CHAITANYA BHARATHI INSTITUTE OF TECHNOLOGY

(An Autonomous College under JNTUA, Anantapuramu, Approved by AICTE, Accredited by NBA, Accredited by NAAC with 'A' Grade)

Vidya Nagar, Pallavolu (V), Proddatur–516362(A.P), India.

Department of Mechanical Engineering

B.Tech Second Year

Course Structure and Syllabi under R22 Regulations

MECHANICAL ENGINEERING

Course Structure (R22)

II B.Tech–I Semester

S. No.	Course Code	Course Title	Contact Periods per week				Cr.	Scheme of Examination Max. Marks		
			L	T	P	Tot		Int. Marks	Ext. Marks	Total Marks
1.	22E00302T	Complex variables, Transforms & PDE	2	1	-	3	3	30	70	100
2.	22E03301T	Machine Drawing	1	-	2	3	3	30	70	100
3.	22E03302T	Manufacturing Processes	3	-	-	3	3	30	70	100
4.	22E03303T	Mechanics of Solids	3	-	-	3	3	30	70	100
5.	22E03304T	Thermodynamics	2	1	-	3	3	30	70	100
6.	22E03305L	Material Science Lab	-	-	3	3	1.5	30	70	100
7.	22E03302L	Manufacturing Processes lab	-	-	3	3	1.5	30	70	100
8.	22E03303L	Mechanics of Solids Lab	-	-	3	3	1.5	30	70	100
9.	22E03304SC	Geometric Modelling	1	-	2	3	2	30	70	100
10	22E00304MC	Constitution of India	2	-	0	2	0	30	-	30
		Total:	**14**	**02**	**13**	**29**	**21.5**	**300**	**630**	**930**

II B.Tech – II Semester

S. No.	Course Code	Course Title	Contact Periods per week				Cr.	Scheme of Examination Max. Marks		
			L	T	P	Tot		Int. Marks	Ext. Marks	Total Marks
1.	22E00402T	Numerical Methods And Probability Theory	2	1	-	3	3	30	70	100
2.	22E01404T	Fluid Mechanics & Hydraulic Machines	3	-	-	3	3	30	70	100
3.	22E03401T	Thermal Engineering	3	-	-	3	3	30	70	100
4.	22E03402T	Kinematics of Machinery	3	-	-	3	3	30	70	100
5.	22E00405T	Managerial Economics And Financial Analysis	3	-	-	3	3	30	70	100
6.	22E01406L	Fluid Mechanics & Hydraulic MachinesLab	-	-	3	3	1.5	30	70	100
7.	22E03401L	Thermal Engineering Lab	-	-	3	3	1.5	30	70	100
8.	22E03403L	Computer Aided Machine Drawing Lab	-	-	3	3	1.5	30	70	100
9.	22E03404SC	3D Printing And Design	1	-	2	3	2	30	70	100
10.	22E00406T	Universal Human Values	3	-	-	3	3	30	70	100
		Total:	**19**	**-**	**11**	**30**	**24.5**	**300**	**700**	**1000**
Community Service Internship/Project (Mandatory) for 6 weeks duration during summer vacation.										
Honors/Minors Courses. (The Hours Distribution can be 3-0-2 or 3-1-0).			**4**	**0**	**0**	**4**	**4**	**30**	**70**	**100**

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II B. Tech. – I Semester

(22E00302T) COMPLEX VARIABLES, TRANSFORMS & PDE

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	2	1	-	3

Prerequisites: Differentiation, Integration

Course Objectives

- This course aims at providing the student to acquire the knowledge on the calculus of functions of complex variables.
- The student develops the idea of using Partial differential equations.
- The student develops the idea of using Fourier series.

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

CO1 : Understand the analyticity of complex functions.
CO2 : Apply Cauchy's integral formula and Cauchy's integral theorem to evaluate improper integrals along contours.
CO3 : Understand the usage of Laplace transforms and Inverse Laplace Transforms.
CO4 : Evaluate the Fourier series expansion of periodic functions.
CO5 : Formulate/solve/classify the solutions of partial differential equations and also find the solution of one-dimensional wave equation and heat equation.

DETAILED SYLLABUS:

UNIT-I: Complex Variable – Differentiation: **(09 Periods)**

Introduction to functions of complex variable- Differentiation, Cauchy-Riemann equations, analytic functions (exponential, trigonometric, logarithm), harmonic Functions, finding harmonic conjugate-construction of analytic function by Milne Thomson Method

UNIT-II: Complex Variable – Integration: **(10 Periods)**

Line integral-Contour integration, Cauchy's integral theorem, Cauchy Integral formula, Power series expansions: Taylor's series, zeros of analytic functions, singularities, Laurent's series; Residues, Cauchy Residue theorem (without proof), Calculation of residues.

UNIT-III: Laplace Transforms: **(09 Periods)**

Definition-Laplace transform of standard functions-existence of Laplace Transform – Inverse Transform – First shifting Theorem, Transforms of derivatives and integrals – Unit step function – Second shifting theorem – Dirac's delta function – Convolution theorem – Laplace transform of Periodic function. Differentiation and integration of transform – solving Initial value problems to ordinary differential equations with constant coefficients using Laplace transforms typical wave forms - Parseval's formula- Complex form of Fourier series.

UNIT-IV: Fourier series: **(10 Periods)**

Determination of Fourier coefficients (Euler's) – Dirichlet conditions for the existence of Fourier series – functions having discontinuity-Fourier series of Even and odd functions – Fourier series in an arbitrary interval – Half-range Fourier sine and cosine expansions.

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UNIT-V: Partial Differential Equations & Applications: **(10 Periods)**

Solution of second order PDEs by Method of separation of variables – Solutions of one dimensional wave equation, one dimensional heat equation under initial and boundary conditions. Steady state two dimensional heat equations (Laplace equations).

Total Periods: 48

TEXT BOOKS:

1. S. Grewal, Higher Engineering Mathematics, 44/e, Khanna Publishers, 2017.
2. B. V. Ramana, Higher Engineering Mathematics, McGraw Hill Education.

REFERENCE BOOKS:

1. Peter O'neil, Advanced Engineering Mathematics, Cengage learning.
2. N.Bali, M. Goyal, C.Watkins, Advanced Engineering Mathematics, Infinity Science press.

WEB RESOURCES:

1. nptel.ac.in/courses/111107056
2. onlinelibrary.wiley.com
3. https://onlinecourses.nptel.ac.in/noc18ma12.

II B. Tech. – I Semester

(22E03301T) MACHINE DRAWING

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	1	0	2	3

PREREQUISITES: Engineering Drawing

COURSE OBJECTIVES:

- To make the students to understand the concepts of I.S. conventions, methods of dimensioning, the title boxes, to draw the machine elements and simple parts.
- To make the students to understand and draw assemblies of machine parts and to draw their sectional views

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

CO1 : Prepare engineering and working drawings with dimensions following proper conventions.
CO2 : Identify the different views of various machine elements.
CO3 : Develop the part drawings of machine components with dimensions and bill of material during design and development.
CO4 : Design and assembly the engine parts
CO5 : Developed a models and assembly of machine fittings

DETAILED SYLLABUS:

Unit-I: Machine Drawing Conventions: **(16 Periods)**

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

Unit-II: Drawing of Machine Elements and simple parts: **(16 Periods)**

Selection of Views, additional views for the following machine elements and parts with every drawing proportion. Popular forms of Screw threads, bolts, nuts, stud bolts, tap bolts, set screws, Keys, cottered joints and Knuckle joint - Riveted joints for plates - Shaft coupling, spigot and socket pipe joint - Journal, pivot, collar and foot step bearings

UNIT-III: Assembly Drawings: **(16 Periods)**

Assembly Drawings: Drawings of assembled views for the part drawings of the following Engine parts- stuffing boxes, cross heads, Eccentrics, Petrol Engine-connecting rod, piston assembly. Other machine parts- Screw jack, Machine Vice, single tool post.

Valves: Steam stop valve, feed check valve. Non return value.

