY.

6. **INPUT - OUTPUT ORGANIZATION:**
   PERIPHERAL DEVICES, INPUT - OUTPUT INTERFACE, ASYNCHRONOUS DATA TRANSFER, MODES OF TRANSFER, PRIORITY INTERRUPT, DIRECT MEMORY ACCESS (DMA), INTRODUCTION TO MULTIPROCESSOR SYSTEM.

TEXT BOOKS:

1. COMPUTER SYSTEM ARCHITECTURE, M. MORRIS MANO, PEARSON EDUCATION (3^{RD} EDITION).

REFERENCES:

1. COMPUTER ORGANIZATION, V. CARL HAMACHER, ZVONKO G. VRANESIC AND SAFWAT G. ZAKY, MCGRAW HILL INTERNATIONAL, (4^{TH} EDITION).

2.DIGITAL COMPUTER FUNDAMENTALS, THOMAS C. BARTEE,TMH.

EEE 316 - FLUID MECHANICS & HYDRAULIC MACHINERY

INSTRUCTION	: 5 Periods per Week
UNIVERSITY EXAMINATION	: 3 Hours
UNIVERSITY EXAMINATION MARKS	: 70
SESSIONAL MARKS	: 30
CREDITS	: 4

I.(A) INTRODUCTION TO FLUID MECHANICS, PRINCIPLE OF CONTINNIUM -FLUID PROPERTIES-MASS DENSITY,SPECIFIC WEIGHT, SPECIFIC GRAVITY,VISCOSITY,SURFACE TESNSION,CAPILLARITY,COMPRESSIBILITY&BULK MODULUS OF ELECTRICITY,VAPOUR PRESSURE.

(B) FLUID STATICS – FLUID PRESSURE AND ITS MEASUREMENT, PASCAL'S LAW,HYDRO-STATIC PRESSURE DISTRIBUTION, MANOMETERS-MICROMANOMETERS-MECHANICAL GAUGES,HYDROSTATIC FORCES ON PLANE SURFACES, RELATIVE EQUIVILIBRIUM UNDER TRANSLATION.

II.(A) FLUID KINEMATICS-DEFINITION OF STEADY AND UNSTEADY, UNIFORM AND NON UNIFORM, COMPRESSIBLE AND INCOMPRESSIBLE, ROTATIONAL AND IRRATIONAL, 1-D,2-D AND 3-D, LAMINAR AND TURBULENT FLOWS, STREAM LINE, PATH LINE, STREAK LINE,STREAM FUNCTION VELOCITY POTENTIAL FUNCTION,LOCAL AND CONVELATIVE ACCELERATIONS- FLOW NETS, PRINCIPLE OF CONSERVATION OF MASS, 3-D CONTINUITY EQUATION IN CARTESIAN COORDINATES, CONTINUITY EQUATION FOR STREAM TUBE.

(B) FLUID DYNAMICS-DERIVATION OF BERNAULLI'S EQUATION FROM THE CONCEPTS OF WORK DONE, TOTAL HEAD, LIMITATIONS OF BERNAULLI'S PRINCIPLE, APPLICATION OF BERNAULLI'S EQUATION, VENTURI METER, ORIFICE METER,FLOW NOZZLE,PITOT TUBE. MOMENTUM PRINCIPLE-IMPULSE MOMENTUM EQUATION AND ITS APPLICATION TO PIPE BENDS AND REDUCERS, IMPACT OF JETS ON SINGLE STATIONERY PLATES

III. FLOW THROUGH PIPES- LAWS OF FRICTION,REYNOLDS EXPERIMENT, DARCY-WEICHBACH EQUATION, MAJOR AND MINOR LOSSES, PIPES IN SERIES, PIPES IN PARALLEL, PIPES CONNECTING TWO RESERVOIRS, SIPHON, POWER TRANSMISSION THROUGH PIPES AND NOZZLES, CONCEPTS OF WATER HAMMER.

IV.(A) HYDRAULIC MACHINES- IMPACT OF JETS ON SERIES OF STATIONERY AND MOVING VANES, VELOCITY TRIANGLES, WORKDONE- TURBINES- HYDRAULIC, MECHANICAL AND OVERALL EFFICIENCY, CLASSSIFICATION, COMPONENT PARTS AND WORKING PRINCIPLES OF PELTON, FRANCIS AND KAPLAN TURBINES, UNIT QUANTITIES, SPECIFIC SPEED, CHARACTERISTIC CURVES.

(B) PUMPS : CLASSIFICATION OF PUMPS,POSITIVE DISPLACEMENT AND ROTODYNAMIC PUMPS, CENTRIFUGAL PUMPS- COMPONENT PARTS, WORKING PRINCIPLES, MANOMETRIC, STATIC AND OVERALL EFFICIENCY, WORK DONE PUMPS IN PARALLEL AND SERIES, SPECIFIC SPEED AND PUMP CHARACTERISTIC CURVES.

RECIPROCATING PUMPS-WORKING PRINCIPLES, ACCELERATION, FRICTION HEAD, INDICATOR DIAGRAMS, WORKDONE, MODIFIED INDICATOR DIAGRAM CONSIDERING AIR VESSELS.

TEXT BOOKS:

1. FLUID MECHANICS AND HYDRAULIC MACHINERY BY A.K. JAIN
2. FLUID MECHANICS AND HYDRAULIC MACHINERY BY P.N.MODI & SM SETHI

EEE317-ELECTRICAL MACHINES LABORATORY-I

INSTRUCTION : 4 Periods per Week
UNIVERSITY EXAMINATION : 3 Hours
UNIVERSITY EXAMINATION MARKS: 50
SESSIONAL MARKS : 50
CREDITS : 4

TEN EXPERIMENTS BASED ON EEE-222 AND PARTLY BASED ON EEE 315 SYLLABUS

EEE 318-L I.C.S & PULSE CIRCUITS LABORATORY

INSTRUCTION : 3 Periods per Week
UNIVERSITY EXAMINATION : 3 Hours
UNIVERSITY EXAMINATION MARKS: 50
SESSIONAL MARKS : 50
CREDITS : 4

TEN EXPERIMENTS BASED ON E-311 & E312 SYLLABI

EEE 319- SOFT SKILLS LABORATORY

INSTRUCTION : 3 PERIODS PER WEEK
UNIVERSITY EXAM. : --
SESSIONAL MARKS : --
CREDITS : 1

(Common for all Branches of Engineering)

Communication:
Importance of communication
Non verbal communication
Personal appearance
Posture
Gestures
Facial expressions
Eye contact
Space distancing

Goal setting:
Immediate, short term, long term,
Smart goals, strategies to achieve goals

Time management:
Types of time
Identifying time wasters
Time management skills

Leadership and team management:
Qualities of a good leader
Leadership styles
Decision making
Problem solving
Negotiation skills

Group discussions:
Purpose (Intellectual ability, creativity, approach to a problem, solving, tolerance, qualities of a leader)
Group behaviour, Analysing performance

Job interviews:
Identifying job openings
Preparing resumes & CV
Covering letter
Interview (Opening, body-answer Q, close-ask Q),
Types of questions

Reference books:

1. 'Effective Technical Communications' by Rizvi M. Ashraf, McGraw–Hill Publication
2. 'Developing Communication Skills' by Mohan Krishna & Meera Banerji, Macmillan
3. 'Creative English for Communication' by N.Krishnaswami & T.Sriraman, Macmillan
4. 'Professional Communication Skills' by Jain Alok, Pravin S.R. Bhatia & A.M. Sheikh, S.Chand & Co.

