I st Semester Curriculum Structure and Syllabus of F.Y.B.Tech. (Non Electrical Group)

Ist Semester *Division 1 To 5*

Subject Code	***Subject Name***	Subject Category	Subject Type	Credit
ML-103	*Physical Education*	Extra Curricular Activity	Lab	0
MA-101	*Engineering Mathematics-I*	4 Credits subject	Theory	4
AS-101	*Engineering Physics-I*	3 Credits subject	Theory	3
EE-101	*Basic Electrical Engineering(NE)*	3 Credits subject	Theory	3
ME-103	*Engineering Graphics*	1 Credits subject	Theory	3
AS-103	*Engineering Chemistry*	3 Credits subject	Theory	3
PE-101	*Engineering Workshop*	2 Credits Laboratory	Lab	2
AS-105	*Engineering Physics-I LAB*	1 Credit Laboratory	Lab	1
AS-107	*Engineering Chemistry Lab*	1 Credit Laboratory	Lab	1
EE-103	*Basic Electrical Engineering(NE)(Lab)*	1 Credit Laboratory	Lab	1
ME-105	*Engineering Graphics lab*	1 Credit Laboratory	Lab	1
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MA-101 ENGINEERING MATHEMATICS - I

Teaching Scheme:
Lectures : 3hrs / week
Tutorial: 1 hr/week

Examination Scheme:
Internal: 40 marks
End Sem. Exam: 60 marks

Objectives: The basic necessity for the foundation of Engineering & Technology being mathematics, the main aim is, to teach mathematical methodologies & models, develop mathematical skills & enhance thinking power of students.

Unit 1 **(8 Hrs)**

Applications Of Derivatives : Extreme values of functions, Rolle's theorem, proof, graphical representation and examples, Mean value theorem, proof, applications, examples, CMVT.proof with consequences, Monotonic function with first derivative test and problems, Indeterminate forms, L'Hospitals Rule, Types of problems on Indeterminate form.

Unit 2 **(12 hrs)**

Infinite series : Infinite sequence and introduction to series, Geometric series with proof, P-Series (without proof), Comparision test, Limit comparision, Ratio and Root Test, Power series and Radius of convergence, Revision of Complex numbers, Finding nth derivative, Leibnitz rule, Series representations, Taylor's and Maclaurin's series, (Theorem 22), Examples

Unit 3 **(12 hrs)**

Partial Differentiation and Its Applications : Functions of several variables, Limits & continuity: Introduction, Partial derivative, Chain rule, Implicit function, Total derivative, Maxima and minima of the functions of two variables(Theorem11), Lagrange's method of multipliers, applications

Unit 4 **(4 hrs)**

Matrices – I: Basics on Martices, Gauss elimination and Echelon form, Rank, Linear dependence/Independence, Solutions to the system of linear equations: Homogeneous & non-homogeneous, Gauss Jordan method.

Unit 5 **(4 hrs)**

Matrices – II : Eigen values and Basics of Eigen vectors, examples ,Orthogonal, Symmetric and Skew symmetric matrices

Text Books :

- Advanced Engineering Mathematics (8th edition) by Erwin Kreyszig, Wiley eastern Ltd &Bombay, 2003
- Thomas' Calculus (11^{th} edition) by Maurice D. Weir, Joel Hass, Frank R. Giordano, Pearson Education, 2008

Reference Books:

- Higher Engineering Mathematics by B. V. Ramana ,Tata McGraw Hill .
- Advanced Engineering Mathematics by C.R. Wylie, McGraw Hill Publications, New Delhi.
- Advanced Engineering Mathematics (5^{th} edition) by Peter V. O' Neil, Thomson. Brooks / Cole, Singapore.
- Differential Calculus by Shanti Narayan, S. Chand and company, New Delhi.
- Engineering Mathematics (Volume-I) by S. S. Sastry, Prentice Hall Publication, New Delhi.
- Higher Engineering Mathematics by B. S. Grewal, Khanna Publications, New Delhi.

Course Outcome:

1. Student will be able to think logically & understand the basic concepts.
2. Demonstrate problem solving for application of derivatives ordinary as well as partial.
3. Exhibit various Engineering applications for topics included in the course.

AS-101 ENGINEERING PHYSICS –I

Teaching Scheme:
Lectures : 3 hrs/week
Practical: 2 hr/week

Examination Scheme:
Assignments/Quiz : 40 marks
End Sem. Exam: 60 marks

Objective: To Teach few Fundamental Principles in Physics and their applications in the field of Engineering

Unit 1 **(6 hrs)**

Polarisation : Preferential direction in a wave, Polarised light, Types of polarization and their representation, Brewster's law, Polarization by double refraction, Law of Malus, Optical Activity, Specific rotation, Fresenel's theory of Optical Rotation, Elliptical and Circular polarization, quarter and half wave plates.

Unit 2 **(6 hrs)**

Interference and Diffraction : Interference due to thin films of uniform thickness and non-uniform thickness (with derivation), Newton's rings, Applications of interference.
Fraunhoffer diffraction at a single slit; condition of maxima and minima, Plane Diffraction grating(Diffraction at multiple slits), Dispersive power of grating, Rayleigh's criterion of resolution, , R.P. of diffraction grating

Unit 3 **(6 hrs)**

Laser Physics : Spontaneous and stimulated emission of radiation, Thermal equilibrium, Condition for Light amplification, Population inversion, Pumping (Three level and four level pumping), Optical Resonator, Laser Beam Characteristics, Ruby laser, He-Ne Laser, Semiconductor Laser, Nd-YAG Laser, Engineering applications of Laser (Fiber optics, Laser material interaction).

Unit 4 **(6 hrs)**

Wave Mechanics : Matter waves, De-Broglie's concept of matter waves, Properties of matter waves, Davison and Germer Experiment, Heisenberg's uncertainty principle and its experimental illustrations, Schrödinger's time dependent and time independent equations, Eigen values and Eigen functions, Expectation values, Physical significance of wave function.

