B.Tech. SYLLABUS

(I YEAR)

2015-16 Onwards

NATIONAL INSTITUTE OF TECHNOLOGY

TIRUCHIRAPPALLI 620015

TAMILNADU, INDIA
## B.Tech I – Semester Courses

<table>
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<tr>
<th>CODE</th>
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<th>Credits</th>
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<td>MEIR 11</td>
<td>Basics of Mechanical Engineering (For CE, EEE, ECE, ICE &amp; CSE)</td>
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<td>EEIR 11</td>
<td>Basics of Electrical and Electronics Engineering (For PE, ME, MME, CE, Ch.E)</td>
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## B.Tech. II – Semester Courses

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**TOTAL**                   | 18/17 | 2/1 | 10 | 24/23 or 23/22 |

### Department Core Course

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<td>MEPC 10</td>
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<td>PR 102 Engineering Mechanics</td>
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HSIR 11 ENGLISH FOR COMMUNICATION

Objective
The primary objective is to develop in the under-graduate students of engineering a level of competence in English required for independent and effective communication for academic and social needs.

Course Material
Instruction will be provided through appropriate material – articles from popular magazines, newspapers, technical journals, samples from industries and also text books. Practice in the four language skills necessary for their specific technical requirements will be provided in an integrated manner.

Course Content

**Communication**
An introduction - Its role and importance in the corporate world – Tools of communication – Barriers – Levels of communication – English for Specific purposes and English for technical purposes.

**Listening**
Listening process & practice – Exposure to recorded & structured talks, class room lectures – Problems in comprehension & retention – Note-taking practice – Listening tests- Importance of listening in the corporate world.

**Reading**

**Speaking**

**Writing**
Effective writing practice – Vocabulary expansion - Effective sentences: role of acceptability, appropriateness, brevity & clarity in writing – Cohesion & coherence in writing –Writing of definitions, descriptions & instructions - Paragraph writing - Introduction to report writing.

Outcome
The students will be able to express themselves in a meaningful manner to different levels of people in their academic and social domains.

Text Books

Reference Books
**MAIR 11 MATHEMATICS - I**

**Objective**
To acquire fundamental knowledge and apply in engineering disciplines.

**Course Content**


Sequences of real numbers – Limit of a sequence – Convergent and divergent sequences– sub sequence– Cauchy’s sequence – monotone convergence theorem (without proof)- Sequence with recurrence relations.


Double integral – Changing the order of Integration – Change of variables from Cartesian to Polar Coordinates – Area using double integral in Cartesian and Polar Coordinates – Triple integral – Change of Variables from Cartesian to Spherical and Cylindrical Coordinates – Volume using double and triple integrals.

**Outcome**
After the completion of the course, students would be able to solve curriculum problems.

**Text Books**

**Reference Books**
PHIR 11 PHYSICS - I
(Common to all branches)

Objectives

- To make a bridge between the physics in school and engineering courses.
- To introduce the basic concepts of modern science like Photonics, Engineering applications of acoustics, fundamentals of crystal physics and materials science.

Course Content

Lasers

Fiber Optics

Acoustics

Crystallography

Magnetic materials, conductors and superconductors

Conductors: classical free electron theory (Lorentz –Drude theory) – electrical conductivity
**Outcome**

The student will be able to understand many modern devices and technologies based on lasers and optical fibers. Student can also appreciate various material properties which are used in engineering applications and devices.

**Text Books**


**Reference Books**


**Laboratory Experiments**

1. Torsional pendulum
2. Numerical aperture of an optical fiber
3. Temperature measurement - Thermocouple
4. Specific rotation of a liquid – Half Shade Polarimeter
5. Thickness of a thin wire – Air Wedge
6. Conversion of galvanometer into ammeter and voltmeter
7. Dispersive power of a prism – Spectrometer
8. Superconductivity- measurement of transition temperature
9. Absorption spectrometer
10. Brewster’s Angle measurement
11. Measurement of Young’s modulus

**Reference Books**

CHIR 11 CHEMISTRY - I
(Common to all branches)

Objectives

To introduce students to water chemistry, bonding concepts, entropy and basic organic chemistry.

Course Content

Water

Sources, hard & soft water, estimation of hardness by EDTA method, softening of water, zeolite process & demineralization by ion exchangers, boiler feed water, internal treatment methods, specifications for drinking water, BIS & WHO standards, treatment of water for domestic use, desalination - Reverse osmosis & Electrodialysis.

