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