E321 CONTROL SYSTEMS

(Common with ECE)

INSTRUCTION	**: 4 Periods per Week**
UNIVERSITY EXAMINATION	**: 3 Hours**
UNIVERSITY EXAMINATION MARKS	**: 70**
SESSIONAL MARKS	**: 30**
CREDITS	**: 4**

TRANSFER FUNCTIONS OF LINEAR SYSTEMS-IMPULSE RESPONSE OF LINEAR SYSTEMS-BLOCK DIAGRAMS OF CONTROL SYSTEMS-SIGNAL FLOW GRAPHS(SIMPLE PROBLEMS)-REDUCTION TECHNIQUES FOR COMPLEX BLOCK DIAGRAMS AND SIGNAL FLOW GRAPHS(SIMPLE EXAMPLES)

INTRODUCTION TO MATHEMATICAL MODELLING OF PHYSICAL SYSTEMS-EQUATIONS OF ELECTRICAL NETWORKS-MODELLING OF MECHANICAL SYSTEMS- EQUATIONS OF MECHANICAL SYSTEMS

TIME DOMAIN ANALYSIS OF CONTROL SYSTEMS- TIME RESPONSE OF FIRST AND SECOND ORDER SYSTEMS WITH STANDARD INPUT SIGNALS-STEADY STATE PERFORMANCE OF FEEDBACK CONTROL SYSTEMS-STEADY STATE ERROR CONSTANTS-EFFECT OF DERIVATIVE AND INTEGRAL CONTROL ON TRANSIENT AND STEADYSTATE PERFORMANCE OF FEEDBACK CONTROL SYSTEMS.

CONCEPT OF STABILITY AND NECESSARY CONDITIONS FOR STABILITY-ROUTH-HURWITZ CRITERION, RELATIVE STABILITY ANALYSIS, THE CONCEPT AND CONSTRUCTION OF ROOT LOCI, ANALYSIS OF CONTROL SYSTEMS WITH ROOT LOCUS (SIMPLE PROBLEMS TO UNDERSTAND THEORY)

CORRELATION BETWEEN TIME AND FREQUENCY RESPONSES- POLAR PLOTS- BODE PLOTS-LOG MAGNITUDE VERSUS PHASE PLOTS-ALL PASS AND MINIMUM PHASE SYSTEMS-NYQUIST STABILITY CRITERION-ASSESSMENT OF RELATIVE STABILITY-CONSTANT M&N CIRCLES.

TEXT BOOKS:

1. CONTROL SYSTEMS ENGINEERING BY I.J. NAGRATH & M.GOPAL, WILEY EASTERN LIMITED.
2. AUTOMATIC CONTROL SYSTEMS BY BENJAMIN C. KUO, PRENTICE HALL OF INDIA

REFERENCE BOOK:

1. MODERN CONTROL ENGINEERING BY OGATA, PRENTICE HALL OF INDIA

EEE322 – ADVANCED NETWORK THEORY

INSTRUCTION	**: 4 Periods per Week**
UNIVERSITY EXAMINATION	**: 3 Hours**
UNIVERSITY EXAMINATION MARKS	**: 70**
SESSIONAL MARKS	**: 30**
CREDITS	**: 4**

FOURIER TRANSFORMS : DEFINITIONS AND PROPERTIES, TRANSFORMS FOR SIMPLE TIME DOMAIN FUNCTIONS, TRANSFORMS OF GENERAL PERIODIC TIME FUNCTIONS, CONVOLUTION AND RESPONSE IN TIME DOMAIN, RESPONSE IN FREQUENCY DOMAIN, RELATIONSHIP BETWEEN FOURIER AND LAPLACE TRANSFORMS.

NETWORK FUNCTIONS : NETWORK FUNCTIONS FOR SINGLE PORT AND TWO PORT, CALCULATION OF NETWORK FUNCTIONS FOR LADDER AND GENERAL NETWORKS, POLES AND ZEROS, RESTRICTION OF POLES AND ZEROS FOR DRIVING POINT ASND TRANSFER FUNCTIONS, TIME DOMAIN BEHAVIOUR FROM POLE ZERO PLOT, TRANSFER FUNCTIONS INTERMS OF Y AND Z FUNCTIONS, SCALING NETWORK FUNCTIONS.

POSITIVE REAL FUNCTIONS AND OTHER PROPERTIES, HERWITZ POLYNOMIALS, COMPUTATION OF RESIDUES, EVEN AND ODD FUNCTIONS, TEST FOR POSITIVE REAL FUNCTIONS.

NETWORK SYNTHESIS : ELEMENTARY SYNTHESIS OPERATION, LC NETWORK SYNTHESIS,PROPERTIES OF RC NETWORK FUNCTIONS, FOSTER AND CAUER FORMS OF RC AND RL NETWORKS.

RLC NETWORKS : MINIMUM POSITIVE REAL FUNCTION, BRUNE'S METHOD OF RLC SYNTHESIS, REALIZATION DIFFICULTIES.

TEXT BOOKS :

1. NETWORK ANALYSIS BY M.E. VAN VALKUNBERG, PHI/EEE

2. MODERN NETWORK SYNTHESIS BY M.E. VAN VALKUNBERG, WILEY EASTERN Ltd., (Chapters 1,2 & 3)

3. ENGINEERING CIRCUIT ANALYSIS BY W.H. HAYAT Jr & J.E. KEMMERLY, Mc Graw Hill Int.Ltd.

EEE323 – POWER ELECTRONICS

INSTRUCTION	**: 4 Periods per Week**
UNIVERSITY EXAMINATION	**: 3 Hours**
UNIVERSITY EXAMINATION MARKS	**: 70**
SESSIONAL MARKS	**: 30**
CREDITS	**: 4**

THYRISTORS : INTRODUCTION, PRINCIPLE OF OPERATION, TWO TRANSITOR MODEL, GATE CHARACTERISTICS,TURN ON METHODS, TURN OFF METHODS, THYRISTOR RATINGS, MEASUREMENT OF THYRISTER PARAMETERS, PROTECTION CIRCUITS.

GATE TRIGGERING CIRCUITS : FIRING OF THYRISTORS, PULSE TRANSFORMERS, OPTO ISOLATORS, GATE TRIGGERING CIRCUITS, RESISTANCE FIRING, RESISTANCE-CAPACITOR FIRING, UJT, PROGRAMMABLE UJT(PUT), UJT AS AN SCR TRIGGER, SYNCHRONIZED UJT TRIGGERING.

SERIES AND PARALLEL OPERATION OF THYRISTORS : EQUALIZING NETWORKS, TRIGGERING, STRING EFFICIENCY,DERATING.

PHASE CONTROLLED RECTIFIERS : SINGLE PHASE -HALF WAVE, FULLWAVE & BRIDGE CONTROLLED RECTIFIERS. THREE PHASE HALF WAVE AND FULLWAVE CONTROLLED RECTIFIERS, THREE PHASE FULLY CONTROLLED BRIDGE RECTIFIER.

INVERTERS : CLASSIFICATION, SERIES AND PARALLEL INVERTERS, SELF COMMUTATED INVERTERS, THE Mc MURRAY INVERTER, THE Mc MURRAY–BEDFORD INVERTER, HARMONIC REDUCTION, CURRENT SOURCE INVERTERS.

CHOPPERS : PRINCIPLE OF OPERATION, STEPUP CHOPPERS, STEPUP/STEPDOWN CHOPPER, JONES CHOPPER, MORGAN CHOPPER.

CYCLO CONVERTERS : PRINCIPLE OF OPERATION, SINGLE PHASE TO SINGLE PHASE CYCLO CONVERTER,CYCLOCONVERTER CIRCUITS FOR THREE PHASE OUTPUT, CONTROL CIRCUITS.

MODERN POWER SEMICONDUCTOR DEVICES: BASIC STRUCTURE AND STATIC CHARACTERISTICS OF POWER DIODE, POWER TRANSISTOR, POWER MOSFET, IGBT, GTO, BASIC STRUCTURE , PRINCIPLE OF OPERATION AND STATIC CHARACTERISTICS OF DIAC AND TRIAC.