Unit 5 **(6 hrs)**

Electrons in Potential Well : Applications of Schrödinger's equation; Motion of a free particle, Electron in an infinite deep potential well (rigid box), Electron in a finite deep potential well (non-rigid box), concept of quantum tunneling, Linear Harmonic oscillator Electron trapped in H-atom; Angular momentum of electrons in H-atom,

Unit 6 **(6 hrs)**

Nuclear Physics : Nuclear reaction, Types of nuclear reactions, Q-value of nuclear reaction, Nuclear fission in natural Uranium, Chain reaction, Four factor formula, Nuclear fusion and thermonuclear reaction, Nuclear Reactor, Particle detectors; Geiger Muller Counter, Scintillation counter, Circular accelerators; cyclotron and Betatron

Text Books:

- Engineering Physics- M.N.Avadhanulu and P.G.Kshirsagar S.Chand Publications
- Engineering Physics R.L.Gaur and S.L.Gupta Dhanpatrai Publication
- A Text Book of Optics – N. Subramanyam & Brijlal; (Vikas Publishing House Pvt.Ltd)
- Nuclear Physics- S B Patel New Age International Publishers
- Concepts of Modern Physics – Arthur Beiser ; Tata McGraw – Hill Edition

Reference Books:

- LASERS Theory and Applications – K. Thyagarajan, A. K. Ghatak; Macmillan India Limited.
- Modern Physics – Jeremy Bernstein , Paul m. Fishbane, Stephen Gasiorowics ; Pearson Education
- Quantum Mechanics – L. J. Schiff; Mc-Graw Hill International Edition.
- PHYSICS (Volume I & II) – Resnick Halliday and Krane; Willey India 5th Edition
- Fundamentals of Optics – Francis A. Jenkins and Harvey E. White ; Mc-Graw Hill International Edition.

Course Outcomes: At the end of the course the student is expected to:

1. Understand wave phenomenon exhibited by Electromagnetic waves
2. Explain applications of Optics
3. Understand components of a laser system and their applications
4. Understand significance and normalization of wave function, Schrodinger wave equation
5. Understand and explain nuclear reactions, controlled chain reactions

EE- 101 BASIC ELECTRICAL ENGINEERING

Teaching Scheme:
Lectures : 3 hrs/week
Practical: 2 hr/week

Examination Scheme:
Assignments/Quiz : 40 marks
End Sem. Exam: 60 marks

Objectives:

- To understand and apply basic concepts of electrical engineering.
- To appreciate the broad significance of the concepts of electrical energy to all branches of Engineering.

Unit 1 **(5 hrs)**

Fundamentals : Circuit components R,L and C, their behavior, temperature dependence of various materials, types of sources, Ohms and Kirchoff's Laws, voltage and current division, elementary calculation of energy and power.

Unit 2 **(6 Hrs)**

Network Theorems : Mesh and Nodal Analysis, Thevenin, Norton and Superposition Theorems, Network Simplifications using star-delta / delta-star transformations.

Unit 3 **(9 hrs)**

AC Circuits: Generation of alternating voltages, fundamentals of ac circuits, behavior of pure R,L, C in ac circuits, concept of phasor and its representation ,series RL, RC and RLC circuits and parallel circuits, concept of Impedance and admittance, power triangle and power factor, three phase ac circuits and power measurements.

Unit 4 **(7 hrs)**

Magnetic Circuits : Magnetic circuit concepts, comparison of electric and magnetic circuits, magnetic materials and B-H curve, practical magnetic circuits with D.C. excitation – magnetic circuits with A.C. excitation – self and mutual inductance , energy stored in magnetic circuits, hysteresis and eddy current losses .

Unit 5 **(7 hrs)**

Electrical Machines : Electromechanical energy conversion, Types of ac and dc motors, characteristics and applications, ac generators.
1_Φ transformer: concept, types, working, ideal transformer, practical transformer, equivalent circuit, efficiency calculations.
Introduction to three phase transformer.

Unit 6 **(6 hrs)**

Utilization of electrical Energy

Basics of Illumination, working principle of commonly used electrical lamps such as Incandescent lamps, fluorescent, CFL, LED, sodium vapour etc.
Introduction to day to day LT switchgear.
Introduction to Tariffs, grounding and lightning protection.

Text Books:

- D.P. Kothari and I.J. Nagrath: Basic Electrical Engineering, TMH Edn. Second Edn.
- Ashfaq Husain: Fundamentals of Elec. Engg., Dhanpat Rai & Co., Delh
- A.E. Fitzgerald & Higginbotham, Basic Elec.Engg Mc Graw Hill Co., New York, 2nd Edn
- Vincent Del Toro: Electrical Engineering Fundamentals, Prentice Hall India.
- E.O. Taylor : Utilization of Elect. Energy

Reference Books:

- A.E. Fitzgerald and D.E. Higginbotham: Basic Electrical Engineering, McGraw Hill Book Co., New York, 2nd edition
- Vincent Del Toro: Electrical Engineering Fundamentals, Prentice Hall India.

Course Outcomes:

At the end of this course students will demonstrate the ability to:

1. Predict the behavior of simple electric and magnetic circuits.
2. Analyze DC and AC electric circuits.
3. Apply the knowledge of relevant laws and principles for solving circuit problems.
4. Familiarize with different theorems and analytical approaches for solving a given electric circuit.
5. Develop a clear understanding of operation and application of single phase transformer
6. Acquire the knowledge of basic principles, working and applications of various electric machines such as dc machines, induction and synchronous machines.
7. Develop the knowledge about various lamps and lighting schemes, commonly used protecting devices in day-to-day electric installations.

