MAHATMA GANDHI UNIVERSITY

B.TECH. DEGREE COURSE

3rd SEMESTER

SCHEME
&
SYLLABUS

2002

ELECTRONICS
&
COMMUNICATION
ENGINEERING BRANCH

ELECTRONICS & COMMUNICATION ENGINEEING

SCHEME

3RD SEMESTER

Course Code	Course No.	Subject	Teaching periods			Uty. Exam duration (hours)	Marks			
			L	T	P		Sessional	Theory	Practical	Total
A	CMEL PA 301	Engineering Mathematics II	3	1	0	3	50	100	-	150
B	LA302	Network Theory	2	1	0	3	50	100	-	150
C	LA303	Electrical Technology	2	1	0	3	50	100	-	150
D	LA304	Solid state devices	3	1	0	3	50	100	-	150
E	LA305	Electronic circuits –I	3	1	0	3	50	100	-	150
F	LA306	Computer programming	3	1	0	3	50	100	-	150
G	LA307	Electrical lab	0	0	4	3	50		100	150
H	L308	Basic Electronics Lab	0	0	4	3	50		100	150
		Total	16	6	8		400	600	200	1200

SYLLABUS

ENGINEERING MATHEMATICS - II

CMELPA 301 **3+1+0**

Module 1

Vector differential calculus: Differentiation of vector functions- scalar and vector fields- gradient - divergence and curl of a vector function - their physical meaning - directional derivative - scalar potential- conservative field – identities - simple problems.

Module2

Vector integral calculus: Line- surface and volume integrals- work done by a force along a path- application of Green's theorem- Stoke's theorem and Gauss divergence theorem.

Module 3

Function of complex variable: Definition of analytic function and singular points- derivation of C.R. equations in Cartesian co-ordinates- harmonic and orthogonal properties- construction of analytic function given real or imaginary parts- complex potential- conformal transformation of functions like Z^n, e^z, $1/z$, Sin z, $z + k^2/z$ - bilinear transformation- cross ratio- invariant property- simple problems.

Module 4

Finite differences: meaning of Δ, ∇, E, μ, δ - interpolation using Newton's forward and backward formula- central differences- problems using Stirlings formula- Lagrange's formula and Newton's divided difference formula for unequal intervals.

Module 5

Difference Calculus: Numerical differentiation using forward and backward differences. Numerical integration- Newton-Cote's formula- trapezoidal rule- Simpson's $1/3^{rd}$ and $3/8^{th}$ rule- simple problems- difference equations - solutions of difference equations.

References

1. Advanced Engg. Mathematics: Erwin Kreyzing- Wiley Eastern. Pub.
2. Higher Engg. Mathematics: B. S. Grewal- Khanna publishers.
3. Numerical methods in Science and Engineering: M K Venkataraman- National Pub.
4. Numerical methods: S Balachandra Rao- University Press.
5. Advanced Engineering Mathematics: Michael D Greenberg- PHI.
6. Theory and Problems of Vector analysis: Murray Spiegel- Schaum's- Mc Graw Hill.

NETWORK THEORY

LA 302 **2+1+0**

Module 1

Source transformation- Mesh and Node voltage Analysis – Coupled circuits – Dot conventions – Analysis of coupled circuits.

Module 2

Network theorems-Super position theorem- Reciprocity theorem - Thevenin's theorem- Norton's theorem- Millman's theorem- Maximum power transfer theorem- Tellegen's theorem- Graph of a network -Trees- co-trees -Incident matrix- cut- set matrix-tie-set matrix- Analysis of networks- equilibrium equations.

Module 3

Fourier Analysis and Laplace transform - Fourier analysis of periodic signals- Trignometric and exponential forms- Non periodic signals and Fourier transforms- Frequency spectrum of periodic waveforms - Laplace Transform- Review of theorems-Laplace transform of important signal waveforms - Periodic functions- Initial value and final value Theorems- DC&AC transients- Solution of network problems using Laplace transform.

Module 4

Two-port Networks and Filters - Voltage and Current ratios of two - port networks -Admittance- impedance- hybrid and transmission parameters of two port networks. Passive filters as two port networks- Characteristics of ideal filters-Image impedance- Constant K low pass- High pass and Band pass filters- m-derived filters-Composite filters.

Module 5

Network Synthesis – Realizability concept – Hurwitz property – positive realness – properties of positive real function – Synthesis of R, L, RC and LC driving point functions – Foster and Cauer forms.

