COURSE STRUCTURE (R20)

I - SEMESTER

S.No	Course Code	Course Title	Contact hours/week			Credits	Scheme of Valuation		
			L	T	P		CIE	SEE	Total
Theory Courses									
1	20FE01	Professional Communication-I	2	0	0	2	30	70	100
2	20FE03	Differential Equations	2	1	0	3	30	70	100
3	20FE05	Applied Chemistry	3	0	0	3	30	70	100
4	20ME01	Engineering Graphics	2	0	4	4	30	70	100
5	20EE02	Basic Electrical and Electronics Engineering	3	0	0	3	30	70	100
Laboratory Courses									
6	20FE52	Applied Chemistry Lab	0	0	3	1.5	15	35	50
7	20EE52	Basic Electrical and Electronics Engineering Lab	0	0	3	1.5	15	35	50
8	20ME51	Engineering Workshop	0	0	3	1.5	15	35	50
Total			**12**	**1**	**13**	**19.5**	**195**	**455**	**650**

II - SEMESTER

S.No	Course Code	Course Title	Contact hours/week			Credits	Scheme of Valuation		
			L	T	P		CIE	SEE	Total
Theory Courses									
1	20FE02	Professional Communication-II	2	0	0	2	30	70	100
2	20FE04	Linear Algebra and Transformation Techniques	2	1	0	3	30	70	100
3	20FE08	Engineering Physics	2	1	0	3	30	70	100
4	20CS01	Programming for Problem Solving using C	3	0	0	3	30	70	100
5	20ME02	Engineering Mechanics	2	1	0	3	30	70	100
6	20MC01	Engineer and Society	2	0	0	0	30	70	100
Laboratory Courses									
7	20FE51	Professional Communication Skills Lab	0	0	2	1	15	35	50
8	20FE55	Engineering Physics Lab	0	0	3	1.5	15	35	50
9	20CS51	Programming for Problem Solving using C Lab	0	0	3	1.5	15	35	50
10	20ME52	Engineering Mechanics and Fuel Testing Lab	0	0	3	1.5	15	35	50
Total			**13**	**3**	**11**	**19.5**	**240**	**560**	**800**

III SEMESTER

S.No	Course code	Course Title	Contact hours/week			Credits	Scheme of Valuation		
			L	T	P		CIE	SEE	Total
Theory Courses									
	20FE10	Numerical Methods and Integral Calculus	**2**	**1**	**-**	**3**	**30**	**70**	**100**
	20ME03	Fluid Mechanics and Hydraulic Machinery	**2**	**1**	**-**	**3**	**30**	**70**	**100**
	20ME04	Thermodynamics	**2**	**1**	**-**	**3**	**30**	**70**	**100**
	20ME05	Metallurgy and Material Science	**3**	**-**	**-**	**3**	**30**	**70**	**100**
	20ME06	Mechanics of Solids	**2**	**1**	**-**	**3**	**30**	**70**	**100**
	20MC02	Environmental Science	**2**	**0**	**0**	**0**	**30**	**70**	**100**
Laboratory Courses									
	20ME55	Fluid Mechanics and Hydraulic Machinery Lab	**-**	**-**	**2**	**1**	**15**	**35**	**50**
	20ME56	Mechanics of solids and Metallurgy Lab	**-**	**-**	**3**	**1.5**	**15**	**35**	**50**
	20AD54	Programming Using Python Lab	**1**	**-**	**2**	**2**	**15**	**35**	**50**
		Skill Oriented Course - I	1	0	2	2		50	50
Total						**21.5**	**225**	**575**	**800**

IV SEMESTER

S.No	Course code	Course Title	Contact hours/week			Credits	Scheme of Valuation		
			L	T	P		CIE	SEE	Total
Theory Courses									
	20FE09	Probability and Statistics	**3**	**-**	**-**	**3**	**30**	**70**	**100**
	20ME07	Applied Thermodynamics	**2**	**1**	**-**	**3**	**30**	**70**	**100**
	20ME08	Production Technology	**3**	**-**	**-**	**3**	**30**	**70**	**100**
	20ME09	Theory of Machines	**3**	**-**	**-**	**3**	**30**	**70**	**100**
	20HS01	Universal Human values 2: Understanding Harmony	**3**	**-**	**-**	**3**	**30**	**70**	**100**
Laboratory Courses									
	20ME57	Production Technology Lab	**-**	**-**	**3**	**1.5**	**15**	**35**	**50**
	20ME58	Theory of Machines Lab	**-**	**-**	**2**	**1**	**15**	**35**	**50**
	20ME59	Computer Aided Machine Drawing Lab	**1**	**-**	**2**	**2**	**15**	**35**	**50**
		Skill Oriented Course - II	1	0	2	2		50	50
Total						**21.5**	**195**	**505**	**700**
Honours/Minor Courses						**4**			

B.Tech. (I Sem.)	20FE01 - PROFESSIONAL COMMUNICATION - I	L	T	P	Cr.
		2	0	0	2

Pre-requisites: Nil

Course Educational Objectives: To improve English language proficiency of the students on various aspects like vocabulary, grammar, communication skills, listening skills, Reading & Writing skills.

Course Outcomes: At the end of the course, the student will be able to

- **CO1** : Write sentences and paragraphs using proper grammatical structures and word forms **(Remember – L1)**
- **CO2** : Comprehend the given text by employing suitable strategies for skimming and scanning and draw inferences **(Understand – L2)**
- **CO3** : Write summaries of reading texts using correct tense forms & appropriate structures (**Remember – L1)**
- **CO4** : Write Formal Letters; Memos & E-Mails **(Apply – L3)**
- **CO5** : Edit the sentences/short texts by identifying basic errors of grammar/vocabulary/syntax **(Understand – L2)**

Unit - I

Exploration - 'A Proposal to Girdle the Earth – Nellie Bly'; Reading: Skimming for main idea; Scanning for specific information; Grammar & Vocabulary: Content Words; Function Words; Word Forms: verbs, nouns, adjectives and adverbs; Nouns: Countable and Uncountable, Singular and Plural forms; Wh - Questions; Word Order in Sentences; Writing: Paragraph Analysis; Paragraph Writing; Punctuation and Capital Letters

Unit – II

On Campus- 'The District School as it Was by One Who Went to it – Warren Burton'; Reading: Identifying Sequence of Ideas; Grammar & Vocabulary: Cohesive Devices: Linkers/signposts/Transition signals, Synonyms, Meanings of Words/Phrases in the context; Writing: Memo Drafting.

Unit – III

Working Together-'The Future of Work'

Reading: Making basic inferences; Strategies to use text clues for comprehension; Summarizing; Grammar & Vocabulary: Verbs: Tenses; Reporting Verbs for Academic Purpose; Writing**:** Rephrasing what is read; Avoiding redundancies and repetitions Abstract Writing/ Summarizing.

Unit – IV

'A.P.J.AbdulKalam'; Grammar & Vocabulary: Direct & Indirect Speech; articles and their Omission; Writing: E-Mail Drafting.

Unit – V

'C.V.Raman'; Grammar & Vocabulary: Subject-Verb Agreement; Prepositions; Writing: Formal Letter Writing.

Text Books:

1. Prabhavati. Y & et al, "English All Round – Communication Skills for Undergraduate Learners", Orient Black Swan, Hyderabad, 2019.
2. "Panorama – A Course on Reading", A collection of prose selections, Oxford University Press, New Delhi, 2016.

Reference Books:

1. Swan,M., "Practical English Usage", Oxford University Press, 2016.
2. Kumar,S and Latha, P, "Communication Skills", Oxford University Press, 2018.
3. Rizvi Ashraf M., "Effective Technical Communication", Tata Mc Graw Hill, New Delhi, 2008.
4. BaradwajKumkum, "Professional Communication", I.K.International Publishing House Pvt.Lt., New Delhi, 2008.
5. Wood,F.T., "Remedial English Grammar", Macmillan, 2007.

B.Tech. (I Sem.) **20FE03 - DIFFERENTIAL EQUATIONS**

L	T	P	Cr.
2	1	0	3

Pre-requisites: Nil

Course Educational Objective: The objective of this course is to introduce the first order and higher order differential equations, functions of several variables. The students also learn solving of first order partial differential equations.

Course Outcomes: At the end of this course, the student will be able to

CO1: Apply first order and first-degree differential equations to find orthogonal trajectories **(Apply – L3)**
CO2: Distinguish between the structure and methodology of solving higher order differential equations with constant coefficients **(Understand – L2)**
CO3: Apply various Numerical methods to solve initial value problem **(Apply – L3)**
CO4: Generate the infinite series for continuous functions and investigate the functional Dependence **(Understand – L2)**
CO5: Solve partial differential equations using Lagrange's method **(Apply – L3)**

UNIT –I

Differential Equations of First Order and First Degree
Differential equations of first order and first degree –Exact and Non Exact differential Equations, Applications of differential equations – Orthogonal Trajectories.

UNIT –II
Linear Differential Equations of Higher Order
Homogeneous and Non-Homogeneous Linear differential equations of second and higher order with constant coefficients with R.H.S. functions e^{ax}, sin $(ax+b)$, cos $(ax+b)$, x^m, $e^{ax}V(x)$, $xV(x)$, Method of variation of parameters.

UNIT – III
Numerical solution of Ordinary Differential Equations
Numerical solution of Ordinary Differential equations, Solution by Taylor's series - Picard's Method of successive approximations.
Euler's Method - Runge- Kutta Methods.

UNIT –IV
Functions of several variables
Generalized Mean Value Theorem (without proof), Maclaurin's series, Functions of several variables, Jacobians (Cartesian and polar coordinates), Functional dependence. Maxima and Minima of function with two variables.

UNIT – V

Partial Differential Equations

Formation of Partial Differential Equations by elimination of arbitrary constants and arbitrary functions.Solution of first order and first degree linear partial differential equation – Lagrange's method.

Text Books:

1. B.S. Grewal, "*Higher Engineering Mathematics*", 42nd Edition, Khanna Publishers, New Delhi, 2012.
2. B. V. Ramana, "*Higher Engineering Mathematics*", 1st Edition, TMH Publications, New Delhi, 2010

Reference Books:

1. M. D. Greenberg, "*Advanced Engineering Mathematics*", 2nd Edition, TMH Publications, New Delhi, 2011.
2. Erwin Kreyszig, *"Advanced Engineering Mathematics"*, 8th Edition, John Wiley & sons, New Delhi, 2011.
3. W.E. Boyce and R. C. Diprima, " *Elementary Differential Equations"*, 7th Edition, John Wiley & sons, New Delhi, 2011.
4. S. S. Sastry, *"Introductory Methods of Numerical Analysis",* 5th Edition, PHI Learning Private Limited, New Delhi, 2012.

B.Tech.(I_Sem)	20FE05 - APPLIED CHEMISTRY	L	T	P	Cr.
		3	0	0	3

Pre-requisites: Nil

Course Educational Objective: It enables the students to understand the fundamental concepts of chemistry and to provide them with the knowledge of industrial problems and finding the solutions. It helps to strengthen thebasic concepts of water, fuel technologies**,** electrochemistry, corrosion and advanced materials used in technologies.

Course Outcomes: At the end of the course, student will be able to:

CO1: Identify the troubles due to hardness of water and its maintenance in industrial applications. **(Understand - L2)**

CO2: Understand the issues related to conventional fuels, biofuels and photo-voltaic cells in energy production. **(Understand - L2)**

CO3: Apply Nernst Equation for calculating electrode cell potentials and compare batteries for different applications. **(Apply - L3)**

CO4: Apply principles of corrosion for design and effective maintenance of various equipment. **(Apply - L3)**

CO5: Analyse the suitability of engineering materials like polymers, lubricants, nano materials and composites in technological applications**. (Understand – L2)**

UNIT – I

WATER TECHNOLOGY

Sources of water and quality; Hardness of Water - Temporary and permanent hardness, units and their inter relation, problems on hardness and disadvantages of hard water in industries. Boiler troubles - Reasons, disadvantages and methods of prevention for Scale and sludge formation, caustic embrittlement, boiler corrosion and carry over (priming and foaming), W.H.O standards of potable water; Water softening: Ion- Exchange Process, merits and demerits; Desalination of brackish water - Electro dialysis and reverse osmosis; Treatment of industrial wastewater.

UNIT – II

FUEL TECHNOLOGY

Classification of fuels (solid, liquid and gaseous fuels, merits and demerits) and characteristics of a good fuel; Calorific value -Definition, gross and net calorific values (definition only).Solid fuels - Coal – origin, proximate analysis of coal and significance; Liquid Fuels - Petroleum-origin, types of crude oil and refining of petroleum. Cracking - moving bed catalytic cracking and synthetic petrol –Fischer Tropsch's process; Gaseous fuels - Natural gas composition and C.N.G - advantages.Bio fuels - Characteristics of bio fuels, sources of bio mass and advantages -Production of biodiesel from rape seed oil; Photo-voltaic Cell - Design, working, schematic diagram, advantages and disadvantages.

UNIT – III

ELECTRO CHEMISTRY & BATTERIES

Types of Electrodes - Calomel Electrode, Glass Electrode**,** Calculation of EMF of Cell**,** Applications of Nernst Equation**,** Applications of Electro chemical Series

Batteries -Lead-acid Battery, Lithium ion Battery, H_2– O_2 Fuel Cell, Mg-Cu reserve battery.

