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	20ME02	Engineering Mechanics	2	1	0	3	30	70	100
Laboratory Courses									
6	20FE52	Applied Chemistry Lab	0	0	3	1.5	15	35	50
7	20ME52	Engineering Mechanics and Fuel Testing Lab	0	0	3	1.5	15	35	50
8	20ME51	Engineering Workshop	0	0	3	1.5	15	35	50
Total			**11**	**2**	**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	20AE01	Elements of Aerospace Engineering	3	0	0	3	30	70	100
6	20MC01	Constitution of India	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	20ME54	Computer Aided Engineering Graphics	0	0	3	1.5	15	35	50
Total			**14**	**2**	**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									
1	20FE10	Numerical Methods and Integral Calculus	2	1	0	3	30	70	100
2	20EE02	Basic Electrical and Electronics Engineering	3	0	0	3	30	70	100
3	20AE02	Engineering Fluid Mechanics	2	1	0	3	30	70	100
4	20AE03	Engineering Thermodynamics	2	1	0	3	30	70	100
5	20AE04	Strength of Materials	2	1	0	3	30	70	100
6	20MC02	Environmental Science	2	0	0	0	30	70	100
Laboratory Courses									
7	20EE52	Basic Electrical and Electronics Engineering Lab	0	0	3	1.5	15	35	50
8	20AE51	Engineering Fluid Mechanics Lab	0	0	3	1.5	15	35	50
9	20AE52	Strength of Materials Lab	0	0	3	1.5	15	35	50
10	20AES1	Advanced AutoCAD	1	0	2	2	--	50	50
Total			**14**	**4**	**11**	**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									
1	20FE09	Probability and Statistics	3	0	0	3	30	70	100
2	20AE05	Aerospace Materials and Manufacturing	3	0	0	3	30	70	100
3	20AE06	Aerodynamics	3	0	0	3	30	70	100
4	20AE07	Aircraft Structures-I	2	1	0	3	30	70	100
5	20HS01	Universal Human values 2: Understanding Harmony	3	0	0	3	30	70	100
Laboratory Courses									
6	20AE53	Manufacturing Technology Lab	0	0	3	1.5	15	35	50
7	20AE54	Thermal Engineering Lab	0	0	3	1.5	15	35	50
8	20AE55	MATLAB applications in Engineering Lab	0	0	3	1.5	15	35	50
9	20ITS1	Problem Solving Using Python	1	0	2	2	--	50	50
Total			**15**	**1**	**11**	**21.5**	**195**	**505**	**700**
Honors/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 the 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 Objectives: 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 the basic concepts of water, fuel technologies**,** electrochemistry, corrosion and advanced materials used in technologies.

Course Outcomes: At the end of the course, students 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 waste water.

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, 3rdEdition, 2003.
2. Jain, Jain, "A Text book of Engineering Chemistry", Dhanpat Rai Publishing Company, New Delhi, 16th Edition, 2015.

REFERENCE BOOKS

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.

B.Tech. (I Sem.) **20ME01 - ENGINEERING GRAPHICS**

L	T	P	Cr.
2	0	4	4

Pre-requisites : Mathematics

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,RegularPolyhedral, 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

B.Tech. (I 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 behavior 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, general 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.

L	T	P	Cr.
0	0	3	1.5

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

Pre-requisites: Nil

Course Educational Objectives: 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 by EDTA method.
4) Determination of permanent hardness of water by EDTA method.

Preparation of Polymers

5) Nylon Fibers
6) Bakelite

Redox Titrations

7) Estimation of Mohr's salt by using potassium permanganate.
8) Estimation of Mohr's salt by 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.

REFERENCES

Lab manual

B.Tech. (I 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

L	T	P	Cr.
0	0	3	1.5

B.Tech. (I Sem.) **20ME51 - ENGINEERING WORKSHOP**

PRE-REQUISITES: Physics and Mathematics

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 anduses.

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 fittingshop, description, demonstration,care, use of tools and safety precautions.

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

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 rectangulartray.
Job II- Preparation of an open scoop/ funnel.
Job III - Preparation of a Single Seam Joint and Double Seam Joint.
Job IV - Preparation of a Corner Seam Joint.

Trade –4: PLUMBING SHOP

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

Job I – preparation of pipelayout.

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, PVCConduits.Study of electrical safety measures and demonstration about use of protective devices suchas fuses, and relays includingearthling.

Job I – One lamp controlled by one 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 LabManual.
2. S.K.HajraChoudary and A.K.Choudary, –Workshop Technology-I‖, MediaPromotersand Publishers Pvt.Ltd., Mumbai,2012.
3. B.S.Raghuvamsi, –Workshop Technology-I‖, Dhanpatrai and company, New Delhi, 2014.
4. P.Khannaiah, K.L.Narayana, –Workshop Mnaual‖,ScitechPublicationsIndiaPvt.Ltd, 2015.

II SEM

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., 2nd Edition, 2014.

REFERENCE BOOKS

1. M.N. Avadhanulu, TVS Arun Murthy, "Applied *Physics*", S. Chand & Co., 2nd Edition, 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 data types, Modular programming, user defined structures, basics of files and its I/O operations.

COURSE OUTCOMES (COs): 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, goto 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.

TEXT BOOKS:

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, 200

B.Tech. (II Sem.)

20AE01 - ELEMENTS OF AEROSPACE ENGINEERING

L	T	P	Cr.
3	0	0	3

Prerequisites: Nil

Course Educational Objectives: To learn the components of airplane and different types of flight vehicles, the basic aspects of aerodynamics and airfoils, the elements of propulsive systems, function of structural components in wing and fundamental aspects of flight vehicle in space.