References

1. Network analysis -M.E Van Valkenburg, PHI
2. Circuits and Networks – analysis & synthesis – A. Sudhakar & S P ShyamMohan
3. Network and Systems -D Roy Chaudhary
4. Network analysis and synthesis-Franklin F Kuo – John Wiley & Sons
5. Engineering Circuit Analysis-W H Hayt & Jack Kennerly – Mc-Graw Hill

ELECTRICAL TECHNOLOGY

LA 303 **2+1+0**

Module 1

D.C.Generator – O.C.C. – Condition for self excitation – field critical resistance – critical speed – Load characteristics of generators – Losses – power flow diagram – efficiency – Condition for maximum efficiency – Applications.

Module 2

D C motor – starter – 3 point and 4 point starters – torque equation – speed equation – speed torque – characteristics of shunt, series and compound motors – Losses – efficiency – Brake test – Swinburne's test – speed control – field control – armature control – series parallel control – applications.

Module3

Transformers: transformer on no-load and load operation – phasor diagram – equivalent circuit – regulation – losses and efficiency – o.c. and s.c. test – applications – Design of step down transformers like 230/6-0-6V, – Basic principles of 3 phase tranformer – autotransformer – applications.

Module 4

A.C Machines: 3 phase induction motors – rotating magnetic field – torque equation – slip – torque-slip characteristics – operating characteristics – starting of 3 phase induction motors – starters – single phase induction motors – constructional features – types – working and characteristics only (no analysis) – constructional features of synchronous machines – principle of operation of alternator – emf equation – regulation by emf and mmf method – principle of operation of synchronous motor – starting of synchronous motor.

Module 5

Special Machines: A C and D C servo motors – synchros – constructional features – working of a tachogenerator – stepper motors – construction, working, applications and specifications of stepper motors – universal motors - constructional features – typical applications – criteria for selection of motors – electromagnetic relays – contactors.

References

1. Electrical & Electronic Technology: Hughes, Pearson Education
2. Electrical Technology: H. Cotton
3. Electrical Machines: R.K.Rajput
4. Electrical Design Estimating & Costing: K.B.Raina & Bhattacharya
5. Electrical Machines & Power systems: Vincent Del Toro

SOLID STATE DEVICES

LA304 **3+1+0**

Module 1

Energy bands and charge carriers in semiconductors: energy bands- metals- semiconductors and insulators- direct and indirect semiconductors- charge carriers in semiconductors: electrons and holes- intrinsic and extrinsic material- n-material and p-material- carrier concentration: fermi level- EHPs- temperature dependance- conductivity and mobility- drift and resistance- effect of temperature and doping on mobility- hall effect.

Module 2

Diffusion of carriers- derivation of diffusion constant D- Einstein relation- continuity equation- p-n junctions: contact potential- equilibrium fermi levels- space charge at junctions- current components at a junction: majority and minority carrier currents- zener and avalanche breakdown- capacitance of p-n junctions.

Module 3

p-n junction diodes: volt-ampere characteristics- switching time- rectifier action- Zener diodes: volt-ampere characteristics- Tunnel diodes: tunneling phenomena- volt-ampere characteristics- Varactor diodes- Photo diodes: detection principle- light emitting diodes.

Module 4

Bipolar junction transistors: npn and pnp transistor action- open circuited transistor- biasing in active region- majority and minority carrier distribution- terminal currents- amplification and switching- α and β gain factors- emitter efficiency γ- schottky transistors- photo transistors.

Module 5

Field effect transistors: operation- pinch off and saturation- pinch off voltage- gate control- volt-ampere characteristics- MOSFETS: n MOS and p MOS: comparison- enhancement and depletion types- control of threshold voltage- MOS capacitance.

References

1. Solid state electronic devices - Ben G Streetman- Pearson Education
2. Microelectronic Devices: Nagchaudhari, Pearson Education
3. Integrated electronics – Millman and Halkias- Mc Graw Hill.
4. Physics of semiconductor devices - S M Sze- Mc Graw Hill.
5. Semiconductor devices – Nagchoudhary- Tata Mc Graw Hill.
6. Physics of semiconductor devices: Shur- PHI.
7. Theory of Semiconductor devices: Karl Hess- PHI.

ELECTRONIC CIRCUITS - I

LA 305 **3+1+0**

Module 1

Rectifiers and Power supplies: Half wave- full wave and bridge rectifiers- working- analysis and design- C filter analysis- regulated power supplies: series and shunt- design of regulated power supplies for specified output conditions- current limiting- short circuit protection- IC regulated power supplies.

Module 2

Transistor as an amplifier: Transistor at low frequencies- h parameter model analysis- expression of voltage and current gain- input and output impedance- CE- CB and CC configurations- comparison- transistor parameters from static characteristics- FET: operation- characteristics- small signal model.