ME-103 ENGINEERING GRAPHICS

Teaching Scheme:
Lectures : 2 hrs/week

Examination Scheme:
T1 & T2 : 40 marks
End Sem. Exam: 60 marks

Objectives:

- To know the fundamental principles of geometrical drawing
- To visualize the various machine components

Unit 1 **(8 hrs)**

Introduction to methods of projections. Projections of points, lines, planes.

Unit 2 **(6 hrs)**

Orthographic Projections: Drawing orthographic projections from pictorial Projections by using first angle projection method.

Unit 3 **(6hrs)**

Isometric Projections: Difference between isometric view and projection. Drawing isometric views from given orthographic views.

Unit 4 **(6 hrs)**

Interpretation of given views, Missing views, Introduction to Computer aided drafting

Course Outcomes
The students should able to

1. The Course is designed to give students an ability to read and write the language of Engineering Graphics: to study its basic theory and to be familiar with its accepted conventions and abbreviations.
2. Develop the ability to visualize and communicate three dimensional shapes.
3. Comprehend general projection theory, with emphasis on orthographic projection to represent three-dimensional objects in two-dimensional views
4. To be able to plan and prepare neat isometric drawings of regular planes and solids
5. Dimension and annotate two-dimensional engineering drawings.
6. Freehand sketching to aid in the visualization process and to efficiently communicate ideas graphically.
7. To be able to plan and prepare neat orthographic drawings of points, straight lines, and regular planes and solids.
8. Knowledge of basics of CAD software

AS- 103 ENGINEERING CHEMISTRY

Teaching Scheme:
Lectures : 3 hrs/week

Examination Scheme:
Assignments/Quiz : 40 marks
End Sem. Exam: 60 marks

Objectives:
To learn about different Chemicals, Engineering materials with reference to Chemical bonding, properties and applications. Give the students a glimpse of Analytical chemistry and supplement the learning with Hands on experience in the Chemistry laboratory

Unit 1 **(8 hrs)**

Chemical bonding, Phase Rule, Metals and Alloys : Review of periodic trends, need for chemical bonding and types of bonding viz. ionic, covalent, metallic - Characteristic Properties , bond energy

Phase rule : concept of Components, phases, degree of freedom, One and two component systems

Unit 2 **(8 Hrs)**

Corrosion : Introduction; electrode and electrode potential, Electrochemical and Galvanic series, Corrosion

Dry (atmospheric) corrosion and mechanism, Pilling-Bedworth Rule .Wet(electrochemical) corrosion

Mechanism of Wet (electrochemical) corrosion – Galvanic corrosion, Concentration cell corrosion; Types like Pitting, Crevice, Stress, Intergranular corrosion

Factors affecting corrosion; nature of metal, nature of environment, Pourbaix (E - pH) diagram
Principles of electrochemical corrosion prevention; Cathodic protection, Passivity of metal and Anodic protection, Coatings-Types and functions

Unit 3 **(8 hrs)**

Water : Physical and chemical properties, Impurites and sources of water, Water quality parameters, Boiler feed water, Calculations of Hardness, Methods of water purification-Reactions involved in soda lime process, Ion exchange method

Unit 4 **(8 hrs)**

Fuels and batteries : Introduction, classification of conventional fuels, Solid, liquid and gaseous fuels. Characteristics of good fuels. Introduction, type fuel cell, H2 and O2 fuel cell , Phosphoric acid, SOFC , batteries- primary (Lead acid) , Secondary (Ni-Cd) , Lithium ion
Rocket fuels

Unit 5 **(6 hrs)**

Analytical Chemistry : Qualitative and Quantitative ananlysis, Titrimetry , gravimetry, instrumental methods of analysis : an overview, Absorption spectrometry UV, Vis, AAS
Electro analyticl methods: Potentiometry, pH metry, conductometry

Unit 6 **(6 hrs)**

Cement and Refractories : Cement types,Chemical and constituents comoposition,Setting and Hardening of cement.Various types of refractories

Reference Books:

- A textbook of Engineering Chemistry: Jain and Jain, Dhanpatrai Publication.
- Instrumental Methods of Chemical analysis, Willard Dean, Merrittee, Tata MacGrow Hill Limited.
- Fundamentals of Materials Science, L H VanVlack, Tata MacGrow Hill Limited.

Course Outcomes

1. Offered at the level of FYBTech, Engineering Chemistry course creates the basic foundation for the students to strengthen their understanding on the related core subjects in their respective branches
2. The significance of teaching the aforementioned course is realized in both research, and development of innovative technologies by the student's successful participation in various basic level research oriented programs, and competitions, both at the national and international levels.
3. Good knowledge of instrumental methods in chemistry.

PE- 101 ENGINEERING WORKSHOP

Teaching Scheme:
Practical : 3 hrs/week

Examination Scheme:
Term work : 100 marks

Objectives:
Introduction to different materials in engineering practices with respect to their workability, formability & machinability with hand tools & power tools and to develop skills through hands on experience.

Term work shall consist of three jobs and journal consisting of six assignments one on each of the following topics.

Carpentry - 1 job (Common for Electrical & Non electrical Group)
Introduction to wood working, kinds of woods, hand tools & machines, Types of joints, wood turning. Pattern making, types of patterns, contraction, draft & machining allowances
Term work includes one job involving joint and woodturning.

Fitting- (**1 Job for Non Electrical Group & Demonstration for Electrical Group)**
Types of Fits, concepts of interchangeability, datum selection, location layout, marking, cutting, shearing, chipping, sizing of metals, drilling and tapping.
Term work to include one job involving fitting to size, male-female fitting with drilling and tapping.

Sheet Metal Practice– (1 Job for Electrical Group & Demonstration for Non Electrical Group)
Introduction to primary technology processes involving bending, punching and drawing various sheet metal joints, development of joints.
Term work to include a utility job in sheet metal.

