SECTION-A

Unit I : D. C. Machines Construction, principle of operation, EMF equation, torque equation, Armature winding – Lap, wave, single layer, double layer. Armature reaction and commutation, method of improving commutation.

Unit II : D. C. Generators Types, characteristics and applications of D. C. shunt, series and compound generators. Parallel operation of D. C. shunt, series and compound generators. Introduction for conducting and reporting the test on D. C. machines as per Indian standard.

UNIT III : D. C. Motors Characteristics, applications of D. C. shunt, series and compound motors, starting and speed control, losses, efficiency and testing

SECTION-B


UNIT V : Three phase Transformer Construction, working, types, connections, applications, testing, parallel operation, open delta, power transformer, distribution transformer construction.

UNIT VI: Three phase to single phase, two phase, six phase, twelve phase conversion. Three-winding transformer and tap changing transformer. Wave forms of no-load current and inrush current phenomenon.

BOOKS RECOMMENDED:-

2) ELECTRIC MACHINERY and Transformer, 3E – Bhag S Guru Oxford University Press
3) Advance Electrical Technology By H. Cotton. 1999
4) Substation Equipment By Satnam and Gupta 2003.

SECTION-A


UNIT II : Electrostatics : Coulomb’s law, electric field, Gauss flux theorem in integral and differential form. Electrostatics potential, Poisson and Laplace equations.


SECTION-B


UNIT V : Magnetic fields in materials : magnetic dipole equivalent volume and plane section curve. H vector, magnetization vector M, boundary conditions between magnetic materials, inductance, Electromagnetic Energy.

UNIT VI: Maxwell equations and wave equations : Displacement current, time varying fields and Maxwell’s equations, plane uniform magnetic waves. Depth of penetration pointing vector.

Recommended Books:-

1) Engineering Electromagnetics by W. H. Hayt, J. A. Buck, TMH 7th edition 2010
4) Principles of Electromagnetics 4/e Mathew Sadiku Oxford University

SECTION A

UNIT I : Introduction to IC’s : Characteristics of IC components, Operation amplifier; Block schematic internal circuits, Level shifting, overload protection, study of IC 741 op-amp. Measurement of op-amp parameter.


UNIT III : Other linear IC’s : Block schematic of regulator IC 723, and its applications, study of 78 **, 79 ** and its applications, SMPS, Block schematic of timer IC 555 and its applications as a timer, astable, mono stable, bistable multivibrator and other applications, Operation of phase lock loop system and IC 565 PLL, its application

SECTION B

UNIT IV : Basic Logic Circuits : Logic gate characteristics, NMOS inverter, propagation delay, NMOS logic gate, CMOS logic gates, BJT inverter, TTL, NAND gate, TTL output, state TTL logic families, ECL circuits, composition logic families.
Unit V: Combinational Digital Circuits: Standard gate assemblies, Binary adder, Arithmetic functions, Digital comparator, Parity check generator, Decoder / demultiplexer, Data selector / multiplexer, Encoder, ROM, Two dimensional addressing of ROM, ROM applications, PROM, EPROM, PAL AND PLAS.

Unit VI: Sequential Circuits and Systems: Bistable Latch, Flip-Flop clocked SR, J-K, T, D type shift Registers, counter. Design using flip-flops, Ripple and synchronous types, application of counters, Dynamic MOS shift registers, RAM, Bipolar RAM Cells

RECOMMENDED BOOKS:
2) Gayakwad, Op-Amp & LLG, 2nd Ed.
4) K. B. Botkar, Integrated Electronics (Khanna Publishers.)

4EP04 / 4EL04 / 4EE04 MATHEMATICS-IV

SECTION A

Unit I: a) Complex variables: analytic functions, Cauchy-Riemann conditions. Harmonic function, Harmonic conjugate functions, Milne’s method. b) Confirmed mapping: mapping by elementary functions of the type W=z+c, W=cz, W=1/z, W=z^2, W=e^z, W=z+1/z and bilinear transformation. (10 Hrs.)