UNIT – IV

SCIENCE OF CORROSION

Dry Corrosion (Direct Chemical corrosion) - Types of dry corrosion-oxidative corrosion, Pilling Bed worth rule, corrosion by other gases and liquid metal corrosion; Wet Corrosion (Electro Chemical corrosion) - Mechanism- oxygen absorption, hydrogen evolution, types of wet corrosion, Galvanic Corrosion, Concentration Cell Corrosion, passivity and Galvanic series; Factors Influencing Corrosion -Nature of metal (purity, position in galvanic series, relative area of cathode & anode, nature of surface film) and nature of environment (temperature, humidity, atmospheric pollution and nature of ions in the medium); Control of Corrosion - Cathodic Protection - Sacrificial anode and impressed current methods, electro plating and metal cladding.

UNIT – V

CHEMISTRY OF ENGINEERING MATERIALS

Polymers - Differences between thermoplasts and thermosets, Types of polymerization with examples, Preparation properties and engineering applications of PVC, Teflon, BUNA-S and Polyurethane;

Lubricants -Characteristics of a good lubricant and properties of lubricants (viscosity, flash and fire points, cloud and pour points, aniline point) and applications;

Nano Materials -Introduction, definition, extraordinary changes observed at nano size of materials and reasons, types of nano-materials, Gas-Phase Synthesis of nanomaterials, Applications;

Composites -Advantageous characteristics of Composites, Constituents, Fibre reinforced composites (GFRP, CFRP), Reasons for failure of composites.

TEXT BOOKS:

1. Shashi Chawla, “A Text book of Engineering Chemistry”, Dhanpat Rai Publishing Company, New Delhi, 3rd Edition, 2003.
2. Jain, Jain, “A Text book of Engineering Chemistry”, Dhanpat Rai Publishing Company, New Delhi, 16th Edition, 2015.

REFERENCE:

1. Shikha Agarwal, “A text book of Engineering Chemistry”, Cambridge University Press, New Delhi, 1st Edition, 2015.
2. S.S. Dara, S.S. Umare, “A Text book of Engineering Chemistry”, S. Chand Publications, New Delhi, 12th Edition, 2010.
3. Y. BharathiKumari, Jyotsna Cherukuri, “A Text book of Engineering Chemistry”, VGS Publications, Vijayawada, 1st Edition, 2009.

20ME01 - ENGINEERING GRAPHICS

B.Tech. (I Sem.)

L	T	P	Cr.
2	0	4	4

Pre-requisites **:** Nil

Course Educational Objective:
To recognize the Bureau of Indian Standards of Engineering Drawing and develop an ability to get familiarized with orthographic projections and isometric views of solid objects.

Course Outcomes: At the end of the course, the student will be able to:

CO1: Identify the geometrical objects considering BIS standards. **(Remember-L1)**
CO2: Comprehend the basics of orthographic projections and deduce orthographic projections of a point and a line at different orientations. **(Understand-L2)**
CO3: Represent graphically the geometrical planes at different positions and orientations. **(Understand-L2)**
CO4: Analyze and draw solid objects at different positions and orientations. **(Apply- L3)**
CO5: Visualize isometric and orthographic views of geometrical objects and convert one form to another. **(Understand-L2)**

UNIT – I
INTRODUCTION TO ENGINEERING DRAWING:
Introduction: Introduction**,** Principles of Engineering Drawing and their significance - Drawing Instruments and their use-Conventions in Drawing- Lettering and Dimensioning – BIS conventions – Geometrical Constructions.
Engineering Curves: Conic Sections- Ellipse, Parabola, Hyperbola and Rectangular Hyperbola-General method and other methods; Cycloid, Epi-Cycloid and Hypo-Cycloid; Involutes.

UNIT – II
ORTHOGRAPHIC PROJECTIONS:
Introduction, Principle of Orthographic Projection-Method of Projections – First and third angle projection methods- Projections of Points – Projections of straight lines of different orientations - True lengths and traces.

UNIT – III
PROJECTIONS OF PLANES: Introduction, Planes parallel to one of the reference planes-Inclined to one reference plane and perpendicular to other-Oblique planes.

UNIT – IV
PROJECTIONS OF SOLIDS: Introduction, Regular Polyhedral, Solids of Revolution**,** Projection of solids in simple position - Axis inclined to one of the reference planes and parallel to the other-Axis inclined to both Principle Planes.

UNIT – V

ISOMETRIC VIEWS: Introduction-theory of isometric projection, isometric views, isometric axes, scale, lines and planes-Isometric view of prism, pyramid, cylinder and cone-non isometric lines-methods to generate an isometric drawing.

TRANSFORMATION OF PROJECTIONS: Conversion of Orthographic Projections to Isometric Views of composite objects, Conversion of Isometric Views to Orthographic Projections**.**

TEXT BOOKS:

1 N. D. Bhatt, Engineering Drawing, 51th Revised and Enlarged Edition, Charotar publishers, 2012

BOS APPROVED REFERENCE BOOKS:

1 Narayana K L, Kannaiah P, Textbook on Engineering Drawing, 2nd Edition, SciTech publishers.
2 R.K.Dhawan, Engineering Drawing, S.Chand Company LTD.
3 Venugopal, Engineering Drawing and Graphics, New Age publishers
4 Dhananjay A. Jolhe, Engineering Drawing, Tata McGraw Hill Publishers
5 N.S.Parthasarathy, Vela Murali, Engineering Drawing, Oxford Higher Education

20EE02 - BASIC ELECTRICAL AND ELECTRONICS ENGINEERING

B.Tech. (I_Sem.)

L	T	P	Cr.
3	0	0	3

Prerequisite: Physics

Course Educational Objective: This course enables student to illustrate the basics of applied electricity and electronics.

Course Outcomes: At the end of the course, the student will be able to:

CO1: Apply network reduction techniques to simplify electrical circuits. **(Apply-L3)**
CO2: Illustrate the working principle of DC machines and transformers. **(Understand-L2)**
CO3: Understand V-I characteristics of semiconductor devices. **(Understand-L2)**
CO4: Illustrate the configuration of Transistors and their applications. **(Understand-L2)**

UNIT – I: Electrical Circuit Fundamentals

Basic definitions, Types of elements-active and passive, Ohm's Law, Kirchhoff's Laws-Network reduction techniques- series, parallel, star to delta, delta to star transformations, source transformation (for resistive networks), mesh analysis, nodal analysis (Basic problems).

UNIT – II: DC Network Theorems and AC Fundamentals

Theorems-Superposition, Thevenin's, Norton's and Maximum Power Transfer (Basic problems in DC excitation only)

Peak, R.M.S, average, instantaneous values, form factor and peak factor– periodic waveforms – Phase and Phase difference –concepts of reactance, impedance, susceptance and admittance, real, reactive and apparent powers, Power Factor- resonance-bandwidth-quality factor.

UNIT – III: DC Machine Fundamentals and Single-Phase Transformers

DC generator principle, constructional details, emf equation, types of generators (Theory only).
DC motor principle, Back emf, types of motor (Theory only).
Construction and Principle of operation of single-phase transformers-Emf equation

UNIT–IV: P-N Junction Diode and Zener Diode

P-N Junction Diode: Operation and V-I characteristics of PN junction diode, Rectifiers-Half Wave Rectifier, Full Wave Rectifier-Bridge type, Zener Diode-Voltage Regulator.

UNIT – V: Transistors

Construction, Principle of Operation, Symbol, CB, CE configurations, JFET, MOSFET and application of transistor as an amplifier (Theory only).

TEXT BOOKS:

1. A.Sudhakar and Shyammohan S Palli, "Electrical Circuits" Tata McGraw-Hill, 3rd Edition.2017
2. M.S.Sukhija, T.K.Nagsarkar, "Basic Electrical and Electronics Engineering", Oxford University Press, 2016 Edition.

REFERENCE:

1. Kothari and Nagarath, "Basic Electrical Engineering", TMH Publications, 3rd Edition.2013
2. G.S.N.Raju, "Electronic Devices and Circuits", I.K.International.2006

B.Tech.(I_Sem) **20FE52 - APPLIED CHEMISTRY LAB**

L	T	P	Cr.
0	0	3	1.5

Pre-requisites: Nil

Course Educational Objective: This course enables the students to analyze water samples and perform different types of volumetric titrations. It provides them with an overview of preparation of polymers and properties of fuels.

Course Outcomes: At the end of the course, the students will be able to:

CO1: Assess quality of water based on the procedures given. **(Understand - L2)**

CO2: Distinguish different types of titrations in volumetric analysis after performing the experiments listed in the syllabus. **(Understand - L2)**

CO3: Acquire practical knowledge related to preparation of polymers. **(Understand - L2)**

CO4: Exhibit skills in performing experiments based on theoretical fundamentals. **(Understand - L2)**

List of Experiments

(Any of the 10 experiments are required to be conducted)

Model Experiment

1) Determination of amount of HCl using standard Na_2CO_3 solution.

Water Analysis

2) Determination of alkalinity of water sample**.**
3) Determination of total Hardness of water using EDTA method.
4) Determination of permanent hardness of using EDTA method.

Preparation of Polymers

5) Nylon Fibers
6) Bakelite

Redox Titrations

7) Estimation of Mohr's salt using potassium permanganate.
8) Estimation of Mohr's salt using potassium dichromate.
9) Determination of Copper (II) using standard hypo solution.

Demonstration Experiments

10) Determination of pH of the given sample solution/ soil using pH meter.
11) Determination of Turbidity of the given sample water.

Estimations

12) Determination of ferrous content in the given sample of iron ore against potassium dichromate using potassium ferricyanide as external indicator.
13) Determination of Iron (III) by colorimetric method.

Fuels

14) Determination of flash and fire points of a given fuel/lubricant.

B.Tech. (I Sem.)	20EE52 - BASIC ELECTRICAL AND ELECTRONICS ENGINEERING LAB	L	T	P	Cr.
		0	0	3	1.5

Pre-requisites : Nil

Course Educational Objective: This lab course enables the student to demonstrate the knowledge of electrical and electronic equipment and analysis of electric circuits. It also deals with plotting characteristics of basic semiconductor devices.

Course Outcomes: At the end of the course, the student will be able to:

CO1: Examine electrical circuits using network theorems. **(Apply-L3)**
CO2: Analyze VI characteristics of semiconductor devices. **(Understand-L2)**
CO3: Analyze electrical circuits. **(Understand-L2)**
CO4: Design Resonance circuits. **(Apply-L3)**

List of Experiments

(Any of the 10 experiments are required to be conducted)

1. V-I relations of passive elements (R, L, C).
2. Verification of Kirchhoff's Laws (KCL and KVL.).
3 Measurement of active power, reactive power and power factor of AC circuits.
4. Calculation of Resonant frequency, Bandwidth and Quality factor of resonant circuits.
5. Verification of Superposition theorem.
6. Verification of Thevenin's and Norton's theorems.
7. Verification of Maximum power transfer theorem.
8. Plot the V-I characteristics of a p-n junction diode.
9. Plot the V-I characteristics of Zener diode.
10. Plot the V-I characteristics of BJT.
11. Calculation of ripple factor and regulation of Full Wave Rectifier with and without filters .
12. Plot the V-I characteristics of MOSFET.

20ME51 - ENGINEERING WORKSHOP

B.Tech. (I Sem.)

L	T	P	Cr.
0	0	3	1.5

PRE-REQUISITES: Nil

COURSE EDUCATIONAL OBJECTIVE:

The objective of this course is to get familiarized with various trades used in Engineering Workshop and learn the safety precautions to be followed in the workshops while working with the different tools.

COURSE OUTCOMES: After completion of the course students will be able to:

CO1: Develop different prototypes in the carpentry section. **(Understand-L2)**
CO2: Fabricate various basic prototypes in fitting trade. **(Understand-L2)**
CO3: Demonstrate various operations related to plumbing, tin smithy and black smithy. **(Understand-L2)**
CO4: Perform various basic house wiring techniques. **(Apply-L3)**

(Conduct at least 4 Trades with 2 exercises from each Trade and demonstrate about 2 Trades)

Trade –1: CARPENTRY SHOP

Introduction to various types of wood such as Teak, Sal, Oak, Beach, Neam, Wallnut Mango, Shisham, Deodar, Babul. demonstration, function and use of carpentry hand-tools and their safety precautions. Introduction to various types of wooden joints, their relative advantages and uses.

Job I - Marking, sawing, plaining and chiselling operations.
Job II - Preparation of half lap-joint
Job III – Preparation of Mortise and Tenon Joint

Trade –2: FITTING SHOP

Introduction to fitting shop tools, common materials used in fitting shop, description, demonstration, care, use of tools and safety precautions.

Job I- Making a L-Fit from a rectangular piece of Mild Steel Flat (MS).
Job II-Making a T-Fit from a rectangular piece of MS Flat.
Job III-Making a V-Fit from a rectangular piece of MS Flat
Job IV-Making a Half round fit from a rectangular piece of MS flat.

Trade -3: TIN- SMITHY SHOP

Introduction to tin-smithy, specification and use of hand tools, accessories and the safety precautions.

Job I - Preparation of a rectangular tray using GI sheet.
Job II- Preparation of an open scoop/ funnel using GI sheet.
Job III - Preparation of a Single Seam Joint and Double Seam Joint using GI sheet.
Job IV - Preparation of a Corner Seam Joint using GI sheet.

Trade –4: PLUMBING SHOP

Introduction to plumbing – demonstration, use of hand tools, accessories and safety

precautions.
Job I – preparation of pipe layout.
Job II – Pipe threading.

Trade -5: BLACK SMITHY

Introduction–demonstration of tools, equipment and safety precautions.
Job I – Preparation of S–Hook.
Job II – Preparation of Chisel

Trade -6: HOUSE WIRING

Demonstration and identification of common electrical materials such as wires, cables, switches, fuses, PVC Conduits. Study of electrical safety measures and demonstration about use of protective devices such as fuses, and relays including earthling.
Job I – One lamp controlled by one-way switch.
Job II – Two lamps in series and parallel connection with one-way switch.
Job III- Florescent lamp and calling bell circuit.
Job IV - One lamp connection with two 2- way switches (stair case connection).
Job V -- House wiring circuit.