Total Periods: 48

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

TEXT BOOKS :

1. K L Narayana, P Kannaiah and K Venkata Reddy, Machine Drawing, 3rd edition, New Age Publications, 2006.
2. N D Bhatt, Engineering Drawing, Charotar Publications, 2000.

REFERENCE BOOKS:

1. N Sidheswar, P Kannaiah and V V S Sastry, Machine Drawing, Tata McGraw Hill, 1980.
2. K C John, Textbook of Machine Drawing, PHI Publications, 2009.
3. K L Narayana, P Kannaiah and K Venkata Reddy, Production Drawing, 2nd edition, New Age Publications, 2009.
4. P S Gill, A Textbook of Machine Drawing, S.K. Kataria & Sons Publishers, 2013.
5. A Khaliq, R A Khan, M Parvez and K Kumar, Machine Drawing, Galgotia Publications, 2004.

WEB RESOURCES:

1. https://eeedocs.files.wordpress.com/2014/02/machinedrawing.pdf

NOTE:

- The End exam will be for 4hrs in the following format
- All answers should be on the drawing sheet only. Answers on the drawing sheet only will valued.
- First Angle Projections.

Q1 : Questions set on section I of the syllabus 2 out of 4 to be answered with a Weightage of 4 marks each 08 marks.

Q2 : Questions set on section II of the syllabus 2 out of 3 to be answered with a Weightage of 10 marks each 20 marks.

Q3 : Drawing of assembled views of section III items of syllabus with a weightage of 42 marks.

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II B. Tech. – I Semester

(22E03302T) MANUFACTURING PROCESSES

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	0	0	3

PREREQUISITES: Workshop Technology

COURSE OBJECTIVES:

- To introduce the students to working principle of different metal casting processes and gating system.
- To impart knowledge on plastic deformation, cold and hot working process, working of a rolling mill and types, extrusion processes and high energy rate forming processes.
- To teach principles of forging, tools and dies, working of forging processes.
- To develop fundamental understanding on classification of the welding processes, working of different types of welding processes and welding defects.
- To impart knowledge on manufacturing methods of plastics, ceramics.

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

CO1 : Comprehend the principles and terminology of the casting process, including sand moulding techniques, as well as different metal casting processes and the design of gating systems

CO2 : Gain an understanding of plastic deformation and distinguish between hot working, cold working, rolling processes, and forging processes

CO3 : Familiarize yourself with the principles and operation types of extrusion, drawing processes, and high-energy rate forming processes

CO4 : Learn about the principles and applications of welding processes, such as gas welding, arc welding, resistance welding, and the identification and prevention of welding defects

CO5 : Acquire knowledge about the manufacturing methods used for plastics and ceramics

DETAILED SYLLABUS:

UNIT-I: Casting Processes **(10 Periods)**

Metal Casting Processes: Casting, casting terms, sand mould making procedure, pattern materials, types of patterns, pattern allowances, moulding sands, moulding sand properties, Cores, Core sands, Moulding machines, chaplets, chills, Elements of gating system. Design of riser and gating system.

Special Casting Processes: CO2 moulding, shell molding, Investment casting, die casting, centrifugal casting, Continuous Casting, Casting defects, causes and remedies.

UNIT-II: Metal Forming Processes **(10 Periods)**

Nature of plastic deformation: Hot working and cold working, types of metal forming processes.

Rolling: Principle of rolling, types of rolling mills, 2-High, 3 –High, 4-High and Cluster mill, Planetary rolling mill

Forging: Principle of forging, forging operations, forging types – smith forging, drop forging, press forging and machine forging.

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UNIT-III: Extrusion, Drawing and High energy rate forming processes **(9 Periods)**

Extrusion Processes: Principle of extrusion, forward and backward extrusion, Impact extrusion and Hydro static extrusion.

Drawing Processes: Wire drawing, Tube drawing and tube making High energy rate **Forming processes:** Principles of explosive forming, electromagnetic forming, Electro hydraulic forming, rubber pad forming, advantages and limitations

UNIT-IV: Welding **(10 Periods)**

Welding Processes: Welding definition, Classification of welding processes, types of joints.

Gas welding: Equipment, Oxy-acetylene welding, types of flames, techniques of welding and Oxy-acetylene cutting.

Arc Welding: Principle of Arc, Arc-Welding equipment, Electrodes and purposes of electrode coating. Manual Metal-arc welding (SMAW), Inert-Gas Shielded Arc welding: Tungsten Inert-Gas Welding (TIG), Metal Inert-Gas Welding (MIG), and Submerged Arc Welding (SAW), defects of welding.

UNIT-V: Processing of Plastics and Ceramics **(9 Periods)**

Plastics: Types, properties and their applications, processing of plastics, extrusion of plastics, transfer molding and compression molding, injection molding, thermoforming, rotational molding, and blow molding.

Ceramics: Classification of ceramic materials, properties and their application, ceramic powder preparation; Processing of ceramic parts: Pressing, casting, sintering; Secondary processing of ceramics: Coatings, finishing.

Powder Metallurgy: Principle, manufacture of powders, steps involved.

Total Periods: 48

TEXT BOOKS:

1. RaoP.N.,ManufacturingTechnology–VolumeI,5/e,McGraw-HillEducation,2018.
2. Kalpakjain S and Schmid S.R., Manufacturing Engineering and Technology, 7/e, Pearson, 2018.

REFERENCE BOOKS:

1. P.C.Sharma, A Text of production Technology (Manufacturing Processes), S.Chand and Company, New Delhi.
2. Dr.R.S.Parmar, Welding Processes and Technology, Khanna Publishers, New Delhi.
3. R. K. Jain, Production Technology, Khanna Publications, New Delhi.

WEB RESOURCES:

1. https://nptel.ac.in/courses/112/107/112107145/
2. https://www.digimat.in/nptel/courses/video/112107145/L01.html
3. https://www.digimat.in/nptel/courses/video/112105126/L01.html

II B. Tech. – I Semester

(22E03303T) MECHANICS OF SOLIDS

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	0	0	3

PREREQUISITES: Maths, Physics & Chemistry

COURSE OBJECTIVES:

- Understand the basics of stresses and strains.
- Draw the shear force and bending moment drawings of various beams.
- Understand the Behaviour of members and Torsional forces.
- Understand the Behaviour of cylinders.
- Understand the stresses developing in curved beams.

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

CO1 : Get acquainted with basic terms used in the mechanics of materials.
CO2 : Comprehend the principles of stresses and strains in materials.
CO3 : Determine the stresses induced in shafts and deflections of springs
CO4 : Analyze the characteristics of cylinders.
CO5 : Gain insight into the failure behavior of materials.

DETAILED SYLLABUS:

UNIT-I: Analysis of Stress and Strain **(10 Periods)**

Introduction- Types of external loads - self weight - internal stresses - normal and shear stresses - strain - Hooke's law - Poisson's ratio - relationship between elastic constants - stress strain diagrams working stress - elongation of bars of constant and varying sections - Stress on inclined planes for axial and biaxial stress fields - principal stresses - Mohr's circle of stress - principal strains - strain rosette – principal stress/strain problem as an Eigen value problem.

UNIT-II: Shear Force and Bending moment **(10 Periods)**

Different types of beams - shear force and bending moment diagrams for simply supported, overhanging and cantilever beams - relationship connecting intensity of loading, shearing force and bending moment.

UNIT-III: Torsion and Springs **(10 Periods)**

Torsion formulation stresses and deformation in circular and hollows shafts – Stepped shafts– Deflection in shafts fixed at the both ends – Stresses in helical springs – Deflection of helical springs, carriage springs.

UNIT-IV: Thin Cylinders, Spheres and Thick Cylinders **(10 Periods)**

Stresses in thin cylindrical shell due to internal pressure circumferential and longitudinal stresses and deformation in thin cylinders – spherical shells subjected to internal pressure –Deformation in spherical shells – Lame's theory.

UNIT-V: Theories of Failure **(8 Periods)**

Maximum principal stress theory, maximum principal strain theory, maximum shear stress theory, maximum shear strain energy theory, energy of distortion.