Unit II: Complex Integral: singular points, Taylor’s series, Laurent’s series, Cauchy’s integral theorem and Cauchy’s integral formula.

Residue: Cauchy’s residue theorem. Contour integrals. Integration forms: f(x) dx, f(sinx, cos x) dx (10 Hrs.)

Unit III: Partial differential equations: first order and first degree p. d. equation type. (i) f (p, q) = 0, (ii) f (p, q, z) = 0, (iii) f (p, q, x, y) = 0 (iv) f (p, q, x, y, z) = 0 etc.

Equation reducible to standard form. Homogeneous P. D. E. of n^th order. (10 Hrs.)

SECTION B

Unit IV: Special functions: solution of Legendre’s and Bessel’s equations by Frobenious method, Bessel’s function 1st kind generating function, recurrence relating values of J_{1/2}(x), J_{-1/2}(x), J_{1/2}(x), etc. Legendre’s function of 1st kind: generating function, Rodrigues function, recurrence relation, Legendre’s polynomials and orthogonal properties. (10 Hrs.)

Unit V: Statistics & Probability: Axioms, conditional probability, Bay’s theorem, mathematical expectations, probability distributions: Binomial, Possion and Normal. (10 Hrs.)


RECOMMENDED BOOKS:
1) Pipes: Mathematics for Engineers and Physicist.
4) P. N. Wartikar: Statistical Methods.
6) Spiegel: Complexva (Schaum Ed., McGraw Hill)

4EP05 / 4EX05 / 4EL05 / 4EE05 NUMERICAL METHODS AND COMPUTER PROGRAMMING

SECTION A


Unit II: Solution of Simultaneous Algebraic equations: Iterative methods: Jacobi’s method and Gauss-Seidel method. Direct methods: Gaussian elimination method & Matrix Inverse method. Finding Eigen values of a matrix, determination of largest Eigen value. Implementation of these methods in C.

Unit III: Interpolation: Evenly spaced points: formation of forward & backward difference table, Newton’s forward & backward difference interpolation formulae. Unevenly spaced points divided difference table and Newton’s divided difference interpolation formula, Lagrange’s method. Interpolation with Cubic splines. Implementation of these methods in C.

SECTION B


Unit VI: Principles of Object Oriented Programming: OOP paradigm, basic concepts of OOP, benefits of OOP, basic data types, users defined data types, derived data types, operators and control statements.
RECOMMENDED BOOKS:
3) Numerical Methods for Engineers and Scientists – Guha Oxford University Press 2008

4EP06 / 4EX06 / 4EL06 / 4EE06 ELECTRICAL MACHINES I LAB
Any TEN experiments based on contents of 4EP01 ELECTRICAL MACHINES-I

4EP07 / 4EL07 / 4EE07 ANALOG AND DIGITAL CIRCUITS LAB
Any TEN experiments based on contents of 4EP03 ANALOG AND DIGITAL CIRCUITS

4EP08 / 4EX08 / 4EL08 / 4EE08 NUMERICAL METHODS AND COMPUTER PROGRAMMING
Any TEN experiments based on contents of 4EP05 NUMERICAL METHODS AND COMPUTER PROGRAMMING

ENVIRONMENTAL STUDIES

PART-A SHORT ANSWER PATTERN
1. The Multidisciplinary nature of environmental studies .
   • Definition, scope and importance.
   • Need for public awareness.

2. Social Issues and the Environment
   • From Unsustainable to Sustainable development
   • Urban problems related to energy
   • Water conservation, rain water harvesting, watershed management
   • RESETTLEMENT and rehabilitation of people; its problems and concerns. Case studies.
   • Environmental ethics : Issues and possible solutions.
   • Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust. Case studies.
   • Waste land reclamation.

3. Human Population and the Environment
   • Population growth, variation among nations.
   • Population explosion - Family Welfare Programme.
   • Environment and human health.
   • Human Rights.
   • Value Education.
   • Consumerism and waste products.
   • Environment Protection Act.
   • Air (Prevention and Control of Pollution) Act.
   • Water (Prevention and Control of Pollution) Act.
   • Wildlife Protection Act.
   • Forest Conservation Act.
   • Issues involved in enforcement of environmental legislation.
   • Public awareness.

