B.Tech - Mechanical Engineering
II Year Course Structure And Syllabus (R20)
Applicable From 2020-21 Admitted Batch

II YEAR I SEMESTER

S. No.	Course Code	Course Title	Course Category	Hours Per Week			Total Contact Hour	Credits	Scheme of Examination Maximum Marks		
				L	T	P			Internal (CIE)	External (SEE)	Total
1	2030005	Probability Distributions and Complex Variables	BSC	3	1	0	4	4	30	70	100
2	2030202	Basic Electrical and Electronic Engineering	HSMC	3	0	0	3	3	30	70	100
3	2030301	Engineering Mechanics	ESC	3	1	0	4	4	30	70	100
4	2030311	Thermodynamics	PCC	3	1	0	4	4	30	70	100
5	2030506	Python Programming	ESC	2	0	0	2	2	30	70	100
6	2030272	Basic Electrical and Electronic Engineering Lab	HSMC	0	0	2	2	1	30	70	100
7	2030373	Fuels and Lubricants Lab	PCC	0	0	2	2	1	30	70	100
8	2030374	Machine Drawing Practice	PCC	0	0	4	4	2	30	70	100
9	2030575	Python Programming Lab	ESC	0	0	2	2	1	30	70	100
10	2030022	Gender Sensitization	*MC	2	0	0	2	0	-	-	-
Total Credits				**16**	**3**	**10**	**29**	**22**	**270**	**630**	**900**

II YEAR II SEMESTER

S. No.	Course Code	Course Title	Course Category	Hours Per Week			Total Contact Hour	Credits	Scheme of Examination Maximum Marks		
				L	T	P			Internal (CIE)	External (SEE)	Total
1	2040312	Mechanics of Solids	PCC	3	1	0	4	4	30	70	100
2	2040313	Metallurgy and Material Science	PCC	3	0	0	3	3	30	70	100
3	2040314	Kinematics of Machinery	PCC	3	1	0	4	4	30	70	100
4	2040315	Thermal Engineering-I	PCC	3	0	0	3	3	30	70	100
5	2040316	Production Technology	PCC	3	0	0	3	3	30	70	100
6	2040375	Production Technology Lab	PCC	0	0	2	2	1	30	70	100
7	2040376	Material Science and Mechanics of Solids Lab	PCC	0	0	2	2	1	30	70	100
8	2040377	Thermal Engineering – Lab	PCC	0	0	2	2	1	30	70	100
9	2040023	Constitution of India	*MC	3	0	0	3	0	-	-	-
10	2040024	OOPS through C++	*MC	0	2	0	2	0	-	-	-
Total Credits				**18**	**4**	**6**	**28**	**20**	**240**	**560**	**800**

II — I

2030005: PROBABILITY DISTRIBUTIONS& COMPLEX VARIABLES

B. Tech. II Year I Sem, MECH **L T P C**
3 1 0 4

Course Objectives: To learn

- The ideas of probability and random variables and various discrete and continuous probability distributions and theirproperties.
- 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'sseries.

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 analyzing experimental data.
- Analysethecomplexfunctionwithreferencetotheiranalyticity,integrationusingCauchy'sintegral and residuetheorems.
- Taylor's and Laurent's series expansions of complex function.

UNIT - I:BasicProbability

Probability spaces, conditional probability, independent events, and Bayes' theorem. Random variables: Discrete and continuous random variables, Expectation of Random Variables,Variance of random variables

LEARNING OUTCOMES:

- Understand the sample space and events
- Explain the notion of random variable, distribution functions and expected value.
- Apply Baye's theorem to real time problems
- Analyse the mean and variance of random variables
- Evaluate the probability of event for more complex outcomes.

UNIT - II:Probabilitydistributions

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

LEARNING OUTCOMES:

- Understand the concept of Probability distribution.
- Explain discrete probability distributions
- Apply Binomial, Poisson and Geometric distributions for real data to compute Probabilities, theoretical frequencies.
- Analyse the properties of Binomial, Poisson and Geometric distributions and its applications.
- Evaluate probabilities, theoretical frequencies.

UNIT - III: Testingof Hypothesis

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

LEARNING OUTCOMES:

- Understand the concept of testing of hypothesis
- Explain the single proportions and difference of proportions.
- Apply the concept of hypothesis testing for large samples.
- Analyse testing hypothesis for small samples to draw the inference.
- Evaluate single mean and difference of means for small samples.

UNIT - IV: ComplexVariables(Differentiation)

Limit, Continuity and Differentiation of Complex functions, Analyticity, Cauchy-Riemann equations (without proof), finding harmonic conjugate; Milne-Thomson method for constructing analytic functions.

LEARNING OUTCOMES:

- Understand the basic theory of complex functions
- Explain the concepts of limit, continuity, differentiability, analyticity.
- Apply C-R equations to different complex functions
- Analyse the harmonic functions
- Evaluate theBilinear Transformation.

UNIT - V: ComplexVariables(Integration)

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.(All theorems are without proof)

LEARNING OUTCOMES:

- Understand the concept of complex integration.
- Explain the Cauchy's integral theorem
- Apply Complex integration over the stream flow functions
- Analyse the contour Integration.
- Evaluation of a line integral along a path.

2030202: Basic Electrical and Electronic Engineering

B.T**ech. II Year I Sem.**

L	T	P	C
3	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 import 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:

PN 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

2020301: ENGINEERING MECHANICS

B. Tech. II Year I Sem

L	T	P	C
3	1	-	4

PRE-REQUISITES: Intermediate Mathematics and Physics.

COURSE OBJECTIVES:

1. To solve the resultant of any force system.
2. To analyze the types of frication for moving bodies and problems related to friction.
3. To determine the centroid of an area and center of gravity of body.
4. To understand the concept of area moment and mass moment about any axes.
5. Understand the work-energy principle

COURSE OUTCOMES : After completion of the course the student is able to

1.Determine the resultant of coplanar concurrent and special force systems and analyse the bodies for equilibrium to find the unknown forces (L_1)

2.Analyze the bodies on rough horizontal and inclined planes and connected Bodies (L_4)

3. Determine the centroid of composite areas, centre of gravity of composite bodies (L_3)

4. Determine the moment of inertia of simple areas and mass moment of inertia of simple bodies (L_3)

5. Apply work-energy principle to solve the rigid body problems (L_3)

UNIT–1 **14**

Introduction to Mechanics: Basic Concepts, system of Forces Coplanar Concurrent Forces - Components in Space -Resultant -Moment of Forces and its Application - Couples and Resultant of Force Systems. Equilibrium of system of Forces: Free body diagrams, Equations of Equilibrium of Coplanar Systems and Spatial Systems.