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

CO1: Describe functions of various external and internal components of an airplane (**Remember - L1**]

CO2: Classify the various forces and moments acting on an airfoil (**Understand - L2)**

CO3: Differentiate the working principles of various aircraft engines systems (**Understand - L2)**

CO4: Formulate the basic aspects of space flight (**Apply - L3)**

UNIT - I

BASIC ASPECTS: History-Early Planes, Components of Airplane and Their Functions, Types of Flight Vehicles, Classifications, Standard Atmosphere, Altitude, Hydrostatic Equation, Geopotential and Geometric Altitudes

UNIT - II

BASIC AERODYNAMICS: Introduction – Airfoils - Airfoil Nomenclature, Classifications of NACA Airfoils, Wing Geometry, Aerodynamic Forces, Lift, Drag and Moment Coefficients, Co-Efficient of Pressure, Centre of Pressure, Aerodynamics Centre, Pressure Distribution Over Aerofoil, Types of Drag.

UNIT - III

PROPULSION: Introduction, Propeller, Reciprocating Engine, Jet Propulsion-The Thrust Equation, Elements of Turbojet Engine-Turbofan Engine-Rocket Engine, Rocket Propellants-Liquid Propellants, Solid Propellants, Rocket Staging

UNIT - IV

FLIGHT VEHICLE STRUCTURES: Introduction, Fuselage-Monocoque, Semi-Monocoque Structures, Components of Wing-Spars, Ribs, Longerons, Stringers, Bulkheads, Aircraft Materials-Metallic and Non-Metallic Materials, Use of Aluminium Alloy, Titanium, Stainless Steel and Composite Materials.

UNIT - V

SPACE FLIGHT: Introduction, Orbit Equation, Basic Aspects of Space Vehicle Trajectories, Kepler's Laws, Earth and Planetary Entry, Space Explorations- Space Vehicles and Its Types, Reusable Space Vehicles, Space Shuttle, Satellites, Types of Satellites and Their Functions.

TEXT BOOK

1. Anderson. J. D, Introduction to Flight, Eighth Edition, McGraw-Hill Education, 2017.

REFERENCES

1. Houghton. E. L., Carpenter P.W., Aerodynamics for Engineering Students, Seventh Edition, Butterworth-Heinemann, 2017.
2. Kermode. A. C, Mechanics of Flight, Eleventh Edition, Pearson Education, 2007.

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 team work 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 apparatusand 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.

# of modules at most 10can 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.)	20ME54 - COMPUTER AIDED ENGINEERING GRAPHICS	L	T	P	Cr.
		0	0	3	1.5

PRE-REQUISITES: Engineering Graphics, Mathematics

Course Educational Objective: The course aims to teach developing and drawing of engineering objects using AutoCAD. The student will be taught the fundamentals of AutoCAD and then asked to develop the projections of objects related to straight lines, planes, solids, orthographic and isometric views, development of surfaces using principles of engineering drawing.

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

CO1: Draw simple objects using functional tools in AutoCAD. (**Understand-L2**)

CO2: Develop and draw the positions and views of points, lines, planes and solids using AutoCAD. (**Understand-L2**)

CO3: Develop and draw the orthographic and isometric projections of simple objects using Auto-CAD. (**Understand-L2**)

CO4: Develop and draw the projections of the solids by developing the surfaces using AutoCAD. (**Understand-L2**)

BASIC AUTOCAD COMMANDS

1. Basic drawing commands (line, circle, arc, ellipse, polygon, and rectangle).

2. Edit commands (copy, move, erase, zoom).

3. Array commands (polar array, rectangular array, P-edit, divide, pline, offset).

4. Hatching &line commands (hatching with different angles& different types of lines).

5. Mirror & trim commands (mirror an object, trim, extend a line, chamfer &fillet, explode).

6. Dimensioning & text commands (linear, angular, radius, diameter& text).

PROJECTION OF POINTS, LINES AND PLANES

1. Projection of points (I, II, III, & IV quadrants).

2. Projection of lines parallel to both reference planes.

3. Projection of lines parallel to one reference plane & inclined to other reference plane.

4. Projection of planes: Single stage projections.

PROJECTION OF SOLIDS

1. Projection of solids in simple position and transfer of points.

2. Projection of solids with axes inclined to one reference plane & parallel to other.

3. Sections of solids: Simple sections

ORTHOGRAPHIC PROJECTIONS

1. Conversion of plane figures to orthographic views.

2. Conversion of circular figures to orthographic views.

3. Conversion of combination of plane figures and circular figures to orthographic views.

ISOMETRIC PROJECTIONS

1. Conversion of plane figures to isometric views.
2. Conversion of circular figures to isometric views.
3. Conversion of combination of plane figures and circular figures to isometric views.

DEVELOPMENT OF SURFACES

1. Parallel-line development (prism, cylinder) for objects in simple position**.**
2. Radial-line development (cone, pyramid) for objects in simple position.

TEXTBOOK

1. D.M. Kulkarni, A.P Rastogi, and A.K. Sarkar, "Engineering Graphics with AutoCAD", PHI Learning Private Limited, New Delhi, 2009.

REFERENCE

1. N. D. Bhatt, "Engineering Drawing", 51st Revised and Enlarged Edition, Charotar Publishers, 2012.

III SEM

B.Tech. (III Sem.)	20FE10 - NUMERICAL METHODS AND INTEGRAL CALCULUS	L	T	P	Cr.
		2	1	0	3

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.(Understand – L2)
CO2: Apply numerical techniques in solving of equations and evaluation of integrals. (Apply – L3)
CO3: Discriminate among Cartesian, Polar and Spherical coordinates in multiple integrals and their respective applications to areas and volumes. (Apply – L3)
CO4: Generate the single valued functions in the form of Fourier series and obtain Fourier series representation of periodic function. (Apply – L3)
CO5: Evaluate the directional derivative, divergence and angular velocity of a vector function. (Apply – 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.