Total Periods: 48

TEXT BOOKS :

1. Mechanics of Material – J. M. Gere and S. P. Timoshenko – CBS publisher.
2. Popov, E.P., Mechanics of Materials, Prentice Hall India, New Delhi, 2002.

REFERENCE BOOKS:

1. Advanced Mechanics of Materials–A. P. Boresi and O. M. idebottom–John Wiley & Sons.
2. Strength of Materials – R. K. Rajput – S. Chand & Company N.Narayana Pillai,
3. Mechanics of Materials - Beer, F.P.,Johnston, E.R. and DeWolf, J.T., , 3rd edition, Tata McGraw-Hill.
4. Strength of Material – Dr. Sadhu Singh – Khanna Publishers.
5. Strength of Material, Vol. I and II – S. P. Timoshenko – EWP Press.

WEB RESOURCES:

1. https://nptel.ac.in/courses/112/107/112107146/
2. https://ocw.mit.edu/courses/materials-science-and-engineering/3-11-mechanics-ofmaterials-fall-1999/
3. https://www.coursera.org/courses?query=mechanics%20of%20materials
4. https://www.udemy.com/course/strengthofmaterials/

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II B. Tech. – I Semester

(22E03304T) THERMODYNAMICS

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	2	1	0	3

PREREQUISITES: Maths, Physics & Chemistry

COURSE OBJECTIVES:

- To introduce the concepts of heat, work, energy and governing rules for conversion of one form to other.
- To explain relationships between properties of matter and basic laws of thermodynamics.
- To teach the concept of entropy for identifying the disorder and feasibility of a thermodynamic process.
- To introduce the concept of available energy for maximum work conversion.
- To impart knowledge on steam properties.
- To provide fundamental concepts of air standard cycles used in IC engines and gas turbines.

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

CO1 : Analyze Temperature scale and apply of law of conservation of energy pertaining to work and heat transfer.
CO2 : Apply steady flow energy equation and mass balance equation to various applications.
CO3 : Recognize the major difference between Refrigerator and Heat Pump, Reversible and irreversible processes, Failure related to carnot cycle.
CO4 : Estimate entropy for solids, liquids and ideal gases undergoing various processes and its applications.
CO5 : Determine dryness fraction of wet steam using calorimeter.

DETAILED SYLLABUS:

UNIT-I: **(10 Periods)**

Basic Concepts and Definitions: Thermodynamic system, Properties, State, Processes and Cycles, Thermodynamic Equilibrium, Quasi-static process, Zeroth law of Thermodynamics.

Work and Heat Transfer: Work Transfer, Path and point functions, Displacement work in various processes, Shaft work, Flow work, Heat transfer, Specific and Latent Heats, Comparison of Work and Heat transfer.

UNIT-II: **(10 Periods)**

First Law of Thermodynamics Closed system: First Law for a closed system undergoing a Cycle and Process, Concept of total energy(E) ; E-property, Various forms of Stored Energy, Internal Energy and Enthalpy, Specific Heat at constant volume and constant pressure, PMM1.

Open system: Control volume, Steady Flow Process, Mass and Energy Balance, Applications of steady flow processes, Problems.

UNIT-III: **(8 Periods)**

Second Law of Thermodynamics: Heat Engine, Kelvin Planck and Clausius statements, Refrigerator and Heat Pump, Reversible and irreversible processes, Carnot

Cycle, Carnot's theorem, Absolute Temperature Scale, Efficiency of a Reversible Heat Engine, PMM2.

UNIT-IV: **(9 Periods)**

Entropy: Clausius inequality, Definition of entropy, Demonstration that entropy is a property, Evaluation of Entropy for solids, liquids and ideal gases undergoing various processes, Entropy principle and its applications.

Availability: Available energy, Maximum work in a Reversible process, Availability in Non-flow and Flow processes, Gibbs and Helmholtz Functions.

UNIT-V: **(11 Periods)**

Pure Substances P-T and P-V diagrams, triple point and critical points. Sub-cooled liquid, saturated liquid, mixture of saturated liquid and vapor, saturated vapor and superheated vapor states of pure substance with water as example. Enthalpy of change of phase (Latent heat).Dryness fraction (quality), T-S and H-S diagrams, representation of various processes on these diagrams. Steam tables and its use. Throttling calorimeter, separating and throttling calorimeter.

Total Periods: 48

TEXT BOOKS :

1. Nag, P. K., Engineering Thermodynamics, TMH Publishers, New Delhi.
2. Rajput, R. K., Thermal Engineering, Lakshmi Publications, New Delhi.
3. Dr. Y.B. Muklesh, Dr. T.K. Chansrasekha, Dr. S.B. Nagesh, Dr. G.S. Jatadhara, Applied Thermodynamics, Scientific International Publishing House.
4. Dr. Y.B. Mukesh, Basic Thermodynamics, Published in 1st Edition, Scientific International Publishing House, ISBN: 978-93-5757-339-9.

REFERENCE BOOKS:

1. Joel Rayner, Basic Engineering Thermodynamics, Addison Wesley Publication, Massachusetts
2. Sonntag, R.E., Borgnakke, C. and Van Wylen, G.J., 6th Edition, Fundamentals of Thermodynamics, John Wiley and Sons, Singapore
3. Jones, J. B. and Duggan, R.E. Engineering Thermodynamics, Prentice-Hall of India

WEB RESOURCES:

1. www.learnthermo.com/tutorials.phpwww.khanacademy.org/science/physics/thermodynamics
2. www.courseera.org/learn/thermodynamics-intro
3. www.edx.org/course/thermodynamics-iitbombayx-me209-1x-1
4. http://nptel.ac.in/courses/112106141
5. https://nptel.ac.in/courses/112/108/112108148/

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II B. Tech. – I Semester

(22E03305L) MATERIAL SCIENCE LAB

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	0	0	3	1.5

PREREQUISITES: Engineering Physics

COURSE OBJECTIVES:

- To understand microstructure and hardness of engineering materials.
- To explain grain boundaries and grain sizes of different engineering materials

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

CO1 : Prepare specimens for metallographic observation by carefully cutting.
CO2 : Identify the microstructure of various metals using an optical microscope.
CO3 : Perform hardenability tests on steels to determine their ability to be hardened through heat treatment processes.
CO4 : Understand the various phases of Iron-Carbon alloys.
CO5 : Evaluate the hardness of treated and untreated steels using hardness testing methods like Rockwell.

DETAILED SYLLABUS:

List of Experiments

1. Preparation of specimen for Metallographic examination of different Engineering materials.
2. Microstructure of pure metals – Iron, copper and Aluminium as per ASTM standards.
3. Microstructure of low carbon steel, mild steel and high carbon steel
4. Microstructure of cast irons.
5. Study on microstructures of Non-Ferrous metals/ alloys.
6. Hardenability of steels by Jominy End Quench Test.
7. Study of Iron carbon equilibrium diagram.
8. Study on heat treatment processes (hardening and tempering) of steel specimen.
9. Microstructure of ceramics, polymeric materials.
10. Construct Binary phase diagram for given problems

TEXT BOOKS:

1. Material Science and Metallurgy - Dr.V.D.Kodgire, Everest Publishers, 2008.
2. Introduction to Physical Metallurgy - Avner, Mc GrawHill , 2nd Edition,1997.

REFERENCE BOOKS:

1. Material Science and Metallurgy - R.B.Choudary - Khanna Pub, 1stEdition.
2. 2. A Text Book of Material Science and Metallurgy , O.P. Khanna , Dhanapat Rai Publiacations,2012

WEB RESOURCES:

1. NPTEL:: Metallurgy and Material Science - NOC: Introduction to Materials Science and Engineering.

II B. Tech. – I Semester

(22E03302L) MANUFACTURING PROCESSES LAB

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	0	0	3	1.5

PREREQUISITES: Engineering Physics

COURSE OBJECTIVES:

- Acquire practical knowledge on Metal Casting, Welding, Press Working.