Chemical Bonding

Basic concepts, bonding in metals, electron gas theory, physical properties of metals (electrical & thermal conductivity, opaque & lusture, malleability & ductility), Alloy-substitutional alloys, interstitial alloys.

Coordinate bond, EAN rule, 16 & 18 electron rule, crystal field theory, splitting of 'd' orbitals in octahedral, tetrahedral and square planar complexes.

Shape & Intermolecular Interactions

Shape-Lewis dot structures, formal charge, VSEPR method, consequences of shape, dipole moment, valence bond theory; Intermolecular interactions-ion ion interactions, ion-dipole interactions, hydrogen bonding, dipole-dipole interactions, London / dispersion forces, relative strength of intermolecular forces; Consequences-surface tension.

Thermodynamics

Entropy as a thermodynamic quantity, entropy changes in isothermal expansion of an ideal gas, reversible and irreversible processes, physical transformations, work & free energy functions, Helmholtz and Gibbs free energy functions, Gibbs-Helmholtz equation, Gibbs-Duhem equation, Clapeyron-Clausius equation & its applications, Van’t Hoff isotherm and applications.

Fuels & Lubricants

Fuels - Classification, examples, relative merits, types of coal, determination of calorific value of solid fuels, Bomb calorimeter, theoretical oxygen requirement for combustion, proximate & ultimate analysis of coal, manufacture of metallurgical coke, flue gas analysis, problems. Lubricants - Definition, theories of lubrication, characteristics of lubricants, viscosity, viscosity index, oiliness, pour point, cloud point, flash point, fire point, additives to lubricants, Solid lubricants.
Outcome
Students will learn about quality of water, bonding theories, entropy change for various processes and basic stereo chemical aspects.

Text Books

Reference Books

Laboratory Experiments
1. Estimation of total alkalinity in the given water sample.
2. Estimation of carbonate, non-carbonate and total hardness in the given water sample.
3. Estimation of dissolved oxygen in the given water sample.
4. Determination of the percentage of Fe in the given steel sample.
5. Estimation of Ca in limestone.
6. Estimation of Fe$^{3+}$ by spectrophotometer.

Reference Books
1. Laboratory Manual, Department of Chemistry, NITT
CSIR 11 BASICS OF PROGRAMMING

Objectives

• To learn the fundamentals of computers.
• To learn the problem solving techniques writing algorithms and procedures.
• To learn the syntax and semantics for C programming language
• To develop the C code for simple logic
• To understand the constructs of structured programming including conditionals and iterations

Course Content

Introduction to computers – Computer Organization – Characteristics – Hardware and Software – Modes of operation – Types of programming languages – Developing a program.


Modular Programming – Functions and Procedures – Examples – Parameter passing methods.


Outcome

1. Ability to write algorithms for problems
2. Knowledge of the syntax and semantics of C programming language
3. Ability to code a given logic in C language
4. Knowledge in using C language for solving problems
Text Books
2. R.G. Dromey, ‘How to Solve it By Computers?’, Prentice Hall, 2001

Reference Books

Laboratory Experiments
1. Programs using sequence construct
2. Programs using selection construct
3. Programs using Iterative construct
4. Programs using nested for loops
5. Programs using functions with Pass by value
6. Programs using functions with Pass by reference
7. Programs using recursive functions
8. Programs using one dimensional Array
9. Programs using two dimensional Arrays
10. Programs using Pointers and functions
11. Programs using Pointers and Arrays
**IR 15 BRANCH SPECIFIC COURSE**

Curriculum and Assessments will be decided by the respective departments

**CEIR 11 BASIC CIVIL ENGINEERING**

(All Branches except CE)

**Objectives**

- To give an overview of the fundamentals of the Civil Engineering fields to the students of all branches of Engineering
- To realize the importance of the Civil Engineering Profession in fulfilling societal needs

**Course Content**

Properties and uses of construction materials - stones, bricks, cement, concrete and steel.

Site selection for buildings - Component of building - Foundation- Shallow and deep foundations - Brick and stone masonry - Plastering - Lintels, beams and columns - Roofs.


Surveying - Classification-Chain Survey-Ranging-Compass Survey-exhibition of different survey equipment.

Sources of Water - Dams- Water Supply-Quality of Water-Wastewater Treatment – Sea Water Intrusion – Recharge of Ground Water.

**Outcome**

1. The students will gain knowledge on site selection, construction materials, components of buildings, roads and water resources
2. A basic appreciation of multidisciplinary approach when involved in Civil Related Projects.