TEXT BOOKS:

1.M.D.SINGH, K.B.KHANCHANDANI – POWER ELECTRONICS. TATA MCGRAW –HIILL PUBLISHING COMPANY LIMITED.

REFERENCE BOOKS:

1.MUHAMMAD.H.RASHID – POWER ELECTRONICS, CIRCUIOTS, DEVICES & APPLICATIONS. PEARSON EDUCATION.

2. ASHFEQ AHMED – POWER ELECTRONICS FOR TECHNOLOGY , PEARSON EDUCATION.

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TEXT BOOKS:

1. POWER ELECTRONICS BY M.D. SINGH & K.B. KARAN CHANDANI, TMH, 1998

EEE324 – TRANSMISSION & DISTRIBUTION

INSTRUCTION	**: 4 Periods per Week**
UNIVERSITY EXAMINATION	**: 3 Hours**
UNIVERSITY EXAMINATION MARKS	**: 70**
SESSIONAL MARKS	**: 30**
CREDITS	**: 4**

A SINGLE LINE DIAGRAM OF A .C. POWER SUPPLY SYSTEM COMPARISON OF A.C. & D.C. TRANSMISSION.
EHVAC TRANSMISSION: NECESSITY & PROBLEMS INVOLVED
HVDC TRANSMISSION:SINGLE LION DIAGRAM OF HVDC TRANSMISSON PRINCIPLES OF **HVDC OPERATION & CONTROL, TYPES OF D.C.LINKS**

POWER SUPPLY SYSTEMS: COMPARISON BETWEEN VARIOUS SYSTEMS AND COPPER EFFICIENCIES, EFFECT OF SYSTEM VOLTAGE ON TRANSMISSION EFFICIENCY, EFFECT OF SYSTEM VOLTAGE ON TRANSMISSION EFFICIENCY, CHOICE OF TRANSMISSION VOLTAGE, CONDUCTOR SIZE AND KELVIN'S LAW.

POWER DISTRIBUTION SYSTEMS: RADIAL AND RING MAIN SYSTEMS, DIFFERENT TYPES OF A.C. DISTRIBUTORS WITH CONCENTRATED AND DISSTRIBUTED LOADS.

TRANSMISSION LINE CONSTANTS: INDUCTANCE AND CAPACITANCE OF SINGLE PHASE AND THREE PHASE LINES, CONCEPT OF SELF GMDR MUTUAL GMD DOUBLE CIRCUIT LINE, INDUCTANCE OF COMPOSITE CONDUCTORS, TRANSPOSITION, SKIN EFFECT AND PROXIMITY EFFECT.

TRANSMISSION LINE MODELLING: GENERALIZED NETWORK CONSTANTS, MODELLING OF SHORT, MEDIUM AND LONG TRANSMISSION LINES, RIGOROUS LINE MODELLING, CIRCLE DIAGRAMS.

MECHANICAL DESIGN OF TRANSMISSION LINES: SAG AND TENSION CALCULATIONS, LINE SUPPORTS, CONDUCTOR MATERIALS, OVERHEAD LINES Vs UNDERGROUND CABLES.

OVERHEAD LINE INSULATORS: TYPES OF INSULATORS, POTENTIAL DISTRIBUTION OVER A STRING OF INSULATORS AND METHODS OF EQUALIZING POTENTIAL.

UNDER-GROUND CABLES: TYPES OF CABLES, INSULATION IN CABLES, ARMONNING & COVERING OF CABLE, INSULATION RESISTANCEE OFR CABLES, STRESS IN INSULATION, SHECTHING IN CABLE, USE OF INTER SHEATHS, CAPACITANCE GRADING, CAPACITANCE IN 3-CORE CABLES.

CORONA: PPHENOMENON OF COROBNA, CRITICAL VOLTAGES, POWER LOSS DUE TO CORONA, FACTORS AFFECTING CORONA LOSS, RADIO IINTERFERENCE.

TEXT BOOKS:

1. A TEXT BOOK ON POWER SYSTEM ENGINEERING BY SONI, GUPTA, BHATNAGAR & CHAKRABARTI,
   DHANPATRAI & Co., 1998
2. ELECTRICAL POWER SYSTEMS BY C.L. WADHWA
3. ELECTRICAL POWER BY S.L. UPPAL

4. PRINCIPLES OF POWER SYSTEMS BY V.K.MEHATA

EEE325 – GENERATION AND UTILIZATION

INSTRUCTION	**: 4 Periods per Week**
UNIVERSITY EXAMINATION	**: 3 Hours**
UNIVERSITY EXAMINATION MARKS	**: 70**
SESSIONAL MARKS	**: 30**
CREDITS	**: 4**

INTRODUCTION: POWER GENERATION, COMPARISON OF DIFFERENT SOURCES OF ENERGY.

THERMAL POWER STATIONS: LINE DIAGRAM, LOCATION, COAL HANDLING, DRAUGHT, CONDENSERS, COOLING WATER SYSTEMS.

HYDRO ELECTRIC PLANTS: CHOICE OF SITE, HYDROLOGY, CLASSIFICATION OF PLANTS, GENERAL ARRANGEMENT, FUNCTIONS OF DIFFERENT COMPONENTS OF A HYDRO PLANT.

NUCLEAR POWER PLANTS: SCHEMATIC ARRANGEMENT, COMPONENTS OF NUCLEAR REACTOR, CLASSIFICATION OF REACTORS, DIFFERENT POWER REACTORS.

GAS TURBINE PLANTS: LAYOUT, COMPONENTS OF A GAS TURBINE PLANT, OPEN CYCLE AND CLOSED CYCLE PLANTS.

MAGNETO HYDRO DYNAMIC (MHD) POWER GENERATION: BASIC CONCEPTS, PRINCIPLE, CLASSIFICATION,COAL BURNING MHD STEAM POWER PLANT, GAS COOLED NUCLEAR MHD POWER, LIQUID METAL MHD GENERATOR.

OPERATIONAL ASPECTS OF GENERATING STATIONS: LOAD CURVES AND ASSOCIATED DEFINITIONS, SELECTION OF UNITS, LOAD DURATION CURVES.

ECONOMIC CONSIDERATIONS: CAPITAL AND RUNNING COSTS OF GENERATING STATIONS, DIFFERENT TARIFFS, COMPARISON OF COSTS.

HEATING AND WELDING: INTRODUCTION, POWER FREQUENCY AND HIGH FREQUENCY METHODS OF ELECTRIC HEATING, ARC FURNACE. RESISTANCE WELDING,ARC WELDING, MODERN WELDING TECHNIQUES.

ILLUMINATION: DEFINITIONS, LAWS OF ILLUMINATION, POLAR CURVES, PHOTOMETRY, THE ELECTRIC LAMPS, COLD CATHODE LAMPS, LIGHT FITTINGS, ILLUMINATION FOR DIFFERENT PURPOSES, REQUIREMENTS OF GOOD LIGHTING.

