

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
B.Tech. in MECHANICAL ENGINEERING
COURSE STRUCTURE & SYLLABUS (R18)

Applicable From 2018-19 Admitted Batch

I YEAR I SEMESTER

S. No.	Course Code	Course Title	L	T	P	Credits
1	MA101BS	Mathematics - I	3	1	0	4
2	PH102BS	Engineering Physics	3	1	0	4
3	CS103ES	Programming for Problem Solving	3	1	0	4
4	ME104ES	Engineering Graphics	1	0	4	3
5	PH105BS	Engineering Physics Lab	0	0	3	1.5
6	CS106ES	Programming for Problem Solving Lab	0	0	3	1.5
7	*MC109ES	Environmental Science	3	0	0	0
		Induction Programme				
		Total Credits	13	3	10	18

I YEAR II SEMESTER

S. No.	Course Code	Course Title	L	T	P	Credits
1	MA201BS	Mathematics - II	3	1	0	4
2	CH202BS	Chemistry	3	1	0	4
3	ME203ES	Engineering Mechanics	3	1	0	4
4	ME205ES	Engineering Workshop	1	0	3	2.5
5	EN205HS	English	2	0	0	2
6	CH206BS	Engineering Chemistry Lab	0	0	3	1.5
7	EN207HS	English Language and Communication Skills Lab	0	0	2	1
		Total Credits	12	3	8	19.0

II YEAR I SEMESTER

S. No.	Course Code	Course Title	L	T	P	Credits
1	MA301BS	Probability and Statistics & Complex Variables	3	1	0	4
2	ME302PC	Mechanics of Solids	3	1	0	4
3	ME303PC	Material Science and Metallurgy	3	0	0	3
4	ME304PC	Production Technology	3	0	0	3
5	ME305PC	Thermodynamics	3	1	0	4
6	ME306PC	Production Technology Lab	0	0	2	1
7	ME307PC	Machine Drawing Practice	0	0	2	1
8	ME308PC	Material Science and Mechanics of Solids Lab	0	0	2	1
9	*MC309	Constitution of India	3	0	0	0
		Total Credits	18	3	6	21

II YEAR II SEMESTER

S. No.	Course Code	Course Title	L	T	P	Credits
1	EE401ES	Basic Electrical and Electronics Engineering	3	0	0	3

MA301BS: PROBABILITY AND STATISTICS & COMPLEX VARIABLES**B.Tech. II Year I Sem.**

L	T/P/D	C
3	1/0/0	4

Pre-requisites: Mathematical Knowledge at pre-university level**Course Objectives:** To learn

- The ideas of probability and random variables and various discrete and continuous probability distributions and their properties.
- The basic ideas of statistics including measures of central tendency, correlation and regression.
- The statistical methods of studying data samples.
- Differentiation and integration of complex valued functions.
- Evaluation of integrals using Cauchy's integral formula and Cauchy's residue theorem.
- Expansion of complex functions using Taylor's and Laurent's series.

Course outcomes: After learning the contents of this paper the student must be able to

- Formulate and solve problems involving random variables and apply statistical methods for analysing experimental data.
- Analyse the complex function with reference to their analyticity, integration using Cauchy's integral and residue theorems.
- Taylor's and Laurent's series expansions of complex function.

UNIT - I: Basic Probability**8 L**

Probability spaces, conditional probability, independent events, and Bayes' theorem.

Random variables: Discrete and continuous random variables, Expectation of Random Variables, Moments, Variance of random variables

UNIT - II: Probability distributions**10 L**

Binomial, Poisson, evaluation of statistical parameters for these distributions, Poisson approximation to the binomial distribution

Continuous random variables and their properties, distribution functions and density functions, Normal and exponential, evaluation of statistical parameters for these distributions

UNIT - III: Testing of Hypothesis**10 L**

Test of significance: Basic of testing of Hypothesis. Null and alternate Hypothesis, types of errors, level of significance, critical region.

Large sample test for single proportion, difference of proportions, single mean, difference of means; small sample tests: Test for single mean, difference of means and test for ratio of variances

UNIT - IV: Complex Variables (Differentiation)**10 L**

Limit, Continuity and Differentiation of Complex functions, Analyticity, Cauchy-Riemann equations (without proof), finding harmonic conjugate; elementary analytic functions (exponential, trigonometric, logarithm) and their properties.

