Choice Based Credit System (CBCS)

Name of the Programme (UG): B.E

Syllabus for III - Semester and IV - Semester

With effect from 2017 - 2018

Specialization /Branch: Production Engineering

Chaitanya Bharathi Institute of Technology (A)
Chaitanya Bharathi (P.O), Gandipet
Hyderabad-500075, Telangana State.

CHAITANYA BHARATHI INSTITUTE OF TECHNOLOGY(A)
Choice Based Credit System
B.E (Production Engineering)

SEMESTER – III

S.No.	Course Code	Title of the Course	Scheme of Instruction		Scheme of Examination			Credits
			Hours per week		Duration of See in Hours	Maximum Marks		
			L/T	P/D		CIE	SEE	
THEORY								
1	16MT C05	Engineering Mathematics-III	3	-	3	30	70	3
2	16ME C04	Material Science and Metallurgy	3	-	3	30	70	3
3	16ME C05	Mechanics of Materials	3/1	-	3	30	70	4
4	16ME C06	Fluid Dynamics	3	-	3	30	70	3
5	16ME C07	Machine Drawing	1	2	3	30	70	2
6	16MB C01	Engineering Economics and Accountancy	3	-	3	30	70	3
PRACTICALS								
7	16ME CO8	Material Science and Metallurgy Lab	-	3	3	25	50	2
8	16ME C09	Mechanics of Materials Lab	-	3	3	25	50	2
9	16ME C10	Computer Drafting Lab	-	3	3	25	50	2
		Total	**17**	**11**	**-**	**255**	**570**	**24**

L: Lecture T: Tutorial D: Drawing P: Practical

CIE - Continuous Internal Evaluation SEE - Semester End Examination

AssessmentProcedures for Awarding Marks

The distribution of marks is based on CIE by concerned teacher and the Semester end examination shall be as follows:

Course (in terms of credits)	CIE	Semester end Examination(Marks)	Remarks	Duration of SemesterEnd Examination
Three(3) Credits/ Four(4) Credits	30*	70**	Theory Course/ Engg.Graphics	3 Hours
Two(2) Credits	20*	50***	Theory	2 Hours
Two(2) Credits	25	50	Lab Course/ Workshop	3 Hours
One(1) Credit	15	35	Lab Course	2 Hours
Two(2) Credits	50	—-	Project Seminar/ Seminar	——
Six(6) Credits	50	100	Project	Viva
One(1) Credit	—-	50***	Environmental Studies,Professional Ethics and Human values	2 Hours
One(1) Credit	50		Mini Project	——-

CIE: Continuous Internal Evaluation

*Out of 30/20 sessional marks(CIE), 10/5 marks are allotted for slip-tests (Three slips test will be conducted, each of 10/5 marks, best two average is considered) and the remaining 20/15 marks are based on the average of two tests, weightage for each test is 20/15 marks.

**The question paper will be in two parts, Part-A and Part-B. Part A is for Ten(10) questions and is compulsory, covers the entire syllabus, and carries 20 marks. Part-B carries 50 marks and covers all the units of the syllabus (student has to answer five out of seven questions).

***The question paper will be in two parts, Part-A and Part-B. Part A is for Ten(10) questions and is compulsory, covers the entire syllabus, and carries 15 marks. Part-B carries 35 marks and covers all the units of the syllabus (student has to answer five out of seven questions).

Note: A course that has CIE (sessional marks) but no semester end examination as per scheme, is treated as Pass/Fail for which pass marks are 50% of CIE.

A candidate has earned the credits of a particular course, if he/she secures not less than the minimum marks/grade as prescribed. Minimum pass marks for theory course is 40% of total marks i.e., CIE plus semester end examinations where as for the lab course/project is 50%.