TEXT BOOKS:

A TEXT BOOK ON POWER SYSTEM ENGINEERING BY SONI, GUPTA, BHATNAGAR & CHAKRABARTI, DHANPAT RAI & Co, 1998

REFERENCE BOOKS:

1. GENERATION & UTILIZATION BY C.L.WADHWA

2. ELECTRICS POWER BY S.L.UPPAL, KHANNA PUBLISHERS

EEE326-PERFORMANCE AND DESIGN OF ELECTRICAL MACHINES – III

INSTRUCTION	**: 4 Periods per Week**
UNIVERSITY EXAMINATION	**: 3 Hours**
UNIVERSITY EXAMINATION MARKS	**: 70**
SESSIONAL MARKS	**: 30**
CREDITS	: 4

(SYNCHRONOUS MACHINES AND DESIGN OF SYNCHRONOUS MACHINES AND INDUCTION MACHINES)

SYNCHRONOUS GENERATORS: BASIC CONCEPTS, TYPES OF MACHINES AND CONSTRUCTION, ARMATURE WINDINGS, EMF EQUATION,EFFECT OF CHORDING AND WINDING DISTRIBUTION, ARMATURE REACTION, REGULATION BY SYNCHRONOUS IMPEDANCE, MMF AND POTIER TRIANGLE METHODS, PARALLEL OPERATION OF SYNCHRONOUS GENERATORS, SYNCHRONIZING CURRENT AND SYNCHRONIZING POWER. SYNCHRONIZING TO INFINITE BUS-BARS AND OPERATION OF INFINITE BUS , POWER TRANSFER EQUATIONS, CAPABILITY CURVE, TWO REACTION MODEL OF SALIENT POLE SYNCHRONOUS MACHINE AND POWER ANGLE CHARACTERISTICS, DETERMINATION OF X_d AND X_q BY SLIP TEST, SHORT CIRCUIT TRANSIENTS IN SYNCHRONOUS MACHINE.

SYNCHRONOUS MOTOR: PRINCIPLES OF OPERATION, METHODS STARTING, POWER FLOW, POWER DEVELOPED BY SYNCHRONOUS MOTORS, EFFECTS OF CHANGING LOAD AT CONSTANT EXCITATION, AND CHANGING EXCITATION AT CONSTANT LOAD, EXCITATION AND POWER CIRCLES FOR SYNCHRONOUS MACHINE, V – AND INVERTED V – CURVES, HUNTING AND DAMPER WINDINGS.

DESIGN OF INDUCTION MOTORS : OUTPUT EQUATION, MAIN DIMENSIONS, AIRGAP LENGTH, SELECTION OF STATOR AND ROTOR SLOTS, DESIGN OF WINDINGS.

DESIGN OF SYNCHRONOUS MACHINES : OUTPUT EQUATION, MAIN DIMENSIONS FOR SALIENT POLE AND NON-SALIENT POLE MACHINES, ARMATURE WINDINGS AND DESIGN, SELECTION OF STATOR SLOTS, AIRGAP LENGTH, DESIGN OF ROTOR FOR SALIENT POLE AND TURBO ALTERNATORS.

TEXT BOOKS:

1. "ELECTROMECHANICAL ENERGY CONVERSION AND DYNAMICS OF MACHINES" BY R. D. BEGAMUDRE.NEWAGE INTERNATIONAL PUBLISHERS, NEW DELHI.
2. " ELECTRICAL MACHINES " BY S. K . BHATTACHARYA, TATA Mac GRAW - HILL CO., 1998

EEE327-DIGITAL ELECTRONICS & MICROPROCESSORS LABORATORY

INSTRUCTION	**: 3 Periods per Week**
UNIVERSITY EXAMINATION	**: 3 Hours**
UNIVERSITY EXAMINATION MARKS	**: 50**
SESSIONAL MARKS	**: 50**
CREDITS	: 3

TEN EXPERIMENTS BASED ON EEE313 SYLLABUS

ELECTIVE-1

EEE411 – 1 INSTUMENTATION

INSTRUCTION : 4 Periods per Week
UNIVERSITY EXAMINATION : 3 Hours
UNIVERSITY EXAMINATION MARKS : 70
SESSIONAL MARKS : 30

CREDITS : 4

INTRODUCTION TO INSTRUMENTATION: TYPICAL APPLICATIONS OF INSTRUMENT SYSTEM, FUNCTIONAL ELEMENTS OF MEASURING SYSTEM,CLASSIFICATION OF INSTRUMENTS, DEFINITIONS OF ACCURACY, PRECISION, FIDILITY, RESOLUTION, LINEARITY, DIGITAL COMPUTERS, STANDARDS AND CALIBRATION.

STATIC AND DYNAMIC CHARACTERISTICS OF INSTRUMENTS: INTRODUCTION, ERRORS AND UNCERTAINITIES IN PERFORMANCE PARAMETERS, PROPAGATION OF UNCERTAINITIES IN COMPOUND QUANTITIES, STATIC PERFORMANCE PARAMETERS, IMPEDANCE LOADING AND MATCHING, SPECIFICATION OF STATIC CHARACTERISTICS, SELECTION OF THE INSTRUMENT. FORMULATION OF THE SYSTEM DYNAMIC EQUATIONS, DYNAMIC RESPONSE COMPENSATION.

TRANSUDUCERS AND INTERMEDIATE ELEMENTS: INTRODUCTION, CLASSIFICATION OF ANALOG, DIGITAL, ACTIVE, PASSIVE, INTERMEDIATE ELEMENTS LIKE AMPLIFIERS COMPENSATORS, DIFFERENTIATING AND INTEGRATING ELEMENTS, FILTERS, A-D AND D-A CONVERTERS, DATA TRANSSIMISION ELEMENTS.

INDICATING AND RECORDING ELEMENTS: INTRODUCTION, DIGITAL VOLTMETERS, , CATHODE RAY OSCILLOSCOPES, GALVONOMETRIC RECORDS, SERVO TYPE POTENTIOMETRIC RECORDS, MAGNETIC TAPE RECORDING, DIGITAL RECORDER, MEMORY TYPE DATA ACQUISITION SYSTEMS, DATA DISPLAY AND STORAGE.

MEASUREMENT OF NON-ELECTRICAL QUANTITIES WITH ELECTRICAL TRANSDUCERS: VELOCITY, ACCELERATION, FORCE, TORQUE, PRESSURE, FLOW, TEMPERATURE AND ACCOUSTICS.

BIOMEDICAL MEASUREMENTS AND BIOMETRICS: INTRODUCTION, MEASUREMENT OF BLOOD PRESSURE AND BIO ELECTRIC POTENTIALS, ECG RECORDING, PHYSIOLOGICAL EFFECTS OF ELECTRIC CURRENT, SHOCK HAZARDS, METHODS OF ACCIDENT PREVENTION.

TEXT BOOK :

1. “INSTRUMENTATION, MEASUREMENT AND ANALYSIS” BY B. C. NAKRA AND K.K. CHAUDARY.

REFERENCE BOOKS :

1. “BIOMEDICAL INSTRUMENTATION AND MEASUREMENT” BY I. CROMWELL, F. J. WEIBALI, AND E.A.PFEIFFER.

2. “ELECTRICAL AND ELECTRONIC MEASUREMENTS AND INSTRUMENTATION” BY A. K. SAWHANEY

3. “ ELECTRONIC INSTRUMENTATION” BY H.S. KALSI.

ELECTIVE-1
EEE411-2 OPERATIONS RESEARCH

INSTRUCTION : 4 Periods per Week
UNIVERSITY EXAMINATION : 3 Hours
UNIVERSITY EXAMINATION MARKS : 70
SESSIONAL MARKS : 30

CREDITS : 4

INTRODUCTION TO OPTIMIZATION: ENGINEERING APPLICATIONS OF OPTIMIZATION, STATEMENT OF PROBLEM, CLASSIFICATION OF OPTIMIZATION PROBLEM TECHNIQUES.

LINEAR PROGRAMMING : INTRODUCTION, REQUIREMENTS FOR A LP PROBLEM, EXAMPLES ON THE APPLICATION OF LP, GRAPHICAL SOLUTION OF 2-VARIABLE LP PROBLEMS, SOME EXCEPTIONAL CASES, GENERAL MATHEMATICAL FORMULATION FOR LPP, CANONICAL AND STANDARD FORMS OF LP PROBLEM, SIMPLEX METHOD, EXAMPLES ON THE APPLICATION OF SIMPLEX TECHNIQUES.

ARTIFICIAL VARIABLE TECHNIQUE: BIG-M METHOD AND TWO PHASE TECHNIQUES.