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

CO1 : Prepare metal and alloy specimens for micro structural analysis using a metallurgical microscope. The process involves cutting.
CO2 : Create castings using sand molding processes.
CO3 : Fabricate various components using injection molding.
CO4 : Prepare welded joints using Metal Arc (MMA).
CO5 : Fabricate different types of components using press working.

DETAILED SYLLABUS:

List of Experiments

1. Casting preparation using single piece pattern.
2. Casting preparation using double piece pattern.
3. Sand Properties Testing–Exercise for Strength and Permeability.
4. Injection moulding.
5. Blow moulding.
6. Arc welding.
7. Spot welding.
8. TIG / MIG welding
9. Press Tool: Blanking and Piercing operation with Simple, Compound and Combination dies.
10. Closed die forging, Deep Drawing and Extrusion operations.

TEXT BOOKS:

1. Rao P.N. Manufacturing Technology–VolumeI,5/e, Mc Graw-Hil lEducation,2018.

REFERENCE BOOKS:

1. P.C. Sharma, A Text of production Technology (Manufacturing Processes), S. Chand and Company, New Delhi.
2. Dr R.S.Parmar, Welding Processes and Technology, Khanna Publishers, New Delhi.

WEB RESOURCES:

1. NPTEL :: Metallurgy and Material Science - NOC: Introduction to Materials Science and Engineering Manufacturing Process Technology I & II - Course (nptel.ac.in).

II B. Tech. – I Semester

(22E03303L) MECHANICS OF SOLIDS LAB

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	0	0	3	1.5

PREREQUISITES: Mathematics, Physics

COURSE OBJECTIVES:

- By performing this laboratory, the student will be able to know the structural behavior of various materials.

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

CO1 : Understand the basic concepts of stress.
CO2 : Perform stress analysis and design of beams subjected to bending and shearing loads using various methods.
CO3 : Evaluate the properties of a material through an impact test.
CO4 : Assess the properties of a material using hardness tests.
CO5 : Evaluate the properties of a material through a tensile test.

DETAILED SYLLABUS:

List of Experiments

1. Tension test.
2. Bending test on (Steel/Wood) Cantilever beam.
3. Bending test on simply supported beam.
4. Torsion test.
5. Vickers Hardness Test
6. Rockwell Hardness Test
7. Brinell Hardness Test
8. Compression test on Open coiled springs
9. Tension test on Closely coiled springs
10. Compression test on wood/ concrete
11. Izod Impact test on metals
12. Charpy Impact test on metals
13. Shear test on metals
14. Direct Shear Test on Timber Specimen
15. Continuous beam – deflection test.

TEXT BOOKS :

1. Strength of Materials Lab Manual by Anand Jayakumar A , Notion Press

REFERENCE BOOKS:

1. Advanced Mechanics of Materials–A. P. Boresi and O. M. idebottom–John Wiley & Sons.
2. Strength of Materials – R. K. Rajput – S. Chand & Company N.Narayana Pillai,
3. Mechanics of Materials - Beer, F.P.,Johnston, E.R. and DeWolf, J.T., , 3rd edition, Tata McGraw-Hill.

WEB RESOURCES:

1. http://sm-nitk.vlabs.ac.in/#

II B. Tech. – I Semester

(22E03304SC) GEOMETRIC MODELLING

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	1	0	2	2

PREREQUISITES: Engineering Graphics

COURSE OBJECTIVES:

- Train the software for 2D sketcher.
- Teach solid modeling of machine parts and their sections.
- Train 3D modelling using Boolean operations.
- Explain creation of 2D and 3D assembly drawings.

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

CO1 : Identify various sketcher and modelling tools for the design.
CO2 : Model three-dimensional components using part design tools.
CO3 : Generate parts using modelling software through Boolean Operations.
CO4 : Use different assembly parts by using product tools.
CO5 : Draw the different views of assembly by using drafting tools.

DETAILED SYLLABUS:

List of Experiments

Any TEN experiments are required to be conducted.

1. Creating a normal sketch by considering the given dimensions.
2. Creating profiles by using lines, Circles, Rectangles, Splines, and arcs, Modifying profiles by using Trims, Extend, Mirror. Move, Copy, Rotate.
3. Design of Bearing Bracket, Shifter.
4. Design of Sliding Bracket, Depth Slot.
5. Design Knuckle Joint.
6. Design Universal Coupling.
7. Boolean operations.
8. Wire frame design.
9. Applying modification to the assembly constraint by using a manipulation tool.
10. Exploded view for the created assembly.
11. Creating views of the final assembly on drafting sheet.
12. Creating front view side view and top view & Isometric view of Assembly.

TEXT BOOKS:

1. K.L. Narayana, P. Kannaiah & K. Venkata Reddy, Machine Drawing, New Age Publishers 4th Edition, 2012.
2. R.K. Dhawan, Machine Drawing, 2nd Edition, S. Chand Publications, 1996.

REFERENCE BOOKS:

1. P.S. Gill, Machine Drawing, Madhurai, 12th Edition, Sk Kataria & Sons, 2009.
2. Rajput, Machine Drawing, Hyderabad, 4th Edition, S.Chand Publications, 2002.

WEB RESOURCES:

1. https://www.sculpteo.com/en/tutorial/prepare-your-model-3d-printing-catia/modeling-3d-printing-catia/

II B. Tech. – I Semester

(22E00304MC) CONSTITUTION OF INDIA

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	00	30	2	0	0	0

PREREQUISITES:

COURSE 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 constitutional bodies like Supreme Court and high court controller and auditor general of India and Election Commission of India.
- To understand the central-state relation in financial and administrative control.

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

CO1 : Understand historical background of the constitution making and its importance for building a democratic India.
CO2 : Understand the functioning of three wings of the government i.e., executive, legislative and judiciary.
CO3 : Understand the value of the fundamental rights and duties for becoming good citizen of India.
CO4 : Analyze the decentralization of power between central, state and local self government
CO5 : Apply the knowledge in strengthening of the constitutional institutions like CAG, Election Commission and UPSC for sustaining democracy.

DETAILED SYLLABUS:

Unit 1: **(6 Periods)**

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 2: **(6 Periods)**

Union Government and its Administration Structure of the Indian Union - Federalism – Centre - State relationship – President's Role, power and position - PM and Council of ministers - Cabinet and Central Secretariat –Lok Sabha - Rajya Sabha - The Supreme Court and High Court - Powers and Functions.

Unit 3: **(6 Periods)**

State Government and its Administration - Governor - Role and Position -CM and Council of ministers - State Secretariat-Organization Structure and Functions

Unit 4: **(7 Periods)**

Local Administration - District's Administration Head - Role and Importance - Municipalities - Mayor and role of Elected Representatives -CEO of Municipal Corporation Pachayati Raj - Functions– PRI –ZillaParishath - Elected officials and their roles – CEO, ZillaParishath - Block level Organizational Hierarchy - (Different departments) - Village level - Role of Elected and Appointed officials - Importance of grass root democracy.

Unit 5: **(7 Periods)**

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

Total Periods: 32

TEXT BOOK:

1. Durga Das Basu, Introduction to the Constitution of India, Prentice – Hall of India Pvt. Ltd.. New Delhi.
2. SubashKashyap, Indian Constitution, National Book Trust.

REFERENCE BOOKS:

1. J.A. Siwach, "Dynamics of Indian Government & Politics".
2. H.M.Sreevai, "Constitutional Law of India", 4th edition in 3 volumes (Universal Law Publication).
3. J.C. Johari, "Indian Government and Politics", Hans India 185 Page.
4. M.V. Pylee, "Indian Constitution", Durga Das Basu, Human Rights in Constitutional Law, Prentice – Hall of India Pvt.Ltd.. New Delhi.

WEB 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-indian-constitution

II B. Tech. – II Semester

(22E00402T) NUMERICAL METHODS AND PROBABILITY THEORY

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	2	1	0	3

PREREQUISITES: Differentiation, Integration, Probability

COURSE OBJECTIVES:

- This course aims at providing the student with the knowledge on various numerical methods for solving equations.
- The student develops the idea of using by Inter polating the polynomials.
- To understand the integral equations and solution of differential equations.
- To introduced the theory of Probability and random variables.