REFERENCES

1. M. D. Greenberg, " *Advanced Engineering Mathematics*", 2nd Edition, TMH Publications, New Delhi,2011.
2. Erwin Krezig, *"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. (III Sem.)	20EE02 - BASIC ELECTRICAL AND ELECTRONICS ENGINEERING	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. (III Sem.) **20AE02 - ENGINEERING FLUID MECHANICS**

L	T	P	Cr.
2	1	0	3

Prerequisites: Nil

Course Educational Objectives: To demonstrate the properties of fluids and behavior of fluids under static conditions, differential relations for fluid flows, features of flow though pipes and to understand the working of Hydraulic turbines and Hydraulic pumps.

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

CO1: Analyze the forces acting on objects submerged in fluids under static conditions (Analyze-L4)
CO2: Apply differential relations to characterize the behavior of fluid flow (Apply-L3)
CO3: Apply the conservation laws to solve elementary fluid flow problems (Apply-L3)
CO4: Analyze the simple pipe network for fluid transportation (Apply-L3)
CO5: Analyze the performance of various hydraulic turbines and pumps (Analyze-L4)

UNIT - I

INTRODUCTION: Fluids and Continuum, Classification of Fluids, Properties of Fluid – Pressure, Temperature, Density, Specific Weight, Specific Gravity, Viscosity-Newton's Law of Viscosity, Compressibility, Surface Tension, Capillarity, Vapour Pressure,

Fluid Statics: Pressure Acting at a Point in a Static Fluid-Pascal's Law, Basic Equation of Fluid Statics-Hydrostatic Pressure Distribution, Hydrostatic Forces on Submerged Plane Surfaces, Manometers, Buoyancy and Stability, Hydostatic pressure distribution in earth's atmosphere

UNIT - II

ANALYSIS OF FLUID FLOW: Eulerian and Lagrangian Approaches, Velocity Field, Flow Patterns- Pathline, Streamline, Streakline, Timeline, Stream Tube.

DIFFERENTIAL RELATIONS FOR FLUID FLOW: Acceleration Field of a Fluid, Differential Equation of Mass Conservation, Differential Equation of Linear Momentum, Euler's Equation, Stream Function, Rotationality and Irrotationality, Vorticity, Velocity Potential, Potential Flow, Bernoulli Equation and its Applications-Venturi Meter, Orifice Meter, Limitations on the Use of Bernoulli Equation.

UNIT - III

FLOW THROUGH PIPES: Introduction, Reynolds Experiment, Head Loss, Darcy-Wiesbach Equation, Hydraulic Gradient and Total Energy Lines, Laminar Fully Developed Pipe Flow-Hagen Poiseuille Law, Moody Chart, Pipes in Series, Equivalent Pipe, Pipes in Parallel, Minor Losses, Hydraulic Diameter.

DIMENSIONAL ANALYSIS AND SIMILARITY: Introduction, Principle of Dimensional Homogeneity, Buckingham's Pi Theorem, Dimensionless Groups, Similarity.

UNIT IV

HYDRAULIC TURBINES: Introduction, Classification of Turbines- Impulse and Reaction Turbines, Pelton Turbine, Francis Turbine and Kaplan Turbine-Working Principle, Velocity Triangles, Work Done and Efficiency, Draft Tube.

PERFORMANCE OF HYDRAULIC TURBINES: Geometric Similarity, Unit and Specific Quantities, Characteristic Curves, Governing of Turbines, Cavitation, Surge Tank, Water Hammer.

UNIT V

RECIPROCATING PUMPS: Classification, Working Principle, Co-Efficient of Discharge and Slip, Indicator Diagram.

CENTRIFUGAL PUMPS: Classification, Working Principle, Work Done, Head and Efficiencies, Losses, Specific Speed, Pumps in Series and Parallel, Performance Characteristics.

TEXT BOOK

1. White. F.M, Fluid Mechanics, Seventh Edition, McGraw-Hill Education 2011.
2. Rathakrishnan. E, Fluid Mechanics an Introduction, Fourth Edition, Prentice Hall of India, 2012.

REFERENCES

1. Balachandran P, Engineering Fluid Mechanics, Prentice Hall of India, 2012.
2. Fox. R.W, Mcdonald, A.J, Introduction of Fluid Mechanics, Fifth Edition, John Wiely, 1999.
3. Douglas. J.F, Gesiorek. J.M., Swaffield. J, A., Fluid Mechanics, Fourth Edition, Pearson Education, 2002.
4. Shames. I.H, Mechanics of Fluids, Third Edition, McGraw-Hill, 1992.

B.Tech. (III Sem.) **20AE03 - ENGINEERING THERMODYNAMICS**

L	T	P	Cr.
2	1	0	3

Prerequisites: Nil

Course Educational Objectives: To learn the basic concepts of energy conversions, laws of thermodynamics, concept of entropy, the properties of different gas mixtures and pure substances and basic aspects of ideal thermal cycles.

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

CO1: Describe the thermodynamic properties of various systems (Understand-L2)
CO2: Apply the laws of thermodynamics to analyze various thermal systems. (Apply-L3)
CO3: Analyze the entropy change of various processes. (Apply-L3)
CO4: Analyze the properties of different gas mixtures and pure substances. (Analyze-L4)
CO5: Analyze ideal gas power cycles and refrigeration cycle to estimate various performance parameters (Analyze-L4)

UNIT - I

BASIC CONCEPTS AND DEFINITIONS: Introduction, Macroscopic and Microscopic View Point, Continuum, System-Closed and Open, Control Volume, Properties of System, State, Path, Process, Cycle, Equilibrium-Thermodynamic Equilibrium, Quasi Static Process, Temperature-Temperature Scales, Zeroth Law of Thermodynamics, Energy-Forms of Energy, Heat, Work, Mechanical Forms of Work, Path and Point Functions.