LEARNING OUTCOME:

1. Determine the resultant of coplanar concurrent and special force systems and analyse the bodies for equilibrium to find the unknown forces.(L_1)

UNIT–2 **10**

Friction: Types of friction -Limiting friction -Laws of Friction -static and Dynamic Frictions – Types of friction – Dry friction – Ladder friction – Wedge friction – Screw friction – Simple Screw Jack

LEARNING OUTCOME:

1. Analyze the bodies on rough horizontal and inclined planes and connected Bodies (L_4)

UNIT–3 **10**

Centroid and Center of Gravity: Introduction – Centroids of lines – Centroids of area - Centroids of Composite figures - Theorem of Pappus -Centre of Gravity - Center of gravity of composite bodies.

LEARNING OUTCOME:

1. Determine the centroid of composite areas, centre of gravity of composite bodies (L_3)
2.

UNIT–4 **16**

Area moments of Inertia: Introduction – Definition of Moment of Inertia -Polar Moment of Inertia – Radius of gyration - Transfer Theorem for moment of inertia – Moments of inertia by integration - Moments of Inertia of Composite Figures.

Mass Moment of Inertia: Introduction - Moment of Inertia of Masses – Radius of gyration – Transfer Formula for Mass Moments of Inertia – Mass moments of inertia by integration - Mass moment of inertia of composite bodies – Product of Inertia.

LEARNING OUTCOME :

1. Determine the moment of inertia of simple areas and mass moment of inertia of simple bodies.(L_3)

UNIT–5 **10**

Kinetics of Rigid Bodies: Types of motion, D'Alemberts principle and its applications in plane motion and connected bodies; Work energy principle and its application in plane motion of connected bodies kinetic of rigid body rotation.

LEARNING OUTCOME :

1. Understanding basic laws and principles of kinetics of particle and rigid body.(L_2)
2. Apply work-energy principle to solve the rigid body problems.(L_3)

TEXT BOOK :

1. Singer's Engineering Mechanics Statics and Dynamics/ K. Vijaya Kumar Reddy and J.Suresh Kumar / BSP/3rd Edition
2. Engineering Mechanics/ Irving Shames, G.Krishna Mohan Rao / Prentice Hall./ 4th Edition

REFERENCE BOOK :

1. Engineering Mechanics/ Bhattaharyya/ Oxford./2nd Edition
2. Tayal A.K.(2010), Engineering Mechanics. Umesh Publications./2014th Edition
3. Engg. Mechanics by S.S. Bhavikati & K.G. Rajasekharappa/2012th Edition.

2030311: THERMODYNAMICS

B.Tech. II Year I Sem	L	T	P	C
PRE-REQUISITES: Engineering Physics & Mathematics	3	1	-	4

COURSE OBJECTIVES

1. To impart the knowledge of basic concepts of thermodynamics.
2. To illustrate the concept of first law of thermodynamics and applications
3. To illustrate the concept of second law of thermodynamics
4. To facilitate the students to know the concepts of pure substance and their properties.
5. To help the students learn the properties of gas mixtures and power cycles

COURSE OUTCOMES : After completion of the course the student is able to

1. Explain the fundamental definitions used in thermodynamics (L_1)
2. Outline the temperature principles of thermometry (L_3)
3. Apply first law of thermodynamics to various thermodynamic systems (L_3)
4. Analyze the concepts of second law of thermodynamics (L_3)
5. Estimate the quality of steam subjected to various thermodynamic process (L_3)
6. Compare various power cycles (L_3)

Tables/Codes: Steam Tables and Mollier Chart

UNIT – 1 **12**

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 – Constant Volume and Pressure - gas Thermometer – Scales of Temperature, Ideal Gas Scale

LEARNING OUTCOME:

1. Restate definition of system, surrounding, closed and open system, extensive and intensive Properties (L2)
2. Calculate absolute and gage pressure, and absolute temperature(L3)

UNIT – 2 **10**

First law of thermodynamics: Joule's Experiments- First law of thermodynamics, PMM-I, Corollaries- First law applied to a Process, applied to a system, Steady Flow Energy Equation, throttling and free expansion processes.

LEARNING OUTCOME:

1. Apply first law of thermodynamics for closed systems and construct conservation of mass and energy equations (L3)
2. Apply the first law of thermodynamics to the nozzles, diffusers, turbines, compressors, throttling valves (L3)

UNIT – 3 **12**

Second law of thermodynamics: 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, 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 Thermo dynamics.

LEARNING OUTCOME:

1. Calculate thermal efficiency and coefficient of performance for heat engine, refrigerators and heat Pumps (L3)
2. Apply the concept of Entropy, Calculate heat, work and other important thermodynamics (L3)

UNIT – 4 **08**

Properties of Pure Substances: Pure substance, P-V-T surfaces, T-S & h-s diagrams, Mollier charts, phase transformations, triple point, at critical state properties during the change of phase, dryness fraction, Clausius Clapeyron equation property tables. Various **Properties of Gas Mixtures:** Mixtures of perfect Gases – Mole Fraction, Mass friction Gravimetric and thermodynamic processes,energy transfer, steam calorimetry.

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

LEARNING OUTCOME :

1. Generate mass and energy balance equations for gas-vapor mixtures (L3).
2. Determine changes in internal energy and enthalpy for ideal gases (L3).

UNIT – 5 **08**

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, Bell-Coleman cycle, Vapour compression cycle-performance Evaluation.

LEARNING OUTCOME :

1. To calculate efficiencies of gas power cycles (L3).
2. To calculate coefficient of performance of refrigeration cycles (L3).

TEXT BOOK :

1. Engineering Thermodynamics, P.K. Nag, Tata McGraw Hill Publishers/ 5th Edition.
2. Thermodynamics: An Engineering Approach Y.A. Cengel and M.A. Boles, Tata Mc-Graw Hill
   Publishers/6th Edition

REFERENCE BOOK :

1. Fundamentals of Engineering Thermodynamics, R Yadav, Central Book Depot, Allahabad/ 7th Edition.
2. Fundamentals of Classical Thermodynamics, G. Van Wylan& R.E. Sonntag, John Wiley Publication/6th Edition.
3. Engineering Thermodynamics, Dr.K.Ramakrishna, Anuradha Publications/ 2nd Edition.

2030506: PYTHON PROGRAMMING

B. Tech II Year. I- Sem

L	T	P	C
3	0	0	3

Course Objectives:

1. Handle Strings and Files in Python.
2. Understand Lists, Dictionaries and Regular expressions in Python.
3. Understand FILES, Multithread programming in Python.

Course Outcomes:

1. Examine Python syntax and semantics and be fluent in the use of Python flow control and functions.
2. Demonstrate proficiency in handling Strings and File Systems.
3. Create, run and manipulate Python Programs using core data structures like Lists, Dictionaries and use Regular Expressions.

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UNIT - I

Python Introduction, History & Installing of Python, Python basics, Python Objects, Standard Types, Other Built-in Types, Internal Types, Standard Type Operators, Standard Type Built-in Functions, Categorizing the Standard Types, Unsupported Types Numbers - Introduction to Numbers, Integers, Floating Point Real Numbers, Complex Numbers, Operators, Built-in Functions.

Control structures

UNIT - II

Related Modules Sequences - Strings, Lists, and Tuples, Mapping and Set Types.