16MT C05

ENGINEERING MATHEMATICS-III

Instruction	3 Hours per week
Duration of End Examination	3 Hours
Semester End Examination	70 Marks
CIE	30 Marks
Credits	3

Course objectives:

1. To study the expansion of functions in various intervals.
2. To form P.D.E and to find its solution.
3. To solve Wave, Heat & Laplace equations.
4. To learn Differentiation and Integration of complex valued functions.
5. To evaluate Complex Integration.
6. To evaluate Real definite integrals.

Course outcomes: On the successful completion of this course the student will be able to

1. Expand functions in the given intervals.
2. Solve linear and non linear PDEs.
3. Solve one-dimension, two-dimension, Heat steady state equations and also one-dimension wave equation.
4. Solve problems on Analytic functions, Cauchy's theorem and Cauchy's integral formula.
5. Expand functions by using Taylor's and Laurent's series.
6. Solve Real and Complex integrals by using Cauchy Theorems.

UNIT – I

Fourier series: Definition of Periodic, Single valued, finite maxima and minima of functions. Euler's Formulae, Dirichlets Conditions for Fourier expansion, Functions having points of discontinuity, Change of interval, Expansion of odd and even functions, Half-range sine series and cosine series.

UNIT-II:

Partial differential equations: Formation of partial differential equations by eliminating the arbitrary constants or arbitrary functions, solutions of linear partial differential equation of first order by using Lagrange's Method, solution of Non-linear partial differential equations of first order by using standard types, Charpit's Method.

UNIT - III

Applications of Partial differential equations: Solution of partial differential equations by using method of separation of variables, solution of vibration of a stretched string (1D-Wave equation), one dimensional heat equation, Two dimensional heat equation under steady state conditions.

UNIT - IV

Theory of Complex variables: Analytic functions, Cauchy Riemann equations (Cartesian and polar forms), construction of Analytic functions by using Milne-Thomson's method. Harmonic function. Complex line integrals, Cauchy's theorem, Cauchy's Integral formula and its derivatives and problems related to the above theorems.

UNIT - V

Expansion of functions, Singularities & Residues: Taylor's and Laurent's series Expansions (Only statements). Zeros, types of singularities, Residues and Cauchy's Residue theorem, Evaluation of real integrals by Cauchy's residue theorem. Evaluation of improper real integrals of the type: $\int_{-\infty}^{\infty} f(x)dx$ Where f(x) has no poles on real axis and $\int_0^{2\pi} f(\sin\theta, \cos\theta)d\theta$.

Text Books:

1. B.S. Grewal, Higher Engineering Mathematics, 43rd Edition, Khanna Publishers, 2015.
2. M.D. Raisinghania, Advanced Differential equations, 7th edition, S Chand publishers, 2013.
3. J. W. Brown and R. V. Churchill, Complex Variables and Applications, 7th edition, McGraw Hill publishers, 2003.

Suggested Reading:

1. N P Bali and Manish Goyal, A Text Book of Engineering Mathematics, 9th Edition, Laxmi publishers, 2016.
2. Alan Jeffrey, Mathematics for Engineers and Scientists, 6th Edition, Chapman & Hall/CRC publishers, 2013.
3. A R Vasistha and R K Gupta, Integral transforms, Krishna prakashan publishers, 2004.
4. R.K.Jain & S.R.K.Iyenger, Advanced Engineering Mathematics, 3rd edition, Narosa Publications, 2007.

16ME C04

MATERIAL SCIENCE AND METALLURGY

Instruction	3 Hours per week
Duration of Semester End Examination	3 Hours
Semester End Examination	70 Marks
CIE	30 Marks
Credits	3

Course Objectives: Students will

1. Enable the student to understand structure property relations, analyze the failures of metals and their prevention.
2. Broad understanding of phase diagrams.
3. Acquire basic knowledge in various heat treatment operations, their purpose and applications.
4. Expose to various methods of extractive metallurgy techniques.
5. Understand various modes of failure and suggest mechanisms for preventions of failures.
6. Understand applications of conventional metals and alloys.