Joining – 1 job (Common for Electrical & Non electrical Group)
Includes making temporary and permanent joints between similar and dissimilar material by processes of chemical bonding, mechanical fasteners and fusion technologies.
Term work includes one job involving various joining processes like riveting, joining of plastics, welding, brazing, etc.

Assembly and Inspection. (Common for Electrical & Non electrical Group)
Assembly and Disassembly of some products, tools used. Videos of advancement in manufacturing technology. Inspection of various components using different measuring instruments.

Safety in Workshop (Demonstration Common for Electrical & Non electrical Group)
Fire hazards, electric short circuit –causes and remedies, Machine protection, Human protection, Accident prevention methods, developing ability to observe safe working habits. Introduction to measuring equipments used in Quality Control.

Forging (Demonstration Common for Electrical & Non electrical Group)
Hot working, cold working processes, forging materials, hand tools & appliances, Hand forging, Power Forging.

Moulding (Demonstration Common for Electrical & Non electrical Group)
Principles of moulding, methods, core & core boxes, preparation of foundry sand, casting, Plastic moulding.

Electrical Board Wiring (Demonstration Common for Electrical & Non electrical Group)
Electric power utilization, energy audit, Types of wiring - House wiring, stair case wiring, two-way switch wiring, Types of fuses and their uses, circuit breaker, Three phase wiring for electrical motors, earthing, minor fault finding.

Plumbing (Demonstration Common for Electrical & Non electrical Group)
Types of pipe joints, threading dies, Pipe fittings.

PCB Making (Demonstrations Common for Electrical & Non electrical Group)
Layout drawing, positive & negative film making, PCB etching and drilling

Course Outcomes:

At the end of this course, students should be able to understand

1. basic Manufacturing Processes used in the industry,
2. importance of safety
3. electrical and electronics circuit making.

AS -105 LABORATORY ENGINEERING PHYSICS – I

Teaching Scheme:
Practical : 2 hrs/week

Examination Scheme:
Term work : 50 marks
Oral +Practicle: 50 marks

Objectives:
To develop experimental skills and understand the principles in Physics and their applications in the field of Engineering.

List of Experiments:

1. To determine the wavelength of sodium light by Newton's ring apparatus.
2. To determine the wavelengths of light of a given source using diffraction grating.
3. Determination of the power distribution within the laser beam and spot size of the beam.
4. To measure the divergence of the laser beam
5. To measure the thickness of fine wire and grating element of the given grating with help of Laser source.
6. To verify of Law of Malus for plane polarized light.
7. Determination of Brewster's angle for a glass surface and Refractive index of a glass.
8. Frank-Hertz Experiment
9. To determine the specific rotation of the given sample with the help of Polarimeter
10. To verify De-Broglie's hypothesis with the help of Electron Diffraction experiment
11. To determine the numerical aperture of the given optical fiber.

Course Outcomes

1. Hands on experience over basic optical instruments
2. Verification of Laws of optics
3. Analyze interference pattern
4. Measurement of Wavelength
5. A basic foundation over quantum theory

AS- 107 CHEMISTRY LABORATORY

Teaching Scheme:
Practical : 2 hrs/week

Examination Scheme:
Term work : Experimentation 72+28 marks exam = 100 marks

Objectives:
To develop experimental skills and understand the principles in Chemistry and their applications in the field of Engineering.

1. Preparation of analytical reagents.
2. Use of pH meter.
3. Verification of Lambert-Beer's law.
4. Estimation of copper from brass.
5. Determination of Alkalinity of water sample
6. Determination of hardness of given water sample by complexometry
7. Determination of Chlorides from water sample by Mohr's method
8. Estimation of Nickel from steel sample
9. Estimation of corrosion susceptibility of various materials
10. Use of Flame photometer for estimation of Metal ions in solution.
11. Preparation of analytical reagents.
12. Use of pH meter.
13. Verification of Lambert-Beer's law.
14. Estimation of copper from brass.
15. Determination of Alkalinity of water sample
16. Determination of hardness of given water sample by complexometry
17. Determination of Chlorides from water sample by Mohr's method
18. Estimation of Nickel from steel sample
19. Estimation of corrosion susceptibility of various materials
20. Use of Flame photometer for estimation of Metal ions in solution.

At the end of semester a practical exam will be conducted worth 28 marks during the regular practical hours

Course Outcomes

1. Chemistry practical course provides the foundation for the students to strengthen their practical understanding on the related core subjects in their respective branches
2. Students become practically competent to successfully participate in both research, and development of innovative technology programs, both at the national and international levels.
3. This course provides hands on training on instruments which are used in various industrial laboratories.

EE-103 BASIC ELECTRICAL ENGINEERING LAB

Teaching Scheme
Practical: 2 hrs/week

Examination Scheme
Term work: 100 Marks

Minimum eight practical's are to be conducted out of the following.

List of Experiments:

1. Effect of temperature on resistance.
2. Verification of KVL and KCL. Verification of current and voltage division.
3. Norton and Thevinin's theorem.
4. Superposition theorem.
5. Evaluation of internal resistance of choke coil.
6. Resonance at constant frequency variable capacitance.
7. Resonance at constant L and C and variable frequency.
8. RL, RC Locus diagram.
9. Three phase balanced star/delta circuits.
10. Experiments on 3-limb transformer.
11. Magnetic force of electric origin.