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

CO1 : Apply numerical methods.
CO2 : Derive interpolating polynomials using interpolation formulae like Lagrange interpolation or Newton's divided difference method.
CO3 : Solve differential equations and integral equations numerically using techniques like Euler's method.
CO4 : Apply probability theory to find the chances of the occurrence of events.
CO5 : Understand various probability distributions such as the binomial distribution.

DETAILED SYLLABUS:

UNIT-I: Solution of Algebraic & Transcendental Equations (10 Periods)

Introduction-Bisection method-Iterative method-Regular falsi method-Newton Raphson method System of Algebraic equations: Gauss Jacobi method-Gauss Siedal iterative method.

UNIT-II: Interpolation (10 Periods)

Finite differences-Newton's forward and backward interpolation formulae – Lagrange's formulae. Gauss forward and backward formula, Stirling's formula, Bessel's formula.

UNIT-III: Numerical Integration & Solution of Initial value problems to Ordinary differential equations (10 Periods)

Numerical Integration: Trapezoidal rule – Simpson's 1/3 Rule – Simpson's 3/8 Rule Numerical solution of Ordinary Differential equations: Solution by Taylor's series-Picard's Method of successive Approximations-Modified Euler's Method-Runge-Kutta Methods.

UNIT-IV: Probability theory (9 Periods)

Probability, probability axioms, addition law and multiplicative law of probability, conditional probability, Baye's theorem, random variables (discrete and continuous), probability density functions, properties, mathematical expectation.

UNIT-V: Probability Distributions (9 Periods)

Probability distribution - Binomial, Poisson approximation to the binomial distribution and normal distribution-their properties-Uniform distribution-exponential distribution.

Total Periods: 48

TEXT BOOKS:

1. Higher Engineering Mathematics, B.S.Grewal, Khanna publishers.
2. Probability and Statistics for Engineers and Scientists, Ronald E. Walpole, PNIE.

REFERENCE BOOKS:

1. Higher Engineering Mathematics, by B.V.Ramana, Mc Graw Hill publishers.
2. Advanced Engineering Mathematics, by Alan Jeffrey, Elsevier.

WEB RESOURCES:

1. https://onlinecourses.nptel.ac.in/noc17_ma14/preview
2. nptel.ac.in/courses/117101056/17

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II B. Tech. – II Semester

(22E01404T) FLUID MECHANICS & HYDRAULIC MACHINES

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	0	0	3

PREREQUISITES: Mechanics, Physics & Chemistry

COURSE OBJECTIVES:

- To impart ability to solve engineering problems in fluid mechanics.
- To explain basics of statics, kinematics and dynamics of fluids and various measuring techniques of hydrostatic forces on objects.
- To enable the students measure quantities of fluid flowing in pipes, tanks and channels.
- To introduce concepts of uniform and non-uniform flows through open channel.
- To impart knowledge on design of turbines and pumps.

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

CO1 : Familiarize basic terms used in fluid mechanics.
CO2 : Understand the principles of fluid statics, kinematics and dynamics.
CO3 : Understand flow characteristics and classify the flows and estimate various losses in flow through channels.
CO4 : Design different types of turbines, centrifugal and multistage pumps.
CO5 : Classify methods of dimensional analysis and Apply Buckingham Pi theorem.

DETAILED SYLLABUS:

UNIT-I: Introduction to Fluid Statics **(10 Periods)**

Introduction: Distinction between a fluid and a solid - characteristics of fluids - Fluid **Pressure:** Pressure at a point, Pascal's law, pressure variation with temperature, density and altitude. Piezometer, U-Tube Manometer, Single Column Manometer, U Tube Differential Manometer, pressure gauges.

Hydrostatic pressure and force: horizontal, vertical and inclined surfaces.

UNIT-II: Fluid kinematics and Dynamics **(10 Periods)**

Fluid kinematics: Classification of fluid flow - Stream line, path line, streak line and stream tube; stream function, velocity potential function. One, two and three - dimensional continuity equations in Cartesian coordinates.

Fluid Dynamics: Surface and body forces; Equations of motion - Euler's equation; Bernoulli's equation – derivation; Energy Principle; Practical applications of Bernoulli's equation: Venturimeter, orifice meter and Pitot tube; Momentum principle; Forces exerted by fluid flow on pipe bend; Vortex Flow – Free and Forced; Definitions of Reynolds Number, Froude Number, Mach Number, Weber Number and Euler Number

UNIT-III: Analysis Of Pipe Flow **(9 Periods)**

Energy losses in pipelines- Darcy – Weisbach equation; Minor losses in pipelines; Hydraulic Grade Line and Total Energy Line; Concept of equivalent length – Pipes in Parallel and Series.

Laminar Flow- Laminar flow through: circular pipes, annulus and parallel plates. Stoke's law, Measurement of viscosity, Reynolds experiment, Transition from laminar to turbulent flow. Resistance to flow of fluid in smooth and rough pipes-Moody's diagram

UNIT-IV: Hydraulic Machines **(10 Periods)**

Impact of Jets- Hydrodynamic force of jets on stationary and moving flat, inclined and curved vanes - velocity triangles at inlet and outlet - Work done and efficiency. **Hydraulic Turbines:** Classification of turbines; Pelton wheel and its design. Francis turbine and its design - efficiency - Draft tube: theory Characteristic curves of hydraulic turbines - Cavitation's - Working principles of a centrifugal pump, work done by impeller; heads, losses and efficiencies; minimum starting speed; Priming; specific speed; limitation of suction lift, net positive suction head (NPSH); Performance and characteristic curves; Cavitation's effects; Multistage centrifugal pumps; troubles and remedies.

UNIT-V: Dimensional Analysis And Similitude: **(9 Periods)**

Dimensional homogeneity - Methods of dimensional analysis- Rayleigh's method - Buckingham - Pi theorem - Similitude - Types of similarities - Model laws.

Boundary Layer Theory& Drag And Lift: Boundary layer – concepts, Prandtl's contribution, Characteristics of boundary layer along a thin flat plate, laminar and turbulent Boundary layers, separation of boundary layers. Expression for drag and lift; Lift and Drag Coefficients; pressure drag and friction drag; Streamlined and bluff bodies.

Total Periods: 48

TEXT BOOKS :

1. P. M. Modi and S. M. Seth, "Hydraulics and Fluid Mechanics", Standard Book House.
2. K. Subrahmanya, "Theory and Applications of Fluid Mechanics", Tata McGraw Hill.

REFERENCE BOOKS:

1. R. K. Bansal, A text of "Fluid Mechanics and Hydraulic Machines", Laxmi Publications (P) Ltd., New Delhi.
2. K. Subramanya, Open channel Flow, Tata McGraw Hill.
3. N. Narayana Pillai, Principles of "Fluid Mechanics and Fluid Machines", Universities Press Pvt Ltd, Hyderabad. 3rd Edition 2009.
4. C. S. P. Ojha, R. Berndtsson and P. N. Chadramouli, "Fluid Mechanics and Machinery", Oxford University Press, 2010.
5. Banga& Sharma, "Hydraulic Machines", Khanna Publishers.

WEB RESOURCES:

1. https://www.coursera.org/courses?query=fluid%20mechanics
2. https://www.udemy.com/topic/fluid-mechanics/
3. https://onlinecourses.nptel.ac.in/noc21_ce31/preview
4. https://ocw.mit.edu/courses/aeronautics-and-astronautics/16-01-unified-engineering-i-ii-iii- iv-fall-2005-spring-2006/fluid-mechanics/
5. http://lms.msitonline.org/mod/folder/view.php?id=138

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II B. Tech. – II Semester

(22E03401T) THERMAL ENGINEERING

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	0	0	3

PREREQUISITES: Basic Thermodynamics

COURSE OBJECTIVES:

- To introduce students to the Working Principles of IC engines.
- To understand combustion process in SI and CI engines.
- To impart knowledge on different types of compressors.
- To familiarize concepts of thermodynamic cycles used in steam power plants and gas turbines.
- To impart knowledge on the working of nozzles, turbines, refrigeration and air conditioning.