Course Outcomes: On the successful completion of this course the student will be able to

1. Know the fundamental science and engineering principles relevant to material.
2. Suggest appropriate physical metallurgy methods (phase diagrams).
3. The type of heat treatment operation to be given to any metal in order to improve desire Mechanical properties.
4. Basic ability to plan an extraction process for given ore.
5. Suggest the appropriate methods for prevention of failures.
6. To analyze the applications of conventional metals and alloys

UNIT–I

Imperfections in crystals, dislocation in crystals, types of dislocations, effect of slip and twinning on the plastic deformation, cold and hot working, strain hardening and Bauchinger effect, recovery, recrystallization, grain growth and its effect on mechanical properties of metals.

Fracture: Types of fracture in metals, modes of fracture, Griffith theory of brittle fracture, crack propagation, ductile fracture, fracture under combined stress.

UNIT–II

Fatigue: S–N curve, Structure of fatigue fracture specimen. Fatigue crack propagation, effect of metallurgical variables on fatigue of metal, low cycle fatigue, experimental determination of fatigue strength (RR–Moore Test).

Creep: Creep strength, creep curve, creep deformation mechanisms, creep test.

Diffusion: Fick's law of diffusion, application of diffusion theory in mechanical engineering.

UNIT–III

Structure of Alloys: study of eutectic, eutectoid, peritectic peritectoid reactions, iron–iron carbide equilibrium diagram, construction and interpretation.

Types of plain carbon steels, cast iron and their properties and characteristics.

UNIT–IV

Heat Treatment: Annealing, normalising, hardening, tempering, construction and interpretation of T–T–T diagram, austempering and martempering, case hardening, carburizing, nitriding, carbo–nitriding, flame hardening, induction hardening.

UNIT–V

Introduction to Extractive Metallurgy: Method of production of pig iron by blast furnace, cast iron by cupola furnace, method of production of steel by Bessemer convertor, L.D process, electric arc process.

Alloy Steels: Effects of alloying elements like nickel, chromium, manganese, silicon and tungsten, titanium, study about stainless steels, HSS, brass, bronze their composition and properties.

Text Books:

1. V. Raghavan, Materials Science and Engineering, Prentice Hall of India Ltd., 4th Edn., 2005.
2. S.H. Avner, Introduction to Physical Metallurgy, Tata McGraw Hill Publishers, 2nd Edn., 2005.

Suggested Reading:

1. S.P. Nayak, Engineering Metallurgy and Material Science, Charoter Publishing House, 6th Edn., 2005.
2. E. Dieter, Mechanical Metallurgy, Metric Edition, Tata McGraw Hill, 3rd Edn, 2005.
3. K.L. Kakani, Material Science, New Age Publications (P) Ltd.,2008.

16ME C05

MECHANICS OF MATERIALS

Instruction	3L+1T Hours per week
Duration of Semester End Examination	3 Hours
Semester End Examination	70 Marks
CIE	30 Marks
Credits	4

Pre-Requisites: Engineering Mathematics, Engineering Mechanics.

Course Objectives:

1. Student is exposed to the concept of different types of loads, stresses, strains and analysis of members for axial loads.
2. Student will acquire knowledge in drawing bending and shear force diagrams of beams for various loads.
3. Student becomes familiar with methods of evaluation of deflection of beams of various configurations and stresses that arise due to simple bending.
4. Student is exposed to the concept of principal stresses and phenomenon of torsion.
5. Student will acquire knowledge in estimating stresses for thin and thick cylindrical shells.
6. Student will acquire knowledge in estimating crippling load in buckling for various columns and struts.

Course Outcomes:

Students who successfully complete this course will have demonstrated ability to:

1. Classify the materials, stresses, strains and understand engineering constants, poisons ratio along with relation between them. Also analyze axially loaded members.
2. Draw shear force, bending moment diagrams for different types of beams and calculate stresses and strains due to simple bending.
3. Determine slope and deflection for various configurations of beams using different methods and stress, strain and deflection due to torsion of circular members.
4. Analyze shear stress distribution in different sections of beams.
5. Understand compound stresses, calculation of principal stresses analytically and graphically using Mohr's circle.