**Reference Books**

5. **Lecture notes prepared by Department of Civil Engineering, NITT.**
MEIR 11 BASIC MECHANICAL ENGINEERING
(For CE, EEE, ECE, ICE & CSE)

Objectives

- To explain the importance of concepts of mechanical engineering and conservation equations.
- To introduce the techniques for analyzing the forces, momentum and power.
- To introduce the various properties of materials, and the techniques of selection of materials.
- To identify the basic elements of a mechanical system and write their constitutive equations and performance analysis techniques.

Course Content

Fundamentals Introduction to mechanical engineering, concepts of thermal engineering, mechanical machine design, industrial engineering, and manufacturing technology.

Thermal Engineering Laws of thermodynamics, types of systems, concepts and types of I.C. engine, air compressors, principle of turbomachines, properties of steam and steam generators, automobile engineering, introduction to gas turbines and refrigeration & air-conditioning.

Engineering Materials Types of materials, selection of materials, material properties, introduction to materials structure, machine elements, transmission, fasteners, and support systems.

Manufacturing Technology Manufacturing, classification, lathe, drilling machines, milling machines, metal joining, metal forming, casting, forging, and introduction to powder metallurgy.

Outcome

The terminal objectives of the course is that, on successful completion of teaching-learning and evaluation activities, a student would be able to identify, appreciate and analyze the problems by applying the fundamentals of mechanical engineering and to proceed for the development of the mechanical systems.

Reference Books

1. Lecture notes prepared by Department of Mechanical Engineering, NITT.
2. K. Venugopal, ‘Basic mechanical Engineering’.
Objectives
This course aims to equip the students with a basic understanding of Electrical circuits and
machines for specific types of applications. The course gives a comprehensive exposure to
house wiring. This course also equips students with an ability to understand basics of
analog and digital electronics.

Course content
DC & AC Circuits: Current, voltage, power, Kirchhoff’s Laws - circuit elements R, L and C,
phasor diagram, impedance, real and reactive power in single phase circuits.

DC & AC Machines: DC Motor, Induction motor, Synchronous motor, Synchronous
generator and Transformers- construction, principle of operation, types and applications.

House wiring & safety: Single phase and three phase system – phase, neutral and earth,
basic house wiring - tools and components, different types of wiring – staircase, florescent
lamp and ceiling fan, basic safety measures at home and industry.

Analog Electronics: semiconductor devices – p-n junction diode, Zener diode, BJT,
operational amplifier - principle of operation and applications – Introduction to UPS.

Digital Electronics: Introduction to numbers systems, basic Boolean laws, reduction of
Boolean expressions and implementation with logic gates.

Outcome
The students shall develop an intuitive understanding of the circuit analysis, basic concepts
of electrical machines, house wiring and basics of electronics and be able to apply them in
practical situation.

Text Books
1. Hughes revised by Mckenzie Smith with John Hilcy and Keith Brown, ‘Electrical and

Reference Books
MEIR 12 ENGINEERING GRAPHICS

Objectives

• Irrespective of engineering discipline, it has become mandatory to know the basics of Engineering graphics. The student is expected to possess the efficient drafting skill depending on the operational function in order to perform day to day activity.
• Provide neat structure of industrial drawing
• Enables the knowledge about position of the component and its forms Interpretation of technical graphics assemblies
• Preparation of machine components and related parts

Course Content

Fundamentals  Drawing standard - BIS, dimensioning, lettering, type of lines, scaling-conventions.

Geometrical constructions  Dividing a given straight line into any number of equal parts, bisecting a given angle, drawing a regular polygon given one side, special methods of constructing a pentagon and hexagon – conic sections – ellipse – parabola – hyperbola - cycloid – trochoid.

Orthographic projection  Introduction to orthographic projection, drawing orthographic views of objects from their isometric views - Orthographic projections of points lying in four quadrants, Orthographic projection of lines parallel and inclined to one or both planes Orthographic projection of planes inclined to one or both planes. Projections of simple solids - axis perpendicular to HP, axis perpendicular to VP and axis inclined to one or both planes.

Sectioning of solids  Section planes perpendicular to one plane and parallel or inclined to other plane.

Intersection of surfaces  Intersection of cylinder & cylinder, intersection of cylinder & cone, and intersection of prisms.

Development of surfaces  Development of prisms, pyramids and cylindrical & conical surfaces.

Isometric and perspective projection  Isometric projection and isometric views of different planes and simple solids, introduction to perspective projection.
**Computer aided drafting Introduction** to computer aided drafting package to make 2-D drawings.