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

CO1 : Test I.C Engines for performance characteristics & Draw the heat balance sheet
CO2 : Derive efficiency and mean effective pressure equations for I C Engines.
CO3 : Determine the working of various air compressors.
CO4 : Evaluate efficiency and power generation using vapour power and gas power cycles.
CO5 : Evaluate the relative performance of different steam turbines.

DETAILED SYLLABUS:

UNIT-I: I.C Engines **(8 Periods)**

Working and classification of IC engines, comparison of two stroke and four stroke engines, comparison of SI and CI Engines.

Testing and Performance of I.C Engines: Methods of testing IC Engines, performance analysis of I.C Engines.

UNIT-II: Air Standard Cycles for I C Engines **(10 Periods)**

Otto cycle, Diesel cycle, Duel cycle, plot on P-V, T-S planes, Thermal efficiency and mean effective pressure and comparative studies

UNIT-III: Air Compressors **(10 Periods)**

Reciprocating Compressor: Single stage reciprocating compressors, work required, effect of clearance in compressors, volumetric efficiency, multi stage compressor, effect of inter cooling in multi stage compressors, compressor performance.

Rotary Compressor: Working principle of a rolling piston type compressor (fixed vane type), multi vane type compressors, characteristics of rotary vane type compressor, working principle of centrifugal and axial flow compressors.

UNIT-IV: Vapour & Gas Power Cycles **(10 Periods)**

Vapour Power Cycle: Simple Rankine cycle, mean temp of heat addition, thermodynamic variables effecting efficiency, Rankine cycle–reheating and regeneration.

Gas Power Cycles: Simple gas turbine plant, Brayton cycle, closed cycle and open cycle for gas turbines, condition for optimum pressure ratio, actual cycle. Methods to improve performance: regeneration, inter-cooling and reheating.

UNIT-V: Nozzles & Steam Turbines **(10 Periods)**

Nozzles: Type of nozzles - gas and steam nozzles. Compressible flow through nozzle-condition for maximum discharge - Nozzle efficiency - Super saturation.

Steam Turbines: Impulse turbine and reaction turbine – compounding of impulse turbines - velocity diagrams in impulse and reaction turbines, blade efficiency, degree of reaction.

Total Periods: 48

TEXT BOOKS:

1. Thermal Engineering, Mahesh V Rathore, Tata McGraw Hill, 2017.
2. M.L.Mathur and F.S.Mehta, Thermal Engineering, Jain brothers, 2014.

REFERENCE BOOKS:

1. Ganesan V, Internal Combustion Engines, Tata McGraw Hill, 2017.
2. Yahya, S. M., Turbines, Compressors and Fans, 4/e, Tata McGraw Hill, 2010.
3. Nag P.K, Engineering Thermodynamics, 4/e, Tata McGraw-Hill, 2008.
4. Onkar Singh, Thermal Turbomachines, 3/e, Wiley India, 2014.
5. C.P.Arora, Refrigeration and Air Conditioning.

WEB RESOURCES:

1. https://nptel.ac.in/courses/112/103/112103307/
2. https://nptel.ac.in/courses/112/103/112103275/

II B. Tech. – II Semester

(22E03402T) KINEMATICS OF MACHINERY

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	0	0	3

PREREQUISITES: Engineering Mechanics

COURSE OBJECTIVES:

- To provide a foundation for the study of Dynamics of Machinery and machine design.
- Comprehend the fundamentals of kinematics and to understand the concept of machines, mechanisms and related terminologies.
- Analyze a mechanism for displacement, velocity and acceleration at any point in a moving link.
- To develop skills for designing and analyzing linkages and mechanisms.
- Formulate the concept of synthesis and analysis of different mechanisms.
- To understand the Principles and working of various straight line motion mechanisms.
- To analyze Steering gear mechanisms and working of Hooke's joint.
- To understand the theory of gears, gear trains and cams.

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

CO1 : Distinguish kinematic and kinetic motion.
CO2 : Apply vector mechanics as a tool for solving kinematic problems.
CO3 : Identify the basic relations between distance, time, velocity, and acceleration.
CO4 : Design a real-world mechanism.
CO5 : Determine the degrees-of-freedom (mobility) of a mechanism.

DETAILED SYLLABUS:

UNIT-I: MECHANISMS AND MACHINES **(11 Periods)**

Introduction: Elements or Links – Classification – Rigid Link, flexible and fluid link. Types of kinematic pairs – sliding, turning, rolling, screw and spherical pairs – lower and higher pairs – closed and open pairs – constrained motion – completely, partially or successfully constrained and incompletely constrained. Mechanisms and machines – classification of mechanisms and machines – kinematic chain – inversion of mechanisms – inversions of quadric cycle chain, single and double slider crank chain. Mobility of mechanisms.

UNIT-II: Steering & Straight-Line Motion Mechanisms **(11 Periods)**

Straight Line Motion Mechanisms- Exact and approximate, copied and generated types – Peaucellier, Hart, Scott Russel, Grasshopper, Watt, Tchebicheff and Robert Mechanisms. Pantograph.

Steering Mechanisms: Conditions for correct steering – Davis Steering gear, Ackermann's steering gear. Hooke's Joint (Universal coupling) - Single and double Hooke's joint – applications – Simple problems.

UNIT-III: KINEMATICS **(10 Periods)**

Velocity and Acceleration Diagrams- Velocity and acceleration – Motion of link in machine – Determination of Velocity and acceleration – Graphical method – Application of relative velocity method – Slider crank mechanism, four bar mechanism. Acceleration

diagrams for simple mechanisms, determination of coriolis component of acceleration, Klein's construction: Analysis of slider crank mechanism for displacement, velocity and acceleration of slider using analytical method.

Instantaneous Centre Method: Instantaneous Centre of rotation, centrode and axode – relative motion between two bodies – Three centers in-line theorem – Locating instantaneous canters for simple mechanisms and determination of angular velocity of points and links.

UNIT-IV: Gears & Gear Trains **(8 Periods)**

GEARS: Higher pairs, toothed gears – types – law of gearing, condition for constant velocity Ratio for transmission of motion, Forms of tooth- cycloidal and involute profiles. Velocity of sliding – phenomena of interference – Methods to avoid interference - Condition for minimum number of teeth, expressions for arc of contact and path of contact. Introduction to Helical, Bevel and Worm gears.

Gear Trains: Introduction –Types of gears – Simple, Compound, Reverted and Epicyclic gear trains, Train value – Methods of finding train value or velocity ratio – Tabular column method for Epicyclic gear trains. Torque in epicyclic gear trains. Differential gear of an automobile – Simple problems.

UNIT-V: Cams & Followers **(8 Periods)**

Definitions of cam and follower – uses – Types of followers and cams – Terminology. Types of follower motion - Uniform velocity, Simple harmonic motion, Cycloidal, uniform acceleration and retardation, Maximum velocity and maximum acceleration during outward and return strokes. Drawing of cam profiles.

Total Periods: 48

TEXT BOOKS :

1. Theory of Machines and Mechanisms-S.S.Rattan, Tata McGraw Hill Publishers.
2. Theory of Machines R.S Khurmi& J.K Gupta, S Chand Publishers.

REFERENCE BOOKS:

1. Theory of Machines by Thomas Bevan/ CBS
2. Theory of Machines / R.K Bansal
3. Theory of Machines Sadhu Singh PearsonsEdn
4. Mechanism and Machine Theory / JS Rao and RV Dukkipati / New Age
5. The theory of Machines /Shiegley/ Oxford.
6. Theory of machines – PL. Balaney/khanna publishers

WEB RESOURCES

1. https://www.digimat.in/nptel/courses/video/112104121/L01.html
2. https://nptel.ac.in/courses/112/105/112105268/

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II B. Tech. – II Semester

(22E00405T) MANAGERIAL ECONOMICS AND FINANCIAL ANALYSIS

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	0	0	3

PREREQUISITES: Probability & Statistics

COURSE OBJECTIVES:

- To inculcate the basic knowledge of micro economics and learn how demand is estimated for different products.
- To make the students learn input-output relationship for optimizing production and cost.
- To Know the Various types of market structure and pricing methods and strategy.
- To provide fundamental skills on accounting and to explain the process of preparing financial statements.
- To give an overview on investment appraisal methods to promote the students to learn how to plan long-term investment decisions.

