

**MAHATMA GANDHI
UNIVERSITY**

B.TECH. DEGREE COURSE

1&2 SEMESTER

**SCHEME
&
SYLLABUS**

2002

**COMMON TO ALL
BRANCHES**

SCHEME

SEMESTER -I & II (Common to all branches)

Course Code	Course No.	Subject	Teaching Period			Duration of Uty. Exam (hrs)	Marks			
			Lect.	Tut.	Prac.		Sessional	Theory	Practical	Total
	CME LRPTA									
A	101	Engineering Mathematics I	3	1	-	3	50	100	-	150
B	102	Engineering Physics	1	1	-	3	50	100	-	150
C	103	Engineering Chemistry	1	1	-	3	50	100	-	150
D	104	Engineering Mechanics	2	2	-	3	50	100	-	150
E	105	Engineering Graphics	1	-	3	3	50	100	-	150
F	106	Basic Civil Engineering	1	1	-	3	50	100	-	150
G	107	Basic Mechanical Engineering	1	1	-	3	50	100	-	150
H	108	Basic Electrical Engineering	1	1	-	3	50	100	-	150
I	109	Basic Electronics Engineering	1	1	-	3	50	100	-	150
J	110	Workshop	-	-	6*	-	50x3	-	-	150
		Total	12	9	9	-	600	900	-	1500

*3 periods will be in Mechanical Engineering Workshop and 3 periods in Civil Engineering Workshop & Electrical Engineering Workshop alternately.

SYLLABUS

ENGINEERING MATHEMATICS – I

CMELRPTA 101

3+1+0

Module 1 Matrix

Elementary transformation – finding inverse and rank using elementary transformation – solution of linear equations using elementary transformations – eigenvalues and eigenvectors – application of Cayley Hamilton theorem – Diagonalization – Reduction of quadratic form into sum of squares using orthogonal transformation – nature of quadratic form.

Module 2 Partial Differentiation

Partial differentiation – chain rules – Euler's theorem for homogeneous functions – Taylor's series for function of two variables – maxima and minima of function of two variables (proof of results not expected.)

Module 3 Multiple Integrals

Double integrals in cartesian and polar co-ordinates – application in finding area and volume using double integrals – change of variables using Jacobian – triple integrals in cartesian, cylindrical and spherical co-ordinates – volume using triple integrals – simple problems.

Module 4 Laplace Transforms

Laplace transforms – Laplace transform of derivatives and integrals – shifting theorem – differentiation and integration of transforms – inverse transforms – application of convolution property – solution of linear differential equations with constant coefficients using Laplace transform – Laplace transform of unit step function, impulse function and periodic function

Module 5 Fourier Series

Dirichlet conditions – Fourier series with period 2π and $2l$ – Half range sine and cosine series – simple problems – rms value.

References

- | | |
|---------------------------------------|-----------------|
| 1. Advanced Engg. Mathematics | Erwin Kreyszig |
| 2. Higher Engg. Mathematics | Grawal B.S. |
| 3. Engg. Mathematics | N.P.Bali |
| 4. Laplace and Fourier Transforms | Goyal and Gupta |
| 5. Advanced Mathematics for Engineers | E.S.Sokolnikoff |
| 6. Methods of Applied Mathematics | F.B.Hilderbrand |

ENGINEERING PHYSICS

CMELRPTA 102

1+1+0

Module 1 Optical Instruments and Applications

Electron microscope – characteristics of laser – spontaneous emission – stimulated emission – population inversion-pumping mechanisms – typical laser systems like Ruby laser – He-Ne laser – semi conductor laser – Applications of laser.

Module 2 Super Conductivity

Transition temperature – Meissner effect – Isotope effect – Type I and II super conductors – BCS theory (qualitative study) – High temperature super conductivity (general idea) – Josephson effect – SQUIDS – Applications of Super conductors.