Course Outcomes:

1. Introduction to the basic Electrical circuit components and their behaviour
2. Practical verification of theorems applied to the Electrical circuits
3. Knowledge of single-phase and three-phase circuits and power measurement
4. Evaluation of magnetic circuit parameters
5. Analysis of errors in the experiments
6. Working in a methodical and organized manner
7. Improved communication ability as a result of careful experiment report writing

ME- 105 ENGINEERING GRAPHICS LAB

Teaching Scheme:
Practical : 2 hrs/week

Examination Scheme:
Term work : 100 marks

Laboratory work shall consist of four A2 (420mm x 594 mm) size drawing sheets as given below

Sketch Book Practice
Methods of dimensioning & symbol for methods of projections as per SP46-1988
Machine Components
Sheet No 1
One problem based on projections of lines and one problem based on projections of planes
Sheet No 2
Three problems based on orthographic projections
Sheet No 3
There problems based on isometric projections
Sheet No 4
Three problems based on missing views
Sheet No 5
Computer Aided Drafting Rule, Types of problems on Indeterminate form

Text Books

1. N.D.Bhatt, Elementary Engineering Drawing, Charotar Publishing House, Anand(India)
2. M.L.Dabhade Engineering Graphics I,Vision Publications,Pune

Reference book

- Warren Luzzader, Fundamentals of Engineering Drawing, Prentice Hall of India, New Delhi.

Course Outcomes

The students should able to

1. The course is designed to give students an ability to read and write the language of Engineering Graphics: to study its basic theory and to be familiar with its accepted conventions and abbreviations.
2. Develop the ability to visualize and communicate three dimensional shapes.
3. Comprehend general projection theory, with emphasis on orthographic projection to represent three-dimensional objects in two-dimensional views
4. To be able to plan and prepare neat isometric drawings of regular planes and solids
5. Dimension and annotate two-dimensional engineering drawings.
6. Freehand sketching to aid in the visualization process and to efficiently communicate ideas graphically.

7. To be able to plan and prepare neat orthographic drawings of points, straight lines, and regular planes and solids.
8. Knowledge of basics of CAD software

IInd Semester Curriculum Structure and Syllabus of F.Y.B.Tech. (Non Electrical Group)

Division 1 To 5 Non Electrical Group

Subject Code	***Subject Name***	Subject Category	Subject Type	Credit
MA-102	*Engineering Mathematics-II*	4 Credits subject	Theory	4
AS-102	*Engineering Physics-II*	3 Credits subject	Theory	3
CE-102	*Engineering Mechanics*	3 Credits subject	Theory	3
ET-102	*Basic Electronics*	3 Credits subject	Theory	3
CT-102	*Fundamentals of Computer Programming*	3 Credits subject	Theory	3
AS-106	*Engineering Physics-II LAB*	1 Credit Laboratory	Lab	1
CE-104	*Engineering Mechanics LAB*	1 Credit Laboratory	Lab	1
CT-104	*Computer Programming LAB*	2 Credits Laboratory	Lab	2
ML-102	*Professional Ethics*	1 Credit subject	Theory	1
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MA-102 ENGINEERING MATHEMATICS - II

Teaching Scheme	Examination Scheme
Lectures : 3hrs / week	Internal: 40 marks
Tutorial: 1 hr/week	End Sem. Exam: 60 marks

Objectives: The basic necessity for the foundation of Engineering & Technology being mathematics, the main aim is, to teach mathematical methodologies & models, develop mathematical skills & enhance thinking power of students.

Unit I : Review and some new techniques of integration (4)
Reduction formulae, Beta & Gamma functions with Properties(without proofs), Differentiation under the Integral sign (both rules (without proofs) with examples).

Unit II : Double Integrals (8)
Double integrals, Examples(Areas, Moments, Center of Mass), Change of order of integration with examples, Double integrals in Polar form.

Unit III : Triple Integrals (8)
Triple integrals in rectangular coordinates, Masses and moments in three dimensions, Triple integrals in spherical and cylindrical coordinates, examples.

Unit IV : Ordinary Differential Equations (6)
Basic concepts and ideas about ordinary differential equations, Exact differential equation, Integrating factors, First order linear differential equation, Bernoulli equation, Applications to basic electric circuits (L-R, R-C, L-C circuits), Orthogonal trajectories.

Unit V: Linear Differential Equations of the second order and their applications: (9)
Homogeneous linear equations of second order, Second order homogeneous equations with constant coefficients, Differential operators, Euler Cauchy Equations, Non-homogeneous Equations, Solution of non-homogeneous equations with constant coefficients using method of undetermined coefficients and method of variation of parameters. Modeling - Mass Spring Systems, Forced Oscillations, Resonance.

Unit VI: Higher Order Linear Differential Equations and Simultaneous Differential Equations **(**5)
Higher order homogeneous and non-homogeneous equations with constant coefficients, Application to elastic beams, Simultaneous differential equations.

Text Books

1. Thomas' Calculus (11th Edition), Pearson Education, Delhi.
2. Advanced Engineering Mathematics (7 Student Edition) by Erwin Kreyszig, Wiley Eastern Ltd.

Reference Books

1. Engineering Mathematics Vol I, II, III by P.N. Wartikar, J. N. Wartikar Pune Vidyarthi Gruha Prakashan.
2. Advanced Engineering Mathematics by C.R. Wylie, McGraw Hill Publications, New Delhi.
3. Advanced Engineering Mathematics (5th edition) by Peter V. O' Neil, Thomson.Brooks / Cole, Singapore.
4. Differential Equations With Applications and Historical Notes by George F Simmons
5. Higher Engineering Mathematics by B. V. Ramana (Tata McGraw Hill Publ.)

Course Outcome:

1. Students will be able to think logically & understand the basic concepts.
2. Demonstrate problem solving for application of multiple integrals in solving Engineering problems.
3. Prepare themselves to understand the more advanced topics in differential equations by learning basics of differential equations.