Self-study only, not to be included in examinations. Demonstration purpose only, not to be included in

**Outcome**
Towards the end of the course it is expected that the students would be matured to visualize the engineering components. A number of chosen problems will be solved to illustrate the concepts clearly.

**Text Books**

**Reference Books**
PRIR 11 ENGINEERING PRACTICE

Objectives

Introduction to the use of tools and machinery in Carpentry, Welding, Foundry, Fitting and Sheet Metal Working.

Carpentry

Wood sizing exercise in planning, marking, sawing, chiseling and grooving to make

1. Half lap joint
2. Cross lap joint

Welding

Exercise in arc welding for making

1. Lap joint
2. Butt joint

Foundry

Preparation of sand mould for the following

1. Flange
2. Anvil

Fitting

Preparation of joints, markings, cutting and filling for making

1. V-joint
2. T-joint

Sheet metal

Making of small parts using sheet metal

1. Tray
2. Funnel
Objectives
The primary objective is to develop in the under-graduate students of engineering a level of competence in English required for independent and effective communication for their professional needs.

Course Material
Instruction will be provided through appropriate material – articles from popular magazines, newspapers, technical journals, samples from industries and also text books. Practice in the four language skills will be provided in an integrated manner.

Course Content
Listening Barriers to listening: Physical & psychological – Steps to overcome them – Purposive listening practice – Active listening and anticipating the speaker – Use of technology in the professional world.


Writing Professional Correspondence – Formal and informal letters – Argument Writing practice – Perspectives in writing – Narrative writing -Different registers - Tone in formal writing – Summary writing practice- Introduction to reports.

Study Skills Reference Skills - Use of dictionary, thesaurus etc – Importance of contents page, cover & back pages – Bibliography.

Outcome
The students will have knowledge of the various uses of English in their professional environment and they will be able to communicate themselves effectively in their chosen profession.

Reference Books
4. Albert J. Harris, Edward R.Sipay (1990), 'How to Increase Reading Ability', Longman.
MAIR 21 MATHEMATICS II

Objectives
To learn mathematical concepts and methods.

Course Content

Basic review of first order differential equation - Higher order linear differential equations with constant coefficients -Particular integrals for $x^n e^{ax}, e^{ax} \cos (bx), e^{ax} \sin (bx)$ – Equation reducible to linear equations with constant coefficients using $x e^t$ - Simultaneous linear equations with constant coefficients – Method of variation of parameters – Applications – Electric circuit problems.

Gradient, Divergence and Curl – Directional Derivative – Tangent Plane and normal to surfaces – Angle between surfaces –Solenoidal and irrotational fields – Line, surface and volume integrals – Green's Theorem, Stokes’ Theorem and Gauss Divergence Theorem (all without proof) – Verification and applications of these theorems.

Analytic functions – Cauchy – Riemann equations (Cartesian and polar) –Properties of analytic functions – Construction of analytic functions given real or imaginary part – Conformal mapping of standard elementary functions ($z^2 e^z, \sin z, \cos z, z + \frac{k^2}{z}$) and bilinear transformation.

Cauchy's integral theorem, Cauchy's integral formula and for derivatives- Taylor’s and Laurent’s expansions (without proof) – Singularities – Residues – Cauchy's residue theorem – Contour integration involving unit circle.

Outcome
After the completion of the course, students are able to solve industrially applicable problems.

Text Books

Reference Books
PHIR 13(A) PHYSICS - II
(Circuit Branches)

Objectives

- To make a bridge between the physics in school and engineering courses.
- To introduce the basic concepts of modern physics like fundamentals of quantum mechanics, nuclear physics and advanced materials.
- To introduce fundamental physics like electrodynamics and semiconductor physics for circuit branch students.

Course Content

Quantum Mechanics


Nuclear and Particle Physics

Nuclear properties and forces - Nuclear models - Shell model - Nuclear reaction - Radioactivity - types and half-lives - application in determining the age of rock and fossils - Stellar nucleosynthesis. Fundamental forces - Particle physics - classification of matter - quark model - neutrino properties and their detection.

Advanced Materials


**Liquid Crystals**: Types – Nematic, Cholesteric, Smectic – Modes: Dynamic scattering, Twisted nematic – Display systems.