Module 3 Crystallography and Lattice Planes

Crystallography – space lattice – unitcell – crystal systems – Co-ordination number packing factor – lattice planes and Miller Indices – spacing between lattice planes – Bragg's law and crystal structure analysis – Bragg's X-ray spectrometer.

Module 4 Magnetic Materials

Dia, Para, Ferro, Antiferro and Ferri magnetic materials – soft and hard magnetic materials – properties – applications – magnetic permeability – susceptibility – relation between them – Hysteresis.

Dielectrics: Properties – Dielectric constant – Dielectric strength – Dielectric loss – Polar and non polar molecule – Dielectric polarization – dielectric susceptibility – types – applications.

Ultra sonics – Production – piezoelectric and magnetostriction method – properties – applications.

Module 5 Fibre Optics and its Application

General ideas of optical fibre – NA of fibre – step index and graded index fibre – multi mode and single mode fibre – applications of optical fibre – fibre optic communication system (block diagram) – Optical fibre sensors.

References

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|--------------------------|------------------------|
| 1. Engg. Physics | R.K.Gaur and S.L.Gupta |
| 2. Engg. Physics | Dr. M.Arumugam |
| 3. Solid State Physics | C.Kittel |
| 4. Engg. Materials | Decker |
| 5. Physics for Engineers | B.Premlet |

ENGINEERING CHEMISTRY

CMELRPTA 103

1+1+0

Module 1 Electro Chemistry

Conductance – Experimental Determination – Galvanic cells – reversible and irreversible cells – EMF and its measurement – Single electrode potential – types of electrodes – Hydrogen electrode – Calomel electrode – Electrochemical series – Nernst equation – concentration cells – polarization and over voltage – decomposition potential – Secondary cells – Lead-Acid accumulator – Fuel cells.

Module 2 Plastics and Elastomers

High Polymers – types of polymerization – addition, condensation and copolymerism - thermo plastics and thermo setting plastics – preparation and properties of PVC, PVA, Polypropylene, Polyvinylidene chloride, Teflon, Terylene, Acrylics, Nylon, Bakelite – Moulding techniques – Lamination – glass reinforced plastics – Natural Rubber properties – Vulcanisation of rubber – synthetic rubber – industrial uses of buna rubbers, butyl rubber, silicon rubber and Thiokol.

Module 3 Corrosion and protective coatings

Chemical and electrochemical corrosion – Factors affecting corrosion – corrosion control – cathodic protection – inorganic coating – metallic coating – hot dipping – electroplating – metal spraying – cladding – vacuum metalization – anodisation – vitreous coating.

Module 4 Domestic water supply

Requirements and methods of processing – Industrial water supply: Hard and soft waters – defects of using water containing dissolved minerals for industrial purposes – Boiler Troubles – methods of treatment.

Module 5

Fuels: Classification – calorific value and its determination – solid, liquid and gaseous fuels – petrol knock – octane number – cetane number – synthetic gasoline – natural gas – pollution – causes of pollution – air pollution due to automobiles – control of air pollution
Lubrication and Lubricants: Mechanism of lubrication – different types of lubricants – manufacture and properties of lubricating oil – manufacture, properties and uses of semi-solid lubricants – properties and uses of solid lubricants – synthetic lubricants.

References

- | | |
|---|-----------------------------|
| 1. Engg. Chemistry | Jain and Jain |
| 2. Engg. Chemistry | O.P. Aggarwal |
| 3. Chemistry in Engg. And Tech. (Vol. I & II) | J.C. Kuriakose and J. Rajam |
| 4. Environmental Chemistry | A.K. De |

ENGINEERING MECHANICS

CMELRPTA 104

2+2+0

Module 1

Forces in Plane – Vector addition of concurrent forces in plane – problems involving the equilibrium of particles – free body diagrams.

Definition of rigid body – moment of a force about an axis – varignon's theorem of moment – couple – properties of force couples – resolution of a given force into force acting at a given point and a couple – reduction of a system of coplanar forces acting on a rigid body into a single force and a single couple – equilibrium of a rigid body under coplanar forces – types of supports – reaction at supports of beams and frames – graphical method.