UNIT - V: Complex Variables (Integration)**10 L**

Line integral, Cauchy's theorem, Cauchy's Integral formula, Zeros of analytic functions, Singularities, Taylor's series, Laurent's series; Residues, Cauchy Residue theorem, Conformal mappings, Mobius transformations and their properties.

TEXT BOOKS:

1. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 35th Edition, 2010.
2. Ronald E. Walpole, Raymond H. Myers, Sharon L. Myers, keying Ye, Probability and statistics for engineers and scientists, 9th Edition, Pearson Publications.
3. J. W. Brown and R. V. Churchill, Complex Variables and Applications, 7th Ed., Mc-Graw Hill, 2004.

REFERENCE BOOKS:

1. Fundamentals of Mathematical Statistics, Khanna Publications, S. C. Gupta and V. K. Kapoor.
2. Miller and Freund's, Probability and Statistics for Engineers, 8th Edition, Pearson Educations
3. S. Ross, A First Course in Probability, 6th Ed., Pearson Education India, 2002.
4. Erwin kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006.
5. N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications, Reprint, 2010.

ME302PC: MECHANICS OF SOLIDS**B.Tech. II Year I Sem.**

L	T/P/D	C
3	1/0/0	4

Course Objectives: The objective is to learn the fundamental concepts of stress, strain, and deformation of solids with applications to bars, beams, and columns. Detailed study of engineering properties of materials is also of interest. Fundamentals of applying equilibrium, compatibility, and force-deformation relationships to structural elements are emphasized. The students are introduced to advanced concepts of flexibility and stiffness method of structural analysis. The course builds on the fundamental concepts of engineering mechanics course.

This course will advance the students' development of the following broad capabilities:

- Students will be able to understand basic concepts of stress, strain and their relations based on linear elasticity. Material behaviors due to different types of loading will be discussed.
- Students will be able to understand and know how to calculate stresses and deformation of a bar due to an axial loading under uniform and non-uniform conditions.
- Students will understand how to develop shear-moment diagrams of a beam and find the maximum moment/shear and their locations
- Students will understand how to calculate normal and shear stresses

Course Outcomes:

- Analyze the behavior of the solid bodies subjected to various types of loading;
- Apply knowledge of materials and structural elements to the analysis of simple structures;
- Undertake problem identification, formulation and solution using a range of analytical methods;
- Analyze and interpret laboratory data relating to behavior of structures and the materials they are made of, and undertake associated laboratory work individually and in teams.
- Expectation and capacity to undertake lifelong learning

UNIT – I

Simple Stresses & Strains: Elasticity and plasticity – Types of stresses & strains–Hooke's law– stress – strain diagram for mild steel – Working stress – Factor of safety – Lateral strain, Poisson's ratio & volumetric strain – Elastic moduli & the relationship between them – Bars of varying section – composite bars – Temperature stresses. Strain energy – Resilience – Gradual, sudden, impact and shock loadings.

UNIT – II

Shear Force and Bending Moment: Definition of beam – Types of beams – Concept of shear force and bending moment – S.F and B.M diagrams for cantilever, simply supported and overhanging beams subjected to point loads, u.d.l., uniformly varying loads and combination of these loads – Point of contra flexure – Relation between S.F., B.M and rate of loading at a section of a beam.

UNIT – III

Flexural Stresses: Theory of simple bending – Assumptions – Derivation of bending equation: $M/I = f/y = E/R$ Neutral axis – Determination bending stresses – section modulus of rectangular and circular sections (Solid and Hollow), I,T, Angle and Channel sections – Design of simple beam sections.

Shear Stresses: Derivation of formula – Shear stress distribution across various beams sections like rectangular, circular, triangular, I, T angle sections.

UNIT - IV

Principal Stresses and Strains: Introduction – Stresses on an inclined section of a bar under axial loading – compound stresses – Normal and tangential stresses on an inclined plane for biaxial stresses

– Two perpendicular normal stresses accompanied by a state of simple shear – Mohr's circle of stresses
– Principal stresses and strains – Analytical and graphical solutions.

Theories of Failure: Introduction – Various theories of failure - Maximum Principal Stress Theory, Maximum Principal Strain Theory, Strain Energy and Shear Strain Energy Theory (Von Mises Theory).