PART-B ESSAY TYPE WITH INBUILT CHOICE

4. Natural resources :
   Renewable and non-renewable resources :
   Natural resources and associated problems.
   -- Forest resources : Use and over exploitation, deforestation, case studies. Timber extraction, mining, dams and their effects on forests and tribal people.
   -- Water resources : Use and over-utilization of surface and ground water, floods, drought, conflicts over water, dams-benefits and problems.
   -- Mineral resources : Use and exploitation, environmental effects of extracting and using mineral resources, case studies.
   - Food resources : World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer–pesticide problems, water logging, salinity, case studies.
   - Energy resources : Growing energy needs, renewable and non renewable energy sources, use of alternate energy sources, Case studies.
   - Land resources : Land as a resource, land degradation, man induced landslides, soil erosion and desertification.

Role of an individual in conservation of natural resources.
Equitable use of resources for sustainable lifestyles.

5. Ecosystems.
   • Concept of an ecosystem.
   • Structure and function of an ecosystem.
   • Producers, consumers and decomposers.
   • Introduction, types, characteristic features, structure and function of the following ecosystem :-
     ✓ Forest ecosystem,
     ✓ Grassland ecosystem,
     ✓ Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries)
   • Energy flow in the ecosystem.
   • Ecological succession.
   • Food chains, food webs and ecological pyramids.

   • Introduction -Definition : genetic, species and ecosystem diversity.
   • Bio geographical classification of India.
   • Value of biodiversity : consumptive use, productive use, social, ethical, aesthetic and option values.
   • Biodiversity at global, National and local levels.

Total Marks : 100
25 Marks (2 Hrs)
50 Marks (6 Hrs)
7. Environmental Pollution

**Definition.**
Causes, effects and control measures of:
- Air pollution,
- Water pollution,
- Soil pollution,
- Marine pollution,
- Noise pollution,
- Thermal pollution,
- Nuclear hazards

**Solid Waste Management:** Causes, effects and control measures of:
- Role of an individual in prevention of pollution.
- Pollution case studies.

**Disaster management:** floods, earthquake, cyclone and landslides.

(8 Hrs)

8. Field work:
- Visit to a local area to document environmental assets - river / forest / grass land / hill / mountain.
- Visit to a local polluted site - Urban / Rural / Industrial / Agricultural.
- Study of common plants, insects, birds.
- Study of simple ecosystems: pond, river, hill slopes, etc.

(5 Hrs)

(Notes: i) Contents of the syllabus mentioned under paras 1 to 8 shall be for teaching for the examination based on Annual Pattern.
ii) Contents of the syllabus mentioned under paras 1 to 4 shall be for teaching to the Semester commencing first, and
iii) Contents of the syllabus mentioned under paras 5 to 8 shall be for teaching to the Semester commencing later.

LIST OF REFERENCES:
2. Bharucha Erach, The Biodiversity of India, Mapin Publishing Pvt. Ltd., Ahmedabad - 380 013, India, Email : mapin@icenet.net (R)
7. Down to Earth, Centre for Science and Environment (R)
9. Hawkins R. E., Encyclopedia of Indian Natural History, Bombay Natural Histroy Society, Mumbai (R)
18. Survey of the Environment, The Hindu (M)
23. Dr. Deshpande A. P. Dr. Chudiwale A. D., Dr. Joshi P. P., Dr. Lad A. B.; Environmental Studies, Pimpalapure & Co., Publishers, Nagpur. (R)
24. R. Rajagopalan : Environmental Studies, Oxford University Press, New Delhi, 2005 (R)

(M) Magazine  (R) Reference  (TB) Textbook

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### Four Year Degree Course in Electrical Engineering

#### Semester Pattern (Credit Grade System)

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<th>Subject</th>
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#### PRACTICALS / DRAWING / DESIGN

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