UNIT - II

FIRST LAW OF THERMODYNAMICS: Introduction, Joule's Experiment, First Law Analysis Of Closed System, Different Forms of Stored Energy –Energy Balance, Internal Energy, Specific Heat, Enthalpy, Conservation of Mass, Conservation of Energy Principle-Flow Work.

FIRST LAW ANALYSIS OF CONTROL VOLUME- The Steady Flow Process-Steady Flow Energy Equation, Steady Flow Engineering Devices-Nozzles and Diffusers, Turbine, Compressors, Throttling Valves, Heat Exchangers.

UNIT - III

SECOND LAW OF THERMODYNAMICS: Introduction, Thermal Energy Reservoirs, Heat Engines, Kelvin-Plank & Clasius Statements of Second Law of Thermodynamics, Refrigerators, Heat Pumps, Equivalence of Kelvin-Plank and Clasius Statements, Perpetual Motion Machines, Reversible and Irreversible Processes, Carnot Cycle, Carnot Principles, Absolute Thermodynamic Temperature Scale, The Carnot Heat Engine, Heat Pump and Refrigerator.

ENTROPY: Introduction Entropy- The Property of a System, Clasius Inequality, Principle of Increase of Entropy, Tds-Relations, Entropy Change for Solids and Liquids, Entropy Change for Ideal Gases, Isentropic Relations for Ideal Gases, Maxwell Relation, Third Law of Thermodynamics.

UNIT – IV

NON REACTIVE GAS MIXTURES: Introduction, Composition of Gas Mixture, Mass Fraction, Mole Fraction, Daltons Law of Additive Pressures, Amagat`s Law of Additive Volumes, Ideal Gas Mixtures.

PROPERTIES OF PURE SUBSTANCES: Introduction, Phases of Pure Substance, Phase Change Processes-Saturated Liquid, Saturated Vapour, Super-Heated Vapour, Property Diagrams- Pressure-Volume, Pressure-Temperature, Temperature-Entropy, Enthalpy-Entropy, Pressure-Volume-Temperature Surface, Dryness Fraction-Saturated Liquid Vapour Mixture.

UNIT - V

GAS POWER CYCLES: Introduction, Analysis of Power Cycles- Carnot, Otto, Diesel, Dual, And Brayton Cycles.

REFRIGERATION CYCLES: Reversed Carnot Cycle, Bell-Coleman Cycle, Simple Vapour Compression Cycle.

TEXT BOOK

1. Rathakrishnan. E, Fundamentals of Engineering Thermodynamics, Second Edition, Prentice Hall of India, 2010.

REFERENCES

1. Nag. P.K, Engineering Thermodynamics- Fifth Edition, McGraw-Hill, 2013.
2. Cengel. Y.A and Boles, M.A, Thermodynamics: An Engineering Approach, Seventh Edition, McGraw-Hill, 2011.
3. Sonntag. R. E, Borgnakke. C, Van Wylen. G. J, Fundamentals of Thermodynamics, Fifth Edition John Wiley & sons, publications Inc, 1998.

B.Tech. (III Sem.) **20AE04 - STRENGTH OF MATERIALS**

L	T	P	Cr.
2	1	0	3

Prerequisites: Engineering Mechanics

Course Educational Objectives: To learn the basic concepts of stress, strain and relations based on linear elasticity, shear force and bending moment diagrams on beams, theory of simple bending and torsion.

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

CO1: Analyze the stress and strain behaviour in different types of members under various load conditions (Analyse-L4)

CO2: Evaluate stress, shear force, bending moment, deflection for beams and torsion for circular shafts under different loading conditions (Apply-L3)

CO3: Evaluate shear stress distributions over different cross sections (Apply-L3)

CO4: Apply the failure theories on structural members principle stresses. (Apply-L3)

CO5: Analyze internal stresses due to internal pressures in thin and thick cylindrical shells. (Apply-L3)

UNIT- I

SIMPLE STRESSES AND STRAINS: Stresses and Strains Due to Axial Force, Hooke's Law, Factor of Safety, Stepped Bars – Uniformly Varying Sections - Stresses in Composite Bars Due to Axial Force and Temperature - Strain Energy Due to Axial Force, Stresses Due to Sudden Loads and Impact. Lateral Strain: Poisson's Ratio - Change in Volume – Shear Stress - Shear Strain - 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 and Overhanging 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: - Introduction-Pure Bending-Theory of Simple Bending with Assumptions - Derivation of The Bending Equation-Bending Stresses in Symmetric Sections – Section Modulus - Calculation of Normal Stresses Due to Flexure Application.

TORSION: Theory of Torsion and Assumptions - Derivation of the Torsion Equation, Polar Modulus, Power Transmitted by a Shaft, Stresses in Solid and Hollow Circular Shafts

UNIT – IV

SHEAR STRESSES: Introduction, Derivation of Shear Stress Distribution Formula – Shear Stress Distribution Across Various Beam Cross Sections Like Rectangular, Circular, Triangular, I and T Sections.

PRINCIPAL STRESSES: State of Stress at a Point-Principal Plane-Principal Stresses- Normal, Tangential and Resultant Stresses On Inclined Planes-Member Subjected to Direct Stress in One Plane, Two Mutually Perpendicular Planes- Two Mutually Perpendicular Planes with Simple Shear. Failure Theories**:** Maximum Stress Theory – Maximum Strain Theory – Maximum Shear Stress Theory –Distortion Energy Theory – Maximum Strain Energy Theory

UNIT – V

DEFLECTION OF BEAMS: Introduction to Deflection, Deflection and Slope of Beams Subjected to Point Load And Uniformly Distributed Load- Differential Equation of Elastic Line - Deflection of Statically Determinate Beams-Simply Supported Beam, Cantilever Beam, Overhang Beam with Point Load And Uniformly Distributed Load - Macaulay's Method for Prismatic Members - Area Moment Method for Stepped Beams with Concentrated Loads.