UNIT - V

Torsion of Circular Shafts: Theory of pure torsion – Derivation of Torsion equations: $T/J = q/r = N\theta/L$
– Assumptions made in the theory of pure torsion – Torsional moment of resistance – Polar section modulus – Power transmitted by shafts – Combined bending and torsion and end thrust – Design of shafts according to theories of failure.

Thin Cylinders: Thin seamless cylindrical shells – Derivation of formula for longitudinal and circumferential stresses – hoop, longitudinal and Volumetric strains – changes in dia, and volume of thin cylinders– Thin spherical shells.

TEXT BOOKS:

1. Strength of materials – R.S. Kurmi and Gupta.
2. Solid Mechanics, by Popov
3. Strength of Materials – Ryder. G.H.; Macmillan Long Man Pub.
4. Strength of Materials – W.A. Nash, TMH

REFERENCE BOOKS:

1. Strength of Materials -By Jindal, Umesh Publications.
2. Analysis of structures by Vazirani and Ratwani.
3. Mechanics of Structures Vol –I by H. J. Shah and S. B. Junnarkar, Charotar Publishing House Pvt. Ltd.
4. Strength of Materials by D.S Prakash Rao, Universities Press Pvt. Ltd.
5. Strength of Materials by S. S. Rattan, Tata McGraw Hill Education Pvt. Ltd.
6. Fundamentals of Solid Mechanics by M. L. Gambhir, PHI Learning Pvt. Ltd
7. Strength of Materials by R.K Rajput, S. Chand & Company Ltd.

ME303PC: MATERIAL SCIENCE AND METALLURGY**B.Tech. II Year I Sem.**

L	T/P/D	C
3	0/0/0	3

UNIT – I

Crystal Structure: Unit cells, Metallic crystal structures, Ceramics. Imperfection in solids: Point, line, interfacial and volume defects; dislocation strengthening mechanisms and slip systems, critically resolved shear stress.

UNIT – II

Alloys, substitutional and interstitial solid solutions- Phase diagrams: Interpretation of binary phase diagrams and microstructure development; eutectic, peritectic, peritectoid and monotectic reactions. Iron-iron-carbide phase diagram and microstructural aspects of ledeburite, austenite, ferrite and cementite, cast iron

UNIT – III

Heat treatment of Steel: Annealing, Normalising, Hardening, Tempering and Spheroidising, Isothermal transformation diagrams for Fe-C alloys and microstructures development.

UNIT – IV

Continuous cooling curves and interpretation of final microstructures and properties- austempering, martempering, case hardening, carburizing, nitriding, cyaniding, carbo-nitriding, flame and induction hardening, vacuum and plasma hardening

UNIT – V

Alloying of steel, properties of stainless steel and tool steels, maraging steels- cast irons; grey, white, malleable and spheroidal cast irons- copper and copper alloys (Brass, bronze and cupro-nickel)- Aluminium and Al-Cu – Mg alloys- Titanium alloys

TEXT BOOKS:

1. V. Raghavan, "Material Science and Engineering", Prentice Hall of India Private Limited, 1999.
2. W. D. Callister, 2006, "Materials Science and Engineering-An Introduction", 6th Edition, Wiley India.

REFERENCE BOOKS:

1. Kenneth G. Budinski and Michael K. Budinski, "Engineering Materials", Prentice Hall of India Private Limited, 4th Indian Reprint, 2002.
2. U. C. Jindal, "Engineering Materials and Metallurgy", Pearson, 2011.

ME304PC: PRODUCTION TECHNOLOGY**B.Tech. II Year I Sem.**

L	T/P/D	C
3	0/0/0	3

Pre-requisites: None**Course Objectives:**

- To teach the process-level dependence of manufacturing systems through tolerances
- To expose the students to a variety of manufacturing processes including their suitability and capabilities.
- To teach the important effects that manufacturing processes may have on the material properties of the processed part with a focus on the most common processes.
- To teach the thermal and mechanical aspects, such as force, stress, strain and temperature of the most common processes.
- To provide a technical understanding of common processes to aid in appropriate process selection for the material and required tolerances
- To provide a technical understanding of common processes to aid in appropriate material selection for a predetermined process.