Iterators, List comprehensions, Generator Expressions

UNIT-III

FILES: File Objects, File Built-in Functions, File Built-in Methods, File Built-in Attributes, Standard Files, Command-line Arguments, File System, File Execution, Persistent Storage Modules, Related Modules

UNIT-IV

Exceptions: Exceptions in Python, Detecting and Handling Exceptions, Context Management, Exceptions as Strings, Raising Exceptions, Assertions, Standard Exceptions, Creating Exceptions, Exceptions and the sys Module, Modules and Files, Namespaces, Importing Modules, Importing Module Attributes,

Multithreaded Programming: Introduction, Threads and Processes, Python, Threads, and the Global Interpreter Lock, Thread Module, Threading Module, Related Modules

UNIT – V

GUI Programming: Introduction, Tkinter and Python Programming, Brief Tour of Other GUIs, Related Modules and Other GUIs

Regular Expressions: Introduction, Special Symbols and Characters, Res and Python

TEXT BOOKS:

1. Core Python Programming, Wesley J. Chun, Second Edition, Pearson.

REFERENCE BOOKS:

2. Think Python, Allen Downey, Green Tea Press
3. Introduction to Python, Kenneth A. Lambert, Cengage
4. Python Programming: A Modern Approach, VamsiKurama, Pearson

2030374: MACHINE DRAWING PRACTICE

B.Tech. II Year I

L	T/P/	D
0	0/4/0	2

Pre-requisites: Engineering graphics

COURSE OBJECTIVES:

1.To familiarize with the standard conventions for different materials and machine parts in working drawings.

2. To make part drawings including sectional views for various machine elements.

3.To prepare assembly drawings given the details of part drawings.

COURSE OUTCOMES : After completion of the course the student is able to

1. Conventional representation of materials, common machine elements and parts such as screws, nuts, bolts, keys, gears, webs, ribs. (L1)
2. Types of sections – selection of section planes and drawing of sections and auxiliary sectional views. Parts not usually sectioned. (L2)
3. Methods of dimensioning, general rules for sizes and placement of dimensions for holes, centers, curved and tapered features.(L3)
4. Title boxes, their size, location and details - common abbreviations and their liberal usage. (L1)
5. Types of Drawings – working drawings for machine parts. (L3)
6. 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.(L2)

PART - A

Drawing of Machine Elements and simple parts

1. Conventional representation of materials, common machine elements and parts such as screws, nuts, bolts, keys, gears, webs, ribs.
2. Types of sections – selection of section planes and drawing of sections and auxiliary sectional views. Parts not usually sectioned.
3. Methods of dimensioning, general rules for sizes and placement of dimensions for holes, centers, curved and tapered features.
4. Title boxes, their size, location and details - common abbreviations and their liberal usage
5. Types of Drawings – working drawings for machine parts. Popular forms of Screw threads, bolts, nuts, stud bolts, tap bolts, set screws. Limits, Fits – Tolerancing of individual dimensions. Keys, cottered joints and knuckle joint. Riveted joints for plates Shaft coupling, spigot and socket pipe joint. Journal, pivot and collar and foot step bearings.

LEARNING OUTCOME:

1. Conventional representation of materials, common machine elements and parts such as screws, nuts, bolts, keys, gears, webs, ribs. (L1)
2. Types of sections – selection of section planes and drawing of sections and auxiliary sectional views. Parts not usually sectioned. (L2)

PART -B

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.

LEARNING OUTCOME:

2. Types of sections – selection of section planes and drawing of sections and auxiliary sectional views. Parts not usually sectioned. (L2)
3. 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.(L2)

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

TEXT BOOK : TEXT BOOKS:

1. Machine Drawing by K.L.Narayana, Wiley Eastern/ 5th Edition
2. Machine Drawing by N.D. Bhatt / Charotar/50th edition

REFERENCE BOOK :

1. Machine Drawing by / Bhattacharyya / Oxford/4th edition
2. Machine Drawing by Ajeet Singh / Mc Graw Hill/2nd edition
3. Machine Drawing byP.S.Gill/S.K.Kataria & Sons /2nd edition

NOTE: Question paper consists of PART-A and PART –B

1. PART -A consists of Part drawing
2. PART – B consists of Assembly drawing.

2030272: Basic Electrical and Electronics Engineering Lab

Pre-requisites: Basic Electrical and Electronics Engineering

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 import 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.

List of experiments/demonstrations:

PART A: ELECTRICAL

1. Verification of KVL and KCL
2. (i) Measurement of Voltage, Current and Real Power in primary and Secondary Circuits of a Single-Phase Transformer
   (ii) Verification of Relationship between Voltages and Currents (Star-Delta, Delta-Delta, Delta- star, Star-Star) in a Three Phase Transformer
3. Measurement of Active and Reactive Power in a balanced Three-phase circuit
4. Performance Characteristics of a Separately Excited DC Shunt Motor
5. Performance Characteristics of a Three-phase Induction Motor
6. No-Load Characteristics of a Three-phase Alternator

PART B: ELECTRONICS

1. Study and operation of
   (i) Multi-meters (ii) Function Generator (iii) Regulated Power Supplies (iv) CRO.
2. PN Junction diode characteristics
3. Zener diode characteristics and Zener as voltage Regulator
4. Input & Output characteristics of Transistor in CB / CE configuration
5. Full Wave Rectifier with & without filters
6. Input and Output characteristics of FET in CS configuration

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. Boylestead 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.

Engineering circuit analysis- by William Hayt and Jack E. Kemmerly, McGraw Hill Company, 6th edition.
3. 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.
4. Network Theory by N. C. Jagan& C. Lakshminarayana, B.S. Publications.
5. Network Theory by Sudhakar, Shyam Mohan Palli, TMH.
6. L. S. Bobrow, "Fundamentals of Electrical Engineering", Oxford University Press, 2011.
7. E. Hughes, "Electrical and Electronics Technology", Pearson, 2010.
8. V. D. Toro, "Electrical Engineering Fundamentals", Prentice Hall India, 1989.

2030273: FUELS AND LUBRICTION LAB

B.Tech. II Year I Sem	L	T	P	C
	-	-	2	1

Pre-requisites: Engineering Physics & Chemistry

COURSE OBJECTIVES:

1. To Understand the fuels and lubricants Properties
2. To present a problem oriented in depth knowledge of automobile fuels and lubricants.

COURSE OUTCOMES : After completion of the course the student is able to

1. Illustrate the viscosity of liquid lubricants..
2. Understand the calorific values of solid and gaseous fuels..
3. Analyze the flash and fire points of liquid fuels.
4. Observe the carbon residue for fuels
5. Compare the depth penetration for different lubricants.