TRANSPORTATION PROBLEM: MATRIX TERMINOLOGY, DEFINITION AND MATHEMATICAL REPRESENTATION OF TRANSPORTATION MODEL, FORMULATION AND SOLUTION OF TRANSPORTATION MODELS (BASIC FEASIBLE SOLUTION BY NORTH-WEST CORNER METHOD, INSPECTION METHOD. VOGELL'S APPROXIMATION METHOD)

ASSIGNMENT PROBLEM: MATRIX TERMINOLOGY, DEFINITION OF ASSIGNMENT MODEL, COMPARISON WITH TRASPORTATION MODEL, MATHEMATICAL REPRESENTATION OF ASSIGNMENT MODEL, FORMULATION AND SOLUTION OF ASSIGNMENT MODELS.

PERT NETWORK: INTRODUCTION, PHASES OF PROJECT SCHEDULING, NETWORK LOGIC, NUMBERING THE EVENTS (FULKERSON'S RULE), MEASURE OF ACTIVITY.

PERT NETWORK COMPUTATIONS: FORWARD PASS AND BACKWARD PASS COMPUTATIONS, SLACK CRITICAL PATH, PROBABILITY OF MEETING THE SCHEDULED DATES.

INVENTORY MODELS: INTRODUCTION, NECESSITY FOR MAINTAINING INVENTORY, CLASSIFICATION OF INVENTORY MODELS, INVENTORY MODELS WITH DETERMINISTIC DEMAND, DEMAND RATE UNIFORM-PRODUCTION RATE INFINITE, DEMAND RATE NON-UNIFORM PRODUCTION RATE FINITE, DEMAND RATE UNIFORM-PRODUCTION RATE FINITE.

GAME THEORY: USEFUL TERMINOLOGY, RULES FOR GAME THEORY, SADDLE POINT, PURE STRATEGY, REDUCE GAME BY DOMINANCE, MIXED STRATEGIES, 2X2 GAMES WITHOUT SADDLE POINT.

TEXT BOOKS:

1. "OPERATIONS RESEARCH-AN INTRODUCTION' BY H.TAHA, PRENTICE HALL OF INDIA Pvt. Ltd.
2. "ENGINEERING OPTIMIZATION-THEORY & PRACTICE" BY S.S. RAO, NEW AGE INTERNATIONAL (P) Ltd.
3. "OPERATIONS RESEARCH – AN INTRODUCTION" BY P.K.GUPTA & D.S.HIRA, S.Chnd & Co. Ltd.

ELECTIVE-1

EEE411-3 DIGITAL SIGNAL PROCESSING

INSTRUCTION : 4 Periods per Week
UNIVERSITY EXAMINATION : 3 Hours
UNIVERSITY EXAMINATION MARKS : 70
SESSIONAL MARKS : 30
CREDITS : 4

1. **DISCRETE - TIME SIGNALS AND SYSTEMS:**
   DISCRETE - TIME SIGNALS – SEQUENCES, LINEAR SHIFT – INVARIANT SYSTEMS, STABILITY AND CASUALITY, LINEAR CONSTANTS – COEFFICIENT DIFFERENCE EQUATIONS, FREQUENCY DOMAIN REPRESENTATION OF DISCRETE – TIME SIGNALS AND SYSTEMS.
2. **APPLICATIONS OF Z – TRANSFORMS:**
   SYSTEM FUNCTIONS H(Z) OF DIGITAL SYSTEMS, STABILITY ANALYSIS, STRUCTURE AND REALIZATION OF DIGITAL FILTERS, FINITE WORD LENGTH EFFECTS.
3. **DISCRETE FOURIER TRANSFORM (DFT):**
   PROPERTIES OF THE DFS, DFS REPRESENTATION OF PERIODIC SEQUENCES, PROPERTIES OF DFT, CONVOLUTION OF SEQUENCES.
4. **FAST – FOURIER TRANSFORMS (FFT):**
   RADIX – 2 DECIMATION – IN – TIME (DIT) AND DECIMATION – IN – FREQUENCY (DIF), FFT ALGORITHMS, INVERSE FFT.
5. **IIR DIGITAL FILTER DESIGN TECHNIQUES:**
   DESIGN OF IIR FILTERS FROM ANALOG FILTERS, ANALOG FILTERS APPROXIMATIONS (BUTTERWORTH AND CHEBYSHEV APPROXIMATIONS), FREQUENCY TRANSFORMATIONS, GENERAL CONSIDERATIONS IN DIGITAL FILTER DESIGN, BILINEAR TRANSFORMATION METHOD, STEP AND IMPULSE INVARIANCE TECHNIQUE.
6. **DESIGN OF IIR FILTERS:**
   FOURIER SERIES METHOD, WINDOW FUNCTION TECHNIQUES, COMPARISON OF IIR AND FIR FILTERS.
7. **APPLICATIONS:**
   APPLICATIONS OF FFT IN SPECTRUM ANALYSIS AND FILTERING, APPLICATION OF DSP IN SPEECH PROCESSING.

TEXT BOOKS:

ALAN V. OPPENHEIM & RONALD W. SCHAFER: DIGITAL SIGNAL PROCESSING, PHI.

REFERENCES:

1. SANJIT K. MITRA, DIGITAL SIGNAL PROCESSING “A – COMPUTER BASED APPROACH”, TATA MC GRAW HILL.
2. RADDAE & RABINER, APPLICATION OF DIGITAL SIGNAL PROCESSING.
3. S. P. EUGENE XAVIER, SIGNALS, SYSTEMS AND SIGNAL PROCESSING, S. CHAND & CO. LTD.
4. ANTONIO, ANALYSIS AND DESIGN OF DIGITAL FILTERS, TATA MC GRAW HILL.

EEE412 POWER SYSTEM ANALYSIS & STABILITY

INSTRUCTION : 4 Periods per Week
UNIVERSITY EXAMINATION : 3 Hours
UNIVERSITY EXAMINATION MARKS : 70
SESSIONAL MARKS : 30
CREDITS : 4

P.U. REPRESENTATION: SINGLE LINE DIAGRAM, PER UNIT QUANTITIES, P.U. IMPEDANCE OF 3-WINDING TRANSFORMERS, P.U. IMPEDANCE DIAGRAM OF A POWER SYSTEM.

LOAD FLOW STUDIES: FORMULATION OF NETWORK MATRICES, LOAD FLOW PROBLEM, GAUSS-SEIDEL METHOD, NEWTON-RAPHSON METHOD & FAST DECOUPLED METHOD OF SOLVING LOAD FLOW PROBLEM.

SYMMETRICAL FAULT ANALYSIS: 3-PHASE SHORT CIRCUIT CURRENTS AND REACTANCES OF A SYNCHRONOUS MACHINE, FAULT LIMITING REACTORS.

SYMMETRICAL COMPONENTS: THE SYMMETRICAL COMPONENTS, PHASE SHIFT IN DELTA/STAR TRANSFORMERS, 3-PHASE POWER INTERMS OF SYMMETRICAL COMPONENTS.

UN-SYMMETRICAL FAULTS: VARIOUS TYPES OF FAULTS – LG, LL, LLG ON AN UNLOADED ALTERNATOR, SEQUENCE IMPEDANCES AND SEQUENCE NETWORKS.

POWER SYSTEM STABILITY: CONCEPTS OF STABILITY (STEADY STATE AND TRANSIENT), SWING EQUATION, EQUAL AREA CRITERION, CRITICAL CLEARING ANGLE AND TIME FOR TRANSIENT STABILITY, STEP BY STEP METHOD OF SOLUTION, FACTORS AFFECTING TRANSIENT STABILITY.

TEXT BOOKS:

1. POWER SYSTEM ANALYSIS BY HADI SADAT, Mc Graw Hill, 1999.
2. ELEMENTS OF POWER SYSTEM ANALYSIS, WILLIAM D. STEVENSON, Jr, Mc Graw Hill Pub.
3. POWER SYSTEM ENGINEERING BY J.G. NAGARATH & D.P. KOTHARI, TMH Pub.