Course Outcomes: Student will be able to:

- Understand the idea for selecting materials for patterns.
- Know Types and allowances of patterns used in casting and analyze the components of moulds.
- Design core, core print and gating system in metal casting processes
- Understand the arc, gas, solid state and resistance welding processes.
- Develop process-maps for metal forming processes using plasticity principles.
- Identify the effect of process variables to manufacture defect free products.

UNIT – I

Casting: Steps involved in making a casting – Advantage of casting and its applications; Patterns - Pattern making, Types, Materials used for patterns, pattern allowances; Properties of moulding sands. Methods of Melting - Crucible melting and cupola operation – Defects in castings; Principles of Gating – Requirements – Types of gates, Design of gating systems – Riser – Function, types of Riser and Riser design. Casting processes – Types – Sand moulding, Centrifugal casting, die- casting, Investment casting, shell moulding; Solidification of casting – Solidification of pure metal, Directional Solidification.

UNIT – II

Welding: Classification – Types of welds and welded joints; Welding Positions - Gas welding - Types, oxy-fuel gas cutting – standard time and cost calculations. Arc welding, forge welding, submerged arc welding, Resistance welding, Thermit welding.

UNIT – III

Inert Gas Welding _ TIG Welding, MIG welding, Friction welding, Friction Stir Welding, induction welding, explosive welding, Laser Welding; Soldering and Brazing; Heat affected zone in welding. Welding defects – causes and remedies; destructive and non- destructive testing of welds.

UNIT – IV

Hot working, cold working, strain hardening, recovery, recrystallisation and grain growth. Sheet metal Operations: Stamping, Blanking and piercing, Coining, Strip layout, Hot and cold spinning – Bending and deep drawing. Rolling fundamentals – theory of rolling, types of Rolling mills and products. Forces

in rolling and power requirements. Drawing and its types – wire drawing and Tube drawing –. Types of presses and press tools. Forces and power requirement in the above operations.

UNIT – V

Extrusion of Metals: Basic extrusion process and its characteristics. Hot extrusion and cold extrusion - Forward extrusion and backward extrusion – Impact extrusion – Extruding equipment – Tube extrusion, Hydrostatic extrusion. Forces in extrusion

Forging Processes: Forging operations and principles – Tools – Forging methods – Smith forging, Drop Forging – Roll forging – Forging hammers: Rotary forging – forging defects – cold forging, swaging, Forces in forging operations.

High Energy Rate Forming Processes: Limitations, Principles of Explosive Forming, Electro-hydraulic Forming, Electro-magnetic forming and rubber pad Forming.

TEXT BOOKS:

1. Manufacturing Technology / P.N. Rao Vol.1 & 2 / Mc Graw Hill
2. Manufacturing Engineering & Technology / Serope Kalpakjian / Steven R. Schmid / Pearson

REFERENCE BOOKS:

1. Metal Casting / T.V Ramana Rao / New Age
2. Production Technology / G. Thirupathi Reddy / Scitech
3. Manufacturing Processes/ J.P. Kaushish / PHI Publications

ME305PC: THERMODYNAMICS**B.Tech. II Year I Sem.**

L	T/P/D	C
3	1/0/0	4

Pre-requisite: Engineering Chemistry and Physics**Course Objective:** To understand the treatment of classical Thermodynamics and to apply the First and Second laws of Thermodynamics to engineering applications**Course Outcomes:** At the end of the course, the student should be able to Understand and differentiate between different thermodynamic systems and processes. Understand and apply the laws of Thermodynamics to different types of systems undergoing various processes and to perform thermodynamic analysis. Understand and analyze the Thermodynamic cycles and evaluate performance parameters.**Tables/Codes: Steam Tables and Mollier Chart, Refrigeration Tables****UNIT – I****Introduction: Basic Concepts:** System, Control Volume, Surrounding, Boundaries, Universe, Types of Systems, Macroscopic and Microscopic viewpoints, Concept of Continuum, Thermodynamic Equilibrium, State, Property, Process, Exact & Inexact Differentials, Cycle – Reversibility – Quasi – static Process, Irreversible Process, Causes of Irreversibility – Energy in State and in Transition, Types, Displacement & Other forms of Work, Heat, Point and Path functions, Zeroth Law of Thermodynamics – Concept of Temperature – Principles of Thermometry – Reference Points – Const. Volume gas Thermometer – Scales of Temperature, Ideal Gas Scale**UNIT - II****PMM I - Joule's Experiments – First law of Thermodynamics – Corollaries – First law applied to a Process – applied to a flow system – Steady Flow Energy Equation.**