6. Estimate stresses in thin and thick cylinders. Also estimate critical load in buckling for various columns and struts.

UNIT–I

Stresses and Strains: Definitions, types of stresses and strains, elasticity and plasticity. Hooke's law, stress-strain diagrams for engineering materials, modulus of elasticity. Poisson's ratio, relationship between elastic constants, linear and volumetric strains, bars of uniform strength, temperature stresses, compound bars.

UNIT–II

Beams: Definition of bending moment and shear force; relationship between intensity of loading, shear force and bending moment; bending moment and shear force diagrams for cantilever, simply supported and overhanging beams; simple theory of bending, moment of resistance, modulus of section.

UNIT–III

Slopes and Deflections: Slope and deflection measurements of cantilever, simply supported beams with Macaulay's and double integration methods subjected to point loads and uniformly distributed loads.

Torsion: Derivation of torsion formula for circular sections, torsional stresses, angle of twist, power transmission, effect of combined bending and torsion.

UNIT–IV

Shear Stresses in beams: Distribution of shear stresses in rectangular, I-section and T-section for solid and hollow sections.

Compound stresses, principal stresses and strains. Mohr's circle of stress.

UNIT–V

Cylinders: Stresses in thin and thick cylinders with internal and external pressures. Hoop and longitudinal stresses in cylinders, stresses in compound cylinders.

Columns and struts: Euler's and Rankine's formulae for axial load applications. Secant and Perry formulae for eccentrically loaded columns.

Text Books:

1. S.S.Rattan, Strength of materials, Tata Mc-Graw Hill, 3rd Edition, 2016.
2. S. Ramamrutham, Strength of Materials, Dhanpatrai and Sons, 1993.
3. G.H.Ryder, Strength of materials, 3rd Edition in SI Units, Macmillan India Limited, Delhi 2002.

Suggested Reading:

1. S.S. Bhavakatti, Strength of Materials, Vikas Publication, 2003.
2. B.C. Punmia, Strength of Materials and Theory of Structures, Laxmi Pub., 1992.
3. G.H. Ryder, Strength of Materials, 3rd Edition in SI units, Macmillan India Limited, Delhi, 2002.

16ME C06

FLUID DYNAMICS

Instruction	3 Hours per week
Duration of Semester End Examination	3 Hours
Semester End Examination	70 Marks
CIE	30 Marks
Credits	3

Course Objectives: Student will understand

1. the fluid properties and different fluids.
2. the centre of pressure and stability conditions.
3. the importance of stream function and velocity potential function.
4. the equations related to Fluid dynamics.
5. different types of fluid flows.
6. major and minor losses of fluid flows.

Course Outcome: On the successful completion of this course the student will be able to

1. differentiate different types of fluids.
2. calculate centre of buoyancy and metacentric height.
3. differentiate rotational and irrotational flows.
4. determine forces exerted on fluid body.
5. differentiate laminar over turbulent flows.
6 determine various losses incurred in fluid flows.

UNIT–I

Properties of fluids: Definition of fluid and concept of continuum. Difference between ideal and real fluids. Classification of fluids. Fluid properties: Pressure, Density, Specific weight, Specific volume, Dynamic and Kinematic viscosity, Compressibility and Bulk modulus, Surface tension and Capillarity.

Pressure measurement: Fluid pressure at a point, pascal's law, Hydrostatic law, Measurement of pressure by different manometers.

UNIT–II

Fluid Statics: Total pressure, centre of pressure, total pressure and centre of pressure on plane surfaces like horizontal plate, vertical plate, inclined plate and curved surfaces.

Buoyancy and Floatation: Buoyancy, buoyant force, centre of buoyancy, Meta centre, stability for submerged and floating bodies.