Thin, Thick Shells: Introduction- Thin Cylindrical Vessel Subjected to Internal Pressure- Stresses Due to Internal Pressure- Hoop and Longitudinal Stresses -Efficiency of Joint- Stresses in a Thick Cylindrical Shell-Lame's Equations.

TEXT BOOK

1. Ramamrutham. S, Narayanan R, Strength of Materials, Dhanpat Rai & Sons, 2017.

REFERENCES

1. Popov. E. P, Mechanics of Materials, Prentice Hall Inc, 1976.
2. Andrew. P, Singer F.L., Strength of Materials, Harper and Row Publishers, New York, 1987.
3. Gambhir. M. L, Fundamentals of Solid Mechanics, PHI Learning, 2009.
   Subramanian. R, Strength of Materials, Second Edition, Oxford University Press, 2010.

B.Tech. (III Sem.)	20MC02 - ENVIRONMENTAL SCIENCE	L	T	P	Cr.
		2	0	0	0

Pre-requisites: 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:

After the completion of this course, the students will 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 Environmental 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, Rain water 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, Green house effect, Ozone layer depletion and Acid rain. Stockholm Conference
- Environmental Impact Assessment (EIA)
- Green building
- Environmental Law- Air, Water, Wild life, Forest, and Environmental protection act

Text Books:

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.

B.Tech. (III 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.

B.Tech. (III Sem.)	20AE51 - FLUID MECHANICS AND HYDRAULIC MACHINERY LAB	L	T	P	Cr.
		0	0	3	1.5

PRE-REQUISITES: Engineering Mechanics Lab

COURSE EDUCATIONAL OBJECTIVE:
In this course student will learn about the insights of calculating the discharge in various flow measuring devices, performance parameters of hydraulic machines.

COURSE OUTCOMES: After completion of the course students are able to:
CO1: Apply the principles Fluid mechanics in discharge measuring devices used in pipes channels and tanks (Apply-L3)
CO2: Analyze the performance of various hydraulic machines (Analyze-L4)

LIST OF EXPERIMENTS
At least 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 pipeline
6. Determine Co-Efficient of 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 Reciprocating Pump.
11. Determination Of Co-Efficient of flow using Turbine flow meter.
12. Flow visualization using Reynolds experiment.
13. Flow Visualization study using Water Flow Channel

REFERENCE: Lab Manual

B.Tech. (III Sem.)	20AE52 - STRENGTH OF MATERIALS LAB	L	T	P	Cr.
		0	0	3	1.5

Prerequisites: Engineering Mechanics and Strength of Materials

Course Educational Objectives: To learn the methods to predict the response of a structure under loading and it susceptibility to various failure modes

Course Outcomes: At the end of the semester, the student will be able to
CO1: Analyze the various materials under different equilibrium loading conditions. (Analyze-L4)
CO2: Perform tests and analyze materials subjected to tension, torsion, bending, and bucking (Apply-L3)

Any of the ten experiments are required to be conducted

1. Tension test on mild steel rod.
2. Deflection test on Simply supported beam
3. Deflection test on Cantilever beam.
4. Deflection test on overhang beams.
5. Compression test on helical spring.
6. Torsion test on mild steel rod.
7. Impact test on metal specimen
   i) Izod ii)Charpy.
8. Brinell hardness test on metals.
9. Rockwell Hardness test on metals
10. Shear test on metals
11. Bending test on solid metal specimen
12. Bending test on hollow metal specimen

B.Tech. (III Sem.)	20AES1-ADVANCED AUTOCAD	L	T	P	Cr.
		1	-	2	2

PRE-REQUISITES: Engineering Graphics, Working knowledge of Microsoft Windows, Basic knowledge AutoCAD & CAD drawing

Course Educational Objective: The course aims to teach developing and drawing of engineering objects using AutoCAD. The student will be taught the advanced features of AutoCAD related to Manipulating Objects and Data, Blocks and Attributes, Layer Management, Layouts, Plotting, Template Drawing Creation.

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

CO1: Draw objects using functional tools in AutoCAD. (**Understand-L2**)
CO2: Create blocks and attributes using AutoCAD. (**Apply-L3**)
CO3: Develop Layout Viewports and Dimensioning in Layouts using Auto-CAD. (**Apply-L3**)
CO4: Draw **Template Drawing** Using Drawing Templates using AutoCAD. (**Understand-L2**)

Drawing Objects Multilines, Donuts, Construction Geometry, Point Objects, Revision Clouds, Wipeouts, Boundaries, Regions
Manipulating Objects and Data Using Quick Select, Purging Objects, Exploding Objects, Dividing and Measuring Objects, Geometry Calculator

Dimensioning-Center Marks, Ordinate Dimensions, Geometric Dimensioning and Tolerances, Dimension Styles and Overrides **Reusable Content** Using Design Center, Creating Custom Tool Palettes, Managing and Sharing Tool Palettes, Using External References

Blocks and Attributes Blocks, Attributes, Edit and Extract Attributes, **Dynamic Blocks**, working with Dynamic Blocks, Creating Dynamic Block Definitions, Dynamic Block Authoring Tools, Additional Visibility Options

Layer Management and Best Practices Layer Properties Manager, Layer Filters, Layer States Manager, Layer Standards **Layouts and Views** Creating Layouts, Modifying Layouts and Using, Page Setups, Creating Layout Viewports, working with Layout, Viewports, Controlling Object Visibility in, Layout Viewports, Dimensioning in Layouts

Plotting Plotter Configuration Files, Plot Style Tables, Publishing Drawings, **Introduction to Sheet Sets** Creating Sheet Sets, working with Sheet Sets, Setting Sheet Set Properties, Using Fields in Sheet Sets, Using Attributes in Sheet Sets, Publishing, Transmitting, and Archiving, Sheet Sets. **Template Drawing Creation** Using Drawing Templates

TEXTBOOK

1. D.M. Kulkarni, A.P Rastogi, and A.K. Sarkar, "Engineering Graphics with AutoCAD", PHI Learning Private Limited, New Delhi, 2009.