REFERENCES

1. LBRCE Workshop Lab Manual.
2. S.K.HajraChoudary and A.K.Choudary, –Workshop Technology-I& II, MediaPromotersand Publishers Pvt.Ltd., Mumbai,2012.
3. B.S.Raghuvamsi, –Workshop Technology-I& II, Dhanpatrai and company, New Delhi, 2014.
4. P.Khannaiah, K.L.Narayana, –Workshop Manual‖,Scitech Publications India Pvt.Ltd, 2015.

B.Tech.(II-Sem.) **20FE02 - PROFESSIONAL COMMUNICATION - II**

L	T	P	Cr.
2	0	0	2

Pre-requisites: Nil

Course Educational Objective: To improve English language proficiency of the students on various aspects like vocabulary, grammar, communication skills, listening skills, Reading & Writing skills.

Course Outcomes: At the end of the course, the student will be able to

- **CO1:** Produce a coherent paragraph interpreting a figure/graph/chart/table **(Understand – L2)**
- **CO2:** Comprehend the given texts thoroughly by guessing the meanings of the words contextually **(Understand – L2)**
- **CO3:** Use language appropriately for describing/comparing/contrasting/giving directions & suggestions **(Remember – L1)**
- **CO4:** Write formal/informal dialogues with an understanding of verbal/non-verbal features of communication. Guess meanings of the words from the context **(Understand – L2)**
- **CO5:** Write well-structured essays; Reports & Résumé **(Apply – L3)**

UNIT - I

Fabric of Change- 'H.G. Wells and the Uncertainties of Progress – Peter J. Bowler'; Reading: Studying the use of Graphic elements in texts; Grammar & Vocabulary**:** Quantifying Expressions; Adjectives and adverbs; Comparing and Contrasting; Degrees of Comparison
Writing: Information Transfer

UNIT - II

Tools for Life - 'Leaves from the Mental Portfolio of a Eurasian – Sui Sin Far'; Reading: Global Comprehension; Detailed Comprehension; Grammar & Vocabulary**:** Active & Passive Voice; Idioms & Phrases; Writing: Structured Essays using suitable claims and evidences.

UNIT - III

'Homi Jahangir Bhabha';
Grammar & Vocabulary: Words often confused; Common Errors; Writing**:** Incident & Investigation Reports.

UNIT - IV

'Jagadish Chandra Bose'; Grammar & Vocabulary: Use of antonyms; Correction of Sentences; Writing**:** Dialogue Writing.

UNIT - V

'**Prafulla Chandra Ray'**; Grammar & Vocabulary: Analogy; Sentence Completion; Writing**:** Writing a Résumé

TEXT BOOKS:

1. Prabhavati. Y & et al, "English All Round – Communication Skills for Undergraduate Learners", Orient Black Swan, Hyderabad, 2019.
2 "The Great Indian Scientists" published by Cengage Learning India Pvt. Ltd., Delhi, 2017

REFERENCE BOOKS:

1. Swan,M., "Practical English Usage", Oxford University Press, 2016.
2. Kumar,S and Latha, P, "Communication Skills", Oxford University Press, 2018.
3. Rizvi Ashraf M., "Effective Technical Communication", Tata Mc Graw Hill, New Delhi, 2008.
4. BaradwajKumkum, "Professional Communication", I.K.International Publishing House Pvt.Lt., New Delhi, 2008.
5. Wood,F.T., "Remedial English Grammar", Macmillan, 2007.

B.Tech. (II Sem.)	20FE04 - LINEAR ALGEBRA AND TRANSFORMATION TECHNIQUES	L	T	P	Cr.
		2	1	0	3

Pre-requisites: Nil

Course Educational Objective: In this course, students learn Matrix Algebra and introduced with transformation techniques such as Laplace Transforms and Z – Transforms.

Course Outcomes: At the end of the course, the student will be able to

CO1: Investigate the consistency of the system of equations and solve them **(Apply – L3)**

CO2: Determine the eigen vectors and inverse, powers of a matrix using Cayley – Hamilton Theorem **(Apply - L3)**

CO3: Use the concepts of Laplace Transforms to various forms of functions **(Understand – L2)**

CO4: Solve ordinary differential equations by using Laplace Transforms **(Apply – L3)**

CO5: Apply Z - Transforms to solve difference equations **(Apply – L3)**

UNIT – I

System of Linear Equations

Matrices - Rank- Echelon form, Normal form, PAQ form– Solution of Linear Systems – Homogeneous system of equations and Non-Homogeneous system of equations.

UNIT – II

Eigen Values and Eigen Vectors

Eigen values – Eigen Vectors – Properties – Cayley-Hamilton Theorem – Inverse and Powers of a matrix by using Cayley-Hamilton Theorem.

UNIT – III

Laplace Transforms

Laplace transforms of standard functions –Linear Property - Shifting Theorems, Change of Scale Property

Multiplication and Division by‘t’ - Transforms of derivatives and integrals – Unit step function – Dirac’s delta function.

UNIT – IV

Inverse Laplace Transforms

Inverse Laplace transforms– Linear Property - Shifting Properties - Convolution theorem, Applications of Laplace transforms to ordinary differential equations.

UNIT – V

Z-Transforms

Z-transform – properties – Damping rule – Shifting rule – Initial and final value theorems - Inverse Z –transform - Convolution theorem – Solution of difference equation by Z-transforms.

Text Books:

1. B.S. Grewal, "*Higher Engineering Mathematics*", 42nd Edition, Khanna Publishers, New Delhi, 2012.
2. B. V. Ramana, "*Higher Engineering Mathematics*", 1st Edition, TMH Publications, New Delhi, 2010.

Reference Books:

1. M. D. Greenberg, "*Advanced Engineering Mathematics*", 2nd Edition, TMH Publications, New Delhi, 2011.
2. Erwin Kreyszig, *"Advanced Engineering Mathematics"*, 8th Edition, John Wiley & sons, New Delhi, 2011.
3. W.E. Boyce and R. C. Diprima, " *Elementary Differential Equations"*, 7th Edition, John Wiley & sons, New Delhi, 2011.

B.Tech.(II Sem.)	20FE08 - ENGINEERING PHYSICS	L	T	P	Cr.
		2	1	0	3

Pre-requisites: Nil

Course Educational Objectives: It enables the students to understand the fundamental concepts of elastic behaviour of materials, lasers, optical fibers, acoustics, ultrasonics, magnetic, dielectric, superconducting and nano materials.

Course Outcomes: At the end of the course, the student will be able to,

CO1: Analyse the different mechanical properties of materials **(Understand – L2).**
CO2: Apply the lasers and optical fibres in different fields **(Apply - L3).**
CO3: Summarize the properties of sound waves **(Understand – L2).**
CO4: Classify the different types of magnetic and dielectric materials **(Understand - L2).**
CO5: Identify the properties of superconducting and nano materials **(Understand – L2).**

UNIT – I

Elasticity

Stress, Strain, Hooke's Law, Elastic behavior of a material, Factors affecting elasticity, Classification of elastic modulus, relation between Young's, bulk and rigidity modulus, bending of beam – bending moment of a beam and Cantilever (qualitative treatment).

UNIT – II

Lasers and Optical fibers

Lasers**:** Introduction- Principle of laser (absorption, spontaneous and stimulated emission of radiation), Einstein Coefficients, Nd - YAG laser, Helium Neon laser - applications.

Optical Fibers: Optical Fiber principle, Structure of optical fiber, numerical aperture and acceptance angle, types of optical fibers - applications.

UNIT – III

Acoustics &Ultrasonics

Acoustics: Introduction **–** Reverberation - Reverberation time - Sabine's formula (Derivation using growth and decay method) – absorption coefficient and its determination.

Ultrasonics: Production of ultrasonics by Magnetostriction - Detection of ultrasonics - acoustic grating – Non - Destructive Testing - Through transmission method and pulse echo method - Applications.

UNIT – IV

Magnetic & Dielectric materials

Magnetic parameters, Classification of magnetic materials-Diamagnetic, paramagnetic and ferromagnetic materials, Hysteresis loop, soft and hard magnetic materials, Applications of Ferro magnetic materials.

Dielectric polarization - Electronic and ionic polarization, orientation polarization (Qualitative), Local field, ClaussiusMosotti equation, Applications of dielectric materials.

UNIT – V

Superconducting and nanomaterials

Introduction - Meissner effect, Type I and Type II super conductors, Josephson Effect, Applications of super conductors.

Nanomaterials**:** Introduction, classification, properties, different methods of preparation and applications.

TEXT BOOKS

1. V. Rajendran, "*Engineering Physics*", TMH, New Delhi, 6th Edition, 2011.
2. M.N. Avadhanulu, P.G. Kshirsagar, "Engineering *Physics*", S. Chand & Co., 2ndEdition, 2014.

REFERENCE BOOKS

1. M.N. Avadhanulu, TVS Arun Murthy, "Applied *Physics*", S. Chand & Co., 2ndEdition, 2007.
2. P.K. PalaniSamy, "*Applied Physics*", Sci. Publ. Chennai, 4th Edition, 2016.
3. P. Sreenivasa Rao, K Muralidhar, "*Applied Physics*", Him. Publi. Mumbai, 1st Edition, 2016.
4. Hitendra K. Mallik , AK Singh " *Engineering Physics*", TMH, New Delhi, 1st Edition, 2009.

B.Tech. (II Sem.)	20CS01 - PROGRAMMING FOR PROBLEM SOLVING USING C	L	T	P	Cr.
		3	0	0	3

Pre-requisite : Nil

Course Educational Objective: The Objective of the course is to make learn the basic elements of C programming, control structures, derived data types, Modular programming, user defined structures, basics of files and its I/O operations.

Course Outcomes: At the end of this course, the student will be able to

- **CO1:** Familiar with syntax and semantics of the basic programming language constructs. **(Understand - L2)**
- **CO2:** Construct derived data types like arrays in solving problem. (**Apply - L3**)
- **CO3:** Decompose a problem into modules and reconstruct it using various ways of user-defined functions. **(Apply - L3)**
- **CO4:** Use user-defined data types like structures and unions and its applications to solve problems. **(Apply- L3)**
- **CO5:** Discuss various file I/O operations and its application. **(Understand - L2)**

UNIT – I

Introduction to Problem solving through C-Programming: Problem Specification, Algorithm / pseudo code, flowchart, examples.

C-Programming: Structure of C program, identifiers, basic data types and sizes, Constants, variables, Input-output statements, A sample c program, operators, expressions, type conversions, conditional expressions, precedence of operators and order of evaluation.

Control statements: if, if else, else if ladder and switch statements, while, do-while and for statements, break, continue, go to and labels.

UNIT – II

Arrays- concept, declaration, definition, accessing elements, storing elements, two dimensional and multi-dimensional arrays.

Character Arrays: declaration, initialization, reading, writing strings, string handling functions, pre-processor Directives, and macros.

Applications of Arrays: Linear search, Binary search, Bubble Sort.

UNIT – III

Pointers- concepts, declaring & initialization of pointer variables, pointer expressions, pointer arithmetic, pointers and arrays, pointers and character arrays, pointers to pointers.

Functions: basics, category of functions, parameter passing techniques, recursive functions-comparison with Iteration, Functions with arrays, Standard library functions, dynamic memory management functions, command line arguments.

Storage classes - auto, register, static and extern.

UNIT – IV

Derived types- structures- declaration, definition, and initialization of structures, accessing structures, nested structures, arrays of structures, structures and functions, pointers to structures, self-referential structures, unions, typedef.

UNIT – V

Files – concept of a file, text files and binary files, streams, standard I/O, Formatted I/O, file I/O operations, error handling.

Textbook:

1. ReemaThareja, Programming in C, Oxford University Press, 2nd Edition, 2015

Reference books:

1. Jeri R.Hanly, Elliot B.Koffman, Problem Solving and Program Design in C, Pearson Publishers, 7th Edition, 2013
2. E Balagurusamy, Computer Programming, McGraw Hill Education, 8th Edition.
3. C: The Complete Reference, McGraw Hall Education,4th Edition.
4. PradeepDey, Manas Ghosh, Programming in C, Oxford University Press, 2nd Edition, 2011.
5. Stephen G.Kochan, Programming in C, Pearson Education, 3rd Edition, 2005.

B.Tech. (II Sem.) **20ME02- ENGINEERING MECHANICS**

L	T	P	Cr.
2	1	0	3

PRE-REQUISITES : Physics, Mathematics

COURSE EDUCATIONAL OBJECTIVE:

The main objective of this course is to develop the ability to predict the behaviour of rigid solid bodies under the action of external forces in real world scenario.

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

CO1: Apply free body diagram concepts to analyze rigid bodies in static conditions. **(Apply-L3)**
CO2: Apply the equilibrium Equations of rigid bodies associated with frictional forces. **(Apply-L3)**
CO3: Identify the location of centroid / centre of gravity and evaluate the moment of inertia of plane sections/solids. **(Apply-L3)**
CO4: Understand the behavior of moving bodies in rectilinear motion using kinematic equations or motion curves. **(Understand-L2)**
CO5: Examine the behavior of moving bodies using dynamic equilibrium conditions. **(Apply-L3)**

UNIT-I

SYSTEM OF FORCES: Introduction, Basic terminology in Mechanics, laws of Mechanics, characteristics of force, system of forces-types, Resolution and Composition of forces, Resultant of coplanar concurrent force system, Resultant of coplanar non-concurrent force system-moment of a force and couple.