LIST OF EXPERIMENTS :

1. Determination of Flash and Fire points of Liquid fuels/Lubricants using: Abels Apparatus.
2. Determination of Flash and Fire points of Liquid fuels/Lubricants using: Pensky Martens Apparatus.
3. Carbon residue test: Liquid fuels.
4. Determination of Viscosity of Liquid lubricants and Fuels using: Saybolt Viscometer.
5. Determination of Viscosity of Liquid lubricants and Fuels using: Redwood Viscometer –I.
6. Determination of Viscosity of Liquid lubricants and Fuels using: Redwood Viscometer – II.
7. Determination of Viscosity of Liquid lubricants and Fuels using: Engler Viscometer.
8. Determination of Calorific value: of Gaseous fuels using: Junkers Gas Calorimeter.
9. Determination of Calorific value: Solid/Liquid/ fuels using: Bomb Calorimeter.
10. Drop point and Penetration Apparatus for Grease.
11. ASTM Distillation Test Apparatus.
12. Cloud and Pour point Apparatus.

2030575: PYTHON PROGRAMMING LAB

B. Tech. II Year. I- Sem

L	T	P	C
0	0	3	1.5

Exercise 1 - Basics

a) Running instructions in Interactive interpreter and a Python Script
b) Write a program to purposefully raise Indentation Error and Correct it

Exercise 2 -Operations

a) Write a program to compute distance between two points taking input from the user (Pythagorean Theorem)
b) Write a program add.py that takes 2 numbers as command line arguments and prints its sum.

Exercise - 3 Control Flow

a) Write a Program for checking whether the given number is a even number or not.
b) Using a for loop, write a program that prints out the decimal equivalents of 1/2, 1/3, 1/4, . . . , 1/10
c) Write a program using a for loop that loops over a sequence. What is sequence?
d) Write a program using a while loop that asks the user for a number, and prints a countdown from that number to zero.

Exercise 4 - Control Flow -Continued

a) Find the sum of all the primes below two million.

Each new term in the Fibonacci sequence is generated by adding the previous two terms. By starting with 1 and 2, the first 10 terms will be:

1, 2, 3, 5, 8, 13, 21, 34, 55, 89, ...

b) By considering the terms in the Fibonacci sequence whose values do not exceed four million, find the sum of the even-valued terms.

Exercise - 5 Files

a) Write a program to print each line of a file in reverse order.
b) Write a program to compute the number of characters, words and lines in a file.

Exercise - 6 Functions

a) Write a function ball_collide that takes two balls as parameters and computes if they are colliding. Your function should return a Boolean representing whether or not the balls are colliding.

Hint: Represent a ball on a plane as a tuple of (x, y, r), r being the radius
If (distance between two balls centers) <= (sum of their radii) then (they are colliding)

b) Find mean, median, mode for the given set of numbers in a list.

Exercise - 7 Functions - Continued

a) Write a function nearly_equal to test whether two strings are nearly equal. Two strings a and b are nearly equal when a can be generated by a single mutation on b.
b) Write a function dups to find all duplicates in the list.
c) Write a function unique to find all the unique elements of a list.

Exercise - 8 - Functions - Problem Solving

a) Write a function cumulative_ product to compute cumulative product of a list of numbers.
b) Write a function reverse to reverse a list. Without using the reverse function.
c) Write function to compute gcd, lcm of two numbers. Each function shouldn't exceed one line.

Exercise 9 - Multi-D Lists

a) Write a program that defines a matrix and prints
b) Write a program to perform addition of two square matrices
c) Write a program to perform multiplication of two square matrices

Exercise - 10 GUI, Graphics

1. Write a GUI for an Expression Calculator usingtk
2. Write a program to implement the following figures using turtle

2030022: Gender Sensitization

B. Tech. II Year. I- Sem L/T/P/C 0/0/3/0

Course Objectives:

- To develop students' sensibility with regard to issues of gender in contemporary India.
- To provide a critical perspective on the socialization of men and women.
- To introduce students to information about some key biological aspects of genders.
- To expose the students to debates on the politics and economics of work.
- To help students reflect critically on gender violence.
- To expose students to more egalitarian interactions between men and women.

Course Outcomes:

- Students will have developed a better understanding of important issues related to gender in contemporary India.
- Students will be sensitized to basic dimensions of the biological, sociological, psychological and legal aspects of gender. This will be achieved through discussion of materials derived from research, facts, everyday life, literature and film.
- Students will attain a finer grasp of how gender discrimination works in our society and how to counter it.
- Students will acquire insight into the gendered division of labour and its relation to politics and economics.
- Men and women students and professionals will be better equipped to work and live together as equals.

UNIT – I

UNDERSTANDING GENDER

Gender: Why Should We Study It? (*Towards a World of Equals:* Unit -1)

Socialization: Making Women, Making Men (*Towards a World of Equals:* Unit -2)

Introduction. Preparing for Womanhood. Growing up Male. First lessons in Caste. Different Masculinities.

UNIT - II

GENDER AND BIOLOGY

Missing Women: Sex Selection and Its Consequences (*Towards a World of Equals:* Unit -4)

Declining Sex Ratio. Demographic Consequences.

Gender Spectrum: Beyond the Binary (*Towards a World of Equals:* Unit -10)

Two or Many? Struggles with Discrimination.

UNIT - III

GENDER AND LABOUR

Housework: the Invisible Labour (*Towards a World of Equals:* Unit -3)

"My Mother doesn't Work." "Share the Load."

Women's Work: Its Politics and Economics (*Towards a World of Equals:* Unit -7)

Fact and Fiction. Unrecognized and Unaccounted work. Additional Reading: Wages and Conditions of Work.

UNIT - IV

ISSUES OF VIOLENCE

Sexual Harassment: Say No! (*Towards a World of Equals:* Unit -6)

Sexual Harassment, not Eve-teasing- Coping with Everyday Harassment- Further Reading: "Chupulu".

Domestic Violence: Speaking Out (*Towards a World of Equals:* Unit -8)

Is Home a Safe Place? -When Women Unite [Film]. Rebuilding Lives. Additional Reading: New Forums for Justice.
Thinking about Sexual Violence (*Towards a World of Equals:* Unit -11)
Blaming the Victim-"I Fought for my Life…." - Additional Reading: The Caste Face of Violence.

UNIT – V
GENDER: CO - EXISTENCE
Just Relationships: Being Together as Equals (*Towards a World of Equals:* Unit -12)
Mary Kom and Onler. Love and Acid just do not Mix. Love Letters. Mothers and Fathers. Additional Reading: Rosa Parks-The Brave Heart.

TEXTBOOK
All the five Units in the Textbook, **"*Towards a World of Equals: A Bilingual Textbook on Gender*"** written by A. Suneetha, Uma Bhrugubanda, Duggirala Vasanta, Rama Melkote, Vasudha Nagaraj, Asma Rasheed, Gogu Shyamala, Deepa Sreenivas and Susie Tharu and published by **Telugu Akademi, Hyderabad**,Telangana State in the year **2015**.