EEE 413- ELECTRIC DRIVES AND TRACTION

INSTRUCTION : 4 Periods per Week
UNIVERSITY EXAMINATION : 3 Hours
UNIVERSITY EXAMINATION MARKS : 70
SESSIONAL MARKS : 30
CREDITS : 4

ELECTRIC DRIVE: CONCEPT AND CLASSIFICATION OF ELECTRIC DRIVES, FOUR QUADRANT OPERATION, TYPES OF LOADS, DYNAMICS OF MOTOR LOAD COMBINATION, STEADY-STATE AND TRANSIENT STABILITY OF DRIVE.

CHARACTERISTICS OF MOTORS: BASIC RELATIONS AND CHARACTERISTICS AND MODIFIED SPEED-TORQUE CHARACTERISTICS OF D.C SHUNT AND SERIES MOTORS, CHARACTERISTICS OF 3- PHASE INDUCTION AND SYNCHRONOUS MOTORS AND MODIFICATION OF THEIR SPEED – TORQUE CHARACTERISTICS

STARTING: EFFECT OF STARTING ON POWER SUPPLY, MOTOR AND LOAD, METHODS OF STARTING, ACCELERATION TIME, ENERGY RELATIONS DURING STARTING, AND METHODS TO REDUCE ENERGY LOSS DURING STARTING.

ELECTRIC BRAKING: TYPES OF BRAKING, BRAKING OF D.C MOTORS DURING LOWERING OF LOADS, BRAKING WHILE STOPPING, BRAKING OF INDUCTION AND SYNCHRONOUS MOTORS, ENERGY RELATIONS DURING BRAKING.

RATING AND HEATING OF MOTORS: HEATING EFFECTS, LOADING CONDITIONS AND CLASSES OF DUTY, DETERMINATION OF POWER RATINGS OF MOTORS FOR DIFFERENT APPLICATIONS, EFFECT OF LOAD INERTIA, LOAD EQUALIZATION AND FLY-WHEE, CALCULATIONS, ENVIRONMENTAL FACTORS.
GENERAL FACTORY DRIVE, PAPER MILL DRIVE, STEEL MILL DRIVE, COAL MINING DRIVE.

ELECTRICAL TRACTION: GENAL FEATURES AND SYSTEMS OF TRAC ELECTRIFICATION, TRACTION MOTORS, LOCO WHEEL ARRANGEMENT AND RIDING QUALITIES, TRANSMISSION OF DRIVE, TRACTION MOTOR CONTROL (SERIES-PARALLEL CONTROL), TRAC EQUIPMENT AND COLLECTION GEAR, TRAIN MOVEMENT, SPEED-TIME CURVE AND SPEED DISTANCE CURVE, SPECIFIC ENERGY CONSUMPTION (SEC) AND FACTORS AFFECTING IT.

TEXT BOOKS:

1. " A FIRST COURSE ON ELECTRIC DRIVES " BY S. K. PILLAI, WILEY ESASTREN LTD.
2. " UTILISATION OF ELECTRICAL ENERGY " (S.I. UNITS) BY E. OPEN SHAW TAYLOR AND V.V.L. RAO ORIENTLONG MAN.

REFERENCE BOOK:

1. " MODERN ELECTRIC TRACTION " BY H. PARTAB. DHANPAT ROY & Co.
2. " ELECTRIC DRIVES" BY VEDAM SUBRAMANYAM, TMH Pub.

EEE414 POWER SYSTEM PROTECTION

INSTRUCTION	**: 4 Periods per Week**
UNIVERSITY EXAMINATION	**: 3 Hours**
UNIVERSITY EXAMINATION MARKS	**: 70**
SESSIONAL MARKS	**: 30**
CREDITS	**: 4**

FUSES: TYPES, HIGH VOLTAGE HRC FUSES, APPLICATIONS, SELECTION. FAULT CLEARING AND CIRCUIT BREAKERS, TRANSIENT RECOVERY VOLTAGE, SINGLE & DOUBLE FREQUENCY TRANSIENTS, RESISTANCE SWITCHING, CURRENT CHOPPING, SWITCHING OF CAPACITOR BANKS AND UN-LOADED LINES, RATINGS AND CHARACTERISTICS OF CIRCUIT BREAKERS, FORMATION OF ARC, METHODS OF ARC EXTINCTION.

CIRCUIT BREAKERS: CLASSIFICATION, PRINCIPLE OF OPERATION, CONSTRUCTIONAL FEATURES OF AIR CIRCUIT BREAKERS, OIL CIRCUIT BREAKERS, AIR BLAST CIRCUIT BREAKERS, SF-6 CIRCUIT BREAKERS AND VACCUM CIRCUIT BREAKERS, TESTING OF CIRCUIT BREAKERS.

RELAYING: DIFFERENT TYPES, PRINCIPLE OF OPERATION AND CHARACTERSTICS, OVER CURRENT, EARTH FAULT, DIFFERENTIAL AND DISTANCE PROTECTION WITH SIMPLE APPLICATIONS TO ALTERNATORS, TRANSFORMERS, SINGLE AND PARALLEL FEEDERS. INTRODUCTION TO SOLID STATE RELAYING, STATIC RELAYS FOR TIME LAG OVER CURRENT AND DIFFERENTIAL PROTECTION.

PROTECTION AGAINST OVER VOLTAGES: CAUSES OF OVER VOLTAGES, OVER VOLTAGES DUE TO LIGHTNING. PROTECTION AGAINST LIGHTNING AND TRAVELLING WAVES – EARTH WIRE, EFFECTS OF SERIES INDUCTANCES, SHUNT CAPACITANCE, SPARK GAP, SURGE ARRESTERS, LIGHTNING ARRESTERS ETC., INSULATION CO-ORDINATION.

SUB-STATION LAYOUT & BUS BARS: SCHEMES OF LAYOUT AND BUS-BAR DESIGN**.**

TEXT BOOKS:

1. ELECTRICAL POWER SYSTEMS BY C.L. WADHWA
2. ELECTRICAL POWER BY S.L. UPPAL
3. POWER SYSTEM PROTECTION & SWITCH GEAR BY B. RAVINDRANATH & M. CHANDA, NEW AGE Pub., 1996

EEE415 DIGITAL CONTROL SYSTEMS

INSTRUCTION	**: 4 Periods per Week**
UNIVERSITY EXAMINATION	**: 3 Hours**
UNIVERSITY EXAMINATION MARKS	**: 70**
SESSIONAL MARKS	**: 30**
CREDITS	**: 4**

SIGNAL CONVERSION AND PROCESSING: INTRODUCTION, BLOCK DIAGRAM REPRESENTATION OF S/H DEVICE, MATHEMATICAL MODELLING OF THE SAMPLING PROCESS, FINITE-PULSE WIDTH SAMPLER, FOLDING FREQUENCY. THE SAMPLING THEOREM, MATHEMATICAL MODELLING OF THE SAMPLING, IDEAL SAMPLER, SAMPLE AND HOLD DEVICES, EXPRESSIONS OF F*(S), S-PLANE PROPERTIES OF F*(S), ZERO-ORDER HOLD, FREQUENCY-DOMAIN CHARACTERISTICS OF ZOH, FIRST ORDER HOLD, FRACTIONAL HOLD DEVICE.

THE Z-TRANSFORM: THE Z-TRANSFORM DEFINITION, RELATIONSHIP WITH LAPLACE TRANSFORM, ALTERNATE EXPRESSION FOR F(Z), EVALUATION OF Z-TRANSFORM, RELATIONSHIP BETWEEN S-PLANE AND Z-PLANE, INVERSE Z-TRANSFORM, NON UNIQUENESS OF THE Z-TRANSFORM, DEFINING EQUATIONS OF THE INVERSE Z-TRANSFORM, THEOREMS OF THE Z-TRANSFORM, LIMITATIONS OF THE Z-TRANSFORM.