Limitations of the First Law – Thermal Reservoir, Heat Engine, Heat pump, Parameters of performance, Second Law of Thermodynamics, Kelvin-Planck and Clausius Statements and their Equivalence / Corollaries, PMM of Second kind, Carnot's principle, Carnot cycle and its specialties, Thermodynamic scale of Temperature, Clausius Inequality, Entropy, Principle of Entropy Increase – Energy Equation, Availability and Irreversibility – Thermodynamic Potentials, Gibbs and Helmholtz Functions, Maxwell Relations – Elementary Treatment of the Third Law of Thermodynamics

UNIT – III

Pure Substances, p-V-T- surfaces, T-S and h-s diagrams, Mollier Charts, Phase Transformations – Triple point at critical state properties during change of phase, Dryness Fraction – Clausius – Clapeyron Equation Property tables. Mollier charts – Various Thermodynamic processes and energy Transfer – Steam Calorimetry.

Perfect Gas Laws – Equation of State, specific and Universal Gas constants – various Non-flow processes, properties, end states, Heat and Work Transfer, changes in Internal Energy – Throttling and Free Expansion Processes – Flow processes

UNIT - IV

Deviations from perfect Gas Model – Vander Waals Equation of State – Compressibility charts – variable specific Heats – Gas Tables

Mixtures of perfect Gases – Mole Fraction, Mass fraction Gravimetric and volumetric Analysis – Dalton's Law of partial pressure, Avogadro's Laws of additive volumes – Mole fraction, Volume fraction and partial pressure, Equivalent Gas const. And Molecular Internal Energy, Enthalpy, sp. Heats and Entropy of Mixture of perfect Gases and Vapour, Atmospheric air - Psychrometric Properties – Dry bulb

Temperature, Wet Bulb Temperature, Dew point Temperature, Thermodynamic Wet Bulb Temperature, Specific Humidity, Relative Humidity, saturated Air, Vapour pressure, Degree of saturation – Adiabatic Saturation, Carrier's Equation – Psychrometric chart.

UNIT - V

Power Cycles: Otto, Diesel, Dual Combustion cycles, Sterling Cycle, Atkinson Cycle, Ericsson Cycle, Lenoir Cycle – Description and representation on P–V and T-S diagram, Thermal Efficiency, Mean Effective Pressures on Air standard basis – comparison of Cycles.

Refrigeration Cycles:

Brayton and Rankine cycles – Performance Evaluation – combined cycles, Bell-Coleman cycle, Vapour compression cycle-performance Evaluation.

TEXT BOOKS:

1. Engineering Thermodynamics / PK Nag / Mc Graw Hill
2. Thermodynamics for Engineers / Kenneth A. Kroos ; Merle C. Potter/ Cengage

REFERENCE BOOKS:

1. Engineering Thermodynamics / Chattopadhyay/ Oxford
2. Engineering Thermodynamics / Rogers / Pearson

ME306PC: PRODUCTION TECHNOLOGY LAB**B.Tech. II Year I Sem.**

L	T/P/D	C
0	0/2/0	1

Pre-requisites: Production Technology**Course Objectives:**

- Know about the basic Physical, Chemical Properties of materials
- Explain why some material(s) are better to be used in a product for given design requirements
- Learn the basic operation of various manufacturing processes
- Learn how various products are made using traditional, non-traditional, or Electronics manufacturing processes
- Design simple process plans for parts and products
- Understand how process conditions are set for optimization of production
- Learn how CNC machines work
- Write and execute CNC machining programs to cut parts on a milling machine
- Measure a given manufactured part to evaluate its size, tolerances and surface finish
- Design and fabricate a simple product

Course Outcomes: Understanding the properties of moulding sands and pattern making. Fabricate joints using gas welding and arc welding. Evaluate the quality of welded joints. Basic idea of press working tools and performs moulding studies on plastics.