AS-102 ENGINEERING PHYSICS –II (NON E)

Teaching Scheme:
Lectures : 3 hrs/week

Examination Scheme:
100 marks: Assignments/Quiz -40 marks
End-Sem Exam- 60 marks

Unit 1

Electrodynamics: Differential and integral calculus: Concept of gradient, operator, divergence and curl Line, surface and volume integrals Introduction, Coulomb,s law, Electric Field, Continuous charge distribution,Gauss theorem,Magnetic fields and forces(introduction 5 min) Biot Savarts law, Ampers circuital law

Unit 2

Structure of Solids and its Characterizations :

Introduction
Crystalline state
Space lattice
Crystal structure basis and lattice
Unit cell and primitive cell in two dimensional lattice
Miller indices
Interplaner distance of lattice plane
Crystal systems (leniently) (cubic, monoclinic,……Triclinic)
Atomic radius (simple cubic, fcc, bcc)
No. of atoms in unit cell
Coordination number
Packing fraction
Reciprocal lattice
X-ray diffraction: Braggs law, x-ray spectrometer, analysis(Excluding laue method)

Unit 3
Solid state physics :
Free electron theory, Band theory of solids, Classification of solids on the basis of band theory, Fermi-Dirac probability function, Position of Fermi level in intrinsic (with derivation) and extrinsic semiconductors, Semiconductor conductivity, Hall effect

Unit 4
Thermodyanamics and statistical mechanics: Microscopic and macroscopic systems, Basic postulates of statistical mechanics, Probability ensembles, Partition function, Fermi dirac, Bose Einstein and Maxwell Boltzmann statistics. Reversible and irreversible processes, Laws of thermodyanamics; Zeroth, first , second, Third, Statisctcal interpretation of basis thermodynamic variables; energy, work, pressure, entropy, Helmotz free energy.

Unit 5

Thermal properties of solids : Thermal vibrations, specific heat of solids, Classical theory : Dulong petit law, Einsteins theory of specific heat, Debye's theory of specific heat:vibrational modes, density of vibrational mode, debye's approximation.

Unit 6

Magnetism and superconductivity : Origin of Magnetic Moment, Diamagnetism, Paramagnetism;Langevin's Theory, Ferromagnetism; Weiss Theory(Spontaneous magnetization and Domain hypothesis), Antiferromagnetism, Ferrimagnetism.
Principle of superconductivity, Meissner effect, Properties of superconductors, Type-I and Type-II superconductors.

Text Books:

- Solid State Physics, S. O. Pillai, New Age International Publishers.
- Fundamentals of statistical Mechanics, B. B. Laud, New Age International Publishers

Reference Books

- *Solid state electronic devices, Ben G. Streetman, Sanjay Banerjee* Pearson Prentice-Hall
- Semiconductor devices, physics and technology, S. M. Sze, Wiley
- Fundamentals of Statistical and Thermal Physics by F. Reif Levant Pub.
- Text Book of Engineering Physics by Avadhanulu & Kshirsagar, S. Chand Pub.

Course Outcomes: The student is expected to:

1. Understand Crystal structure analysis by X-ray diffraction
2. Understand Fermi-Dirac probability function, position of Fermi level in intrinsic and extrinsic Semiconductors, Semiconductor Conductivity
3. Fermi Dirac, Bose Einstein and Maxwell Boltzmann statistics
4. Statistical interpretation of basis thermodynamic variables; energy, work, pressure, entropy, Helmholtz free energy.
5. Langevin's Theory, Weiss Theory and Principles of superconductivity

CE-102 ENGINEERING MECHANICS

Teaching Scheme:
Lectures : 3 hrs/week

Examination Scheme:
T1 & T2 : 40 marks
End Sem. Exam: 60 marks

Objectives:
This is a basic engineering course common to all branches to inculcate in the students, problem solving abilities and to enhance their analytical abilities..

Unit 1 **(7 hrs)**

Introduction to the principles of mechanics, General force system, Moment of a force about a point and about an axis, Equivalent force systems: Resultant of a force system, 3 D and 2 D cases, Properties of surfaces: Centroid, Second moment of area, Products of inertia.

Unit 2 **(7 Hrs)**

Equilibrium: 3 D and 2 D cases, Beams, Trusses, frames and cables.

Unit 3 **(7hrs)**

Friction forces: Laws of Coulomb friction; simple contact friction problems; Belt friction, Principle of virtual work: Application to beams and simple mechanisms.

Unit 4 **(7 hrs)**

Kinematics of particles: Basic concepts; Rectangular components; Normal and tangential components; Radial and transverse components; Relative motion; Dependant motion: Kinematics of rigid bodies: Translational motion; Rotation about a fixed axis; General plane motion; Instantaneous centre of rotation.

Unit 5 **(7 hrs)**

Kinetics of particles: Newton's second law; Impulse momentum principle; Central impact; Energy principles.

Unit 6 **(7 hrs)**

Introduction, Free vibration, Torsional vibration, Energy methods, Forced vibration without damping under sinusoidal loading.

Text Books:

- Irving H. Shames, Engineering Mechanics, Prentice Hall, New Delhi 1997.
- Beer and Johnston , Mechanics for Engineers, Statics and Dynamics, McGraw Hill
- Timoshenko and Young, Engineering Mechanics, McGraw Hill Publication.

Course Outcome:

1. Demonstrate a working knowledge Engineering Mechanics.
2. Demonstrate problem solving ability for rigid body mechanics.
3. Exhibit various applications of Newtonian Mechanics

ET- 102 BASIC ELECTRONICS

Teaching Scheme:
Lectures : 3 hrs/week

Examination Scheme:
End Sem Exam – 60 marks
Quizzes: 40 marks

Objectives:
To create awareness amongst students regarding electronic and communication devices, circuits and systems used in industry, laboratories and day-to-day applications.

Unit 1 **(8 hrs)**

Semiconductor Devices and Applications: Introduction to P-N junction Diode, Full-wave bridge rectifier, capacitor filter, Zener diode and characteristics, Zener diode as voltage regulator, Regulated power supply, Introduction to BJT, BJT as a Single stage CE amplifier, Frequency response and bandwidth, LED and LCD Displays.