TRANSFER FUNCTION, BLOCK DIAGRAMS & SIGNAL FLOW GRAPHS: TRANSFER FUNCTIONS, BLOCK DIAGRAMS, SIGNAL FLOW GRAPHS, THE PULSE TRANSFER FUNCTION AND Z-TRANSFORM FUNCTION, SYSTEMS WITH CASCADED ELEMENTS SEPARATED BY A SAMPLER & NOT SEPARATED BY A SAMPLER, PULSE TRANSFORM FUNCTION OF ZOH AND RELATION BETWEEN G(S) AND G(Z), CLOSED LOOP SYSTEMS, CHARACTERISTIC EQUATION, PHYSICAL REALIZABILITY.

T**HE STATE VARIABLE TECHNIQUES:** THE STATE VARIABLE TECHNIQUES, STATE EQUATION AND STATE TRANSITION EQUATIONS OF CONTINUOUS DATA SYSTEMS. STATE TRANSITION MATRIX SOLUTIONS, PROPERTIES OF STATE TRANSITION MATRIX, SOLUTION OF NON-HOMOGENEOUS STATE EQUATIONS, STATE EQUATIONS OF DESCRETE SYSTEMS WITH SAMPLE AND HOLD DEVICES, STATE TRANSITION EQUATIONS, THE RECURSIVE METHOD, THE Z-TRANSFORM METHOD, STATE EQUATIONS AND TRANSFER FUNCTION, CHARACTERISTIC EQUATION, EIGEN VALUES, EIGEN VECTORS, DIAGONALIZATION OF THE 'A' MATRIX, JORDAN CANONICAL FORM COMPUTING STATE TRANSITION MATRIX.

CONTROLLABILITY, OBSERVABILITY, STABILITY: DEFINITION OF CONTROLLABILITY, THEOREM ON CONTROLLABILITY, DEFINITION OF OBSERVABILITY, THEOREM ON OBSERVABILITY, RELATIONSHIPS BETWEEN CONTROLLABILITY AND OBSERVABILITY AND TRANSFER FUNCTION, STABILITY OF LINEAR DIGITAL CONTROL SYSTEMS, DEFINITION & THEOREM, STABILITY TESTS, BI-LINEAR TRANSFORMATION METHOD, JURY'S STABILITY TEST.

TEXT BOOKS:

1. DIGITAL CONTROL SYSTEMS BY B.C. KUO, SECOND EDITION, SAUNDERS COLLEGE PUBLICATION-1992
2. DIGITAL CONTROL SYSTEMS BY OGATA
3. DIGITAL CONTROL SYSTEMS (SOFTWARE & HARDWARE) BY LAYMOUNT & AZZO

EEE 416 ADVANCED CONTROL SYSTEMS

INSTRUCTION	**: 4 Periods per Week**
UNIVERSITY EXAMINATION	**: 3 Hours**
UNIVERSITY EXAMINATION MARKS	**: 70**
SESSIONAL MARKS	**: 30**
CREDITS	**: 4**

CONTROL SYSTEMS COMPONENTS: D.C. & A.C. TACHOMETERS-SYNCHROS, A.C. AND D.C. SERVO MOTORS-STEPPER MOTORS AND ITS USE IN CONTROL SYSTEMS, AMPLIDYNE-METADYNE-MAGNETIC AMPLIFIER –PRINCIPLE, OPERATION AND CHARACTERISTICS-WARD-LEONARD SYSTEMS.

STATE VARIABLE ANALYSIS: CONCEPT OF STATE VARIABLES & STATE MODELS, STATE MODEL FOR LINEAR CONTINUOUS TIME SYSTEMS, SOLUTION OF STATE EQUATION, STATE TRANSITION MATRIX, CONCEPT OF CONTROLLABILITY & OBSERVABILITY (SIMPLE PROBLEMS TO UNDERSTAND THEORY)

INTRODUCTION TO DESIGN: INTRODUCTION-PRELIMINARY CONSIDERATIONS OF CLASSICAL DESIGN-LEAD COMPENSATION-LAG COMPENSATION-REALIZATION OF COMPENSATING NETWORKS-CASCADE COMPENSATION IN TIME DOMAIN AND FREQUENCY DOMAIN (ROOT LOCUS AND BODE PLOT TECHNIQUES)- POLE PLACEMENT BY STATE FEED-BACK, STATE VARIABLES AND LINEAR DISCRETE-TIME SYSTEMS.

TEXT BOOKS:

1. CONTROL SYSTEMS COMPONENTS BY G.J. GIBSON & TUETOR
2. CONTROL SYSTEMS BY R.C. SUKLA, DHANPATHRAI PUBLICATIONS
3. AUTOMATIC CONTROL SYSTEMS BY B.C. KUO, PRENTICE HALL PUBLICATION

REFERENCE BOOK:

1. CONTROL SYSTEM PRINCIPLES & DESIGN BY M. GOPAL, TMH, 1998.

E421-ENGINEERING ECONOMICS & MANAGEMENT

INSTRUCTION	**: 4 Periods per Week**
UNIVERSITY EXAMINATION	**: 3 Hours**
UNIVERSITY EXAMINATION MARKS	**: 70**
SESSIONAL MARKS	**: 30**
CREDITS	**: 4**

1. **FUNDAMENTALS OF ECONOMICS**- SCARCITY AND EFFICIENCY MARKET, COMMAND AND MIXED ECONOMICS. BASIC ELEMENTS OF SUPPLY AND DEMAND- LAW OF DEMAND- ELASTICITY OF DEMAND.

2. **BUSINESS ORGANIZATIONS**- INDIVIDUAL PROPRIETORSHIP- PARTNERSHIP- THE CORPORATION.

   STATEMENTS OF PROFIT AND LOSS- THE BALANCE SHEET- BREAK-EVEN ANALYSIS- COST CONCEPTS- ELEMENTS OF COSTS.

3. **PRINCIPLES AND FUNCTIONS OF MANAGEMENT**- EVOLUTION OF MANAGEMENT THOUGHT- DECISION MAKING PROCESS.
   ORGANIZATION THEORY AND PROCESS- LEADERSHIP- MOTIVATION- COMMUNICATION- CONFLICT MANAGEMENT IN ORGANIZATION.

4. **PLANT LOCATION**- PLANT LAYOUT- PRODUCTION PLANNING AND CONTROL- PRODUCT DESIGN AND DEVELOPMENT- CHANNELS OF DISTRIBUTION. MATERIALS MANAGEMENT- INVENTORY CONTROL.

5. **INDUSTRIAL DISPUTES AND THEIR SETTLEMENTS**- PROVISION OF FACTORIES ACT AND INDUSTRIAL DISPUTES ACT. RECENT TRENDS IN CONTEMPORARY BUSINESS ENVIRONMENT.

REFERENCES:

1. ECONOMICS- PAUL A. SAMUELSON AND WILLIAM D. NORDHAUS.
2. ENGINEERING ECONOMICS- VOL..1, TARA CHAND.
3. FINANCIAL MANAGEMENT- S.N. MAHESWARI.
4. ESSENTIALS OF MANAGEMENT- KOONTZ & O' DONNEL.
5. PRODUCTION & OPERATION MANAGEMENT- B.S. GOEL.
6. MODERN PRODUCTION/OPERATION MANAGEMENT- ELWOOD S. BUFFA, RAKESH K. SARIN.
7. INDUSTRIAL LAW- S.P. JAIN.
8. INDUSTRIAL LAW- R.P. MAHESWARI & S.N. MAHESWARI.
9. LABOUR & INDUSTRIAL LAWS- SINGH, AGARWAL & GOEL.