REFERENCE BOOKS:

1. Menon, Nivedita. Seeing like a Feminist. New Delhi: Zubaan-Penguin Books, 2012
2. Abdulali Sohaila. "I Fought For My Life…and Won."Available online at: http://www.thealternative.in/lifestyle/i-fought-for-my-lifeand-won-sohaila-abdulal/

II - II

2030312: MECHANICS OF SOLIDS

B.Tech. II Year II Sem	L	T	P	C
PRE-REQUISITES: Basics of Engineering mechanics	**3**	**1**	**-**	**4**

COURSE OBJECTIVES:

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

1. 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.
2. 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.
3. Students will understand how to develop shear-moment diagrams of a beam and find the maximum moment/shear and their locations
4. Students will understand how to calculate normal and shear stresses.

COURSE OUTCOMES : At the end of the course, the student will be able to

1. Determine the resistance and deformation in member's subjected to axial, flexural and torsional loads. Evaluate the forces in pin joint – plane frames. (L3)
2. Determine the deflections of beams using different methods. Analyze and design thin, thick cylinders and springs (L2,L3)

UNIT – 1 **14**

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

LEARNING OUTCOME:

1. Restate definition of stress, strain, strain energy and resilience (L2)
2. Calculate stress and relation between the elastic moduli temperature stresses(L3)

UNIT – 2 **12**

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.

LEARNING OUTCOME:

2. Apply shear force and bending moment concepts on cantilever, simply supported and overhanging beams (L3)
3. state the behavior of beams under different loadings (L1)

UNIT – 3 **12**

FLEXURAL STRESSES:

Theory of simple bending – Assumptions Derivation of bending equation: M/I=f/y=E/R Neutral axis – Determination bending stresses – section modules 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.

LEARNING OUTCOME:

1. Calculate bending stresses for the following rectangular and circular cross-section(L4)
2. Illustrate shear stress distribution for cross-section rectangular, circular, triangular, I, and T angle sections (L3)

UNIT – 4 **12**

ANALYSIS OF PIN-JOINTED PLANE FRAMES: Determination of Forces in members of plane, pin-joined, perfect trusses by (i) method of joints and (ii) method of sections. Analysis of various types of cantilever and simply – supported trusses – by method of joints and method of sections.

DEFLECTION OF BEAMS: Bending into a circular arc – slope, deflection and radius of curvature – Differential equation for the elastic line of a beam – Double integration and Macaulay's methods – Determination of slope and deflection for cantilever and simply supported beams subjected to point loads, - U.D.L. uniformly varying load. Mohr's theorems – Moment area method – application to simple cases including overhanging beams.

LEARNING OUTCOME :

1**.** To identify zero-force member in a structure (L1)

2. Analyze the mathematical expression to determine the slope and deflection of cantilever and simply supported beams subjected to different types of loads. (L3)

UNIT – 5 **10**

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.

LEARNING OUTCOME :

1. To calculate torsion problems in bars (L4)

2. Analyze the mathematical expression for circumferential and longitudinal stresses in thin cylinders (L3)

TEXT BOOK :

1. Strength of Materials by Ramamruthan / 4th Edition / Dhantatrai publishers
2. Strength of Materials – Bhavikatti/ 4th Edition / Vikas publishers

REFERENCE BOOK :

4. Strength of Materials by Bansal / 6th Edition / Lakshmi Publications
5. Strenght of Mateirals by Rajput / 5th Edition/ S.Chand publishers
6. Strength of Materials by Sadhu Singh / 9th Edition / Khanna publishers

2040313: METALLURGY AND MATERIAL SCIENCE

B.Tech. II Year II Sem

L	T	P	C
3	-	-	3

PRE-REQUISITES: Basic knowledge of Engineering Physics and Chemistry

COURSE OBJECTIVES

1. To understand of the correlation between the internal structure of the materials their mechanical properties and various methods to quantify their mechanical integrity and failure criteria.
2. To provide a detailed interpretation of equilibrium phase diagram.
3. To learn about heat treatment methods to tailor the properties of Fe-C alloys.
4. To introduce various materials related to properties and applications.

1. **COURSE OUTCOMES :**

1. Analyze the Structure of materials at different levels, basic concepts of crystalline materials like unit cell, FCC, BCC, HCP, APF (Atomic Packing Factor), Co-ordination Number etc.(L4)
2. Understand concept of mechanical behavior of materials and calculations of same using appropriate equations.(L1)
3. Explain the concept of phase & phase diagram & understand the basic terminologies associated with metallurgy. Construction and identification of phase diagrams and reactions.(L2)
4. Analyze the binary phase diagrams of alloys including Fe-Fe3C, brass, and bronze.(L4)
5. Understand and suggest the heat treatment process (L2,L4)
6. Understand the properties of smart materials, piezoelectric materials, biomaterials, composite materials etc.(L1)

UNIT – 1 **15**

Structure of metals: Lattices, basic idea of symmetry. Bravais lattices, unit cells, crystal structures, crystal planes and directions, co-ordination number. Imperfections in solids: point defects, line defects, surface defects. Grain and grain boundaries, effect of grain boundaries on the properties of metal / alloys, determination of grain size.

Constitution of alloys: Necessity of alloying, types of solid solutions, Hume Rotherys rules, intermediate alloy phases, and electron compounds.

LEARNING OUTCOMES:

1. To understand the types of crystal structures and relate it to the final properties. (L2)
2. Compare among different of crystal imperfections. (L3)

UNIT – 2 **13**

Equilibrium diagrams: Experimental methods of construction of equilibrium diagrams, Isomorphous alloy systems, equilibrium cooling and heating of alloys, Lever rule, coring miscibility gaps, eutectic systems, congruent melting intermediate phases, peritectic reaction. Transformations in the solid-state allotropy, eutectoid, peritectoid reactions, phase rule, relationship between equilibrium diagrams and properties of alloys. Study of Fe-Fe3C, equilibrium phase diagram**.**

LEARNING OUTCOMES:

1. Understand the concept of solid solutions and types.(L2)
2. Apply the principles of Tie-line rule and Lever rule to find the composition of the phases present and their weight percentages. (L3)

UNIT – 3 **11**

Cast irons and steels: Structure and properties of White Cast iron, Malleable Cast iron, grey cast iron, Spheroidal graphite cast iron, Alloy cast irons. Classification of steels, structure and properties of plain carbon steels, tool and die steels.

Non-ferrous metals and alloys: Structure and properties of copper and its alloys, Aluminium and its alloys. Titanium and its alloy.

LEARNING OUTCOME:

1. Understand the Fe-C diagram with invariant reactions, critical temperatures& equilibrium phases. (L2)
2. Apply the principles of Tie-line rule and Lever rule to find the composition of the phases present and their weight percentages. (L3)

UNIT – 4 **11**

Heat treatment of alloys: Effect of alloying elements on Fe-Fe3C system, Annealing, normalizing, Hardening, TTT diagrams, tempering, Hardenability, surface hardening methods, Age hardening treatment, Cryogenic treatment of alloys. Special metals and alloys- Super alloys maraging steels.

LEARNING OUTCOME:

1. Suggest suitable heat treatment process for a particular requirement. (L2 ,L4)
2. Distinguish between the major heat treatment processes. (L4)

UNIT – 5 **10**

Ceramic materials: Crystalline ceramics, glasses, cermets, abrasive materials, nanomaterials - definition, properties and applications.