REFERENCE

1. N. D. Bhatt, "Engineering Drawing", 51st Revised and Enlarged Edition, Charotar Publishers, 2012.

IV SEM

L	T	P	Cr.
3	0	0	3

B.Tech. (IV Sem.) **20FE09 - PROBABILITY AND STATISTICS**

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 this course, the student will be able to

- **CO1:** Understand various probabilistic situations using the various laws of probability and random variables **(Understand - L2)**
- **CO2:** Apply probability distributions like Binomial, Poisson, Normal and Exponential distributions in solving engineering problems (**Apply - L3**)
- **CO3:** Calculate the standard error of sampling distribution and confidence intervals for parameters like mean and proportion based on the sample data. **(Apply - L3)**
- **CO4:** Analyze the data scientifically with the appropriate statistical methodologies to apply the suitable test of hypothesis **(Analyze - L4)**
- **CO5:** Construct the regression lines to predict the dependent variables and calculate the Correlation Coefficient for a bivariate statistical data.**(Apply – L3)**

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.

REFERENCES

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

B.Tech. (IV Sem.)	20AE05 - AEROSPACE MATERIALS AND MANUFACTURING	L	T	P	Cr.
		3	0	0	3

Pre-requisites: Nil

Course Educational Objectives: The objectives of this course are to acquire knowledge on structure of metals and alloys, understand the concept of alloys and equilibrium diagrams and to learn primary manufacturing processes, working of basic machines and various operations to be performed and also about conventional and unconventional machining processes

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

CO1: Estimate the properties of the metals and alloys based on structures. (Understand-L2)
CO2: Classify, construct and analyze equilibrium diagrams, various ferrous, non-ferrous metals and alloys. (Understand-L2)
CO3: Acquire knowledge of the basic aspects of casting process. (Understand-L2)
CO4: Know the various basic concepts of welding process, metal forming process and sheet metal operations in the manufacturing of products. (Understand-L2)
CO5: Know different conventional and unconventional machining processes while manufacturing a product. (Understand-L2)

UNIT – I

STRUCTURE OF METALS: Crystal Structures-Body centered cubic, Face cantered cubic, closed packed hexagonal, Mechanism of grain and grain boundaries, Effect of grain boundaries on the properties of metal / alloys, Determination of grain size. Solid solutions-Interstitial Solid Solution and Substitution Solid Solution, Hume Rothery rules.

UNIT – II

EQUILIBRIUM DIAGRAMS AND TRANSFORMATIONS: Classification of equilibrium diagrams- isomorphous, eutectic, partial eutectic equilibrium diagrams. Lever rule, Study of Cu-Ni and 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 – III

INTRODUCTION TO MANUFACTURING AND CASTING: Classification of Manufacturing Processes; Engineering Materials. Steps Involved in Making a Casting-Advantages and Its Applications, Types of Patterns- Pattern Allowances, Principles of Gating, Gating Ratio, Types of Raisers, Special Casting Processes – Centrifugal – Die - Investment – Continuous.

UNIT - IV

WELDING: Classification of Welding Process- Types of Weld- Welded Joints, Principle and Applications- Gas Welding- Arc Welding- Friction Welding, Soldering and Brazing.
METAL FORMING PROCESSES: Types of Rolling Mills and Products; Principles of Forging - Types of Forging-Smith Forging, Drop Forging

EXTRUSION OF METALS: Hot Extrusion and Cold Extrusion –Forward Extrusion and Backward Extrusion, Impact Extrusion, Hydrostatic Extrusion.

UNIT - V

MACHINING PROCESSES: Tool Geometry; Cutting Tool & Tool Wear- Cutting Materials; Cutting Fluids; Introduction and Working Principle of Lathe and Operations

SHAPING, PLANNING, MILLING AND DRILLING MACHINES: Principles of Working, Principle Parts, Specifications, Classification, Comparison and Operations Performed.

INTRODUCTION TO UNCONVENTIONAL MACHINING PROCESSES: Classification of Unconventional Machining Processes. Abrasive Jet Machining, Ultrasonic Machining, Laser Beam Machining

TEXT BOOK

1. V.D.Kotgire, S.V.Kotgire, Material Science and Metallurgy, Everest Publishing House, 24th Edition, 2008.
2. Rao. P. N, Manufacturing Technology, Volume 1 and 2 Tata McGraw-Hill, 2013.

REFERENCES

1. Ghosh. A, Malik. A. K, Manufacturing Science, Second Edition, East West Publisher, 2010.
2. Kalpakjain. S, Schmid. S. R, Manufacturing Processes for Engineering Materials, 6th Edition, Pearson Education, 2017
3. Richard A.Flinn, Paul K.Trojan, Engineering Materials and Their Applications, Jaico Publishing House, 4thEdition, 1999.
4. William and callister, Materials Science and engineering, Wiley India private Ltd., 2011.

B.Tech. (IV Sem.)	20AE06 - AERODYNAMICS	L	T	P	Cr.
		3	0	0	3

Pre-requisites: Engineering Fluid Mechanics

Course Educational Objective: To learn the theoretical methods to solve the potential flow problems, potential flow theory to solve for airfoil characteristics, the finite wing theory and properties of viscous flows and boundary layer development over flat plate.