EQUILIBRIUM OF SYSTEM OF FORCES: Free Body Diagram, Lami's theorem, Equilibrium of a rigid body subjected to coplanar concurrent forces and non-concurrent forces, Equilibrium of connected bodies.

UNIT-II

FRICTION: Introduction**,** Frictional force, laws of Coulomb friction, angle of friction, limiting friction and angle of repose, problems on blocks resting on horizontal and inclined planes.

UNIT - III

CENTROID AND AREA MOMENT OF INERTIA: Introduction, centroid, axis of symmetry, centroid of simple figures from first principles, centroid of simple composite sections, area moment of inertia, polar moment of inertia, theorems of moment of inertia, moment of inertia of rectangle, circle, semi-circle, I and T cross sections.

CENTRE OF GRAVITY AND MASS MOMENT OF INERTIA: Centre of gravity, centre of gravity of solid cylinder, right circular cone, hemi sphere, mass moment of inertia, radius of gyration, mass moment of inertia of uniform rod, rectangular plate, circular plate and solid cylinder only.

UNIT –IV

KINEMATICS: Introduction, **g**eneral principles in dynamics, types of motion, rectilinear motion, motion curves, motion with uniform velocity, motion with uniform acceleration, motion with varying acceleration, angular motion, relationship between linear and angular motions.

UNIT – V

KINETICS: Introduction, Newton's second law of motion-inertia force, D-Alembert's principle, bodies in rectilinear translation, fixed axis rotation of rigid bodies.

TEXT BOOKS

1. S.S. Bhavikatti and K.G. Rajashekarappa, Engineering Mechanics, New Age, 2012.
2. N.H. Dubey, Engineering Mechanics, Mc Graw Hill, 2013.

REFERENCES

1 F. L. Singer, Engineering Mechanics, Harper – Collins, 1994
2. B. Bhattacharya, Engineering Mechanics, Oxford University Press, 2008
3. A.K.Tayal, Engineering Mechanics, Umesh Publications, 2012.
4. R.K.Bansal, Engineering Mechanics, Laxmi Publications, 1996.
5. R.K.Rajput, A Text book of Applied Mechanics, Laxmi Publications, 2011.

B.Tech. (II Sem.) **20MC01 - CONSTITUTION OF INDIA**

L	T	P	Cr.
2	0	0	0

Pre-requisites: Nil

Course Educational Objectives

• To enable the student to understand the importance of constitution.
• To understand the structure of Executive, Legislature and Judiciary.
• To understand Philosophy of fundamental rights and duties.
• To understand the autonomous nature of constitution bodies like Supreme Court and High Court Controller and Auditor General of India and Election Commission of India.
• To understand the Central and State relation, financial and administrative.

Course Outcomes: *At the end of the course, the student shall be able to*

CO1: Understand history and philosophy of constitution with reference to Preamble, Fundamental Rights and Duties (**Understand – L2**).
CO2: Understand the concept of Unitary and Federal Government along with the role of President, Prime Minister and Judicial System (**Understand – L2**).
CO3: Understand the structure of the state government, Secretariat, Governor and Chief Minister and their functions (**Understand – L2**).
CO4: learn local administration viz. Panchayat, Block, Municipality and Corporation (**Understand – L2**).
CO5: learn about Election Commission and the process and about SC, ST, OBC and women (**Understand – L2**).

UNIT – I:

Introduction to Indian Constitution: 'Constitution' meaning of the term, Indian Constitution – Sources and Constitutional History, Features – Citizenship, Preamble, Fundamental Rights and Duties, Directive Principles of State Policy.

UNIT – II:

Union Government and its Administration Structure of the Indian Union: Federalism Centre – State relationship, President: Role, Power and Position. Prime Minister (PM) and Council of Ministers, Cabinet and Central Secretariat, Lok Sabha, Rajya Sabha. The Supreme Court and High Court: Powers and Functions.

UNIT – III:

State Government and its Administration Governor – Role and Position – Chief Minister (CM) and Council of Ministers. State Secretariat: Organization, Structure and Functions.

UNIT – IV:

A Local Administration -- Role and Importance, Municipalities – Mayor and Role of Elected Representative, Panchayati Raj: Functions of Panchayati Raj Institution, Zilla Panchayat, Elected Officials and their roles, Village level – Role of Elected and Appointed officials.

UNIT – V:

Election Commission: Election Commission – Role of Chief Election Commissioner and Election Commissionerate State Election Commission: Functions and Commissions for the welfare of SC/ST/OBC and Women.

Reference Books

1. Durga Das Basu, Introduction to the Constitution of India, Prentice – Hall of India Pvt.Ltd., New Delhi.
2. Subash Kashyap, Indian Constitution, National Book Trust.
3. J.A. Siwach, Dynamics of Indian Government and Politics.
4. D.C. Gupta, Indian Government and Politics.
5. H.M.Sreevai. Constitutional Law of India, 4th edition in 3 volumes (Universal Law Publication).
6. J.C. Johari, Indian Government and Politics Hans.
7. J.Raj, Indian Government and Politics.
8. M.V. Pylee, Indian Constitution, Durga Das Basu, Human Rights in Constitutional Law, Prentice – Hall of India Pvt. Ltd., New Delhi.
9. Noorani, A.G. (South Asia Human Rights Documentation Centre), Challenges to Civil Right). Challenges to Civil Rights Guarantees in India, Oxford University Press 2012.

E-Resources:

1. nptel.ac.in/courses/109104074/8.
2. nptel.ac.in/courses/109104045.
3. nptel.ac.in/courses/101104065.
4. www.hss.iitb.ac.in/en/lecture-details.
5. www.iitb.ac.in/en/event/2nd-lecture-institute-lecture-series-indianconstitution.

* * *

B.Tech. (II Sem.)	20FE51 - PROFESSIONAL COMMUNICATION SKILLS LAB	L	T	P	Cr.
		0	0	2	1

Pre-requisites : Nil

Course Educational Objective: To improve the proficiency of students in English with an emphasis on better communication in formal and informal situations; Develop speaking skills required for expressing their knowledge and abilities and to face interviews with confidence.

Course Outcomes: At the end of this course, the student will be able to

- **CO1:** Introduce oneself and others using appropriate language and details **(Understand – L2)**
- **CO2:** Comprehend short talks and speak clearly on a specific topic using error free English **(Understand – L2)**
- **CO3:** Report effectively after participating in informal discussions ethically **(Remember –L1)**
- **CO4:** Interpret data aptly, ethically & make oral presentations **(Apply – L3)**

Syllabus: Professional Communication Lab (PCS) shall have two parts:

- **Computer Assisted Language Learning (CALL) Lab** for 60 students with 60 systems, LAN facility and English language software for self- study by learners.
- **Interactive Communication Skills (ICS) Lab.** with movable chairs and audio-visual aids with a P.A System, a T. V., a digital stereo – audio & video system and camcorder etc.

Exercise – I

CALL Lab: Understand - Sentence structure.

ICS Lab: Practice - Listening: Identifying the topic, the context and specific information
Speaking: Introducing oneself and others.

Exercise – II

CALL Lab: Understand - Framing questions.

ICS Lab: Practice - Listening: Answering a series of questions about main idea and supporting ideas after listening to audio text.
Speaking: Discussing in pairs/small groups on specific topics; Delivering short structured talks using suitable cohesive devices (JAM)

Exercise – III

CALL Lab: Understand - Comprehension practice – Strategies for Effective Communication

ICS Lab: Practice - Listening: Listening for global comprehension and summarizing
Speaking: Discussing specific topics in pairs/small groups, reporting what is discussed

Exercise – IV

CALL Lab: Understand- Features of Good Conversation – Strategies for Effective Communication.

ICS Lab: Practice -Listening: making predictions while listening to conversations/transactional dialogues with/without video Speaking: Role – plays – formal & informal – asking for and giving information/directions/instructions/suggestions

Exercise – V

CALL Lab: Understand - Features of Good Presentation, Methodology of Group Discussion
ICS Lab:Practice - Introduction to Group Discussions.
Listening: Answering questions identifying key terms and understanding concepts.
Speaking: Formal Oral & Poster presentations on topics from academic contexts without the use of PPT.

Lab Manual:

1. Prabhavati. Y & et al, "English All Round – Communication Skills for Undergraduate Learners", Orient Black Swan, Hyderabad, 2019.

Suggested Software:

1. Digital Mentor: Globarena, Hyderabad, 2005
2. Sky Pronunciation Suite: Young India Films, Chennai, 2009
3. Mastering English in Vocabulary, Grammar, Spelling, Composition, Dorling Kindersley,USA,2001
4. Dorling Kindersley Series of Grammar, Punctuation, Composition, USA, 2001
5. Oxford Talking Dictionary, The Learning Company, USA, 2002
6. Learning to Speak English - 4 CDs. The Learning Company,USA,2002
7. Cambridge Advanced Learners English Dictionary (CD). Cambridge University Press, New Delhi,2008.

B.Tech.(II Sem.) **20FE55 - ENGINEERING PHYSICS LAB**

L	T	P	Cr.
0	0	3	1.5

Pre - requisites: Nil

Course Educational Objectives: This course enables the students to acquire theoretical ideas, analytical techniques, and graphical analysis, by completing a host of experiments with the procedures and observational skills for appropriate use of simple and complex apparatus.

Course Outcomes: At the end of the course, the student will be able to,
CO1: Analyze the wave characteristics of light **(Understand – L2).**
CO2: Determine the wavelength of laser source and width of slit **(Apply - L3).**
CO3: Estimate the magnetic field using Stewart's and Gee's apparatus and the rigidity modulus of material using Torsional Pendulum **(Understand - L2).**
CO4: Identify the phenomena of resonance in strings **(Understand – L2).**
CO5: Improve report writing skills and individual teamwork with ethical values **(Understand – L2)**

List of Experiments

(Any of the 10 experiments are required to be conducted)

General experiments:

1. Determine the frequency of AC supply by using Sonometer.
2. Verification of Laws of vibrations in stretched strings - Sonometer.
3. Determine the frequency of a tuning fork by using Melde' s arrangement.
4. Study the magnetic field along the axis of a current carrying circular coil using Stewart's& Gee's apparatus and to verify Biot - Savart's law.
5. Determine the rigidity modulus of a given material using Torsional pendulum.
6. Determination of Young's modulus by the method of single Cantilever oscillations.
7. Measurement of magnetic susceptibility by Gouy's method.
8. Determination of ultrasonic velocity in Liquid.
9. Determination of dielectric constant by charging and discharging method.
10. Determination of velocity of sound by Volume resonator method.

Optics lab experiments:

11. Determine the wavelength of a laser radiation.
12. Determine the width of a single slit by forming diffraction pattern.
13. Determine the acceptance angle and numerical aperture of a fiber.
14. Measure the bending losses in the optical fiber cable at different wavelengths.

B.Tech. (II Sem.)	20CS51 - PROGRAMMING FOR PROBLEM SOLVING USING C LAB	L	T	P	Cr.
		0	0	3	1.5

Pre-requisite : NIL

Course Educational Objective: The objective of the course is to learn the basic elements of C Programming Structures like Data Types, Expressions, Control Statements, and Various I/O Functions and to solve simple mathematical problems using control structures. Design and implementation of various software components, which solve real world problems.

Course Outcomes (CO): At the end of this course, the student will be able to:

CO1: Apply control structures of C in solving computational problems. (**Apply - L3**)

CO2: Implement derived data types & use modular programming in problem solving **(Apply- L3)**

CO3: Implement user defined data types and perform file operations. **(Apply- L3)**

CO 4: Improve individual / teamwork skills, communication & report writing skills with ethical values. **(Apply- L3)**

# of modules at most 10 can be taught and all the modules should be in line with theory.

Module 1: Introduction to Raptor Tool.

Module 2: Problem solving using Raptor Tool.

Module 3: Exercise Programs on Basics of C-Program.

Module 4: Exercise Programs on Control Structures.

Module 5: Exercise Programs on Loops & nesting of Loops.

Module 6: Exercise Programs on Arrays & Strings.

Module 7: Exercise Programs on Pointers.

Module 8: Exercise Programs on Functions.

Module 9: Exercise Programs on user defined data types.

Module 10: Exercise Programs on Files.

B.Tech. (II Sem.)	20ME52 - ENGINEERING MECHANICS AND FUEL TESTING LAB	L	T	P	Cr.
		0	0	3	1.5

PRE-REQUISITES: Engineering Mechanics, Applied Chemistry

COURSE EDUCATIONAL OBJECTIVE:

The main objective of this course is to demonstrate the concepts of Engineering Mechanics and fuels through experiments.

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

CO1: Verify the basic laws of Mechanics in static environment. **(Apply-L3)**

CO2: Evaluate the forces in the mechanical systems. **(Apply-L3)**

CO3: Estimate various properties of fuel like Viscosity Flash and Fire point. **(Apply-L3)**

CO4: Determine calorific-value of fuels. **(Apply-L3)**

LIST OF EXPERIMENTS:
At least 10 experiments are to be conducted

1 Verification of polygon law of forces using Universal-Table apparatus.
2 Verification of Lami's Theorem.
3 Study of the equilibrium of parallel forces using Beam Reaction apparatus.
4 Determination of coefficient of friction between the two materials using Tilting-plane method.
5 Estimate Time period of oscillations of a simple and compound pendulum.
6 Verification of Newton 's second law.
7 Determination of viscosity of given oil using Saybolt Viscometer.
8 Determination of Calorific value of given fuel using Junkers Gas Calorimeter.
9 Determination of viscosity of given oil using Red-wood-II Viscometer.
10 Determination of viscosity of given oil using Englers Viscometer.
11 Determination of Flash and Fire point of given oil using ABELS Apparatus.
12 Determination of Calorific value of given fuel using BOMB Calorimeter.