Composite materials: Classification of composites, particle - reinforced materials, fibre reinforced materials, metal ceramic mixtures, metal matrix composites and C – C composites.

LEARNING OUTCOME :

1. Acquire knowledge about composite materials, types, manufacturing methods & its applications. (L2, L3)
2. Suggest suitable materials for the modern world. (L3)

TEXT BOOK :

1. Introduction to Physical Metallurgy by Sidney H. Avener, Tata McGraw hill education (P) Ltd, New Delhi, India./ 2nd edition
2. Materials Science and Engineering by V. Raghavan (2015), PHI Learning Private Ltd, India./ 6thEdition,

REFERENCE BOOK :

1. Mechanical Metallurgy by Dieter, George Ellwood, Copyright © 1988 McGraw-Hill Book Company (UK) Limited./3rd Edition
2. Engineering Materials properties & selection by Kenneth G, G.Budiniski /Prentice hall of India/8th edition.
3. Mechanics of composite materials, ROBERT M. JONES, Taylor & Francis ,U.S.A Balram Gupta et al Aerospace Materials, S B Chand & Company Ltd, January 2009./2nd edition.

2040314: KINEMATICS OF MACHINERY

B. Tech. II Year II Sem **L T P C**

PRE-REQUISITES: Basic principles of Mechanics **3 1 - 4**

COURSE OBJECTIVES:

To study the relative motion, velocity and accelerations of the various elements in a mechanism.

1. Analyze the mechanisms and their inversions
2. To study about different straight line motion mechanisms and steering mechanisms
3. To Analyze the motion of cams, gears& gear trains.

COURSE OUTCOMES : After completion of the course the student is able to

1. Understand the relative motions obtained in different type of components used in mechanical Engineering. (L2)
2. Understand different mechanisms (L2)
3. Draw the trajectories of various kinematic objects (L3)

UNIT – 1

CLASSES:10

Mechanisms: Elements or Links – Classification – Rigid Link, flexible and fluid link – Types of kinematics pairs – sliding, turning, rolling, screw and spherical pairs – lower and higher pairs – closed and open pairs – constrained motion – completely, partially or successfully and incompletely constrained .

Mechanism and Machines: Mobility of Mechanisms: Grubler's criterion, classification of mechanism – kinematics chain – inversions of mechanism – inversions of quadric cycle chain, single and double slider crank chains, Mechanical Advantage, Intermittent motion Mechanism, Ratchet & Pawl Geneva Mechanism.

LEARNING OUTCOME:

1. Differentiate between types of links (L1)
2. Learn about mechanisms and their inversions (L1)

UNIT – 2 **12**

VELOCITY AND ACCELERATION DIAGRAMS, AND ANALYSIS OF MECHANISMS:

Kinematics: Velocity and acceleration – Motion of link in machine – Determination of Velocity and acceleration – Graphical method – Application of relative velocity method.
Plane motion of body: Instantaneous center of rotation- centrodes and axodes – Three centers in line theorem – Graphical determination of instantaneous center, determination of angular velocity of points and links by instantaneous center method.
Kliens construction - Coriolis acceleration - determination of Coriolis component of acceleration
Analysis of Mechanisms: Analysis of slider crank chain for displacement- velocity and acceleration of slider – Acceleration diagram for a given mechanism.

LEARNING OUTCOME:

1. Learn to find velocities and accelerations of links in a mechanism (L1)
2. Will be able to apply graphical method to find velocities and accelerations of various links in a mechanism (L3)

UNIT – 3 **12**

STRAIGHT LINE MOTION MECHANISMS, STEERING GEARS, HOOKE'S JOINT:

Straight-line motion mechanisms: Exact and approximate copied and generated types – Peaucellier - Hart - Scott Russel – Grasshopper – Watt -Tchebicheff's and Robert Mechanism - Pantographs

Steering gears: Conditions for correct steering – Davis Steering gear, Ackerman's steering gear.
Hooke's Joint: Single and double Hooke's joint –velocity ratio – application – problems

LEARNING OUTCOME:

1. Identify different straight-line motion mechanisms (L1)
2. Understand conditions of correct steering in an automobile (L1)

UNIT – 4 **13**

CAMS, ANALYSIS OF MOTION OF FOLLOWERS:

Cams: Definitions of cam and followers – their uses – Types of followers and cams – Terminology – Types of follower motion - Uniform velocity, Simple harmonic motion and uniform acceleration and retardation. Maximum velocity and maximum acceleration during outward and return strokes in the above 3 cases.

Analysis of motion of followers: Tangent cam with Roller follower – circular arc cam with straight, concave and convex flanks.

LEARNING OUTCOME :

1. Identify types of cams and followers (L1)
2. Understand different motions of the follower (L2)

UNIT – 5 **13**

HIGHER PAIRS, GEAR TRAINS:

Higher pair: Friction wheels and toothed gears – types – law of gearing, condition for constant velocity ratio for transmission of motion – velocity of sliding.Forms of teeth, cycloidal and involutes profiles – phenomena of interferences – Methods of interference. Condition for minimum number of teeth to avoid interference – expressions for arc of contact and path of contact of Pinion & Gear and Pinion & Rack Arrangements– Introduction to Helical – Bevel and worm gearing

Gear Trains: Introduction – Types – Simple – compound and reverted gear trains – Epicyclic gear train. Methods of finding train value or velocity ratio of Epicyclic gear trains. Selection of gear box - Differential gear for an automobile

LEARNING OUTCOME :

1. Derive the law of gearing (L3)
2. Identify the types of gears and their profiles (L2)

TEXT BOOK :

1.. Kinematic analysis and synthesis of mechanisms: by Mallik, A. K., Ghosh, A., & Dittrich/ G CRC Press/ 10th Edition, 2008.

2. Theory of Machines by Rattan.S.S. McGraw-Hill Education (India) Pvt Ltd./ 6th Edition/ 2013.

REFERENCE BOOK :

1. The theory of machines: A Text-Book for Engineering Students: by Bevan T/ Pearson Education/ 4th Edition/ 2013.

2. Fundamentals of kinematics and dynamics of machines and mechanisms: by Vinogradov, O. G./ CRC Press/ 2nd Edition/ 2014.

3. Theory of Machines :Kinematics and Dynamics by Sadhu Singh/Pearson Education/3th Edition/2018.

2040315: THERMAL ENGINEERING – I

B.Tech. II Year II Sem

L	T	P	C
3	-	-	3

PRE-REQUISITES: Thermodynamics

COURSE OBJECTIVES

1. To impart the knowledge on working of IC engine and the various losses.
2. To teach the basic concepts of combustion phenomenon and knocking in S.I. and C.I. Engines.
3. To enable the students to calculate the performance of S.I and C.I Engines.
4. To make students learn about different types of compressors and to calculate power and efficiency.