Unit 2 **(6hrs)**

Feedback and OPAMP: Principle of feedback, block schematic of feedback amplifier, Effect of negative feedback on amplifier parameters, Op-Amp as black box, Ideal Op-Amp, Study of practical op-amp IC 741, Linear applications: Inverting and Non-inverting, Summing, Difference amplifier, unity gain buffer.

Unit 3 **(6hrs)**

Timing Circuits and Signal Generators: RC-timing circuits, IC 555 and its applications as Astable and Mono-stable multi vibrators, Positive feedback, Barkhausen's criteria for Oscillations, R-C oscillators, IC 8038 as function generator IC.

Unit 4 **(6 hrs)**

Digital Electronics Fundamentals: Difference between analog & digital signals, Boolean algebra, Basic & Universal Gates, Symbols, Truth tables, Expressions, Logic simplification, Logic ICs, Adder/Subtractor, Multiplexers/de-multiplexers, Flip-Flops, Asynchronous counters.

Unit 5 **(6 hrs)**
Introduction to Microprocessors: Shift registers, Memory (RAM, ROM, PROM, EPROM), Architecture and instruction set of 8085 microprocessor, Programming examples for simple applications

Unit 6 **(8 hrs)**

Introduction to Electronic Communication Systems: Block schematics, modulation schemes, Wired and wireless channels, Broadcast radio, principle of Systems such as cellular telephony and its generations up to 4G, Data networks and Internet, Convergence.erformance parameters of an amplifier, Analysis of one circuit for each
Feedback topology.

Text Books:

- Malvino; Electronic Principles; PHI.
- R. P. Jain; Modern Digital Electronics; Tata Mc Graw Hill; Third Edition

Reference Books:

- Frenzel; Communication Electronics; WIE.
- Allen Mottershed; Electronic Devices & Circuits; PHI.

Course Outcomes:

1. Students will develop an understanding of the fundamental principles of electronics and will be able to apply this knowledge to analog and digital electronic circuits.
2. Students will get acquainted with types of memory and the timing circuits.
3. Students will have a good foundation on basic microprocessor- principles and practices.
4. Students can understand the concepts of wired and wireless communication systems.

CT-102 FUNDAMENTALS OF COMPUTER PROGRAMMING

Teaching Scheme:
Lectures : 3 hrs/week
Practical : 3 hr/week

Examination Scheme:
T1 & T2 : 40 marks
End Sem. Exam: 60 marks

Objectives:

- Introduction to computer technology with emphasis on computer programming
- Building logical approach to solve practical problems using computers

Unit 1 **(4 hrs)**

Introduction :

1. **Introduction to computers**
   - Brief history of computers
   - Computer hardware: various parts such as CPU, input/output devices etc.
   - Types of computers: single user (PC), multi-user/client-server etc.
   - General concepts related to software
     - System software, application software
     - Free and Open Source vs. Proprietary software
     - World-wide Web, e-mail, office applications, newsgroups etc.

2. **Overview of programming environments**
   - Example of a popular proprietary operating system such as Microsoft Windows
   - Example of a popular open source operating system such as GNU/Linux

Unit 2 **(10 Hrs)**

C' language syntax and basic problem solving

1. **Introduction to following 'C' language constructs:**
   - Basic program structure of a typical 'C' program
   - I/O statements
   - Variables and Constants
   - Operators
   - Control flow statements and blocks: if-else, switch
   - Loop statements: for, while, do-while, break and continue

2. **Application of the above constructs to solve the following elementary programming problems**
   - Exchanging the values of two variables
   - Summation of a set of numbers
   - Sine function computation

- Generation of the Fibonacci sequence
- Finding the square root of a number
- The greatest common divisor of two integers
- Generating prime numbers
- Raising a number to large power

Unit 3 **(8 hrs)**

Array Techniques, Functions and Problem solving using Arrays and Functions

1. 'C' language syntax related to Arrays and Functions

- Defining array variables (one, two and multi-dimensional)
- Defining and calling functions
- Global, local and static variables

2. Solving problems using Arrays and Functions

- Finding the maximum number in a set
- Array order reversal
- Removal of duplicates from an ordered array
- Selection sort
- Bubble sort

Unit 4 **(10 hrs)**

Introduction to Data Structures

1. 'C' syntax for following constructs/features

- Pointers and addresses
- Pointers and dynamic arrays
- Structures and Unions
- File handling

2. Programs using data structures

- Create a linked list
- Insert element into an existing linked list
- Delete element(s) from a linked list
- Traverse a linked list
- Reading (writing) structures from(to) a file

Unit 5 **(4 hrs)**

Recursive Algorithms

- Concept of Recursion
- Factorial computation
- Tower of Hanoi problem
- Finding (n, r) (Combinations of n things taken r at a time)
- Finding maximum number from an array of numbers

Unit 6 **(4 hrs)**

Introduction to Object Oriented Programming paradigm

1. Concepts related to Object Oriented Programming paradigm
   - Classes, Objects
   - Private and Public variables and methods
   - Inheritance

2. Sample programs using OO Programming language (C++/Java)

Text Books:

- How to solve it by Computer by R.G. Dromey, Pearson Education
- Programming in ANSI C by E. Balguruswamy, Tata Mc-Graw Hill
- Object-Oriented Programming With C++ By E. Balaguruswamy, Tata Mc-Graw Hill

Reference Books:

- The 'C' programming language by Kernighan and Ritchie, Prentice Hall
- Computer Programming in 'C' by V. Rajaraman , Prentice Hall

Course outcomes:

This course is one of the fundamental courses for all Engineering disciplines as computer programming has become an indispensable part of every branch of technology. This course

1. Introduces the fundamental concepts related to computer programming – development of step-by-step procedure to solve a complex problem by breaking it down into smaller manageable problems
2. Introduces 'C', one of the widely used higher level languages
3. Emphasizes the use of computer as a programmable device to handle repetitive tasks that make the problems tedious for human beings
4. Stresses on logic building, the skill that is independent of programming environment, required for programming.