REFERENCES:

Lab-Manual

R20

20FE10-Numerical Methods and Integral Calculus
(Common to AE, CE, EEE, ECE, MECH)

L	T	P	Cr.
2	1	--	3

B. Tech. (III Sem.)

Pre-requisites : None

Course Educational Objective: The main objective of this course is to enable the students learn Numerical Techniques for solving the equations and apply interpolation techniques. They will also learn about the Fourier analysis of single valued functions, Multiple Integrals in different coordinate systems and Vector differentiation.

Course Outcomes: At the end of the course, the student will be able to:

CO1: Estimate the best fit polynomial for the given tabulated data using Interpolation. **(Understanding-L2)**

CO2: Apply numerical techniques in solving of equations and evaluation of integrals. **(Applying-L3)**

CO3: Discriminate among Cartesian, Polar and Spherical coordinates in multiple integrals and their respective applications to areas and volumes. **(Applying-L3)**

CO4: Generate the single valued functions in the form of Fourier series and obtain Fourier series representation of periodic function. **(Applying-L3)**

CO5: Evaluate the directional derivative, divergence and angular velocity of a vector function. **(Applying-L3)**

UNIT – I

Interpolation and Finite Differences

Interpolation: Introduction – Finite differences- Forward Differences- Backward Differences-Central differences – Symbolic relations and separation of symbols-Differences of a polynomial-Newton's formulae for interpolation – Lagrange's Interpolation formula.

UNIT – II

Numerical Solution of Equations and Numerical Integration

Solutions of Algebraic and Transcendental Equations – Regula Falsi method and Newton Raphson Method in one variable.

Numerical Integration

Trapezoidal rule – Simpson's 1/3 Rule –Simpson's 3/8 Rule.

UNIT – III

Multiple Integrals

Multiple integrals - double and triple integrals (Cartesian, polar, spherical coordinates) – Changing the order of Integration.

UNIT IV

Fourier series

Determination of Fourier coefficients – Fourier series – even and odd functions – Fourier series in an arbitrary interval– Half-range sine and cosine series

UNIT – V

Vector Differentiation

Vector Differentiation: Gradient- Directional Derivatives -Divergence – Solenoidal fields- Curl – Irrotational fields-potential surfaces - Laplacian and second order operators

Text Books:

1. B.S. Grewal, "*Higher Engineering Mathematics*", 42nd Edition, Khanna Publishers, New Delhi, 2012.
2. B. V. Ramana, "*Higher Engineering Mathematics*", 1st Edition, TMH Publications, New Delhi, 2010.
3. S. S. Sastry, *"Introductory Methods of Numerical Analysis"* 5th Edition, PHI Learning Private Limited, New Delhi, 2012.

Reference:

4. M. D. Greenberg, " *Advanced Engineering Mathematics*", 2nd Edition, TMH Publications, New Delhi,2011.
5. Erwin Krezig, *"Advanced Engineering Mathematics"* , 8th Edition, John Wiley & sons, New Delhi,2011.
6. W.E. Boyce and R. C. Diprima, " *Elementary Differential Equations"* , 7th Edition, John Wiley & sons, New Delhi,2011.

R20

B.Tech. (III Sem.)

20ME03 - FLUID MECHANICS AND HYDRAULIC MACHINERY

L	T	P	Cr.
2	1	--	3

Pre Requisites: Engineering Physics and Mathematics

Course Educational Objective: To understand the fundamental concepts of fluid mechanics, various flow measuring devices, boundary layer separation and performance characteristics of hydraulic machines.

Course Outcomes:

After completion of the course the students are able to

CO1: Understand the fundamentals of fluid mechanics and dimensional analysis and similarity concepts. **(Understanding-L2)**

CO2: Comprehend the kinematics and dynamics of fluid flows. **(Understanding - L2)**

CO3: Analyze boundary layer flow and friction losses in pipes. **(Analyzing-L4)**

CO4: Apply impulse momentum concept to impact of jet problems. **(Applying-L3)**

CO5: Evaluate the performance parameters of hydraulic turbines and pumps. **(Applying-L3)**

UNIT-I

FLUID STATICS: Dimensions and Units: Physical Properties of Fluids-Specific Gravity, Viscosity, Surface Tension, Vapour Pressure and their Influence on Fluid Motion, Atmospheric Gauge and Vacuum Pressure – Measurement of Pressure – Piezometer, U-Tube and Differential Manometers.

DIMENSIONAL ANALYSIS AND SIMILARITY: Introduction, Principle of dimensional homogeneity, Rayleigh's method, Buckingham's Pi theorem method.

UNIT-II

FLUID KINEMATICS: Stream Line, Path Line, Streak Line, Stream Tube, Classification of Flows -Equation of Continuity for One Dimensional Flows.

FLUID DYNAMICS: Surface and Body Forces-Euler's Equation, Bernoulli's Equations For Flow along a Stream Line, Momentum Equation and Its Application on Force on Pipe Bend. Reynolds Experiment, Darcy's -Weisbach Equation-Minor Losses In Pipes, Pipes In Series, Parallel-Total Energy Line-Hydraulic Gradient Line, Measurement Of Flow-Pitot Tube, Venturimeter, Orifice Meter.

UNIT-III

BOUNDARY LAYER FLOW: Laminar and Turbulent Boundary Layer, Boundary Layer Thickness, Displacement Thickness, Energy Thickness, Momentum Thickness, Boundary Layer Separation.

IMPACT OF JETS: Hydro dynamic forces of Jets on Stationary and moving flat, Inclined, Curved vanes, Jet striking centrally and a tip for Symmetrically and Un-symmetrically vanes, Velocity diagrams, work done and efficiency, Flow over radial vanes.

UNIT-IV

HYDRAULIC TURBINES: Classification of Turbines, Pelton Wheel, work done and efficiencies of Pelton Wheel, Working proportions of Pelton Wheel, Francis Turbine, work done and Efficiencies of Francis Turbine, Working proportions of Francis Turbine, Kaplan Turbine, work done, heads and efficiencies.

PERFORMANCE OF THE HYDRAULIC TURBINES: Specific speed, Specific Quantities, Unit Quantities, Draft Tube and its types, Performance characteristic curves, Governing of Turbines, Cavitations in Turbines.

UNIT-V

CENTRIFUGAL PUMPS: Working of Centrifugal Pumps, Types of Centrifugal Pumps, Work done by The Impeller –Losses and Efficiencies, Specific Speed, Pumps in Series and Parallel.

RECIPROCATING PUMPS: Main components and working of a Reciprocating Pumps, Types of Reciprocating Pumps, work done by Reciprocating Pump, Percentage of Slip and Negative slip of pump.

TEXTBOOKS

1. P.N.Modi and S.M.Seth, Hydraulics, "Fluid Mechanics and Hydraulic Machinery, 15th Edition, Standard Book House, 2004.
2. Philip J, Robert W.fox, Fluid mechanics, 7th edition, John Wiley & sons, 2011.

REFERENCES

1. R.K.Bansal, "Fluid Mechanics and Hydraulic Machines", 9th Edition, laxmi publications.
2. Banga & Sharma, "Hydraulic Machines", Edition, Khanna publishers, 6th Edition, 1999.
3. Rama Durgaiah, "Fluid Mechanics and Machinery", Edition, New Age International, 1st edition, 2006.
4. D.S.Kumar, "Fluid Mechanics and Fluid power engineering", 5th Edition, S.K.Kataria & Sons.

R20 **20ME04 – THERMODYNAMICS**

B.Tech. (III Sem.)

L	T	P	Cr.
2	1	--	3

Pre-requisites **:** Engineering Physics

Course Educational Objective:

To provide an intuitive understanding of thermodynamics to emphasize on physics of thermodynamic systems and this covers the heat and work interactions. It also provides insights on laws of thermodynamics and its applications, properties of pure substances, ideal gases and different thermodynamic cycles.

Course Outcomes (COs):

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

CO1: Classify the various thermodynamic systems, properties and processes with examples and temperature scale of a system. **[Remembering-L1]**

CO2: Differentiate open and closed system and built up the heat and work transfer relations of thermal systems. **[Understanding-L2]**

CO3: Apply the laws of thermodynamics to find the thermodynamic properties and parameters of various thermal systems. **[Applying-L3]**

CO4: Understand the properties of pure substance and gases to compute the non reactive mixture parameters. **[Understanding-L2]**

CO5: Analyse the performance parameters of various thermodynamic cycles. **[Analyzing-L4]**

UNIT – I

Basic Concepts and Zeroth Law of Thermodynamics

Basic Concepts: Introduction, Classification of thermodynamic systems, Macroscopic and Microscopic view point, Control mass, Control volume, Properties of system, State, Change of state, Path, Process - reversible and irreversible processes, Quasi static process, Equilibrium, Path and Point Functions, Specific Heat, Internal Energy, Enthalpy.

Zeroth Law of Thermodynamics: Introduction, Zeroth law of thermodynamics, Measurement of temperature, comparison of thermometers, working of constant volume gas thermometer, Advantages of gas thermometers over liquid thermometers and Thermocouple.

UNIT – II

First Law of Thermodynamics

First Law Analysis of Closed Systems: Introduction**,** First law for a closed system undergoing change of state and cycle, Representation of Thermodynamic processes on P-V planes, Different forms of stored energy, Forms of energy, Mechanical and Non mechanical forms of Work transfer, pdV work and other types of work transfer.

First Law Analysis of Open Systems: Introduction**,** Control Volume**,** Flow work ,Steady Flow Process, Mass and Energy balance in simple steady flow process -Steady Flow Energy Equation (SFEE), Steady Flow Engineering Devices-Nozzles, Diffusers, Turbine, Compressors, Throttling Valves, Heat Exchangers, Limitations on first law of thermodynamics, PMM1.

UNIT – III

Second Law of Thermodynamics

Second Law Analysis of Thermodynamics: Introduction, Energy Reservoirs, Heat Engines, Refrigerators, Heat Pumps, Kelvin-Planck & Clausius Statements of Second law of Thermodynamics, Equivalence of Kelvin-Plank and Clausius Statements, Differences between Reversibility and Irreversibility, Carnot Cycle, Carnot Theorem, PMM II.

Entropy: Introduction, Characteristics of entropy, Principle of increase of entropy, t-s plot of different processes, TdS relations, Entropy change for ideal gases, Clausius inequality, Applications of Entropy principle, Entropy and disorder.

UNIT – IV

Properties of Pure Substances and Gases

Properties of Pure Substance: Introduction, Phases of pure substance, *p-v, p-T, T-s* and *h-s* diagrams for pure substance, *p-v-T* Surface, Properties of steam, quality or dryness fraction, phase change processes, Mollier diagram for a pure substance.

Properties of Ideal Gases: Equation of state of a gas, Avogadro's law, Ideal gas, perfect gas, real gas, properties of mixture of gases – Dalton's law and Amagat's law of partial pressures, Internal energy, enthalpy and specific heats of gas mixtures, Entropy of gas mixtures.

UNIT – V

Thermodynamic Cycles

Introduction**,** working of Carnot vapour cycle, working of simple Rankine cycle, Problems on Carnot vapour cycle and simple Rankine cycle, Gas power cycles -Otto, Diesel, Dual and Brayton Cycle, Refrigeration Cycles - Reversed Carnot cycle, Bell-Coleman cycle and simple vapour compression refrigeration Cycle (Theory).

TEXT BOOKS

1. P.K.Nag, "Engineering Thermodynamics"- McGraw-Hill. 6th Edition, 2017

2. Y.A. Cengel, and M.A.Boles, "Thermodynamics: An Engineering Approach", McGraw-Hill, 8th Edition, 2017.

REFERENCES

1. G.J.Van Wylen & Sonntag, "Fundamentals of Thermodynamics", John Wiley& sons, publications Inc. 5th Edition 1998.
2. E.Rathakrishnan, "Fundamentals of Engineering Thermodynamics", PHI, 2nd Edition, 2010.
3. R.K.Rajput, Engineering Thermodynamics, Laxmi Publications (P) Ltd, 3rd Edition 2007.

R20 **20ME05- METALLURGY AND MATERIAL SCIENCE**

L	T	P	Cr.
3	-	-	3

B.Tech. (III Sem.)

Prerequisite Subject: Engineering Physics, Engineering Chemistry

Course Educational Objectives: The objective of this course is to acquire knowledge on the structure, properties and applications of metals and alloys and also understand the effect of mechanical working and heat treatment on materials.

Course Outcomes:

After completion of the course students will be able to:

1. Comprehend the structure of materials, alloys and correlated the material properties with structure. **(Remembering-L1)**
2. Illustrate the procedure of drawing the equilibrium diagrams and apply the principle of equilibrium diagrams in evaluating the materials properties. **(Understanding-L2)**
3. Recall the properties, applications of ferrous, non ferrous and composite materials. **(Remembering-L1)**
4. Apply the principle of mechanical working on metals and heat treatment on materials. **(Applying-L3)**
5. Identify the types of composite materials and the manufacturing processes of fiber reinforced composites. **(Understanding-L2)**

UNIT – I

STRUCTURE OF METALS: Crystal structures-Body cantered cubic, Face cantered cubic, closed packed hexagonal, crystallographic planes. Mechanism of crystallization of metals, grain and grain boundaries, Effect of grain boundaries on the properties of metal / alloys – Determination of grain size.

CONSTITUTION OF ALLOYS: Necessity of alloying, Solid solutions-Interstitial Solid Solution and Substitution Solid Solution, Hume Rothery's rules.