COURSE OUTCOMES : After completion of the course the student is able to

1. Understand the functionality of the major components of the IC Engines and effects of operating conditions on their performance(L_2)
2. Calculate the performance test on IC engines. (L_3)
3. Explain the classification and working principle of various types of air compressors. (L_2)

UNIT – 1 **10**

Classification - Working principles of Four & Two stroke engine, SI & CI engines, Valve and Port Timing Diagrams, air – Standard, air-fuel and actual cycles and their analysis-fuels.

LEARNING OUTCOMES:

1.Recognize and define basic elements and subsystems of an IC Engine with their functions.(L_3)

2.Ability to recognize and define operational modes of a piston-piston rod-crank mechanism, some related parameters such as compression ratio, some volumes, TC, BC etc. and carry out basic mathematical analysis.(L_3)

UNIT – 2 **10**

Engine systems – Carburetor and Fuel Injection Systems for SI engines, Fuel injection systems for CI engines, Ignition, Cooling and Lubrication system, Fuel properties and Combustion Stoichiometry.

LEARNING OUTCOMES:

1. Able to know the working principle of various types of engine systems, Fuel injection system, lubrication system and cooling systems of IC engines.(L_2)

UNIT – 3 **12**

Combustion in SI & CI Engines:

Normal Combustion and abnormal combustion in SI engines – Importance of flame speed and effect of engine variables – Abnormal combustion, pre-ignition and knocking in SI Engines – Fuel requirements and fuel rating, anti knock additives – combustion chamber – requirements, types of SI engines.

Four stages of combustion in CI engines – Delay period and its importance – Effect of engine variables – Diesel Knock– Need for air movement, suction, compression and combustion induced turbulence in Diesel engine – open and divided combustion chambers and fuel injection– Diesel fuel requirements and fuel rating

LEARNING OUTCOME:

1.Able to carry out some elementary analysis on combustion chemistry and associated effect on engine performance through the combustion efficiency.(L_3)

2.Able to know about different models of thermodynamic properties and also be able to read these Properties from thermodynamic charts for unburned and burned gas.(L_3)

UNIT – 4 **08**

Measurements, Testing and Performance:

Parameters of performance - measurement of cylinder pressure, fuel consumption, air intake, exhaust gas composition, Brake power – Determination of frictional losses and indicated power – Performance test – Heat balance sheet and chart.

LEARNING OUTCOME :

1. Realize the importance of cycle approximations as engineering approaches, assumptions included and their effect on the performance calculation.(L_2)
2. Recognize and define important points of a real cycle process and also to get some knowledge about how a good engine performance is achieved by design and adjustment.(L_3)
3. Describe effect of atmospheric and operational conditions and design properties on volumetric efficiency of a 4-stroke engine and on scavenging parameters of a 2-stroke engine.(L_3)

UNIT – 5 **14**

Need for alternate fuel: Availability and properties of alternate fuels, LPG, hydrogen, ammonia, CNG and LNG, vegetable oils and biogas, merits and demerits of various alternate fuels,

Electric, Hybrid, Fuel Cell And Solar Cars : Concept of hybrid electric drive train, types, architecture of series and parallel hybrid electric drive train, merits and demerits, high energy and power density batteries, fuel cell vehicles, solar powered vehicles – Working operations.

LEARNING OUTCOME :

1. Calculation of theoretical compression work and power distinguishing.(L_3)
2. principles of rotary compressors: single and multiple vane, Roots, screw and scroll.(L_2)
3. Compression cycle and volumetric performance due to real compressor properties, compressor capacity(L_3).

TEXT BOOK :

1. I.C. Engines by V. Ganesan, TMH/4th Edition
2. Thermal Engineering by Rajput, Lakshmi Publications/8th Edition

REFERENCE BOOK :

1. IC Engines by Mathur& Sharma – DhanpathRai& Sons./1st Edition
2. Engineering fundamentals of IC Engines by Pulkrabek, Pearson, PHI/2ndEdition
3. Alternate Fuels – Dr. S. S. Thipse – Jaico Publications./1st Edition

2040316: PRODUCTION TECHNOLOGY

B.Tech. II Year II Sem

L	T	P	C
3	-	-	3

PRE REQUESTS: Material Science.

COURSE OBJECTIVES :

1. To teach the process-level dependence of manufacturing systems through tolerances
2. To expose the students to a variety of manufacturing processes including their suitability and capabilities.
3. 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.
4. To teach the thermal and mechanical aspects, such as force, stress, strain and temperature of the most common processes.
5. To provide a technical understanding of common processes to aid in appropriate process selection for the material and required tolerances
6. To provide a technical understanding of common processes to aid in appropriate material selection for a predetermined process.

COURSE OUTCOMES :

1. Understand the idea for selecting materials for patterns. Know Types and allowances of patterns used in casting and analyze the components of moulds. (L1)
2. Design core, core print and gating system in metal casting processes.(L4)
3. Understand the arc, gas, solid state and resistance welding processes. (L1)
4. Develop process-maps for metal forming processes using plasticity principles.(L4)
5. Identify the effect of process variables to manufacture defect free products.(L2)
6. Communicate effectively with industry personnel by developing a manufacturing-centric vocabulary.(L1)

UNIT – 1 **9**

Casting: Steps involved in making a casting and its applications; Design of Patterns - Types, pattern allowances; Types and Properties of moulding sands,Cores. Methods of Melting - Crucible melting and cupola operation. Design of gating systems and riser design. Different Casting processes - Centrifugal casting, die- casting, Investment casting, Solidification of casting – Directional Solidification. Defects in castings.

LEARNING OUTCOME :

1. Recognize the different types of casting process. (L2)
2. Design of riser and gating system.(L4)

UNIT – 2 **9**

Welding: Classification – Types of welds and welded joints; Welding Positions - Gas welding – Types of flames, oxy-fuel gas cutting. Arc welding, forge welding, submerged arc welding, Resistance welding, Thermit welding. Inert Gas Welding _ TIG Welding, MIG welding, Friction Stir 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.

LEARNING OUTCOME :

1. Select suitable fabrication process for typical components.(L4)
2. Describe the various welding process.(L2)

UNIT – 3 **9**

Metal Forming: Hot working, cold working, strain hardening. Recrystallisation, Grain growth .Sheet metal Operations, Strip layout, Hot and cold spinning – Bending, forming-stretch forming and deep drawing. Rolling fundamentals, types of Rolling mills and products. Drawing and its types – Types of presses and press tools.

LEARNING OUTCOME :

1. Select suitable manufacturing process for typical components.(L4)
2. Judge the concept of rolling process, stamping and drawing.(L4)

UNIT – 4 **9**

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

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

LEARNING OUTCOME :

1. Identify the different types of extrusion processes.(L4)
2. Explain the various types of operations carried out in forging.(L2)

UNIT – 5 **9**

Powder Metallurgy: Introduction- Powder production methods, steps in powder metallurgy processes, cold and hot isostatic pressing, typical industrial applications.

Additive Manufacturing: Need for Additive Manufacturing, Fundamentals of Additive Manufacturing, AM Process Chain, Advantages and Limitations of AM, Classification of AM process, Distinction between AM and CNC, other related technologies.