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

CO1 : Describe different functions happening in the economic environment.
CO2 : Describe various measurements of production which effects demand in the Markets.
CO3 : Explain impact of business in present scenario.
CO4 : Develop the accounting statements and evaluate the financial performance of Business entity.
CO5 : Analyze how to invest their capital and maximize returns.

DETAILED SYLLABUS:

UNIT-I: Introduction to Managerial Economics **(9 Periods)**

Introduction, Nature and Scope of Managerial Economics, Demand-Concepts (Determinants of Demand, Types of Demand, Law of Demand) – Elasticity of Demand-Types and Measurements of Elasticity, Factors determining elasticity. Demand Forecasting (Steps in Demand Forecasting, Methods Of Demand Forecasting) - Relationship of Managerial Economics with other Subjects.

UNIT-II: Theory of Production & Cost Analysis **(10 Periods)**

Introduction, Importance of Production, Types of Production functions- Cobb-Douglas Production Function. Internal and External Economies of scale. Cost Concepts. Break-Even Analysis (BEA) - Determination of Break-Even Point. Managerial significance and limitations of Break-Even Analysis.

UNIT-III: Introduction to Markets and business Environment **(09 Periods)**

Introduction, Characteristics of Markets, Types of markets, Pricing Methods and strategies. Introduction to Business, Forms of Business organizations (Sole Proprietary, Partnership, Joint Stock Company, Cooperative Societies), Public Enterprises.

UNIT-IV: Financial Accounting and Analysis **(10 Periods)**

Introduction, Importance of Accounting, Principles of Accounting, Difference between Accounting and Book keeping, Types of Accounts. The Accounting Process (Journal, Ledger, Trial Balance, Trading And Profit and Loss A/c, Balance Sheet with Adjustments),

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Ratio Analysis-Types of Ratios, Simple Problems on different types of ratios.

UNIT-V: Capital and Capital Budgeting **(10 Periods)**

Importance of Capital: Types of Capital (Fixed Capital and Working Capital), Types of Working Capital, Working capital Life cycle, Sources of Capital (Long term, Medium term and Short term Sources).

Capital Budgeting: Importance of capital budgeting, Techniques of Capital Budgeting (PBP, ARR, NPV, PI, IRR).

Total Periods: 48

TEXT BOOKS :

1. Aryasri: Business Economics and Financial Analysis, 4/e, MGH, 2019.
2. Varshney & Maheswari: Managerial Economics, Sultan Chand, 2013.

REFERENCE BOOKS:

1. Ahuja Hl Managerial economics Schand,3/e,2013.
2. S.A. Siddiqui and A.S. Siddiqui: Managerial Economics and Financial Analysis, New Age .International, 2013.
3. Joseph G. Nellis and David Parker: Principles of Business Economics, Pearson, 2/e, New Delhi.
4. Domnick Salvatore: Managerial Economics in a Global Economy, Cengage, 2013.

WEB RESOURCES:

1. https://www.slideshare.net/rossanz/production-and-cost-45827016. https://www.slideshare.net/darkyla/business-organizations-19917607.
2. https://www.slideshare.net/balarajbl/market-and-classification-of-market.
3. https://www.slideshare.net/ruchi101/capital-budgeting-ppt-59565396.
4. https://www.slideshare.net/ashu1983/financial-accounting.

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II B. Tech. – II Semester

(22E01406L) FLUID MECHANICS & HYDRAULIC MACHINES LAB

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	0	0	3	1.5

PREREQUISITES: Probability & Statistics

COURSE OBJECTIVES:

- By performing this laboratory, the student will be able to know the fluid flow measurements by considering different types flow measurement devices and working principles of various pumps and motors.

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

CO1 : Calculate the coefficient of discharge of Venturimeter and Orifice-meter by applying Bernoulli's theorem.
CO2 : Determine the coefficient of loss of head in a sudden contraction and friction factor.
CO3 : Determine coefficient of discharge for a small orifice, external mouth piece and notch.
CO4 : Calculate the coefficient of impact for stationary vane and study of hydraulic jump.
CO5 : Performance and characteristics of hydraulic machines.

DETAILED SYLLABUS:

LIST OF EXPERIMENTS

1. Verification of Bernoulli's equation.
2. Calibration of Venturimeter & Orifice meter.
3. Determination of Coefficient of discharge for a small orifice by constant head method.
4. Determination of Coefficient of discharge for a small orifice by variable head method.
5. Determination of Coefficient of discharge for an external mouth piece by Constant headmethod.
6. Determination of Coefficient of discharge for an external mouth piece by variable headmethod.
7. Calibration of contracted Rectangular Notch.
8. Determination of friction factor.
9. Impact of jet.
10. Determination of loss of head in a sudden contraction.
11. Performance test on Impulse turbines.
12. Performance test on reaction turbines (Francis Turbine).
13. Performance test on centrifugal pumps, determination of operating point and efficiency.

TEXT BOOKS:

1. P. M. Modi and S. M. Seth, "Hydraulics and Fluid Mechanics", Standard Book House

REFERENCE BOOKS:

1. Fluid Mechanics & Hydraulic Machines A Lab Manual by Ts Desmukh (Author), Laxmi Publications (P) Ltd.

2. Fluid Mechanics & Machinery Laboratory Manual by N Kumara Swamy (Author), Charotar Books Distributors
3. Lab. Manual of Fluid Mechanics & Machines by Gupta, Chandra (Author), cbspd (Publisher).

WEB RESOURCES:

1. http://eerc03-iiith.vlabs.ac.in/

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II B. Tech. – II Semester

(22E03401L) THERMAL ENGINEERING LAB

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	0	0	3	1.5

PREREQUISITES: Thermodynamics, Thermal Engineering

COURSE OBJECTIVES:

- Understand the functioning and performance of I.C. Engines.
- To find heat losses in various engines.

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

CO1 : Explain different working cycles of engine.
CO2 : Explain the valve and port timing diagrams of I.C engines.
CO3 : Apply the two stage air compressor test rig.
CO4 : Explain the study of boilers.
CO5 : Evaluate heat balance sheet of IC engine.

DETAILED SYLLABUS:

List of Experiments

1. Valve timing diagram of 4-stroke diesel engine.
2. Port timing diagram of 2-stroke petrol engine.
3. Performance of 2-stroke single cylinder petrol engine.
4. Performance of 4-stroke single cylinder diesel engine.
5. Assembly and disassembly of diesel and petrol engines.
6. Performance of two stage reciprocating air compressor.
7. Heat Balance of an I.C. Engine.
8. Air/Fuel Ratio and Volumetric Efficiency of an I.C. Engines.
9. Retardation and motoring test on 4- stroke engine.
10. Study of Boilers.

TEXTBOOKS:

1. Thermal Engineering, Mahesh V Rathore, Tata McGraw Hill 2017
2. M.L.Mathur and F.S.Mehta, Thermal Engineering, Jain brothers,2014

REFERENCE BOOKS:

1. Ganesan V, Internal Combustion Engines, Tata McGraw Hill, 2017.
2. Nag P.K, Engineering Thermodynamics, 4/e, Tata McGraw-Hill, 2008

WEB RSOURCES:

1. https://nptel.ac.in/courses/112/103/112103307/
2. https://nptel.ac.in/courses/112/103/112103275/

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II B. Tech. – II Semester

(22E03403L) COMPUTER AIDED MACHINE DRAWING LAB

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	0	0	3	1.5

PREREQUISITES: Engineering Drawing, Engineering Graphics

COURSE OBJECTIVES:

- Introduce conventional representations of material and machine components.
- Train to use software for 2D and 3D modeling.
- Familiarize with thread profiles, riveted, welded and key joints.
- Teach solid modeling of machine parts and their sections.
- Explain creation of 2D and 3D assembly drawings.
- Familiarize with limits, fits and tolerances in mating components.