UNIT – II

EQUILIBRIUM DIAGRAMS: Experimental methods of construction of equilibrium diagrams, Classification of equilibrium diagrams- isomorphous, eutectic, partial eutectic equilibrium diagrams. Equilibrium cooling and heating of alloys, lever rule, coring. Transformations in the solid state – allotropy, eutectic, eutectoid, peritectoid reactions. Study of Cu-Ni and Bi-Cd equilibrium diagrams.

UNIT – III

FERROUS METALS AND ALLOYS: Study of Iron-Iron carbide equilibrium diagram

STEEL: Classification of steels, structure, properties and applications of plain carbon steel-low carbon steel, medium carbon steel and high carbon steel.

CAST IRONS: Structure, properties and applications of white cast iron, malleable cast iron, grey cast iron, spheroidal graphite cast iron.

NON-FERROUS METALS AND ALLOYS: structure, properties and applications of copper and its alloys, Aluminium and its alloys.

UNIT - IV

MECHANICAL WORKING: Hot working, Cold working, Strain hardening, Recovery, Recrystallisation and Grain growth. Comparison of properties of cold and hot worked parts.

HEAT TREATMENT OF ALLOYS: Annealing, normalizing and hardening. Construction of TTT diagram for eutectoid steel. Hardenability- jominy end quench test. Surface - hardening methods and age hardening treatment and application.

UNIT – V

COMPOSITE MATERIALS: Classification of composites, various methods of component manufacture of fiber reinforced composites-Hand layup process, Filament winding process, SMC processes, Continuous pultrusion processes, Resin transfer moulding.

TYPES OF COMPOSITES: Introduction to metal ceramic mixtures, Metal – Matrix composites and C – C composites and applications

TEXT BOOKS:

1. Sidney H. Avener, Introduction to Physical Metallurgy, Tata McGraw-Hill, 3rdEdition, 2011.
2. V.D.Kotgire, S.V.Kotgire, Material Science and Metallurgy, Everest Publishing House, 24th Edition, 2008.

REFERENCES:

1. Richard A.Flinn, Paul K.Trojan, Engineering Materials and Their Applications, Jaico Publishing House, 4thEdition, 1999.
2. William and callister, Materials Science and engineering, Wiley India private Ltd., 2011.
3. U.C Jindal and Atish Mozumber, Material since and metallurgy, Pearson education- 2012

R20 **20ME06- MECHANICS OF SOLIDS**

L	T	P	Cr.
2	1	-	3

B.Tech. (III Sem.)

Pre-requisites **:** Engineering Mechanics

Course Educational Objective:

The objective of the course is to identify nature of the stress and compute the deformations in mechanical members due to various loads.

Course Outcomes:

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

CO1 : Compute the stresses and deformations of a member subjected to various types of loading. **(Applying-L3)**

CO2 Construct the shear force and bending moment diagrams along the length of beam. **(Applying-L3)**

CO3 : Comprehend the variation of bending and shear stresses across the cross section of the beams. **(Understanding-L2)**

CO4 : Analyze the structural members subjected to biaxial stresses. **(Analyzing-L4)**

CO5 : Formulate the equations for stresses and deformations due to various loads. **(Applying-L3)**

UNIT- I

SIMPLE STRESSES AND STRAINS: Stress and strain due to axial force, Hooke's law, Strains, Poisson's ratio, Stepped bars - Stresses in composite bars due to axial force - Relationship between elastic constants.

UNIT - II

SHEAR FORCE AND BENDING MOMENT: Relationship between loading, shear force and bending moment - Shear force and bending moment diagrams for cantilever, simply supported beams subjected to concentrated loads and uniformly distributed loads only - Maximum bending moment and Point of contra flexure.

UNIT – III

STRESSES IN BEAMS: Theory of simple bending - Assumptions - Derivation of flexure equation – Section modulus - Normal stresses due to flexure applications.

SHEAR STRESSES: Derivation of formula – Shear stress distribution across beam cross sections like Rectangular, Circular sections only.

UNIT - IV

ANALYSIS OF COMBINED STRESSES: State of plane stress at a point in stressed body, Normal and Tangential stresses on inclined planes - Principal stresses and their planes - Plane of maximum shear.

UNIT - V

DEFLECTION OF BEAMS: Differential equation of elastic line - Deflection in statically determinate beams – Double Integration method - Macaulay's method.

THIN AND THICK CYLINDRICAL SHELLS: Hoop stress and longitudinal stress- Thin and Thick cylinders –Lami's equation.

TEXT BOOKS

1. E.P. Popov, Engineering Mechanics of Solids, PHI Learning, 2009.
2. Sadhu Singh, Strength of Materials, Khanna Publishers, 2013.

REFERENCES

1. S. Ramamrutham, Strength of Materials, Dhanpat Rai & Sons, 2011.
2. M.L. Gambhir, Fundamentals of Solid Mechanics, PHI Learning, 2009
3. M. Chakraborti, "Strength of Materials", S.K.Kataria & Sons.
4. R.Subramanian, "Strength of Materials", Oxford University Press, 2010.
5. R.K.Bansal, "Strength of Materials", Laxmi Publishers, 2013.

B.Tech. (IV Sem.) **20MC02 – ENVIRONMENTAL SCIENCE**

L	T	P	Cr.
2	0	0	0

Pre-requisite **:** Nil

Course Objectives:
In this course the student will learn about

- Environmental issues like over population, human health etc related to local, regional and global levels.
- The necessity of resources, their exploitation and sustainable management.
- The interactions of human and ecosystems and their role in the food web in the natural world.
- The global biodiversity, threats to biodiversity and its conservation.
- Environmental problems like pollution, disasters and possible solutions.
- The importance of environmental decision making in organizations through audits.

Course Outcomes: At the end of this course, the student will be able to

CO1: Identify environmental problems arising due to engineering and technological activities that help to be the part of sustainable solutions. **(Remember– L1)**
CO2: Evaluate local, regional, and global environmental issues related to resources and their sustainable management **(Understand - L2)**
CO3: Realize the importance of ecosystem and biodiversity for maintaining ecological balance. **(Understand - L2)**
CO4: Acknowledge and prevent the problems related to pollution of air, water, and soil. **(Apply– L3)**
CO5: Identify the significance of implementing environmental laws and abatement devices for environmental management. **(Understand - L2)**

UNIT – I :Nature and scope of Environmental Problems

- Introduction to Environment Science.
- Population explosion, variations among nations
- Resettlement and Rehabilitation - Issues and possible solutions
- Environmental hazards – causes and solutions. Biological hazards – AIDS, Malaria, Chemical hazards- BPA, PCB, Phthalates, Mercury, Nuclear hazards- Risk and evaluation of hazards.
- Role of Information Technology in environmental management and human health

UNIT – II :Natural Resources and Conservation

Introduction and classification of Natural Resources

- Forest resources: Use and over-exploitation, deforestation, Timber extraction, mining, dams and their effects on forests and tribal people
- Water resources: Use and over-utilization of surface and ground water, conflicts over water, interlinking of rivers, dams-benefits and problems, Rainwater harvesting
- Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources
- Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, soil salinity

- Energy resources: Growing energy needs renewable, non-renewable and alternate energy resources

UNIT – III :Ecology and Biodiversity

- Structure and functions of an Ecosystem, Food chains and Food webs, Ecological succession, Ecological pyramids, Biogeochemical cycles
- Biodiversity, Values of biodiversity, Bio geographical classification of India. Endangered and endemic species of India, Threats to biodiversity; Man and wild life conflicts, Conservation of biodiversity: In-situ and Ex-situ conservation methods

UNIT – IV : Environmental Pollution

Introduction to Environmental Pollution Causes, effects and control measures of:
Air pollution, Water pollution, Noise pollution, Solid Waste Management – Sources, Classification, effects and control measures of Municipal solid waste, Biomedical waste & Hazardous and e-waste, Disaster Management.

UNIT – V : Environmental Management

- Sustainable development and unsustainability
- Climate disruption, Greenhouse effect, Ozone layer depletion and Acid rain.
- Stockholm and Rio Summit
- Environmental Impact Assessment (EIA)
- Green building
- Environmental Law- Air, Water, Wildlife, Forest, and Environmental protection act

TEXTBOOKS:

1. Anubha Kaushik, C.P.Kaushik, "*Perspectives in Environmental Studies*", 5nd edition, New age international publishers, Delhi, 2016.
2. G. Tyler Miller, Scott Spoolman, *"Introduction to Environmental Studies"*, 13th Edition, Cengage Learning, New Delhi, 2009.

REFERENCE BOOKS:

1. M. Anji Reddy, "Textbook of Environmental Sciences and Technology", 2nd Edition, BS Publications, Delhi 2011.
2. Deeshita Dave, P. Udaya Bhaskar, "Environmental Studies", 2nd Edition, Cengage Learning, New Delhi, 2012.
3. S.Deswal, A. Deswal, "A Basic course in Environmental Studies", 2nd Edition, Educational & Technical Publishers, Delhi, 2014.
4. R. Rajagopalan, "Environmental Studies (From Crisis to Cure)", 3rd Edition, Oxford University Press, New Delhi, 2012.
5. De, A.K, "Environmental Chemistry", 5th Edition, New Age International (P) Limited, New Delhi, 2003.
6. Dr.K.V.S.G. Murali Krishna, "Environmental Studies", 1st Edition, VGS Techno Series, Vijayawada, 2010.
7. Mahua Basu, S.Xavier, "Fundamentals of Environmental Studies", 1st edition, Cambridge University Press, Delhi, 2016.

R20

B.Tech. (III Sem.)

20ME55 - FLUID MECHANICS AND HYDRAULIC MACHINERY LAB

L	T	P	Cr.
-	-	2	1

Pre-requisites **:** Engineering Mechanics

COURSE EDUCTIONAL OBJECTIVE:

Determine the discharge of various flow measuring devices, estimation of friction factor and performance parameters of hydraulic machines.

COURSE OUTCOMES:

After completion of the course students will be able to

CO1: Identify the need and use ofvarious flow measuring devices. **(Understanding-L2)**

CO2: Apply the Bernoulli's equation for energy balance of fluid flow system. **(Applying - L3)**

CO3: Determine the friction losses of fluid flow through different pipes. **(Applying-L3)**

CO4: Evaluate the performance characteristics of hydraulic pumps, turbines and impact of jets. **(Applying-L3)**

LIST OF EXPERIMENTS

Atleast 10 Experiments are required to be conducted.

1. Verification of Bernoulli's Theorem.
2. Calibration of Venturi meter.
3. Calibration of Orifice meter.
4. Determination of friction factor for a given pipe line.
5. Determination of loss of head due to sudden contraction in a pipe line.
6. Impact of jets on Vanes.
7. Performance Test on Pelton Wheel.
8. Performance Test on Kaplan Turbine.
9. Performance Test on Single Stage Centrifugal Pump.
10. Performance Test on Multi Stage Centrifugal Pump.
11. Performance Test on Reciprocating Pump.
12. Turbine flow meter.
13. Reynolds experiment.
14. Flow Visualization study using Water Flow Channel.

REFERENCES: Lab Manuals

R20	20ME56 - MECHANICS OF SOLIDS AND METALLURGY LAB	L	T	P	Cr.
B.Tech. (III Sem.)		-	-	3	1.5

Prerequisite Subjects: Mechanics of solids, Metallurgy and Material science

COURSE EDUCATIONAL OBJECTIVES:

The main objective of the course is to determine various mechanical properties of materials by testing under different load conditions and observe the microstructure of various materials and perform heat treatment of materials.

COURSE OUTCOMES:

After completion of the course students are able to:

CO1: Evaluate the mechanical properties of materials by conducting various tests. **(Applying-L3)**
CO2: Estimate the behaviour of various materials under different loading. **(Understanding-L2)**
CO3: Identify the material by observing the microstructure. **(Remembering-L1)**
CO4: Perform the hardness test and heat treatment of steels. **(Applying-L3)**

PART-A : MECHANICS OF SOLIDS

LIST OF EXPERIMENTS

Any 6 Experiments are required to be conducted

1. Compression test on helical spring.
2. Tension test on mild steel rod.
3. Double shear test on metals.
4. Torsion test on mild steel rod.
5. Impact test on metal specimen.
   (a) Izod Impact Test (b) Charpy Impact Test
6. Hardness test on metals. (a) Rockwell Hardness Test (b) Brinell Hardness Test
7. Deflection test on beams. (a) Cantilever Beam (b) Simply Supported beam 8. Compression test on brittle materials.

PART-B: METALLURGY

Any 6 Experiments are required to be conducted

1. Preparation and study of the microstructure of pure metals like Iron, Cu and Al.
2. Preparation and study of the microstructure of low carbon steels, medium carbon steel and high carbon steels.
3. Study of the microstructures of gray cast iron, malleable cast iron and nodular cast iron.
4. Study of the microstructures of brass.
5. Study of the microstructures of heat treated steels.
6. Hardenability of steels by Jominy end quench test.
7. Hardness of various treated and untreated steels.

REFERENCE BOOKS

Lab Manual

B.Tech. (III Sem.)	20AD54 - Programming using Python Lab	L	T	P	Cr.
		1	-	2	2

Pre-requisite : Programming languages like C Language.

Course Educational Objective:

The Objective of Python course is to lead the students from the basics of writing and running Python scripts in problem solving and also to design and implement the modules and understands the working of classes and objects in python.