EEE422 POWER SYSTEM OPERATION & CONTROL

INSTRUCTION	**: 4 Periods per Week**
UNIVERSITY EXAMINATION	**: 3 Hours**
UNIVERSITY EXAMINATION MARKS	**: 70**
SESSIONAL MARKS	**: 30**
CREDITS	**: 4**

LOAD FLOW STUDIES:
REVIEW OF LOADFLOW MODELS, DECOUPLED LOADFLOW, FAST DECOUPLED LOADFLOW (FDLF), APPLICATION OF SPARSE TECHNIQUES TO LOAD FLOW MODELS.

OPTIMAL SYSTEM OPERATION:
OPTIMAL OPERATION OF GENERATORS OF A BUS BAR, OPTIMAL UNIT COMMITMENT, OPTIMAL GENERATION SCHEDULING, OPTIMAL LOADFLOW PROBLEM, OPTIMAL LOADFLOW SOLUTION, OPTIMAL SCHEDULING OF HYDRO-THERMAL SYSTEMS, POWER SYSTEM SECURITY

AUTOMATIC GENERATION & VOLTAGE CONTROL:
LOAD-FREQUENCY CONTROL, CONCEPTS, LOADFREQUENCY CONTROL OF A SINGLE AREA SYSTEM, LOADFREQUENCY CONTROL OF A TWO AREA SYSTEM, LOADFREQUENCY CONTROL AND ECONOMIC DISPATCH CONTROL, SPEED GOVERNOR DEAD-BAND AND ITS EFFECT ON AUTOMATIC GENERATION CONTROL

EMERGENCY CONTROL:
CONCEPTS, PREVENTIVE AND EMERGENCY CONTROL, COHERENT AREA DYNAMICS, STABILITY ENHANCEMENT METHODS, LONG TERM FREQUENCY DYNAMICS, AVERAGE SYSTEM FREQUENCY, CENTRE OF INERTIA.

TEXT BOOKS:

1.POWER SYSTEM ENGINEERING BY I.G. NAGARATH & D.P. KOTHARI (TMH PUBLICATIONS)
2.ELECTRIC ENERGY SYSTEMS THEORY-AN INTRODUCTION BY OLLE I. ELGERD (TMH EDITION)

REFERENCE BOOKS:

1. ADVANCED POWER SYSTEM ANALYSIS AND DYNAMICS BY L.P. SINGH , WILEY EASTERN LIMITED, THIRD EDITION
2. POWER SYSTEM ANALYSIS BY HADI SADAT, Mc GRAW Hill Pub.

ELECTIVE-II
EEE423 DATA STRUCTURES

INSTRUCTION	**: 4 Periods per Week**
UNIVERSITY EXAMINATION	**: 3 Hours**
UNIVERSITY EXAMINATION MARKS	**: 70**
SESSIONAL MARKS	**: 30**
CREDITS	**: 4**

REVISION OF 'C' LANGUAGE: OVER-VIEW ONLY(no questions to be set on this)

ARRAYS AND FUNCTIONS: ORGANIZATION AND USE OF ONE DIMENSIONAL, TWO DIMENSIONAL AND MULTI DIMENSIONAL ARRAYS, HANDLING OF CHARACTER STRINGS, STRING OPERATIONS, CONCEPT OF FUNCTION, PARAMETER PASSING, RECURSION.

STRUCTURES, POINTERS & FILES: DEFINITION OF STRUCTURE AND UNION, PROGRAMMING EXAMPLES, POINTER, POINTER EXPRESSIONS, PROGRAMMING EXAMPLES, FILE OPERATIONS AND PREPROCESS.

LINEAR DATA STRUCTURES: STACK REPRESENTATION, OPERATION, QUEUE REPRESENTATION, OPERATIONS, CIRCULAR QUEUES, LIST REPRESENTATION, OPERATIONS, DOUBLE LINKED AND CIRCULAR LISTS.

NON-LINEAR DATA STRUCTURE: TREES, BINARY TREE REPRESENTATION, TREE TRANSVERSALS, CONVERSION OF A GENERAL TREE TO BINARY TREE, REPRESENTATION OF GRAPHS.

SEARCH TECHNIQUES: BASIC SEARCH TECHNIQUES, TREE SEARCHING GRAPHICS, LINKED REPRESENTATION OF GRAPHS, GRAPH TRANSVERSAL AND SPANNING TREES.

TEXT BOOKS:

1. PROGRAMMING IN ANSI C BY E. BALAGURUSWAMY
2. DATA STRUCTURES USING C BY A.M. TANENBAUM AND OTHERS.

REFERENCE BOOKS:

1. AN INTRODUCTION TO DATA STRUCTURES WITH APPLICATIONS BY TRMBLY & SORENSON
2. THE 'C'-PROGRAMMING LANGUAGE BY KERNIGAN & WRITCHI

ELECTIVE-II
EEE 423-3 HIGH VOLTAGE ENGINEERING

INSTRUCTION	**: 4 Periods per Week**
UNIVERSITY EXAMINATION	**: 3 Hours**
UNIVERSITY EXAMINATION MARKS	**: 70**
SESSIONAL MARKS	**: 30**
CREDITS	**: 4**

Unit 1: Generation of high voltages: Direct voltages - A.C. to D.C. conversion, Electrostatic generators, Alternating voltages - Testing transformers, Series resonant circuits, Impulse voltages - Impulse voltage generator circuits, Operation, design and construction of impulse generators.

Unit 2: Measurement of High Voltages & Currents: Measurement of high DC voltages, AC Voltages and Impulse Voltages. Measurement of high Currents – direct, alternating and impulse. CRO for impulse voltage and current measurements.

Unit 3: Non-destructive testing of Materials and Electrical apparatus: Measurement of direct current resistivity, Measurement of dielectric constant and loss factor, Partial discharge measurements.

Unit 4: High voltage testing of Electrical Apparatus: Testing of insulators, bushings, isolators, circuit breakers, cables, transformers, and surge arrestors. Radio interference measurements.

Unit 5: Design, Planning and Layout of high voltage laboratories: Test facilities provided in HV laboratories, activities and studies in HV and UHV labs, Classification of HV labs, Size and ratings of large size HV labs, Grounding of impulse testing laboratories, Insulation coordination.

TEXT BOOKS:

1. High Voltage Engineering Fundamentals, E. Kuffel, W.S. Zaengl, J. Kuffel (Second edition), Newnes
2. High Voltage Engineering, M.S.Naidu & V.Kamaraju, (Third Edition), TMH.

REFERENCE BOOKS:

1. C.L.Wadhawa – High Voltage Engineering.
2. High Voltage Laboratory techniques by J.D.Craggs & Meak Butter Worths scientific publications, London.
3.High Voltage measurement techniques by Schawab, M.I.T Press Cambridge, Massachusetts

EEE424 – POWER SYSTEM SIMULATION LAB

INSTRUCTION	**: 3 Periods per Week**
UNIVERSITY EXAMINATION	**: 3 Hours**
UNIVERSITY EXAMINATION MARKS	**: 50**
SESSIONAL MARKS	**: 50**
CREDITS	**: 4**

EEE425-CONTROL SYSTEMS LABORATORY

INSTRUCTION	**: 3 Periods per Week**
UNIVERSITY EXAMINATION	**: 3 Hours**
UNIVERSITY EXAMINATION MARKS	**: 50**
SESSIONAL MARKS	**: 50**
CREDITS	**:2**

TEN EXPERIMENTS BASED ON E-321, EEE-415 & EEE-422 SYLLABI

EEE426-PROJECT WORK

INSTRUCTION	**: 6 Periods per Week**
UNIVERSITY EXAMINATION	**: VIVA-VOCE**
UNIVERSITY EXAMINATION MARKS	**: 100**
SESSIONAL MARKS	**: 100**
CREDITS	**: 8**