**Shape memory alloys** one way and two way memory effect- pseudoelasticity- applications

Electrodynamics


Semiconductor Physics

Introduction-Direct and indirect band gap semiconductors - Intrinsic semiconductor at 0 K-Intrinsic semiconductor at room temperature-Intrinsic carriers- Electron and Hole concentrations-doping-n-type – p-type-temperature variation of carrier concentration in extrinsic semiconductor-Extrinsic conductivity-Law of Mass action-Charge neutrality-Fermi level in extrinsic semiconductors-Electrical conduction in extrinsic semiconductors- Hall effect.
Outcome
The student will be able to understand fundamentals of electrodynamics and semiconductor physics which is base of many modern devices and technologies. Student will also get an exposure to modern physics topics like nuclear physics, nanotechnology and advanced materials.

Text Books

Reference Books
PHIR 12(B) PHYSICS - II
(Non-Circuit Branches)

Objectives

• To make a bridge between the physics in school and engineering courses
• To introduce the basic concepts of modern physics like fundamentals of quantum mechanics, nuclear physics and advanced materials.
• To introduce the concepts of NDT and Vacuum Technology.

Course content

Quantum Mechanics

Nuclear and Particle Physics
Fundamental forces - Nuclear properties and forces - Nuclear models - Shell model - Nuclear reaction - Radioactivity - types and half lives - application in determining the age of rock and fossils- Neutrons and its applications (neutron diffraction, nuclear reaction etc)- Stellar nucleosynthesis. Particle physics - classification of matter - quark model-neutrino properties and their detection.

Advanced Materials
Liquid Crystal types - nematic, cholesteric, smectic - modes: dynamic scattering, twisted nematic - display systems.
Shape memory alloys-one way and two way memory effect- pseudoelasticity-applications

Non-Destructive Testing

Vacuum Technology
Introduction-Exhaust pump and their characteristics-different types of pumps-rotary vane pump-roots pump-diffusion pump-turbo-molecular pump-measurement of low pressure-pirani gauge-penning guage - applications of vacuum technology - thin film deposition: thermal evaporation-sputtering.
**Outcome**
Student will get an exposure to most modern and advanced concepts in nuclear physics, nanotechnology and advanced materials. Study of basic concept of NDT is very important for a modern engineer.

**Text Books**

**Reference Books**

**Laboratory Experiments**
1. Wavelength of sodium light – Newton’s rings
2. Thermal conductivity – Lee’s Disc
3. Wavelength of mercury spectrum – Spectrometer
4. Calibration of Voltmeter – Potentiometer
5. Wavelength of laser using diffraction grating
6. Field along the axis of a Circular coil
7. Non-destructive testing by ultrasonic flaw detector.
8. GM counter experiment
9. Zeeman effect experiment
10. Millikan’s oil drop experiment
11. Kunds tube experiment

**Reference Books**
CHIR 13(A) CHEMISTRY - II  
(For CSE, ECE, EEE and ICE)

Objectives
To introduce the students to basic principles of electrochemistry, cell construction and evaluation, electrochemical power sources, the importance of corrosion in metal/alloy and polymer.

Course Content

Electrochemistry
Conductivity of electrolytes- Specific, molar and equivalent conductivity, Nernst equation for electrode potential, EMF series, hydrogen electrode, calomel electrode, glass electrode, Electrolytic and galvanic cells, cell EMF, its measurement and applications, Weston standard cell, reversible and irreversible cells, concentration cell, electrode (hydrogen gas electrode) and electrolyte concentration cell, concentration cell with and without transference.

Corrosion
Dry corrosion and wet corrosion, mechanisms, types of corrosion, DMC, DAC, stress, intergranular, atmospheric and soil corrosion, Passivity, Polarization, over potential and its significance, Factors affecting corrosion, protection from corrosion by metallic coatings, electroplating, electroless plating and cathodic protection, Chemical conversion coatings and organic coatings- Paints, enamels.

Batteries

Solid State
Types of solids - close packing of atoms and ions - bcc, fcc structures of rock salt - cesium chloride- spinel - normal and inverse spinels, Stoichiometric Defect, controlled valency & Chalcogen semiconductors, Non-elemental semiconducting Materials, Preparation of Semiconductors-steps followed during the preparation of highly pure materials and further treatments. Semiconductor Devices-p-n junction diode.

Polymer
Nomenclature, functionality, classification, methods of polymerization, mechanism of polymerization, molecular weight determination-Viscometry, light scattering methods. Plastics-Moulding constituents of a plastics and moulding of plastics into articles. Important thermoplastics and thermosetting resins- synthesis & applications of PVA,
FLUON, PC, Kevlar, ABS polymer, phenolic & amino resins, epoxy resins and polyurethanes. Conductive polymers.