Course Outcomes (COs): *At the end of the course, the student shall be able to*

- **CO 1:** Identify various programming constructs available in Python and apply them in solving computational problems. (**Applying - L3)**
- **CO 2:** Demonstrate data structures available in Python and apply them in solving computational problems. (**Applying - L3**)
- **CO 3:** Implement modular programming, string manipulations and Python Libraries (**Applying - L3**)
- **CO 4:** Improve individual / teamwork skills, communication & report writing skills with ethical values. (**Applying - L3**)

Introduction: Language basics and example problems (Two weeks)

Implement Python Script for checking the given year is leap year or not.

Implement Python Script for finding biggest number among 3 numbers.

Implement Python Script for displaying reversal of a number.

Implement Python Script to check given number is Armstrong or not.

Implement Python Script to print sum of N natural numbers.

Implement Python Script to check given number is palindrome or not.

Implement Python script to print factorial of a number.

Implement Python Script to print all prime numbers within the given range.

Implement Python Script to calculate the series: S=1+x+x2+x3+.....xn

Implement Python Script to print the following pattern:

```
*
* *
* * *
```

Modue 1: Exercise Programs on Lists.

Write a Python script to display elements of list in reverse order.

Write a Python script to find the minimum and maximum elements without using built-in operations in the lists.

Write a Python script to remove duplicates from a list.

Write a Python script to append a list to the second list.

Write a Python script to count the number of strings in a list where the string length is 2 or more.

Module 2: Exercise Programs on Tuples.

Write a Python script to create a tuple with different data types.

Write a Python script to find the repeated items of a tuple.

Write a Python script to replace last value of tuples in a list.

Sample list: [(10, 20, 40), (40, 50, 60), (70, 80, 90)]

Expected Output: [(10, 20, 100), (40, 50, 100), (70, 80, 100)]

Write a Python script to sort a tuple by its float element.

Sample data: [('item1', '12.20'), ('item2', '15.10'), ('item3', '24.5')]

Expected Output: [('item3', '24.5'), ('item2', '15.10'), ('item1', '12.20')]

Module 3: Exercise Programs on Sets.

Write a Python script to add member(s) in a set.

Write a Python script to perform Union, Intersection, difference and symmetric difference of given two sets.

Write a Python script to test whether every element in S is in T and every element in T is in S.

Module 4: Exercise Programs on Dictionaries

Write a Python script to sort (ascending and descending) a dictionary by value.

Write a Python script to check whether a given key already exists or not in a dictionary.

Write a Python script to concatenate following dictionaries to create a new one.

Sample Dictionary : dic1={1:10, 2:20} dic2={3:30, 4:40} dic3={5:50,6:60}

Expected Result : {1: 10, 2: 20, 3: 30, 4: 40, 5: 50, 6: 60}

Write a Python script to print a dictionary where the keys are numbers between 1 and 15 (both included) and the values are square of keys.

Write a Python program to map two lists into a dictionary.

Module 5: Exercise Programs on functions and recursion.

a) Define a function max_of_three() that takes three numbers as arguments and returns the largest of them.

b) Write a program which makes use of function to display all such numbers which are divisible by 7 but are not a multiple of 5, between given range X and Y.

c) Define functions to find mean, median, mode for the given numbers in a list.

d) Define a function which generates Fibonacci series up to n numbers.

e) Implement a python script for factorial of number by using recursion.

f) Implement a python script to find GCD of given two numbers using recursion.

Module 6: Exercise programs on Strings

a) Implement Python Script to perform various operations on string using string libraries.

b) Implement Python Script to check given string is palindrome or not.

c) Implement python script to accept line of text and find the number of characters, number of vowels and number of blank spaces in it.

d) Implement python script that takes a list of words and returns the length of the longest one.

Module 7: Exercise programs on Regular Expressions

a) Write a Python script to check that a string contains only a certain set of characters (in this case a-z, A-Z and 0-9).

b) Write a Python script to check whether password is valid or not.

Conditions for a valid password are:

Should have at least one number.

Should have at least one uppercase and one lowercase character.

Should have at least one special symbol.

Should be between 6 to 20 characters long.

Module 8 : Exercise programs on Matplotlib Library

a) Write a Python program to draw a line with suitable label in the x axis, y axis and a title.

b) Write a Python program to plot two or more lines with legends, different widths and colors.

c) Write a Python program to create multiple plots.

d) Write a Python programming to display a bar chart using different color for each bar.

e) Write a Python programming to create a pie chart with a title.

f) Write a Python program to draw a scatter plot with empty circles taking a random distribution in X and Y and plotted against each other.

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R20	20FE09-PROBABILITY AND STATISTICS	L	T	P	Cr.
B. Tech (IV Sem.)	(Common to AI&DS, CSE, IT & MECH)	3	--	--	3

Pre-requisite(s) : None

Course Educational Objective: The objective of this course is to provide students with the foundations and applications of probabilistic and statistical methods mainly used in varied applications in engineering and science.

Course Outcomes: At the end of the course, the student will be able to

CO1: Understand various probabilistic situations using the various laws of probability and random variables. **(Understanding-L2)**

CO2: Apply probability distributions like Binomial, Poisson, Normal and Exponential distributions in solving engineering problems. **(Applying-L3)**

CO3: Calculate the standard error of sampling distribution and confidence intervals for parameters like mean and proportion based on the sample data. **(Applying-L3)**

CO4: Analyse the data scientifically with the appropriate statistical methodologies to apply the suitable test of hypothesis. **(Analyzing-L4)**

CO5: Construct the regression lines to predict the dependent variables and calculate the Correlation Coefficient for a bivariate statistical data. **(Evaluating-L5)**

Unit-1:

Probability and Random variables

Probability, Sample space and events, Additive Rule, Conditional probability, Multiplicative rule, Baye's theorem.

Random variables – Discrete and continuous Random Variables, distribution function. Mathematical Expectation of one-dimensional Random Variable.

Unit-2:

Probability Distributions

Binomial distribution , Poisson distribution , Poisson approximation to Binomial distribution, Exponential distribution, Normal distribution , Normal approximation to Binomial distribution.

Unit-3:

Sampling distribution & Estimation

Population, sample, parameter, statistic, sampling distribution, Standard error, Types of sampling, Sampling distribution of means and sampling distribution of variance, Parameter estimations – point estimation and interval estimation for mean and proportions.

Unit-4:

Tests of Hypothesis

Hypothesis, Null and Alternate Hypothesis, , Type I and Type II errors, level of significance.

Z-test for means and proportions, t-test for single mean, difference of means, paired t-test, F-test for equality of population variances, χ^2 - test for goodness of fit and independence of attributes.

Unit-5:

Correlation & Regression

Karl Pearson's coefficient of correlation, linear Regression, Regression lines, Regression coefficients, Spearman's Rank correlation coefficient, Spearman's Rank correlation for repeated ranks.

Text books

1. Jay L.Devore "Probability and Statistics for engineering and the sciences", 8th edition, Cengage Learning India, 2012.
2. S.C.Gupta, V.K.Kapoor, "Fundamentals of Mathematical Statistics", 11thEdition, Sultan Chand and sons, New Delhi, 2014.

Reference Books

1. Miller & Freund's "Probability and Statistics for Engineers",8th edition. PHI, New Delhi, 2011.
2. B.V. Ramana, "Higher Engineering Mathematics", 1st Edition, TMH, New Delhi, 2010

R20
B.Tech. (1V Sem.) 20ME07 – APPLIED THERMODYNAMICS

L	T	P	Cr.
2	1	-	3

PRE-REQUISITES : Thermodynamics

COURSE EDUCATIONAL OBJECTIVE: This course provides the analysis of vapour power cycle, principle of working, thermodynamic analysis, performance and applications of its components.

COURSE OUTCOMES:

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

CO1: Describe the working of a vapour power cycles and identify the suitable fuels for power plants. **(Understanding-L2)**

CO2: Identify the need of various boilers and draught systems for a thermal power plant. (Remembering-L1)

CO3: Apply thermodynamic analysis to study the characteristics of steam nozzles and steam condensers. **(Applying-L3)**

CO4: Evaluate the performance characteristics of an impulse and reaction turbines. **(Applying-L3)**

CO5: Comprehend the different compressors used in thermal systems.**(Understanding-L2)**

UNIT – I

VAPOUR POWER CYCLES: Introduction, Carnot Vapour Power Cycle, Rankine Cycle, Actual Vapour Power Cycle, Methods to improve efficiency of Rankine cycle, Reheating of steam, Regeneration-Open and Closed Feed Water Heaters. Fuels used in power plant.

UNIT – II

BOILERS: Introduction, Boiler systems-Function and Classification, Fire Tube Cornish, Lancashire, Cochran, Water Tube-Babcock and Wilcox, High pressure boilers-Loeffler and Benson boilers, Boiler Mountings and Accessories.

DRAUGHT SYSTEM: Functions, Types, Natural Draft-Height of chimney for given draught and discharge, Condition for maximum discharge, Efficiency of chimney, artificial draught-induced and forced.

UNIT – III

STEAM NOZZLES: Introduction**,** Types of nozzle, Flow through nozzles- thermodynamic Analysis, velocity of nozzle at exit, condition for maximum discharge, critical pressure ratio, Ideal and actual expansion in nozzle, velocity coefficient.

STEAM CONDENSERS: Introduction, Elements of a condenser plant, Types of Condensers-Jet condensers, Surface Condensers–working principle.

UNIT – IV

STEAM TURBINES: Introduction, Classification.

IMPULSE TURBINES –Mechanical details, Working principle, Velocity diagram–effect of friction–power developed, axial thrust, blade or diagram efficiency–condition for maximum efficiency. De-Laval Turbine – its features. Method store ducerotor speed-velocity compounding (Curtis Turbine), Pressure compounding (Rateau Turbine) and pressure and velocity compounding.

REACTION TURBINES: Introduction, Parson‘s reaction turbine, performance analysis, degree of reaction, condition for maximum efficiency.

UNIT – V

COMPRESSORS– Introduction, Classification

RECIPROCATING COMPRESSORS: Principle of operation, Work required, Isothermal Efficiency, Volumetric efficiency and Effect of clearance volume, Multistage Compression.

ROTARY COMPRESSORS: Roots blower and Vane's sealed compressor-principle of working and applications. Centrifugal and Axial flow compressors: Construction, Principle of operation and applications.

TEXT BOOKS:

T1 Mahesh. M. Rathore, Thermal Engineering,1st Edition, 2012, TMH.

T2 R.K.Rajput, Thermal Engineering, 5th Edition, 2005, Laxmi publications.

REFERENCE BOOKS:

R1 T.D. Eastop and A. McConkey, Applied Thermodynamics, Pearson, 5th Edition, 2013.

R2 R. Yadav, Thermodynamics and Heat Engines, 5th Edition, Volume-II, 1999.

R20

B.Tech. (1V Sem.) **20ME08 –PRODUCTION TECHNOLOGY**

L	T	P	Cr.
3	-	-	3

PRE-REQUISITES: Metallurgy and Material Science

COURSE EDUCATIONAL OBJECTIVE:

The main objective of this course is to understand the various manufacturing processes available for mechanical engineer and apply them in producing the components.

COURSE OUTCOMES:

At the end of the course, the student will be able to

CO1: Classify various manufacturing processes and illustrate the casting processes. **[Understanding – L2]**

CO2: Recall the various welding techniques and explain gas welding and arc welding. **[Understanding – L2]**

CO3: Illustrate resistance welding, special welding, soldering and brazing processes. **[Understanding – L2]**

CO4: Understand the nature of plastic deformation and identify the types of metal forming processes. **[Remembering – L1]**

CO5: Distinguish various types of metal forming processes. **[Understanding – L2]**

UNIT – I

INTRODUCTION TO MANUFACTURING: Historical perspective; Importance of manufacturing; Classification of manufacturing processes.

CASTING: Steps involved in making a casting, advantage and limitations of casting and its applications. Patterns – Types of patterns and pattern allowances, pattern Materials, Cores and core prints, Chaplets, Moulding sands and Properties of moulding sand, Principles of Gating system, types of gates and Gating ratio, Risers – Types, Function and Design, special casting processes: Centrifugal casting, Die casting, Investment casting, cleaning of castings, casting defects and remedies, non destructive testing of castings.

UNIT – II

WELDING: Classification of welding process, Principle of gas welding, Oxy- acetylene welding equipment, Process and applications, Hydrogen welding, Gas cutting process and applications.

ELECTRIC ARC WELDING: Principle, equipment, electrodes and electrode polarities, Consumable and non consumable welding process. MIG welding Sub-merged arc welding (SAW) processes and applications. Inert gas welding, Tungsten Inert Gas Welding (TIG) process and applications, Carbon arc welding.

UNIT - III

RESISTANCE WELDING: Principle and types of resistance welding and applications, Thermit welding, friction welding, explosive welding and induction welding.

SOLDERING AND BRAZING: Soldering, brazing and braze welding processes and applications, welding defects, causes and remedies. Non-destructive examination of weldments.

UNIT – IV

METAL FORMING PROCESSES: Nature of plastic deformation, Hot working and Cold working, Principles of Rolling fundamentals – Theory of rolling, Types of Rolling mills, Drawing and its types – Wire drawing and Tube drawing – Coining – Hot and cold spinning processes.

FORGING: Principles of forging – Tools and dies – Types of forging operations – Smith forging, Drop Forging and Machine forging, Forging defects, Causes and remedies. Applications of forming and forging processes.

UNIT – V

EXTRUSION OF METALS: Basic extrusion process, its characteristics and applications. Hot extrusion and cold extrusion - Forward extrusion and backward extrusion – Impact extrusion, and Hydrostatic extrusion.

SHEET METAL OPERATIONS: Stamping, Forming and other cold working processes, Blanking and piercing – Bending and stretch forming, Embossing and coining.