Module 3

Transistor Biasing: operating point- DC and AC load lines- Q point selection- bias stability- definition of stability factors- derivation of stability factor for I_{CO} variation- fixed bias- collector to base bias- self bias circuits- bias compensation- compensation for I_{CO} and V_{BE}.

Module 4

RC Coupled amplifier: working- analysis and design- phase and frequency response- FET amplifier: biasing- analysis and design.

Module 5

Wave shaping circuits: clipping- clamping- RC integration- differentiation- transistor as a switch- astable multivibrator- working and design- UJT- working and applications- simple sweep circuit.

References

1. Electronic devices and circuits: Boylsted & Nashelsky- Pearson Edn.
2. Integrated Electronics: Millman & Halkias- Mc Graw Hill.
3. Electronic Principles: Malvino- Tata Mc Graw Hill.
4. Electronic devices and circuits: Bogart- UBS.
5. Electronic devices and circuits: Allen Mottershed- PHI.
6. Electronic devices: Floyd- Pearson Edn.
7. Electronic devices and applications: B Somanathan Nair- PHI.
8. Electronic devices and circuits: J B Gupta- S K Kataria & Sons Pub.

COMPUTER PROGRAMMING

LA 306 **3+1+0**

Module 1

Introduction to C: C fundamentals - The character set - identifiers and keywords - Data types - constants - variables and arrays - declarations - expressions - statements - symbolic constants- arithmetic operators - Relational and Logical operators - The conditional operator - Library functions - Data input and output - getchar – putchar, scanf, printf - gets and puts functions - interactive programming.

Module 2

Control Statements: While - do while - for - nested loops -if else switch- break - continue - The comma operator - go to statement, Functions - a brief overview - defining a function - accesing a function - passing arguments to a function - specifying argument - data types - function prototypes - Recursion.

Module 3

Program structure: storage classes - Automatic variables - external variables - multi file programs. Arrays: defining an array - processing an array - passing arrays in a function – multi dimensional arrays - array and strings. Structures and unions: defining a structure - processing a structure - user defined data types - passing structure to a function – self referential structures - unions.

Module 4

Pointers: Fundamentals - pointer declaration - passing pointers to a function - pointers and one dimensional arrays - operations on pointers - pointers and multi dimensional arrays – passing functions to other functions.

Module 5

Data files: Opening and closing of a data file - creating a data file - processing a data file, low level programming - register variables – bit wise operation - bit fields - enumeration - command line parameters - macros - the C pre-processor.

Text Book

1. Programming with ANSI and Turbo C: Ashok N Kanthane, Pearson Edn.

References

1. Theory and problems of programming with C- Gottfried, Schaum's series.
2. The C programming language: Kernighan & Ritche, PHI.
3. Programming Techniqes through C: Venkateshmurthy, Pearson Edn.
4. Programming in C: Balaguruswamy, Tata Mc Graw Hill.
5. Programming Ansi C: Ram Kumar.
6. Computer Programming: Rajaraman, PHI.

ELECTRICAL LAB

LA 307 **0+0+4**

1. Measurement of Electric power (single phase and three phase) and energy using wattmeter and energy meter.
2. Study of star-delta connections.
3. O.C.C. and Load characteristics of D.C. generators.
4. Swinburne's test.
5. Load characteristics of D.C. shunt, series and compound motors
6. O.C and S.C test on single-phase transformer.
7. Load test on step-up/step-down transformer; calculation of efficiency and regulation at different power factors.
8. Study of starting of three phase induction motors and load test on squirrel cage induction motor.
9. Load test on slipring induction motor.
10. Study of stepper and servomotors.
11. Load test on single phase induction motor.
12. Pre-determination of regulation of the alternator by emf and mmf method.

BASIC ELECTRONICS LAB

L 308 **0+0+4**

1. Familiarization of CRO, DVM, AF generator etc and soldering practice.
2. Characteristics - Diode, Transistor, FET, UJT. Determination of parameters.
3. Design and testing of DC power supplies for specified output.
4. Design of Single stage RC coupled amplifier. Determination of Band width.
5. Design of FET amplifier. Determination of Band width.
6. Wave shaping. Design of clipping, clamping, RC differentiator & Integrator.
7. Design of Astable multi-vibrator for specified time period - sharpening of edges.
8. Simple sweep circuit.
9. Familiarization of data sheets of components – OA79, 1N4001, SZ6.8, BC107, BC547, BC557, BFW10, 2N2646.
10. Simulation of simple circuits using Spice.

Note

New experiments may be added in the above list concerned to the relevant theory paper (LA 305).