**Outcome**
Students would become familiar with the important practical applications of electrochemistry, solids, their properties and applications, and the polymer materials.

**Text Books**

**Reference Books**
Objectives
To introduce the students to basic principles of electrochemistry, cell construction and evaluation, corrosion, adsorption, phase equilibrium and engineering materials of importance.

Course Content

Electrochemistry
Conductivity of electrolytes- Specific, molar and equivalent conductivity, Nernst equation for electrode potential, EMF series, hydrogen electrode, calomel electrode, glass electrode, Electrolytic and galvanic cells, cell EMF, its measurement and applications, Weston standard cell, reversible and irreversible cells, concentration cell, electrode (hydrogen gas electrode) and electrolyte concentration cell, concentration cell with and without transference, fuel cells, hydrox fuel cell.

Corrosion
Dry corrosion and wet corrosion, mechanisms, types of corrosion, DMC, DAC, stress, intergranular, atmospheric and soil corrosion, Passivity, Polarization, over potential and its significance, Factors affecting corrosion, protection from corrosion by metallic coatings, electroplating, electroless plating and cathodic protection, Chemical conversion coatings and organic coatings- Paints, enamels.

Surface Chemistry

Engineering Materials
Polymers and Composites

Concept of macromolecules-Nomenclature of polymers-Tacticity- Polymerization processes- Mechanism-Types of Polymerization-Classification of Polymers-Effect of Polymer structure on properties-Moulding of plastics into articles-Important addition and condensation polymers -synthesis and properties – Molecular mass determination of polymers- Static and dynamic methods, Light scattering and Gel Permeation Chromatography-Rubbers –Vulcanization – Synthetic rubbers – Conducting polymers-Composite materials – Reinforced composites and processing.

Outcome

Students would have learnt the significance of electrochemistry and its application, corrosion, adsorption, engineering materials of importance and polymer.

Text Books


Reference Books

Objectives
To introduce the students to basic principles of electrochemistry, importance of corrosion, spectroscopic techniques, metals, alloys polymers and composites.

Course Content

Electrochemistry
Conductivity of electrolytes- Specific, molar and equivalent conductivity, Nernst equation for electrode potential, EMF series, hydrogen electrode, calomel electrode, glass electrode, Electrolytic and galvanic cells, cell EMF, its measurement and applications, Weston standard cell, reversible and irreversible cells, concentration cell, electrode (hydrogen gas electrode) and electrolyte concentration cell, concentration cell with and without transference, fuel cells, hydrox fuel cell.

Corrosion
Dry corrosion and wet corrosion, mechanisms, types of corrosion, DMC, DAC, stress, inter granular, atmospheric and soil corrosion, Passivity, Polarization, over potential and its significance, Factors affecting corrosion, protection from corrosion by metallic coatings, electroplating, electroless plating and cathodic protection, Chemical conversion coatings and organic coatings- Paints, enamels.

Spectroscopic Techniques

Metals and Alloys
Polymers and Composites
Concept of macromolecules-Nomenclature of polymers-Tacticity- Polymerization processes- Mechanism-Types of Polymerization-Classification of Polymers-Effect of Polymer structure on properties-Moulding of plastics into articles-Important addition and condensation polymers –synthesis and properties – Molecular mass determination of polymers- Static and dynamic methods, Light scattering and Gel Permeation Chromatography-Rubbers –Vulcanization – Synthetic rubbers – Conducting polymers- Composite materials – Reinforced composites and processing.

Outcome
Students would become familiar with the importance of electrochemistry, its applications, corrosion, spectroscopic techniques for characterization, importance of properties of metals, alloys polymers and composites.

Text Books

Reference Books

Laboratory Experiments (for all Branches)
1. Corrosion rate by polarization technique
2. Conductometric titration
3. Potentiometric titration
4. pH metric titration
5. Percentage purity of bleaching powder
6. Percentage purity of washing soda
7. Determination of molecular weight of polymer by viscometry
8. Demonstration of sophisticated instruments and assignments on them

Reference Books
1. Laboratory Manual, Department of Chemistry, NITT
ENIR 11 ENERGY AND ENVIRONMENTAL ENGINEERING

Objectives

- To teach the principal renewable energy systems.
- To explore the environmental impact of various energy sources and also the effects of different types of pollutants.

Course Content

Present Energy resources in India and its sustainability - Different type of conventional Power Plant--Energy Demand Scenario in India-Advantage and Disadvantage of conventional Power Plants – Conventional vs Non-conventional power generation


Power and energy from wind turbines- India’s wind energy potential- Types of wind turbines- Off shore Wind energy- Environmental benefits and impacts.

