**SYLLABUS**

**B. Tech. First Semester**

Mathematics – I

## Total Credits: 4 Subject Code: BES1-1

**Teaching Scheme Examination Scheme**

Lectures: 3 Hours/Week Theory T (U): 70 Marks, T (I): 30 Marks

Tutorial: 1 Hour/Week Duration of University Exam: 3 hours

## Course Objectives:

1. The topics covered will equip them the techniques to understand advanced level mathematics and its applications that would enhance analytical thinking power.
2. The aim is to inculcate and develop the basic mathematics skills of engineering students that are imperative for effective understanding of engineering subjects.

## Course Outcomes:

After completing the course, students will be able to

1. Analyze real world scenarios to recognize when derivatives or integrals are appropriate, formulate problems about the scenarios, creatively model these scenarios (using technology, if appropriate) in order to solve the problems using multiple approaches, judge if the results are reasonable, and then interpret and clearly communicate the results.
2. Appreciate ODE and system of ODEs concepts that are encountered in the real world, understand and be able to communicate the underlying mathematics involved to help another person gain insight into the situation.
3. Apply knowledge of mathematics, physics and modern computing tools to scientific and engineering problems.
4. Develop an ability to identify, formulate and/or solve real world problems.
5. Understand the impact of scientific and engineering solutions in a global and societal context.

## Unit 1: Differential Calculus (8 Hours)

Successive differentiation: Leibnitz’s Rule,Taylor’s and Maclaurin’s series for function of one variable, Indeterminate forms and L’Hospital’s Rule, Maxima and Minima for function of one variable.

**Unit 2: Multivariable Calculus (Differentiation) (12 Hours)** Functions of several variables, First and Higher order partial derivatives, Euler’s theorem, Chain rule and Total differential coefficient, Jacobians, Taylor’s and Maclaurin’s series for function of two variables, Maxima and Minima for function of two variables, Lagrange’s method of undetermined multipliers.

## Unit 3: Matrices (8 Hours)

Inverse of a matrix by Partitioning method, Rank of a matrix, Consistency of linear system of non-homogeneous equations, Homogeneous system of Linear equations, Symmetric, Skew- symmetric and Orthogonal matrices, Linear and Orthogonal transformations, Cayley- Hamilton theorem.

**Unit 4: First Order Ordinary Differential Equations (8 Hours)** Linear, Reducible to linear and Bernoulli’s differential equations, Exact differential equations (excluding the cases of integrating factors), Equations of first order and higher degree: Solvable for p, Solvable for y, Solvable for x and Clairaut’s type, Application of first order differential equation to simple electrical circuits.

**Unit 5: Higher Order Ordinary Differential Equations (12 Hours)** Higher order ordinary linear differential equations with constant coefficients, Method of variation of parameters, Cauchy’s and Legendre’s homogeneous differential equations, Simultaneous differential equations, Equations of the type d2y/dx2=f(x) and d2y/dx2=f(y), Applications of higher order differential equations to simple electrical circuits.

# B. Tech. Semester I Applied Physics (Total Credits: 4)

**Teaching Scheme Examination Scheme**

**Lectures: 3hr/Week, T (U): 70 Marks T (I): 30 Marks Activity/Tutorial: 2 hr/Week Duration of University Exam. : 3 Hours**

**Unit 1: Wave optics (09 Hours) 14 Marks**

Huygen’s principle, superposition of waves and interference of light by wavefront splitting and amplitude splitting, Interference in thin films, Interference in Wedge shape thin film, Newton’s rings, Anti-reflection coating.

Fraunhoffer diffraction from a single slit and a circular aperture, Diffraction grating and its resolving power.

## Unit 2: Quantum Mechanics (10Hours) 14 Marks

Planck’s Hypothesis, Properties of Photons, Compton Effect: Equations for energy and momentum conservation, Expression for Compton shift & its interpretation. Concept of wave- particle duality, de-Broglie Hypothesis, Matter Waves, Davisson-Germer Experiment; Bohr’s Quantization condition.

Wave function Ψ and normalization condition, concept of wave packets, Heisenberg Uncertainty Principle. Schrodinger wave equation (time dependent and time independent), Application to one dimensional infinite potential well.