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

CO1 : Demonstrate the conventional representations of materials and machine components.

CO2 : Model the three-dimensional machine components using CAD system.

CO3 : Create assembly models of the machine parts and sectional views of machine components using modelling software.

DETAILED SYLLABUS:

List of Experiments

List of Experiments

Sketcher:

1. Conventional representation of materials, common machine elements and Screw threads.

Part Design:

2. Screws, nuts,bolts, keys, gears, webs, ribs.
3. Bolts, nuts, stud bolts, tap bolts.
4. Keys, cotter joints and knuckle joint.
5. Riveted joints for plates.
6. Foot step bearing.

Assembly:

7. Design of Stuffing box and Connecting rod.
8. Design of Eccentric, Design of Screw jack, Design of Plumber Block.
9. Design of light duty non return valve.
10. Details of slip bush, Details of Main spindle of lathe tail stock.
11. Details of Single tool post.

TEXT BOOKS:

1. K.L. Narayana, P. Kannaiah & K. Venkata Reddy, Machine Drawing, NewAge Publishers 4th Edition, 2012.
2. R.K. Dhawan, Machine Drawing, 2nd Edition, S. Chand Publications, 1996.

REFERENCE BOOKS:

1. P.S. Gill, Machine Drawing, Madhurai, 12th Edition, Sk Kataria & Sons, 2009.
2. Rajput, Machine Drawing, Hyderabad, 4th Edition, S.Chand Publications, 2002.

WEB RESOURCES:

1. https://eeedocs.files.wordpress.com/2014/02/machinedrawing.pdf

II B. Tech. – II Semester

(22E03404SC) 3D PRINTING AND DESIGN

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	1	0	2	2

PREREQUISITES: Engineering Graphics & Manufacturing Process

COURSE OBJECTIVES:

- Understand different methods of 3D Printing.
- Gain knowledge about simulation of FDM process.
- Estimate time and material required for manufacturing a 3D component.

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

CO1 : Demonstrate the knowledge on 3D printing and .stl files for developing complex components.
CO2 : Explain different types of 3d Printing techniques and processes for various applications.
CO3 : Analyze the functional characteristics of 3D printing and reverse engineering techniques for engineering applications.
CO4 : Identify the defects in 3D Printed components.

DETAILED SYLLABUS:

Module 1:
Introduction to Prototyping, Working of 3D Printer, Types of 3D printing Machines:
Exp 1: Modelling of Engineering component and conversion of STL format.
Exp 2: Slicing of STL file and study of effect of process parameter like layer thickness, orientation, and in fill on build time using software.
Exercise 1 : Component-1
Exercise 2 : Component-2

Module 2:
Exp 1 : 3D Printing of modelled component by varying layer thickness.
Exp 2 : 3D Printing of modelled component by varying orientation.
Exp 3: 3D Printing of modelled component by varying infill.

Module 3
Exp1: Modelling of component using 3D Scanner of real life object of unknown dimension in reverse engineering.
Exp 2: 3D Printing of above modelled component.

Module 4: Identifying the defects in 3D Printed components.

List of Experiments

1. Design the 3D Simple Box.
2. Design the bolt and create the threads over the surface.
3. Design a Basic Hexagonal Nut.
4. Design a U Bracket Sheet Metal.
5. How to Print the design in 3D printer.
6. Fabricate the key chain in 3D printer.
7. Fabricate the simple box in 3D printer.
8. Fabricate the Hex Nut in 3D printer.

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9. Fabricate U Bracket in 3D printer.

TEXT BOOKS :

1. Prof H N Pandya, 3D Printing Technology: Fundamentals and Applications, OM publications.

REFERENCE BOOKS:

1. Ian Gibson, David W. Rosen, Brent Stucker, Additive Manufacturing Technologies: Rapid Prototyping to Direct Digital Manufacturing, 1/e, Springer, 2010.
2. Chua C.K., Leong K.F. and Lim C.S., Rapid Prototyping: Principles and Applications, 2/e, World Scientific Publishers, 2003.

WEB RESOURCES:

1. https://www.hubs.com/knowledge-base/introduction-fdm-3d-printing.
2. https://onlinecourses.nptel.ac.in/noc21_me115/preview.

II B. Tech. – II Semester

(22E00406T) UNIVERSAL HUMAN VALUES

(Common to all branches)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	0	0	3

PREREQUISITES: Constitution of India

COURSE OBJECTIVES:

- Development of a holistic perspective based on self-exploration about themselves (human being), family, society and nature/existence.
- Understanding (or developing clarity) of the harmony in the human being.
- Understanding the harmony at the level of family, society and nature/existence.
- Developing clarity about the Harmony in nature and existence.
- To make engineering graduates understand the significance of Humanistic Education, Humanistic Constitution and Humanistic Universal Order.

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

CO1 : Students are expected to become more aware of themselves, and their surroundings (family, society, nature).

CO2 : They would become more responsible in life, and in handling problems with sustainable solutions, while keeping human relationships and human nature in mind.

CO3 : They would have better critical ability.

CO4 : They would also become sensitive to their commitment towards what they have understood (human values, human relationship and human society).

CO5 : Students could be able to apply what they have learnt to their own self in different day-to-day settings in real life, at least a beginning would be made in this direction.

DETAILED SYLLABUS:

UNIT-I: Course Introduction - Need, Basic Guidelines, Content and Process for Value Education: (10 Periods)

Value – Universal Human Values and its features. Self-Exploration–what is it? - Its content and process; '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- the basic requirements for fulfillment of aspirations of every human being with their correct priority. Understanding Happiness and Prosperity correctly. A critical appraisal of the current scenario. Method to fulfill the above human aspirations: understanding and living in harmony at various levels.

UNIT-II: Understanding Harmony in the Human Being - Harmony in Myself: (10 Periods)

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 Programs to ensure Sanyam and Health.

UNIT-III: Understanding Harmony in the Family and Society- Harmony in Human- Human Relationship: (10 Periods)

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 meaning of Trust; Difference between intention and competence. Understanding the meaning of Respect, Difference between respect and differentiation; the other salient values in relationship. Understanding the harmony in the society (society being an extension of family): Resolution, Prosperity, fearlessness (trust) and co-existence as comprehensive Human Goals. Visualizing a universal harmonious order in society- Undivided Society, Universal Order- from family to world family.

UNIT-IV: Understanding Harmony in the Nature and Existence - Whole existence as Coexistence: (9 Periods)

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: (9 Periods)

Definitiveness of Ethical Human Conduct. Basis for Humanistic Education, Humanistic Constitution and Humanistic Universal Order. Competence in professional ethics:

- Ability to utilize the professional competence for augmenting universal human order.
- Ability to identify the scope and characteristics of people friendly and eco-friendly production systems.
- Ability to identify and develop appropriate technologies and management patterns for above production systems. Case studies of typical holistic technologies, management models and production systems.

Total Periods: 48

TEXT BOOKS:

1. R R Gaur, R Asthana, G P Bagaria, "A Foundation Course in Human Values and Professional Ethics", 2nd Revised Edition, Excel Books, New Delhi, 2019. ISBN 978-93- 87034-47-1.
2. R R Gaur, R Asthana, G P Bagaria, "Teachers' Manual for A Foundation Course in Human Values and Professional Ethics", 2nd Revised Edition, Excel Books, New Delhi, 2019. ISBN 978-93-87034-53-2.

REFERENCE BOOKS:

1. Jeevan Vidya: Ek. Parichaya, A Nagaraj, Jeevan Vidya Prakashan, Amar kantak, 1999.
2. A. N. Tripathi, "Human Values", New Age Intl. Publishers, New Delhi, 2004.
3. The Story of Stuff (Book).
4. Mohandas Karamchand Gandhi "The Story of My Experiments with Truth".
5. E. FSchumacher. "Small is Beautiful".
6. Slow is Beautiful –Cecile Andrews.
7. J C Kumarappa "Economy of Permanence".

WEB RESOURCES:

1. http://www.uhv.org.in/
2. www.fdp-si-aicte-india.org

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