AS-106 LABORATORY II – PHYSICS – II

Teaching Scheme
Practical: 2-hrs/week

Examination Scheme
Term work: 50 Marks
Oral + Experiment:50 Marks

List of Experiments:

1. Characteristic of GM counter
2. Measurement of e/m of an electron by Thomson's method
3. Band gap of a semiconductor by four probe method
4. Structural study of crystalline material
5. Hall effect in Semiconductor
6. Magnetoresistance measurement of semiconductor
7. Linear or mass attenuation coefficient by GM counter
8. Measurement of magnetic susceptibility by Quinke's method
9. Hysteresis loop trace
10. Study of Biot-Savart's law

Course Outcomes:

1. Measurement of resistivity and band gap of Semiconductors
2. Measurement of linear attenuation coefficient
3. Parameters for classification of magnetic materials
4. Basic understanding of electromagnetic force

CE-104 ENGINEERING MECHANICS LAB

Teaching Scheme :	**Examination Scheme**
Lab: 2 hrs/ week	Term work: 75 Marks
	Oral : 25 Marks

Objective

To verify the principles of mechanics experimentally and to develop in the students the skill of using graphical methods and computer programming for the solution of mechanics problems.

There shall be 6 experiments and 6 assignments (Based on the graphical methods and computer programming) on 6 units of the theory course.

Course Outcome:

1. Identify when theory applies and when theory is limited by simplifying assumptions
2. Identify reasons why actual measurements will differ from theoretical calculations
3. Use the laboratory equipment correctly and safely to perform all experiments

CT-104 FUNDAMENTALS OF COMPUTER PROGRAMMING LAB

List of Experiments :

Instructors will have flexibility in framing assignments so as to cover all the topics discussed in the class. The programs mentioned in the theory syllabus are listed below for ready reference:

- Exchanging the values of two variables
- Summation of a set of numbers
- Sine function computation
- Generation of the Fibonacci sequence
- Finding the square root of a number
- The greatest common divisor of two integers
- Generating prime numbers
- Raising a number to large power
- Finding the maximum number in a set
- Array order reversal
- Removal of duplicates from an ordered array
- Selection sort
- Bubble sort
- Create a linked list
- Insert element into an existing linked list
- Delete element(s) from a linked list
- Traverse a linked list
- Reading (writing) structures from(to) a file
- Factorial computation
- Tower of Hanoi problem
- Finding (n, r) (Combinations of n things taken r at a time)
- Finding maximum number from an array of numbers

Sample programs using OO Programming language (C++/Java

Course outcomes:

This laboratory course

1. Makes students familiar with computer systems as a programmer
2. Makes them familiar with debugging techniques
3. Enables them to see the usage of computer as a programmable device to handle repetitive and tedious tasks
4. makes them proficient in 'C', a widely used higher level language

ML-102 PROFESSIONAL ETHICS AND HUMAN VALUES

Teaching Scheme:
Lectures : 1 hrs/week

Examination Scheme:
T1 & T2 : 40 marks
End Sem. Exam: 60 marks

Objectives:

- To create an awareness on Engineering Ethics and Human Values.
- To understand social responsibility of an engineer .
- To appreciate ethical dilemma while discharging duties in professional life.

Unit 1 **(2 hrs)**

HUMAN VALUES : Morals, Values and Ethics – Integrity – Work Ethic – Honesty – Courage – Empathy – Self-Confidence – Character .

Unit 2 **(3 Hrs)**

ENGINEERING ETHICS : Senses of 'Engineering Ethics' - variety of moral issued - types of inquiry - moral dilemmas - moral autonomy - Kohlberg's theory - Gilligan's theory - consensus and controversy – Models of Professional Roles - theories about right action - Self-interest - customs and religion - uses of ethical theories. Valuing Time – Co-operation – Commitment

Unit 3 **(3 hrs)**

ENGINEERING AS SOCIAL EXPERIMENTATION : Engineering as experimentation - engineers as responsible experimenters - codes of ethics - a balanced outlook on law - the challenger case study

Unit 4 **(3 hrs)**

SAFETY, RESPONSIBILITIES AND RIGHTS : Safety and risk - assessment of safety and risk - risk benefit analysis and reducing risk - the three mile island and chernobyl case studies.

Unit 5 **(3 hrs)**

GLOBAL ISSUES : Multinational corporations - Environmental ethics - computer ethics - weapons development - engineers as managers-consulting engineers-engineers as expert witnesses and advisors -moral leadership-

Text Books:

- Mike Martin and Roland Schinzinger, "Ethics in Engineering", McGraw-Hill, New York 1996.
- Govindarajan M, Natarajan S, Senthil Kumar V. S, "Engineering Ethics", Prentice Hall of India, New Delhi, 2004.

Reference Books:

- Charles D. Fleddermann, "Engineering Ethics", Pearson Education / Prentice Hall, New Jersey, 2004 (Indian Reprint now available).
- Charles E Harris, Michael S. Protchard and Michael J Rabins, "Engineering Ethics – Concepts and Cases", Wadsworth Thompson Leatning, United States, 2000 (Indian Reprint now available)
- John R Boatright, "Ethics and the Conduct of Business", Pearson Education, New Delhi, 2003.
- Edmund G Seebauer and Robert L Barry, "Fundamentals of Ethics for Scientists and Engineers", Oxford University Press, Oxford, 2001.

Semester II

Course Outcomes

1. Understand the need, basic guidelines, content and process for value education.
2. Understand the need of self and body, harmony of self with body.
3. Understand the harmony in the family, difference between respect and differentiation.
4. Understand the harmony in nature, interconnectedness and mutual fulfillment in nature, holistic perception of harmony.
5. Understand natural acceptance of human values, competence in professional ethics.