Module 2

Centre of gravity, centroid of wires, areas, volumes – moment of inertia of lamina and radius of gyration – parallel axis theorem and its applications – mass moment of inertia of thin circular and rectangular plates – mass moment of inertia of solid rectangular prisms, cylinders and cones.

Friction-angle of friction and coefficient of friction – laws of dry friction-ladder friction – wedge friction.

Module 3

Simple trusses – analysis of trusses by methods of joints and sections – graphical-method. Simple stress and strain – bars of uniform cross section – shear stress – modulus of rigidity – bulk modulus – Poisson's ratio – Relation between different moduli.

Module 4

Dynamics: Kinematics (Velocity – acceleration) rectilinear motion of a particle under variable acceleration

Relative velocity – simple cases only. Circular motion with uniform acceleration – relation between angular and rectilinear motion – normal and tangential acceleration – motion of rotation and translation – instantaneous centre of zero velocity (elementary treatment only)

Module 5

Kinetics of particles – Newton's Laws of motion of translation – work, energy and power – principles of momentum and impulse. Motion of rotation – couple – torque – Newtons laws of motion of rotation – differential equations of rotation – angular impulse and torque – conservation of angular momentum – work-done and power by torque and couple.

References

1. Shames I.H., Engineering Mechanics, Prentice hall of India
2. S.Timoshenko, Engineering Mechanics, McGraw Hill
3. Ramachandra, Engineering Mechanics, Standard Publishers and Distributors
4. S. Rajasekaram & G.Sankarasubramanian, Engineering Mechanics, Vikas Publishing Co.
5. Beer F.P. & Johnston E.R., Mechanics for Engineers – Statics and Dynamics, McGraw Hill
6. Meriam J.L. & Kraige L.G., Engineering Mechanics, John Wiley

ENGINEERING GRAPHICS

CMELRPTA 105

1+0+3

Module 1

Introduction of Engineering Graphics: drawing instruments and their uses – familiarization with current, Indian standard code of practice for general engineering drawing.

Scales – plain scale – vernier scale – diagonal scale.

Conic sections – construction of ellipse, parabola, hyperbola and rectangular hyperbola. Construction of cycloids, involute, archimedean spiral and logarithmic spiral – drawing tangents and normals to these curves.

Module 2

Introduction to orthographic projections: planes of projection – projection of points in different quadrants. Orthographic projection of straight lines parallel to one plane and inclined to the other plane – straight lines inclined to both the planes – true length and inclination of lines with reference planes – traces of lines – projection of planes.

Module 3

Projection of polyhedra and solids of revolution – cubes, prisms, cones, cylinders, pyramids, tetrahedron, octahedron and sphere – frustums.

Projection of solids with axis parallel to one plane and parallel, perpendicular or inclined to the other plane - projection of solids on auxiliary planes.

Sections of solids by planes inclined to horizontal or vertical planes.

Module 4

Development of surfaces of cubes, prisms, cylinders, pyramids and cones – development of funnels and pipe elbows.

Introduction to isometric projection – isometric scale – isometric views – isometric projections of prism, pyramids, cylinders, cones and spheres.

Module 5

Introduction to perspective projections: perspective views of prisms.

Intersection of surfaces – methods of determining lines of intersection – intersection of prism, cylinder in cylinder.

References

1. Elementary Engineering Drawing – N.D.Bhatt.
2. Geometrical Drawing – P.S.Gill.
3. Geometrical Drawing – V.Lakshmi Narayanan & M.C.Marhur
4. Engineering Graphics – P.I.Varghese & K.C.John

BASIC CIVIL ENGINEERING

CMELRPTA 106

1+1+0

Module 1

Materials: Cement – Types of Portland cement – grades of cement and its uses – Steel – types of steel for reinforcement bars – steel structural sections. Aggregates: sources, types & sizes – requirements of good aggregates. Mortar preparation – Concrete – grades of concrete as per IS Code – water cement ratio, workability, batching, mixing, compaction and curing.