Biomass resources-Biomass conversion Technologies- Feedstock preprocessing and treatment methods- Bioenergy program in India-Environmental benefits and impacts.


Air pollution- Sources, effects, control, air quality standards, air pollution act, air pollution measurement. Water pollution-Sources and impacts, Soil pollution-Sources and impacts, disposal of solid waste.


Outcome

Students will be introduced to the Principal renewable energy systems and explore the environmental impact of various energy sources and also the effects of different types of pollutants.

Text Books


References

1. 'Unleashing the Potential of Renewable Energy in India' –World bank report.
CEPC 10 Engineering Mechanics

Objectives

- To explain the importance of mechanics in the context of engineering and conservation equations
- To explain the significance of centroid, center of gravity and moment of inertia.
- To introduce the techniques for analyzing the forces in the bodies.
- To analyze the internal member forces acting on cables and trusses.
- To understand the basic principles of dynamics.

Course Content

Fundamentals: Mechanics and its relevance, concepts of forces, laws of mechanics – Lami’s Theorem, Concept of free-body diagram, centroids, center of gravity, area moment of inertia, mass, moment of inertia.

Friction: Laws of friction, application of laws of friction, wedge friction, body on inclined planes.

Statics: Principles of statics, Types of forces, concurrent and non-concurrent forces, composition of forces, forces in a plane and space, simple stresses and strains, elastic constant.

Cables and Trusses: Cable subjected to concentrated loads, UDL with supports at different levels – analysis of Trusses – method of joints – method of sections.

Dynamics: Principles of dynamics, D’Alembert’s principle, conservation of momentum and energy, vibrations of simple systems.

Outcome

The terminal objectives of the course is that, on successful completion of teaching-learning and evaluation activities, a student would be able to identify and analyze the problems by applying the fundamental principles of engineering mechanics and to proceed to research, design and development of various engineering systems.

Text Books


Reference Books

CLPC 10 STRENGTH OF MATERIALS

Objective

To understand the fundamental principles of stress-strain relationship. To understand the estimation of various loads and load distributions on beams. To evaluate the principle stresses & Strains and use of Mohr’s Circle. To learn the concepts in design of columns and pressure vessels.

Course Content

**Stress (Axial Load):** Normal Stress, Shear Stress, Factor of Safety, plane stress, stress components associated with arbitrary oriented faces in plane stress.

**Stress Strain Relation:** Hook’s Law, Poisson’s ratio, Strain components, Strain components associated with arbitrary sets of axes, tensile test and elastic stress-strain relation.

**Torsion:** Basic assumptions, Torsion formula, Hollow and Stepped circular shafts, Angular deflection.

**Flexural Loading:** Theory of pure bending, Flexural formula, Shear force and Bending moments diagram for different types of loading and support conditions on beams. Transverse shear stress distribution in circular hollow circular, I-box and T, angle sections.

**Deflection of beams:** Strain curvature and moment curvature relation, Solution of beam deflection problems by Direct integration method, Area moment method, Super position.

**Principle Stresses and Strains:** Normal and Shear stress, Concept of equivalent bending & equivalent twisting moment, Mohr’s circle of Stress and Strain, Strain Rosette’s.

**Columns:** Euler’s formula for different end conditions, Concepts of equivalent length, Eccentric loading, Ranking formula.

**Pressure Vessels:** Thin Pressure vessel, Circumferential and longitudinal stresses in cylindrical shell, spherical shell under internal pressure. Introduction to thick Pressure vessel.

Outcomes

1. Learn fundamental concepts of stress-strain relationship.
2. Learn estimation of Torsion/ Flexural loading on beams.
3. Learn to use the concepts in design of columns and pressure vessels

Text Books & References

CSPC 11 DISCRETE STRUCTURES

Objectives

To get familiar and understand the fundamental notions in discrete mathematics. To understand and demonstrate the basic concept of an algorithm and its application in combinatorial mathematics. To identify the basic properties of graphs and trees and model simple applications

Course Content


Linear Algebra and Recurrence relations – Linear Algebra: Vector space, Basis, Dimension, Orthogonally, Recurrence Relations: Homogenous and Inhomogenous Recurrences and their solutions – Solving Recurrences using Generating functions.


Outcomes

1. Ability to distinguish between the notion of discrete and continuous mathematical structures
2. Ability to construct and interpret finite state diagrams and DFSA
3. Ability to apply induction and other proof techniques towards problem solving

Text Books

EEPC 10 ELECTRON DEVICES

Objective

To educate on the construction and working of common electronic devices and to prepare for application areas.