Course Outcomes: At the end of the semester, the student will be able to
CO1: Apply Laplace equation for obtaining 2D and axisymmetric solutions. (Apply-L3)
CO2: Apply conformal transformation to from aerodynamic shapes. (Apply-L3)
CO3: Apply potential flow theory to solve for airfoil characteristics. (Apply-L3)
CO4: Apply the Prandtl's lifting line theory to predict finite wing properties. (Apply-L3)
CO5: Analyze the effect of boundary layer on flow over objects. (Analyze-L4)

UNIT - I
POTENTIAL FLOW: Introduction, Laplace's Equation, Basic Flows – Uniform Parallel Flow, Source, Sink, Simple Vortex, Doublet, Combination of Simple Flows-Flow Past a Half Body, Rankine Oval, Flow Past a Circular Cylinder without Circulation and with Circulation, Kutta-Joukowsky Theorem

UNIT - II
CONFORMAL TRANSFORMATION: Introduction, Basic Principles, Methods for Performing Transformation, Kutta-Joukowski Transformation, Transformation of Circle to Straight Line, Transformation of Circle to Ellipse, Transformation of Circle to Symmetrical Aerofoil, Transformation of Circle to Cambered Aerofoil

UNIT - III
THIN AEROFOIL THEORY: Introduction, Aerofoil Characteristics, Vortex Sheet, Kutta Condition, Kelvin's Circulation Theorem, Starting Vortex, Thin Aerofoil Theory-Symmetrical Aerofoil and Cambered Aerofoil.

UNIT - IV
FINITE WING THEORY: Introduction, Down Wash, Induced Drag, Trailing Vortex, Vortex Filament, Biot-Savart Law and Helmholtz Theorems, Prandtl's Classical Lifting Line Theory-Elliptic Lift Distribution, General Lift Distribution.

UNIT - V
BOUNDARY LAYER: Introduction, Boundary Layer Development, Boundary Layer Thickness, Displacement Thickness, Momentum Thickness, Energy Thickness, Types of Boundary Layer, Momentum Integral Estimates- Karman Analysis of the Flat Plate, Boundary Layer Equations-2D Flow, Boundary Layer Growth on a Flat Plate-Blasius Solution, Boundary Layer with Pressure Gradient

TEXT BOOK
1. Anderson, J.D., Fundamentals of Aerodynamics", McGraw-Hill Book Co., New York, 1998.
2. Rathakrishnan. E, Theoretical Aerodynamics, Wiley, 2013.

REFERENCES
1. Houghton. E. L., Carpenter P. W, Collicott. C. H, Valentine. D. T, Aerodynamics for Engineering students, Seventh Edition, Elseveir, 2017.
3. Milne-Thomson. L. H., Theoretical aerodynamics, Courier Corporation, 2012.
4. Clancy. J. L, Aerodynamics, Sterling Book House, 2006.

B.Tech. (IV Sem.)	20AE07 - AIRCRAFT STRUCTURES - I	L	T	P	Cr.
		2	1	0	3

Pre-requisites: Engineering Mechanics and Strength of Materials

Course Educational Objectives: To learn the basic aspects of elasticity, characteristics of statically determinate and indeterminate structures, energy methods and theorem applicable to beams and trusses, behavior of columns under loading conditions

Course Outcomes: At the end of the semester, the student will be able to
CO1: Solve problems related to elastic members by applying stress-strain relations (Apply-L3)
CO2: Analyze the behavior of beams, frames and trusses under various loading conditions (Analyze-L4)
CO3: Analyze the statically indeterminate structures under various loading conditions (Analyze-L4)
CO4: Evaluate the strain energy stored in the structural members (Apply-L3)
CO5: Analyze the buckling of columns and compressive member under various loading conditions (Analyze-L4)

UNIT - I
BASIC ELASTICITY: Concept of Principal Planes-Principal Stresses-Determination of Normal and Tangential Stresses-Mohr's Circle. Basic Elasticity Stresses and Strains, Equations of Equilibrium, Plane Stress and Plane Strain Problems, Compatibility Equations, Stress - Strain Relations, Airy's Stress Function.

UNIT - II
STATICALLY DETERMINATE STRUCTURES: Introduction, Principle of Superposition, Equations of Equilibrium, Determinacy and Stability, Beams, Frames, - Types of Frames-Reactions of Supports of a Frame- Analysis of Plane Truss - Method of Joints- Method of Sections- Plane Frames.

UNIT - III
STATICALLY INDETERMINATE STRUCTURES: Introduction**,** Methods for Indeterminate Beams, Double Integration Method, Propped Cantilever- Fixed-Fixed Beams-Continuous Beams Carrying Point Load And Uniformly Distributed Load- Shear Force and Bending Moment Diagrams, Clapeyron's Three Moment Equation – Moment Distribution Method-Relative Stiffness –Continuous Beams.

UNIT - IV
ENERGY METHODS: Strain Energy Due to Axial Loading, Strain Energy Due to Bending– Strain Energy Stored by A Beam Subjected to Uniform Bending Moment- Work Done by A Force On a Member-Law's of Reciprocal Deflections- Castigliano's First Theorem-Castigliano's Second Theorem -Maxwell's Reciprocal Theorem, Unit Load Method - Application to Beams and Trusses.

UNIT – V
Columns: Introduction- Axially Loaded Compression Members-Crushing Load- Buckling Load-Euler's Theory-Effective Length of Column-Expressions for Buckling Load With Different Column End Conditions- Limitations-Euler's Formula- Rankine's Formula –Column with Initial Curvature- Columns Subjected to Eccentric Loading – Euler's Method- Rankine's Method.

TEXT BOOKS

1. Timoshenko. S, Strength of Materials, Vol. I and II, Princeton D. Vonostrand Co, 1990.
2. Megson. T. M. G, Aircraft Structures for Engineering Students, Sixth Edition, Elsevier, 2007.