Module 2

Timber – Varieties found in Kerala – effects, seasoning, decay preservation – specification for use in construction.

Bricks: varieties and strength – tests on bricks.

Roofing: Steel truss. A. C. and GI sheets roofing for industrial buildings – sketches only – reinforced concrete roofs. (Design details not required)

Module 3

Building Components: Foundation: Bearing capacity and settlement - definitions - Isolated footing - combined footing - rafts, piles and well foundation - machine foundation - special situations where those foundations are suitable. (Brief description only).

Superstructure: Walls - brick masonry - English bond - Flemish bond - Stone masonry-Random Rubble masonry.

Module 4

Surveying: Classifications - based on object of survey - based on instruments used. Chain Surveying: Instruments - field work - field book - procedure and booking. Compass Surveying: Prismatic compass – Basic principles - Bearing of survey lines & local attraction.

Leveling: field work - reduction of levels - Height of instrument method.

Module 5

Site plan preparation for buildings (Sketch only) – Kerala Municipal Building Rules – 1999-general provisions regarding site and building requirements – Exterior and interior open air spaces – coverage and floor area ratio – provisions of the size, height and ventilation of rooms (residential buildings) disposal of

domestic waste water through septic tank and soak pit. Classification of roads and components of roads – basics of traffic engineering – Road marking – Traffic Islands, signaling – (brief description only)

References

1. Jha and Sinha, Construction and foundation Engineering, Khanna Publishers
2. Punmia B. C., Surveying Vol –I, Laxmi Publications
3. Rangwala, Building Materials, Charotar Book stall
4. K. Khanna & C. E. G. Justo, Highway Engineering, Khanna Publishers
5. Neville, Properties of Concrete, Mc Graw Hill
6. Kerala Municipal Rules – 1999

BASIC MECHANICAL ENGINEERING

CMELRPTA 107

1-1-0

Module 1

Thermodynamics: Basic concepts and definitions, Gas laws, specific heat – Universal gas constant – Isothermal, adiabatic and polytropic processes, work done and heat transferred: Carnot, Otto & Diesel Cycles – air standard efficiency.

Module 2

I.C. Engines: Working of two stroke and four stroke engines – petrol and diesel engines – fuel systems, injector and carburetor – ignition system – lubrication and cooling systems.

Refrigeration and air-conditioning: methods of refrigeration – vapour compression and vapour absorption systems – block diagrams and general descriptions – winter and summer air conditioning systems – general description.

Module 3

Power transmission: Methods of transmission – belt, rope, chain and gear drives. Fields of application, calculation of length of belt – expression for ratio of belt tension. Velocity ratio and slip – simple problems – velocity ratio and choice of gear wheels – simple problems.

Module 4

Power plants: General layout of hydraulic, diesel, thermal and nuclear power plants, nonconventional energy sources, general description only.
Types of hydraulic turbines – selection of turbines depending upon head, discharge and specific speed – steam turbines – reaction and impulse turbines – compounding methods.

Module 5

Simple description of general purpose machines like lathe, shaping machines, drilling machine, milling machine and grinding machine.

Manufacturing process: moulding and casting, forging, rolling, welding – arc welding – gas welding (simple descriptions only)

References

- | | |
|---------------------------------------|--------------|
| 1. Elements of Heat Engines | R.C.Patel |
| 2. Thermal Engineering | P.L.Bellany |
| 3. Elements of Mechanical Engineering | S.Domkundwar |
| 4. Power Plant Engineering | Nagpal |

BASIC ELECTRICAL ENGINEERING

CMELRPTA 108

1+1

Module 1

S I unit of Current, Voltage, Power and Energy, Ohm's Law – Temperature Coefficient of Resistance – Kirchhoff's Laws – Solution of Series-Parallel D.C. circuits – star Delta Transformation – Magnetic Circuits – Flux-Flux density – $m f$ – Magnetising Force – Reluctance – Permeability – Comparison of Electric and Magnetic Circuits-Force experienced by a current carrying conductor in Magnetic Field – Electromagnetic Induction – Farady's Laws – Lenz's Law – Statically Induced $e m f$ – dynamically induced e.m.f. – Self and mutual Induction – Coefficient of coupling.