Course Content

Semiconductor Materials- Semiconductors – Charge carriers, electrons and holes in intrinsic and extrinsic Semiconductors – Hall effect.

Diodes – PN junction – current equation – junction capacitance – breakdown characteristics, Zener, Tunnel, Schottky Diodes


Unipolar devices – FET, MOSFET, UJT and Opto-Electronic devices – theory and characteristics

Rectifiers and Switched mode power supplies – theory and design, filter circuits, applications.

Outcomes

1. Understanding the semiconductor physics of the intrinsic p and n type materials and various devices and characteristics.
2. Analyze simple diode circuits under DC and AC excitation.
3. Analyze and Design simple amplifier circuits using BJT in CE, CC and CB configurations.
4. Understand the analysis and salient features of CE, CC and CB amplifier circuits.
5. Understand the construction and characteristics of FET, MOSFET and UJT.

Text Books

MEPC 10/MTPC 10/ECPC10 ENGINEERING MECHANICS
(ECE, ME, MME)

Objectives

- To explain the importance of mechanics in the context of engineering and conservation equations.
- To explain the significance of centroid, centre of gravity and moment of inertia. To introduce the techniques for analyzing the forces in the bodies.
- To apply the different principles to study the motion of a body, and concept of relative velocity and acceleration.
- To describe the trajectory of a particle under projectile motion.
- To identify the basic elements of a mechanical system and write their constitutive equations.

Course Content

Fundamentals


Friction

Laws of friction, static friction, rolling friction, application of laws of friction, ladder friction, wedge friction, body on inclined planes, simple screw jack – velocity ratio, mechanical advantage, efficiency, Numerical.

Statics

Principles of statics, types of forces, concurrent and non-concurrent forces, composition of forces, forces in a plane and space, simple stresses and strains, elastic coefficients, Numerical.

Kinematics

Fundamentals of rectilinear and curvilinear motion, application of general equations, concept of relative velocity, analytical and graphical techniques, Numerical.

Dynamics

Principles of dynamics, D’Alembert's principle, conservation of momentum and energy, vibrations of simple systems, Numerical.

Outcome

The terminal objectives of the course is that, on successful completion of teaching-learning and evaluation activities, a student would be able to identify and analyze the problems by applying the fundamental principles of engineering mechanics and to proceed to research, design and development of the mechanical systems.
Text Books

Reference Books
ICPC 10 ENGINEERING MECHANICS

Course Objectives

• To introduce the fundamentals of mechanics and machines in engineering to the instrumentation and control engineering students.
• To explain the application of basic mechanical science concepts
• To apply different physical principles to the analysis of mechanics and machines
• To identify the different elements of a mechanical system and write the mathematical equations for them.

Course Content

Strain energy – Dynamic loading – Strain energy due to shear – Impact torsional loading – Strain energy due to bending – Impact loading of beams.


Outcomes

After successfully completing this course, the student will be able to

1. Identify simple mechanisms and their principles of operation.
2. Write the mathematical equations for static and dynamic loading in simple mechanical systems.
3. Write the equations for energy and power in simple mechanical systems.
4. Analyze free and forced oscillations in simple dynamic systems.
**Textbook**


**Reference Books**


PRPC 10 ENGINEERING MECHANICS

Objectives

- To provide a practice in the application of knowledge in science, mathematics and engineering so that students can expand this knowledge in the area of rigid body mechanics.
- To enable students to solve open ended problem in the design of complex system.
- To prepare students for higher level courses such as mechanics of materials, theory of machines, design of machine elements and numerical analysis.

Course Content

Point force and distributed forces - Equivalent systems of Forces – Equilibrium of Rigid Bodies – Free body Diagram – Centroids and Center of Gravity.

Dry Friction, Wedge Friction, Disk Friction (thrust bearing), Belt friction, Square of threaded screw, Journal bearings (Axle friction), Wheel friction, Rolling resistance, Moment of Inertia.

Moving particle in Cartesian, Cylindrical and Path Co-ordinate systems. Translation and Rotation of Rigid bodies. Motion of particles relative to rotating frame.


Outcome

1. Students will be able to solve problems dealing with forces in plane or in space and equivalent forces systems.
2. An ability to identify, analyse and solve problems related to rigid body mechanics involving friction.
3. The student will understand the fundamentals of laws of motion and their application in the area of dynamics.
Reference Books