TEXT BOOKS

1) P.N. Rao , Manufacturing Technology – Vol I & II, TMH, 5th Edition, 2018.
2) Richard W Heine, Philp Rosenthal& Karl R.Loper, Principles of metal casting, TMH Edition, 2017.

REFERENCES:

1) S. Kalpakjain, S.R.Schmid, Manufacturing Engineering and Technology, Pearson Edu., 7th Edition, 2014.
2) R.K. Jain , Production Technology /Khanna Publishers, 19th Edition, 2020.
3) Lindberg, Process and materials of manufacturing, PE, 4th Edition, 2015.
4) Sarma P C, Production Technology, S Chand & Company Ltd, 8th Edition, 2014.
5) B.S. Raghuvamsi, Workshop Technology, Dhanapatirai and co. 12th Edition, 2013.

R20
B.Tech. (IV Sem.) **20ME09 – THEORY OF MACHINES**

L	T	P	Cr.
3	-	-	3

PRE-REQUISITES: Mechanics of Solids

COURSE EDUCATIONAL OBJECTIVE:
The main objective of this course is to identify the basic components, layout and kinematics of mechanisms and familiarize the standard mechanisms used for speed and stability control under the effects of vibrations.

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

- **CO1.** Comprehend the layout and working of various mechanisms. **[Understanding-L2]**
- **CO2.** Analyze the velocity and accelerations of various kinematic links in a mechanism. **[Analyzing-L4]**
- **CO3.** Analyze the gear kinematics and turning moment diagrams of engines.**[Analyzing-L4]**
- **CO4.** Analyze the speed regulations in various types of governors. **[Analyzing-L4]**
- **CO5.** Solve the balancing of the rotating parts and undamped, damped free vibrating mechanical systems. **[Applying-L3]**

UNIT – I
MECHANISMS: Elements – Classification –Types of kinematic pairs –Types of motions - Degree of freedom- Mechanism and Machines – Classification of mechanisms – Kinematic chain – Inversion of mechanism - Inversions of quadric cycle chain – Single and Double slider crank chains.

UNIT – II
VELOCITY AND ACCELERATION ANALYSIS: Absolute and Relative motions - Instantaneous centre - Kennedy's theorem- Determination of angular velocity of links for simple mechanisms -Relative velocity method –Velocity Polygon-Acceleration Polygon- Velocity and acceleration diagrams for simple mechanisms -Coriolis component of acceleration.

UNIT – III
GEARS: Terminology – Law of gearing- Profile for gears- Involute action- Path of contact, Arc of contact, Contact ratio- Velocity of sliding –Interference and Undercutting.
TURNING MOMENT DIAGRAMS: Turning moment – Angular velocity and acceleration of connecting rod –Piston effort, Crank effort and torque diagrams – Inertia torque of connecting rod - Fluctuation of energy.

UNIT – IV
GOVERNORS: Introduction, types of governors - Watt, Porter and Proell governors - Hartnell governor, Sensitiveness, stability - Isochronism – Hunting.

UNIT – V
BALANCING: Introduction – Balancing of Rotating Masses – Single and Multiple – Single plane and Different planes.

BASICS OF VIBRATIONS: Introduction, Types of vibrations-longitudinal, torsional and transverse vibrations, Un damped free vibrations of spring mass system using energy method, under damped free vibrations of spring mass system, logarithmic decrement.

TEXT BOOKS

1. S.S.Rattan, Theory of Machines, Tata McGraw-Hill, 2007.
2. J.E.Shigley and J.J. Uicker, Theory of Machines and Mechanisms, Tata McGraw Hill, 1995.

REFERENCES

1. J.S.Rao and R.V.Dukkipati, Mechanism and Machine Theory, New Age, 2007.
2. Thomas Bevan, Theory of Machines, CBS Publishers, 1984.
3. B.SadhuSingh,Theory of Machines, Pearson Education, 2002.
4. P.L.Ballaney, Theory of Machines, Khanna Publishers,1990.
5. A. Ghosh and A.K.Mallik, Theory of Mechanisms and Machines, EW Press, 1988.

R20	20HS01 – UNIVERSAL HUMAN VALUES 2: UNDERSTANDING HARMONY	L	T	P	Cr.
B.Tech. (IV Sem.)		3	-	-	3

Pre-requisites: Nil

Course Educational Objective: To become more aware of themselves, and their surroundings (family, society, nature); they would become more responsible in life, and in handling problems with sustainable solutions, while keeping human relationships and human nature in mind.

COURSE OUTCOMES:

At the end of the course, the student will be able to

CO1: Apply the value inputs in life and profession. **(Applying – L3)**

CO2: Distinguish between values and skills, happiness and accumulation of physical facilities, the self, and the Body. **(Understanding – L2)**

CO3: Understand the role of a human being in ensuring harmony in society. **(Understanding – L2)**

CO4: Understand the role of a human being in ensuring harmony in the nature and existence. **(Understanding – L2)**

CO5: Distinguish between ethical and unethical practices. (**Applying – L3**)

UNIT-I:

Need, Basic Guidelines, Content and Process for Value Education

'Natural Acceptance' and Experiential Validation- as the process for self-exploration; Continuous Happiness and Prosperity- A look at basic Human Aspirations; Right understanding, Relationship and Physical Facility, Understanding Happiness and Prosperity

UNIT-II:

Understanding Harmony in the Human Being - Harmony in Myself!

Understanding human being as a co-existence of the sentient 'I' and the material 'Body'; Understanding the needs of Self ('I') and 'Body' - happiness and physical facility; Understanding the Body as an instrument of 'I' (I being the doer, seer and enjoyer);

Understanding the characteristics and activities of 'I' and harmony in 'I'; Understanding the harmony of I with the Body: Sanyam and Health; correct appraisal of Physical needs, meaning of Prosperity in detail

UNIT-III:

Understanding Harmony in the Family and Society- Harmony in Human-Human Relationship

Understanding values in human-human relationship; meaning of Justice (nine universal values in relationships) and program for its fulfilment to ensure mutual happiness; Trust and Respect as the foundational values of relationship;

Understanding the harmony in the society: Resolution, Prosperity, fearlessness and co-existence as comprehensive Human Goals; Visualizing a universal harmonious order in society- Undivided

Society, Universal Order- from family to world family, Gratitude as a universal value in relationships.

UNIT-IV:

Understanding Harmony in the Nature and Existence - Whole existence as Coexistence

Understanding the harmony in the Nature; Interconnectedness and mutual fulfilment among the four orders of nature- recyclability and self regulation in nature; Understanding Existence as Co-existence of mutually interacting units in all-pervasive space; Holistic perception of harmony at all levels of existence.

UNIT-V:

Implications of the above Holistic Understanding of Harmony on Professional Ethics

Natural acceptance of human values; Definitiveness of Ethical Human Conduct; Basis for Humanistic Education, Humanistic Constitution and Humanistic Universal Order; Competence in professional ethics, Strategy for transition from the present state to Universal Human Order.

Text Book:

Human Values and Professional Ethics by R R Gaur, R Sangal, G P Bagaria, Excel Books, New Delhi, 2010.

Reference Books:

1. Jeevan Vidya: Ek Parichaya, A Nagaraj, Jeevan Vidya Prakashan, Amarkantak, 1999.
2. Human Values, A.N. Tripathi, New Age Intl. Publishers, New Delhi, 2004.
3. The Story of My Experiments with Truth - by Mohandas Karamchand Gandhi.

R20
B.Tech. (IV Sem.) 20ME57 - PRODUCTION TECHNOLOGY LAB

L	T	P	Cr.
-	-	3	1.5

Prerequisite Subject(s): Engineering Workshop, Engineering Graphics

COURSE EDUCATIONAL OBJECTIVE:

The objective of the course is to provide hands-on experience in primary production processes to design, fabricate, testing and evaluation of mechanical components of different materials using casting, welding, press working and moulding techniques.

COURSE OUTCOMES:

After completion of the course, students will be able to:

1. Choose a suitable primary production process to design an industrial component. **(Understanding-L2)**
2. Select a suitable production process for fabrication of designed component. **(Applying-L3)**
3. Choose a suitable mechanical press working operation to get the required shape of component. **(Remembering-L1)**
4. Manufacture a plastic component using various plastic processing techniques. **(Applying-L3)**

I. METAL CASTING

1. Pattern Design and making
2. Moulding sand properties testing and evaluation
3. Mould Making, Melting and Casting

II WELDING

1. ARC Welding
2. Resistance Welding
3. Special Welding Techniques
4. Brazing and Soldering

III MECHANICAL PRESS WORKING

1. Study of simple, compound, and progressive press tools.
2. Hydraulic Press - Operations

IV PROCESSING OF PLASTICS

1. Injection Moulding
2. Blow Moulding

Ref: Production Technology Lab Manual

R20
B.Tech. (IV Sem.) **20ME58 – THEORY OF MACHINES LAB**

L	T	P	Cr.
-	-	2	1

PRE-REQUISITES: Engineering Mechanics andTheory of Machines

COURSE EDUCATIONAL OBJECTIVE:
The main objective of this course is to demonstrate the concepts of theory of machines.

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

CO 1. Apply the dynamics of cams, gyroscopes for any practical problems.**(Applying-L3)**
CO 2. Evaluate the speed regulations in governors. **(Applying-L3)**
CO 3. Execute the static and dynamic balancing for rotating parts of a machine. **(Applying-L3)**
CO 4. Analyze the vibration parameters of oscillating bodies. **(Analyzing-L4)**

LIST OF EXPERIMENTS:
At least 10 experiments are to be conducted

1. Study the cam jump phenomenon of various cams and followers.
2. Determination of gyroscopic couple on Motorized Gyroscope.
3. Determination of centrifugal forces and draw the characteristics curve of Watt and Porter governor.
4. Determination of centrifugal forces and draw the characteristics curve of Proell governor.
5. Determination of centrifugal forces and draw the characteristics curve of Hartnell governor.
6. Balance the given rotor system dynamically with the aid of the force polygon and the couple polygon.
7. Determination of whirling speed of rotating shaft with various boundary conditions.
8. Determination of natural frequency of the spring-mass damped and undamped systems.
9. Determination of natural frequency of torsional vibrations of a single rotor system.
10. Verification of dunkerley's formula for transverse vibrations of beams with different end conditions.
11. Determination of damped and undamped forced vibrations of beams.
12. Determination of radius of gyration of the Bifilar suspension system.

REFERENCES:

Lab-Manual

R20

B.Tech. (IV Sem.)

20ME59 - COMPUTER AIDED MACHINE DRAWING LAB

L	T	P	Cr.
1	-	2	2

Pre-requisites **:** Engineering Graphics, Engineering Drawing with AutoCAD

Course Educational Objective:

The main objectives of the course are to familiarize the basic conventions and various machine elements used in design and to understand the assembly drawings for engine parts, machine parts, valves etc.

Course Outcomes:

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

CO1 : Comprehend basic conventions needed for machine drawing. **(Understanding-L2)**

CO2 : Construct the machine elements with suitable proportions used in mechanical systems. **(Applying-L3)**

CO3 : Execute the assembly drawings of engine parts. **(Analyzing-L4)**

CO4 : Execute the assembly drawings of machine parts. **(Analyzing-L4)**

UNIT- I

I.MACHINE DRAWING CONVENTIONS:

Need for drawing conventions – introduction to IS conventions

a) Conventional representation of materials, common machine elements and parts such as screws, nuts, bolts, keys, gears, webs and ribs.

b) Types of sections – selection of section planes and drawing of sections and auxiliary sectional views, Parts not usually sectioned.

c) Methods of dimensioning, general rules for sizes and placement of dimensions for holes, centres, curved and tapered features.

d) Title boxes, their size, location and details - common abbreviations & their liberal usage

e) Types of Drawings – working drawings for machine parts.

II.DRAWING OF MACHINE ELEMENTS AND SIMPLE PARTS:

1. Sections of Solids: Introduction, Sections prisms, Pyramids, Cylinders and cones

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

a) Popular forms of screw threads, bolts, nuts, stud bolts, tap bolts and set screws.

b) Keys, cotter joints and knuckle joint.

c) Riveted joints for plates

d) Shaft coupling, spigot and socket pipe joint.

e) Journal, pivot and collar and foot step bearings.

III.ASSEMBLY DRAWINGS:

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

a) Engine parts – Stuffing box, Cross head, Eccentric, Connecting rod, Piston assembly.

b) Other machine parts - Screws jack, Bench Vice, Pipe vice, Plummer block, Tailstock.

List of Experiments:

S.No.	Type of Drawings	Name of the Experiment	No. of Hours
1	Conventional Drawing	Conventional representations of various materials	02
2		Conventional representations of various machine parts	02
3		Sectional Views	02
4	Drawing of Machine elements for simple parts	Thread Profiles	02
5		Bolt with Nut and Washer	02
6		Flanged Coupling	02
7		Riveted Joint	02
8	Assembly Drawing	Stuffing box	04
9		Piston Assembly	04
10		Plummer block	02
11		Universal Joint	02
12		Screw Jack	02

TEXT BOOK

1. K.L.Narayana, P.Kannaiah& K. Venkata Reddy, Machine Drawing, 4th Edition New Age Publishers. 2004.

2. P.S Gill, Machine Drawing, 18th Edition Eastern Publisher, 2013.

REFERENCES

1. N.Sidheshwar, Machine Drawing, 4th Edition, Tata McGraw Hill, 2001.

2. Dhawan, Machine Drawing, revised edition, S.Chand Publications, 2002.

3. K. C. JOHN, Machine Drawing 6th Edition, Stronck publishers, 2007.

4. N.D.Bhatt, V.M.Panchal Machine Drawing Charotar Publishing House, 2005.