Module 2

Alternating Quantity – Generation of Sinusoidal Voltage – Frequency – R.M.S. and Average Value – Form Factor – Peak Factor – Phasor Representation – Phase and Phase Difference – Solution of Series R L C circuits – Power and p.f. – Operator 'j' – Admittance – solution of series and parallel R L C circuits.

Module 3

Resonance – Series and Parallel – Q factor – Selectivity and Bandwidth – Three phase system – Representation – Star and Delta Systems – Phase sequence – Balanced Delta connected System – Balanced Star Connected system – Phasor representations – Simple Problems.

Module 4

D.C. Machine – Principle of Operations of a D.C. generator – Constructional Details – e.m.f. equation – Types of Generators.

D.C. Motor – Principle of Operations – Back e.m.f. and its Significance – Necessity of Starters – Types of motors and Applications.

Transformer – Principle of Operations – e.m.f. equation – Ideal Transformer – Constructional Details – Losses and Efficiency – Use of Power, Distribution and Instrument Transformers.

Induction Motor – Principle of Operation of 3 phase Induction Motor – Cage and Slip ring – Slip – Applications – types of Single Phase Induction Motors – Applications.

Alternator – Principle of Operations – Types

Module 5

Requirements of Good Lighting System – Working Principle of Incandescent – Fluorescent and Mercury Vapour Lamps – Estimate the quantity of Materials required and Draw the wiring layout of (a) Residential Building with One or Two rooms. (b) Workshop with one Induction Motor.

Generation – Types of Generation – Hydroelectric, Thermal, Nuclear and Non Conventional – Transmission – Need for high Voltage Transmission – Transmission Voltages in Kerala – Distribution – Underground Versus Overhead – Feeder – Distributor – Service Mains – Conductor materials – One line Diagram of a typical Power System.

References

- | | |
|--|-----------------------------|
| 1. Electrical Technology | H.Cotton |
| 2. Electrical Technology | Hughese |
| 3. Electrical Circuits | Edminister J.A. |
| 4. Electrical Design, Estimating & Costing | S.K.Bhattacharya, K.B.Raina |
| 5. A Course in Electrical Power | M.L.Soni & P.V.Gupta |

BASIC ELECTRONICS ENGINEERING

CMELRPTA109

1+1+0

Module 1

Basic circuit components

Passive components: Resistors - Types of resistors - Fixed Resistors - Variable resistors, resistor tolerance, colour coding, power rating of resistors.

Capacitors: Types of capacitors: Fixed capacitors, Mica, Paper, Ceramic and Electrolytic capacitors, Variable capacitors, voltage rating of capacitors.

Inductors: Fixed and Variable inductors.

Semiconductor Components: Definition of insulators, semiconductors and conductors types: Intrinsic and extrinsic, p and n type materials, pn junction, Classifications: Germanium, Silicon, Zener, LEDs (working principle only).

Transistors: npn, pnp, working principle.

Integrated circuits: Advantages, classification, Linear and Digital ICs.

Module 2

Basic electronic circuits

Diode circuits: Forward and reverse characteristics, Rectifiers: Half wave, full wave, Bridge circuits, DC Power supply: Capacitor filter, Zener regulator, eliminator circuit.

Transistor circuits: CB, CE, CC characteristics, concept of α and β , Amplifiers, common emitter RC coupled amplifier, Frequency response, Bandwidth.