## Unit 3: Crystal Structure (08 Hours) 14 Marks

Crystal structure, Meaning of lattice and basis, Unit cell: primitive and non primitive unit cell; Cubic crystal structure: Simple, Body and Face centered cubic structures, Unit cell characteristics: Effective number of atoms per unit cell, atomic radius, nearest neighbor distance, coordination number, atomic packing fraction, void space, density.

Crystal planes and Miller indices, Inter-planar distance and its co-relation with Miller indices and lattice parameter , Bragg’s law of X-ray diffraction.

## Unit 4: Optical Fiber (08 Hours) 14 Marks

Optical fibers: Propagation by total internal reflection, structure and classification (based on material, refractive index and number of modes), Modes of propagation in fiber, Acceptance angle, Numerical aperture, Attenuation and dispersion.

Light sources and Detectors, Applications of optical fiber as Sensors - i) Temperature Sensor ii) Pollution / Smoke detector iii) Liquid level sensor, Fiber optic communication system

## Unit 5: Electron Optics (07 Hours) 14 Marks

Basic idea of motion of charged particle in electric and magnetic fields, Velocity selector, Bethe’s law of electron refraction, electric focusing, Construction & working of Electrostatic lens.

Devices: Cathode Ray Tube, Cathode Ray Oscilloscope and its applications, Block Diagram, Function & working of each block, Bainbridge mass spectrograph.

**CHEMISTRY**

**SYLLABUS FOR FIRST YEAR (SEMESTER I & II) BACHELOR OF TECHNOLOGY**

**Energy and Environment**

**UNIT 1:- Basics of Energy and Solid Fuels (8 Hours) (Marks 14)**

* Basics of Energy - Introduction, sources and types of energy, Units of energy, Thermal Basics of energy -fuels, thermal energy contents of fuel, heat capacity, sensible and latent heat, evaporation, condensation, steam, moist air and humidity & heat transfer.
* Classification of fuels, Calorific Value (HCV & LCV). Determination of Calorific value by Bomb and Boy’s Calorimeter.
* Solid Fuels:- Significance of Proximate and Ultimate Analysis of coal,
* Numerical based on Dulong’s formula.
* Numerical on Goutal’s Formula for Gross Calorific Value based on Proximate Analysis
* Numerical on Calorific Value determination.
* Numerical on GCV & NCV by using relation formula (convert answer in joules or one of the CV given in joules)

**UNIT 2: Liquid and Gaseous Fuels**

**(8 Hours) (Marks 14)**

* Liquid Fuel:-Fractional distillation of crude oil, Catalytic cracking and its advantages
* Knocking in internal combustion petrol and diesel engine, Octane and Cetane number, Knocking and its relationship with structure of fuel, Doping agents,
* Power alcohol, Gasohol, Diesehol, Aviation fuel, Bio-diesel.
* Gaseous Fuel:-CNG, H2 as specialised fuel
* Combustion Calculations**.**

**UNIT 3:- AlternateSources of Energy &Waste to Energy Conversion (8 hours) (Marks 14)**

* Bio-energy, Photolysis of water- Chemical Conversion of Solar Energy.
* Nuclear fuels: Numerical on Binding Energy & Average Binding Energy per Nucleon
* Fuel cells- working, advantages and disadvantages of alkaline, methanol fuel cells.
* Classification of waste on the basis of segregation at source, hazardous solid waste management technology:Physical method, chemical method, biological treatment, Eco-friendly Incineration, Depoymerization,landfill techniques.
* Utilization of Biogas and Landfill Gas for Biofuels and High Value Chemicals, gasification and Utilization of Syngas, Thermochemical Conversion of Syngas

**UNIT 4:- Environmental impacts of Energy Technologies (8 Hours) (14 Marks)**

* Industrial pollution due to non-renewable energy sources: General Introduction of Industrial pollution and its types. Principle, processes, source of pollution.
* Environmental impact and its control with reference to specific industries; like Nitrogen containing fertilizers- ammonia synthesis, Cement manufacturing Industry; Sulfuric acid manufacturing industry and petroleum Industry

**UNIT 5:- Advanced materials for sustainable development (8 Hours)** (**14 Marks)**

* Introduction of Advance materials, properties and applications:- composites, liquid Crystal polymers, conducting polymers, insulating materials, adhesives, biodegradable polymers.
* Nanomaterials in energy- Photochemical devices like lithium ion batteries, Nanomaterials for Energy Storage, nanomaterials in solar cells.