REFERENCES

1. Donaldson. B. K, Analysis of Aircraft Structures-An Introduction, McGraw-Hill, 1993.
2. Bruhn. E. F, Analysis and design of flight vehicle structures, Tri set of offset Company, USA, 1973
3. Punmia. B. C, Theory of Structures, Laxmi Publication.
4. Ramamrutham. S, Narayanan. R, Theory of Structures, Dhanpat Rai Publishing Co, 2003.

B.Tech. (IV Sem.)	20HS01 – UNIVERSAL HUMAN VALUES 2: UNDERSTANDING HARMONY	L	T	P	Cr.
		3	0	0	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 **(Apply – L3)**
CO2: Distinguish between values and skills, happiness and accumulation of physical facilities, the self, and the Body **(Understand – L2)**
CO3: Understand the role of a human being in ensuring harmony in society **(Understand – L2)**
CO4: Understand the role of a human being in ensuring harmony in the nature and existence. **(Understand – L2)**
CO3: Distinguish between ethical and unethical practices (**Apply – 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 BOOKS

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

REFERENCES

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

B.Tech. (IV Sem.) **20AE53 - MANUFACTURING TECHNOLOGY LAB**

L	T	P	Cr.
0	0	3	1.5

Pre-requisites: Engineering workshop

Course Educational Objectives:
The objectives of the course are to provide hands-on laboratory experience to acquire basic knowledge in the area of casting, welding and its equipment, lathe machine and special machine operations.

COURSE OUTCOMES: After completion of the course students are able to:
CO1: Design and develop a product using casting (Apply-L3)
CO2: Fabricate machine components with suitable welding, lathe and other machining operations (Understand-L2)
CO3: Manufacture plastic components using various plastic processing techniques (Understand-L2)

I. METAL CASTING LAB
1. Pattern Design and making - for one casting drawing.
2. Moulding, Melting and Casting - 1 Exercise

II. WELDING LAB
1. ARC Welding Lap & Butt Joint - 2 Exercises
2. Spot Welding - 2 Exercises

III PROCESSING OF PLASTICS
1. Injection Moulding
2. Blow Moulding

IV MACHINE TOOLS LAB
1. Lathe Operations
2. Special Machines: Drilling, Shaping, Milling Grinding (Surface Grinding).
3. Preparation of Single Point Cutting Tool

B.Tech. (IV Sem.) **20AE54 - THERMAL ENGINEERING LAB**

L	T	P	Cr.
0	0	3	1.5

Prerequisite: ICGT, Thermal Engineering

Course Objectives: The main objective of this course is to familiarize the principles and its evaluation of various performance parameters of mechanical systems and its impact on global environment.

Course Outcomes: After the completion of the course, students should be able to

CO1: Estimate various fuel characteristics through experimental testing (Apply-L3)

CO2: Analyze the performance characteristics of Internal Combustion Engines (Analyze-L4)

CO3: Evaluate the performance parameters of refrigeration and air conditioning systems (Apply-L3)

LIST OF EXPERIMENTS (Any 10 experiments):

1. I.C. Engines Valve & Port Timing Diagrams
2. Performance Test on Variable Compression Ratio single cylinder 4-Stroke petrol Engine By using Eddy Current Dynamometer
3. Test on single cylinder 4 -Stroke Diesel Engine by using Mechanical Dynamometer
4. Evaluation of performance parameters of twin cylinder 4-stroke diesel engine.
5. Determination of performance characteristics of 2-Stroke Petrol Engine.
6. Evaluation of engine friction power by conducting Morse test on Multi cylinder 4-Stroke Petrol Engine.
7. Heat Balance of 4 stroke single cylinder diesel engine
8. Performance Test on Reciprocating Air – Compressor.
9. Determination of COP of Vapour Compression Refrigeration Unit.
10. Performance Test on Air Conditioning Unit.
11. Demonstration of automobile working components.
12. Measurement of exhaust emissions and smoke of I.C Engines.
13. Solar parabolic concentrator apparatus
14. Determination of calorific value of fuel using bomb calorimeter.

References:

Thermal engineering lab manuals.

B.Tech. (IV Sem.)	20AE55 - MATLAB APPLICATIONS IN ENGINEERING LAB	L	T	P	Cr.
		0	0	3	1.5

Pre-requisites: Engineering Mechanics and Numerical Methods

Course Educational Objectives: This course is designed to use the basic in-built commands and to write the MATLAB code to solve ordinary differential equation, integration and make the user-friendly environment using graphical user interface.

Course Outcomes: At the end of the course, the student will be able to
CO1: Apply the basic MATLAB operations in basic engineering problems (Apply-L3)
CO2: Solve the system of linear algebraic equation using matrix operation (Apply-L3)
CO3: Apply the graphical user interface to write the code as more user friendly (Apply-L3)

LIST OF EXPERIMENTS

Part – I: Introduction to MATLAB

1. Basic matric operations
2. Solving ordinary differential equations
3. Solving double integration problems
4. Plotting of simple 2D and 3D graphs
5. Introduction to graphical user interface – addition and subtraction

Part – II: Application of MATLAB

6. Solving of system of linear algebraic equation using matrix
7. Solving of ordinary differential equation using Runge-Kutta method a numerical approach
8. Solving of integration using Simpsons 1/3 rule a numerical approach
9. Graphics – kinematics of particle – position, velocity and acceleration
10. Develop the graphical user interface to identify the area moment of inertia of simple section – trapezoidal and triangle
11. Identification of shear force and bending moment diagram of cantilever beam with point load
12. Identification of pathline traced by a particle in fluid domain.

B.Tech. (IV Sem.) **20ITS1-PROBLEM SOLVING USING PYTHON**

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

Introduction: Language basics and example problems

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.

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.