Module 3

Basic communication engineering

Communication: Frequency bands: RF, VHF, UHF. Modulation – need for modulation, basic principles of amplitude, frequency, phase and pulse modulation.

Radio engineering: block schematic of AM radio receiver and transmitter - function of each block.

Television Engineering: Basic principles of TV – CRT - scanning - simplified block schematic of a monochrome TV receiver.

Wireless communication: mobile, microwave and satellite (basic principles and block schematic only).

Module 4

Basic instrumentation and Digital electronics

Electronic instrumentation: Transducers: Basic principles of Strain gauge, LVDT, Thermistor, Photodiode, microphones, Loud speaker.

Measurements: Multimeter and X-Y recorder.

Digital electronics: number systems - binary, octal and hexadecimal - conversion - representation of negative numbers using 1's compliment and 2's compliment method. Logic gates – truth table.

Module 5

Basic Computer engineering

Digital computer: Block schematic, function of each block: CPU, Memory, I/O devices.

Memory: RAM, ROM, Magnetic Tape, Floppy Discs, Hard Discs and CD.

Programming: Machine language, Assembly language, High level language, System Software, Operating systems, Compilers and Assemblers.

References

1. Basic Electronics: Bernad Grob, Mc Graw Hill Publication
2. Electronic Devices: Floyd, Pearson Education
3. Electronic Devices & Circuits Theory: Boyelstad & Naschelsky, Prentice Hall.
4. Electronic Principles: Malvino, Mc Graw Hill Publication
5. Digital Principles: Malvino & Leach, Mc Graw Hill Publication
6. Integrated Electronics: Millman & Halkias, Mc Graw Hill Publication
7. Electronic Instrumentation: H.S Kalsi, Mc Graw Hill Publication
8. Systems Programming: J.J. Donovan, Mc Graw Hill Publication

WORKSHOP

A-MECHANICAL ENGINEERING WORKSHOP

CMELRPTA 110

0+0+6

<u>Carpentry</u>	Planing – cutting – chiseling, marking – sawing – cross and tee joints – dovetail joints – Engineering Application, Seasoning, Preservation – Plywood and plyboards.
<u>Fitting</u>	Practice in chipping – filing – cutting – male and female joints
<u>Smithy</u>	Forging of square and hexagonal prisms, hexagonal bolt – Forging Principles, materials and different operations.
<u>Foundry</u>	Preparation of Simple sand moulds – moulding sand characteristics, materials, gate, runner, riser, core, chaplets and casting defects. Demonstration & study of machine tool - lathe, drilling, boring, soltting shaping and milling machines, grinding, CNC and machining centers.

B-CIVIL ENGINEERING WORKSHOP

CMELRPTA 110

Masonry English bond – flemish bond – wall – junction – one brick – one and a half brick - two brick two and a half brick—Arch setting.

Plumbing Study of water supply and sanitary fittings—water supply pipe fitting –tap connections - sanitary fittings - urinal, wash basin—closet (European and Indian), manholes.

Surveying Study of surveying instruments – chain – compass – plane table – leveling – theodolite—minor instruments.

**C – ELECTRICAL & ELECTRONICS ENGINEERING WORKSHOP
CMELRPTA 110**

1. Wiring of one lamp and one plug, control of two lamps in series and in parallel.
2. Stair case Wiring.
3. Godown Wiring.
4. Hospital Wiring.
5. Wiring of fluorescent, C F L and mercury vapour lamp.
6. Wiring of Distribution Board including Power Plug using Isolator, M C B and E L C B.
7. Insulation megger – earth megger, measurement of Insulation resistance and earth resistance.

8. Identification of electronic components and soldering practice.
9. Soldering and testing of a H W and FW rectifier with capacitor filter in a P C B.
10. Soldering of typical I C circuit.

3 periods will be in Mechanical Engineering Workshop and 3 periods in Civil Engineering Workshop & Electrical Engineering Workshop alternately.