Minimum of 12 Exercises need to be performed**I. Metal Casting Lab:**

1. Pattern Design and making - for one casting drawing.
2. Sand properties testing - Exercise -for strengths, and permeability – 1
3. Moulding Melting and Casting - 1 Exercise

II. Welding Lab:

1. ARC Welding Lap & Butt Joint - 2 Exercises
2. Spot Welding - 1 Exercise
3. TIG Welding - 1 Exercise
4. Plasma welding and Brazing - 2 Exercises
(Water Plasma Device)

III. Mechanical Press Working:

1. Blanking & Piercing operation and study of simple, compound and progressive press tool.
2. Hydraulic Press: Deep drawing and extrusion operation.
3. Bending and other operations

IV. Processing Of Plastics

1. Injection Moulding
2. Blow Moulding

REFERENCE BOOK:

1. Dictionary of Mechanical Engineering – G.H.F. Naylor, Jaico Publishing House.

ME307PC: MACHINE DRAWING PRACTICE**B.Tech. II Year I Sem.**

L	T/P/D	C
0	0/2/0	1

Pre-requisites: Engineering graphics

Course objectives: To familiarize with the standard conventions for different materials and machine parts in working drawings. To make part drawings including sectional views for various machine elements. To prepare assembly drawings given the details of part drawings.

Course Outcomes:

- Preparation of engineering and working drawings with dimensions and bill of material during design and development. Developing assembly drawings using part drawings of machine components.
- Conventional representation of materials, common machine elements and parts such as screws, nuts, bolts, keys, gears, webs, ribs.
- Types of sections – selection of section planes and drawing of sections and auxiliary sectional views. Parts not usually sectioned.
- Methods of dimensioning, general rules for sizes and placement of dimensions for holes, centers, curved and tapered features.
- Title boxes, their size, location and details - common abbreviations and their liberal usage
- Types of Drawings – working drawings for machine parts.

Drawing of Machine Elements and simple parts

Selection of Views, additional views for the following machine elements and parts with every drawing proportion.

1. Popular forms of Screw threads, bolts, nuts, stud bolts, tap bolts, set screws.
2. Keys, cottered joints and knuckle joint.
3. Rivetted joints for plates
4. Shaft coupling, spigot and socket pipe joint.
5. Journal, pivot and collar and foot step bearings.

Assembly Drawings:

Drawings of assembled views for the part drawings of the following using conventions and easy drawing proportions.

1. Steam engine parts – stuffing boxes, cross heads, Eccentrics.
2. Machine tool parts: Tail stock, Tool Post, Machine Vices.
3. Other machine parts - Screws jacks, Petrol engine connecting rod, Plummer block, Fuel Injector
4. Valves - Steam stop valve, spring loaded safety valve, feed check valve and air cock.

NOTE: First angle projection to be adopted. The student should be able to provide working drawings of actual parts.

TEXT BOOKS:

1. Machine Drawing / N.D. Bhatt / Charotar
2. Machine Drawing with Auto CAD / Goutham Pohit, Goutam Ghosh / Pearson

REFERENCE BOOKS:

1. Machine Drawing by / Bhattacharyya / Oxford
2. Machine Drawing / Ajeet Singh / Mc Graw Hill

ME308PC: MATERIAL SCIENCE & MECHANICS OF SOLIDS LAB

B.Tech. II Year I Sem.

L	T/P/D	C
0	0/2/0	1

MATERIAL SCIENCE:

Course Objective: The purpose of this course is to make the students learn the concepts of Metallurgy and Material Science role in all manufacturing processes which convert raw materials into useful products adapted to human needs.

Course Outcomes: The Primary focus of the Metallurgy and Material science program is to provide undergraduates with a fundamental knowledge based associated materials properties, and their selection and application. Upon graduation, students would have acquired and developed the necessary background and skills for successful careers in the materials-related industries. Furthermore, after completing the program, the student should be well prepared for management positions in industry or continued education toward a graduate degree.

List of Experiments:

1. Preparation and study of crystal models for simple cubic, body centred cubic, face centred cubic and hexagonal close packed structures.
2. Preparation and study of the Microstructure of pure metals like Iron, Cu and Al.
3. Preparation and study of the Microstructure of Mild steels, low carbon steels, high – C steels.
4. Study of the Microstructures of Cast Irons.
5. Study of the Microstructures of Non-Ferrous alloys.
6. Hardenability of steels by Jominy End Quench Test.