LEARNING OUTCOME :

1. Understand other than basic AMT method(L2)
2. Apply the new method in Various application(L2)
3. Conclude the process parameter using in various AMT method(L3)

45Hrs

TEXT BOOK :

1. Manufacturing Technology / P.N. Rao Vol.1 & 2 / Mc Graw Hill /3rd Edition.
2. Manufacturing Engineering & Technology / Serope Kalpakjian / Steven R. Schmid / Pearson/5th Edition.
3. Production technology / R.K.Jain/Khanna Publishers/18th Edition.

REFERENCE BOOK :

1. Production Technology /P.c.Sharma/S.Chand/3rd Edition.
2. Amitabh Ghosh & Mallick, "Manufacturing Science", Assoc. East west Press Pvt. Ltd/ 4th Edition.
3. Workshop Technology (vol.1)/Hajra Chowdary/Asia Publishing House/5th Edition.

2040375: PRODUCTION TECHNOLOGY LAB

B.Tech. II Year II Sem **L T P C**

PRE REQUESTS: Production Technology **0 0 2 1**

COURSE OBJECTIVE :

1. Know about the basic Physical, Chemical Properties of materials.
2. Know about some material(s) are better to be used in a product for given design requirements.
3. Learn the basic operation of various manufacturing processes.
4. Learn how various products are made using traditional, non-traditional or Electronics manufacturing processes.
5. Design simple process plans for parts and products.
6. Understand how process conditions are set for optimization of production.
7. Measure a given manufactured part to evaluate its size, tolerances and surface
8. Design and fabricate a simple product.

COURSE OUTCOMES:

1. Understanding the properties of moulding sands and pattern making.
2. Fabricate joints using gas welding and arc welding.
3. Evaluate the quality of welded joints.
4. Understanding the various metal forming processes like stamping, drawing etc.,
5. Basic idea of press working tools
6. Performs moulding studies on plastics and their products.

LIST OF EXPERIMENTS :

1. Preparation of green sand by using sand Muller to measure permeability of green sand specimen by using permeability meter and to measure compatibility of green sand specimen.
2. To measure the hardness of green sand specimen by using hardness tester (before heating and after heating) and to measure the sheer strength and compression strength of green sand.
3. Preparation of wooden pattern (stepped pulley) by using wood turning lathe machine.
4. Preparation of mould cavity by using dumbbell & stepped pulley pattern.
5. Melting of aluminum and casting in the prepared mould cavity.
6. Arc Welding –Butt joint & Lap joint.
7. Spot welding –Lap joint & Plasma welding, Plasma cutting.
8. Gas Welding & Brazing.
9. MIG Welding & TIG Welding.
10. Preparation of blanking component by using fly press , extruded part by using hydraulic press , lever by using power press.
11. Preparation of key chain by using Injection moulding machine.
12. Preparation of bottle by using Blow moulding machine.

2040376: MATERIAL SCIENCE AND MECHANICS OF SOLIDS LAB

B.Tech. II Year I Sem	L	T	P	C
	-	-	2	1

PRE-REQUISITES: Engineering Physics & Chemistry

MATERIAL SCIENCE LAB

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 centered cubic, face centered 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 LAB

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.

Course Outcomes:

1. Analyze the behavior of the solid bodies subjected to various types of loading.
2. Apply knowledge of materials and structural elements to the analysis of simple structures.
3. Undertake problem identification, formulation and solution using a range of analytical methods.
4. 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.
5. 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

2040377: THERMAL ENGINEERING LAB

B.Tech. II Year II Sem	L	T	P	C
	-	-	2	1

Pre-requisites: Thermodynamics

COURSE OBJECTIVES:

1. To provide the knowledge to the student about working of IC Engines.
2. To train the student to conduct performance and heat balance test on IC Engines.
3. To practice the student to calculate the frictional losses in an IC Engine.
4. To impart practical exposure on performance of Reciprocating air compressor.
5. To make the student to understand the working principle of various types of boilers.

COURSE OUTCOMES : After completion of the course the student is able to

1. Identify the various parts of an IC Engine.
2. Sketch the Valve and Port Timing diagrams for IC Engines.
3. Determine the performance of various types of IC Engines.
4. Prepare the heat balance sheet for various types of IC Engines.
5. Calculate the frictional power in various types of IC Engines.
6. Analyze the performance of reciprocating air compressor.

LIST OF EXPERIMENTS :

1. Draw the valve and port timing diagrams for four and two stroke engines.
2. Evaluate the performance of 4 –stroke Diesel engines.
3. Evaluate the performance of 2-stroke Petrol engine.
4. Evaluate the performance of 4 –stroke Petrol engines.
5. Evaluation of frictional power by conducting Morse test on 4-stroke multi cylinder petrol engine.
6. Draw the heat balance sheet for 4-stroke Single cylinder Diesel engine.
7. Draw the heat balance sheet for 4- stroke multi cylinder petrol engine.
8. Calculate the performance of variable compression ratio engines.
9. Performance test on reciprocating air compressor unit.
10. Study of Steam boilers.
11. Disassembly / assembly of engines.

2040023: CONSTITUTION OF INDIA

B.Tech. II Year II Sem. **L/T/P/D /C**

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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

2040024 : OOPS through C++Lab

L	T /P	C
0	0/2	0

Objectives:

- To strengthen problem solving ability by using the characteristics of an object-oriented approach.
- To design applications using object oriented features
- To handle Exceptions in programs.

Week 1: Write C++ programs for demonstrating arithmetic ,logical, relational and bitwise operators .

Week2: a) Write a C++ program to find the sum of individual digits of a positive integer.

b) Write a C++ program to print even and odd numbers up to given number.

Week 3: a) Write a C++ program to generate all the prime numbers between 1 and n, where n is a value supplied by the user.

b) Write a C++ program to find both the largest and smallest number in a list of integers.

Week 4:a) Write a C++ program to sort a list of numbers in ascending order.

b) Write a Program to illustrate New and Delete Keywords for dynamic memory allocation

Week 5:Write a C++ a program Illustrating Class Declarations, Definition, and Accessing Class Members.

Week 6: Write a C++ program to demonstrate scope resolution operator

Week 7: Write a C++ Program to illustrate default constructor, parameterized constructor and copy constructors

Week 8: Write a C++ Program to Demonstrate the i)Operator Overloading.ii) Function Overloading.

Week 9: Write a C++ Program to Demonstrate Friend Function and Friend Class.

Week 10: Write a C++ program to demonstrate single and Multilevel Inheritance

Week 11: Write a C++ program to demonstrate Multiple and Hybrid Inheritance

Week 12: Write a C++ program to demonstrate Exception handling

Text Books: 1. C++, the Complete Reference, 4th Edition, Herbert Schildt, TMH.

2. Object Oriented Programming with C++ by Balagurusamy

References: 1. C++ Primer, 3rd Edition, S.B.Lippman and J.Lajoie, Pearson Education.

2. The C++ Programming Language, 3rd Edition, B.Stroutstrup, Pearson Education