MECHANICS OF SOLIDS:

Course Objectives: The objective is to learn the fundamental concepts of stress, strain, and deformation of solids with applications to bars, beams, and columns. Detailed study of engineering properties of materials is also of interest. Fundamentals of applying equilibrium, compatibility, and force-deformation relationships to structural elements are emphasized. The students are introduced to advanced concepts of flexibility and stiffness method of structural analysis. The course builds on the fundamental concepts of engineering mechanics course.

The students will advance the students' development of the following broad capabilities:

- Students will be able to understand basic concepts of stress, strain and their relations based on linear elasticity. Material behaviors due to different types of loading will be discussed.
- Students will be able to understand and know how to calculate stresses and deformation of a bar due to an axial loading under uniform and non-uniform conditions.
- Students will understand how to develop shear-moment diagrams of a beam and find the maximum moment/shear and their locations
- Students will understand how to calculate normal and shear stresses on any cross-section of a beam. Different cross-sections (including I-beam) will be discussed and applied Continuous Assessment Test 10 marks Mid Semester Test 15 marks End

Course Outcomes

- Analyze the behavior of the solid bodies subjected to various types of loading.
- Apply knowledge of materials and structural elements to the analysis of simple structures.
- Undertake problem identification, formulation and solution using a range of analytical methods
- Analyze and interpret laboratory data relating to behavior of structures and the materials they are made of, and undertake associated laboratory work individually and in teams.
- Expectation and capacity to undertake lifelong learning.

List of Experiments:

1. Direct tension test
2. Bending test on Simple supported beam
3. Bending test on Cantilever beam
4. Torsion test
5. Brinell hardness test/ Rockwell hardness test
6. Test on springs
7. Izod Impact test/ Charpy Impact test

MC309/*MC409: CONSTITUTION OF INDIA*B.Tech. II Year I Sem.**

L	T/P/D	C
3	0/0/0	0

The Constitution of India is the supreme law of India. Parliament of India cannot make any law which violates the Fundamental Rights enumerated under the Part III of the Constitution. The Parliament of India has been empowered to amend the Constitution under Article 368, however, it cannot use this power to change the “basic structure” of the constitution, which has been ruled and explained by the Supreme Court of India in its historical judgments. The Constitution of India reflects the idea of “Constitutionalism” – a modern and progressive concept historically developed by the thinkers of “liberalism” – an ideology which has been recognized as one of the most popular political ideology and result of historical struggles against arbitrary use of sovereign power by state. The historic revolutions in France, England, America and particularly European Renaissance and Reformation movement have resulted into progressive legal reforms in the form of “constitutionalism” in many countries. The Constitution of India was made by borrowing models and principles from many countries including United Kingdom and America.

The Constitution of India is not only a legal document but it also reflects social, political and economic perspectives of the Indian Society. It reflects India’s legacy of “diversity”. It has been said that Indian constitution reflects ideals of its freedom movement; however, few critics have argued that it does not truly incorporate our own ancient legal heritage and cultural values. No law can be “static” and therefore the Constitution of India has also been amended more than one hundred times. These amendments reflect political, social and economic developments since the year 1950. The Indian judiciary and particularly the Supreme Court of India has played an historic role as the guardian of people. It has been protecting not only basic ideals of the Constitution but also strengthened the same through progressive interpretations of the text of the Constitution. The judicial activism of the Supreme Court of India and its historic contributions has been recognized throughout the world and it gradually made it “as one of the strongest court in the world”.

Course content

1. Meaning of the constitution law and constitutionalism
2. Historical perspective of the Constitution of India
3. Salient features and characteristics of the Constitution of India
4. Scheme of the fundamental rights
5. The scheme of the Fundamental Duties and its legal status
6. The Directive Principles of State Policy – Its importance and implementation
7. Federal structure and distribution of legislative and financial powers between the Union and the States
8. Parliamentary Form of Government in India – The constitution powers and status of the President of India
9. Amendment of the Constitutional Powers and Procedure
10. The historical perspectives of the constitutional amendments in India
11. Emergency Provisions: National Emergency, President Rule, Financial Emergency
12. Local Self Government – Constitutional Scheme in India
13. Scheme of the Fundamental Right to Equality
14. Scheme of the Fundamental Right to certain Freedom under Article 19
15. Scope of the Right to Life and Personal Liberty under Article 21

EE401ES: BASIC ELECTRICAL AND ELECTRONICS ENGINEERING**B.Tech. II Year II Sem.**

L	T/P/D	C
3	0/0/0	3

Course Objectives:

- To introduce the concepts of electrical circuits and its components
- To understand magnetic circuits, DC circuits and AC single phase & three phase circuits
- To study and understand the different types of DC/AC machines and Transformers.
- To impart the knowledge of various electrical installations.
- To introduce the concept of power, power factor and its improvement.
- To introduce the concepts of diodes & transistors, and
- To impart the knowledge of various configurations, characteristics and applications.

Course Outcomes:

- To analyze and solve electrical circuits using network laws and theorems.
- To understand and analyze basic Electric and Magnetic circuits
- To study the working principles of Electrical Machines
- To introduce components of Low Voltage Electrical Installations
- To identify and characterize diodes and various types of transistors.

UNIT - I:**D.C. CIRCUITS**

Electrical circuit elements (R, L and C), voltage and current sources, KVL&KCL, analysis of simple circuits with dc excitation.

A.C. CIRCUITS

Representation of sinusoidal waveforms, peak and rms values, phasor representation, real power, reactive power, apparent power, power factor, Analysis of single-phase ac circuits, Three-phase balanced circuits, voltage and current relations in star and delta connections.

UNIT - II:**ELECTRICAL INSTALLATIONS**

Components of LT Switchgear: Switch Fuse Unit (SFU), MCB, ELCB, MCCB, Types of Wires and Cables, Earthing. Types of Batteries, Important Characteristics for Batteries. Elementary calculations for energy consumption, power factor improvement and battery backup.

UNIT - III:**ELECTRICAL MACHINES**

Working principle of Single-phase transformer, equivalent circuit, losses in transformers, efficiency, Three-phase transformer connections. Construction and working principle of DC generators, EMF equation, working principle of DC motors, Torque equations and Speed control of DC motors, Construction and working principle of Three-phase Induction motor, Torques equations and Speed control of Three-phase induction motor. Construction and working principle of synchronous generators.

UNIT - IV:

P-N JUNCTION AND ZENER DIODE: Principle of Operation Diode equation, Volt-Ampere characteristics, Temperature dependence, Ideal versus practical, Static and dynamic resistances, Equivalent circuit, Zener diode characteristics and applications.

RECTIFIERS AND FILTERS: P-N junction as a rectifier - Half Wave Rectifier, Ripple Factor - Full Wave Rectifier, Bridge Rectifier, Harmonic components in Rectifier Circuits, Filters – Inductor Filters, Capacitor Filters, L- section Filters, π - section Filters.

UNIT - V:

BIPOLAR JUNCTION TRANSISTOR (BJT): Construction, Principle of Operation, Amplifying Action, Common Emitter, Common Base and Common Collector configurations, Comparison of CE, CB and CC configurations.

FIELD EFFECT TRANSISTOR (FET): Construction, Principle of Operation, Comparison of BJT and FET, Biasing FET.

TEXT BOOKS:

1. Basic Electrical and electronics Engineering –M S Sukija TK Nagasarkar Oxford University
2. Basic Electrical and electronics Engineering-D P Kothari. I J Nagarath, McGraw Hill Education

REFERENCES:

1. Electronic Devices and Circuits – R. L. Boylestad and Louis Nashelsky, PEI/PHI, 9th Ed, 2006.
2. Millman's Electronic Devices and Circuits – J. Millman and C. C. Halkias, Satyabrata Jit, TMH, 2/e, 1998.
3. Engineering circuit analysis- by William Hayt and Jack E. Kemmerly, McGraw Hill Company, 6th edition.
4. Linear circuit analysis (time domain phasor and Laplace transform approaches) - 2nd edition by Raymond A. De Carlo and Pen-Min-Lin, Oxford University Press-2004.
5. Network Theory by N. C. Jagan& C. Lakshminarayana, B.S. Publications.
6. Network Theory by Sudhakar, Shyam Mohan Palli, TMH.
7. L. S. Bobrow, "Fundamentals of Electrical Engineering", Oxford University Press, 2011.
8. E. Hughes, "Electrical and Electronics Technology", Pearson, 2010.
9. V. D. Toro, "Electrical Engineering Fundamentals", Prentice Hall India, 1989.