UNIT-III

Fluid Kinematics: Classification of fluid flow: steady and unsteady, uniform and non-uniform, laminar and turbulent, rotational and irrotational,

one, two and three dimensional flows, General concepts of path line, stream line and stream tube. Definition and properties of stream function, velocity potential function and use of flow nets.

UNIT–IV

Fluid Dynamics: Energy of fluid body, potential energy and potential head, pressure energy and pressure head, kinetic energy and kinetic head, derivation of Euler's and Bernoulli's equations and their applications like venturi meter, orifice meter, pitot tube, impulse momentum equation and applications. Discharge equations for weirs and notches.

UNIT–V

Laminar and Turbulent flow in pipes: Distinction between laminar and turbulent flows, Reynold's number and its significance, upper and lower critical values of Reynold's number for flow in pipes, development of laminar and turbulent flow in circular pipes. Hagen–Poiseuille equation, frictional losses in pipes, Darcy equation, estimation of Darcy's friction factor, empirical formulae and Moody's chart.

Flow through pipes: Loss of energy in pipes, Major losses, Minor losses, Hydraulic gradient and total energy lines.

Text Books:

1. P.N.Modi and S.M.Seth, Hydraulic and Fluid Mechanics, Standard Book House, 2010.
2. R.K.Rajput, Fluid Mechanics and Hydraulic Machines, S. Chand and Company, 2010.

Suggested Reading:

1. K.L.Kumar, Engineering Fluid Mechanics, Eurasia Publishing House, 2005.
2. V.L.Streeter, Fluid Mechanics, Mc.Graw Hill Co. Ltd., 2005.
3. D.S.Kumar, Fluid Mechanics, S.K. Kataria and Sons, 2010.

16ME C07

MACHINE DRAWING

Instruction	1L+2D Hours per week
Duration of Semester End Examination	3 Hours
Semester End Examination	70 Marks
CIE	30 Marks
Credits	2

Pre-Requisites: The student is required to have an idea about Engineering Drawing

Course Objectives:

1. Understand drawing and develop capacity to represent any object with the help of sketch.
2. Study the conventions and rules to be followed by engineers for making accurate drawings.
3. Understand the basic dimensioning practices that have to be followed in the preparation of Drawings.

Course Outcomes:

On successful completion of this course the students will be able to:

1. Draw conventional representation of different materials and mechanical components.
2. Read the working drawings in the machine shop.
3. Draw the orthographic projections and sectional views of machine parts.
4. Draw missing views as well as to analyze and interpret drawings of machine components.
5. Understand the shape and structure of different types of screws, keys, couplings, and rivets.
6. Draw assembly drawings of certain Machine Tools, Engine parts and Valves etc.

1. INTRODUCTION:

Format of drawing sheet, title block, conventions of drawing lines and dimensions, First and third angle projections, conversion of Pictorial view to orthographic views, convention for sectional views. Orthographic projections including sectional views of simple machine elements.

2. DRAWING OF FASTENERS, JOINTS AND COUPLINGS:

Practices of sketching work: Free hand sketches of typical machine elements for simple cases for riveted and screwed fastening, joints, and couplings (To indicate proportions).

3. ASSEMPBLY DRAWING:

Preparation of assembly drawings from given details, Ability to supply additional views. The exercises will be drawings of typical machine parts like:

1. Bearings-Plummer block(Pedestal bearing),
2. Petrol Engine Connecting rod,
3. Eccentric,
4. Cross head,
5. Stuffing box,
6. Pipe vice,
7. Screw jack,
8. Lathe Tail-stock
9. Single Tool Post,
10. Revolving centre.

Note: The test is for the ability of the student to read and interpret drawing. The drawing should include part list in standard format.

Text Books:

1. N. Siddeshwar, Machine Drawing, Tata McGraw Hill Publishing Co., Ltd., 5th edition, 2004.
2. N.D. Bhatt, V.M. Panchel, Machine Drawing, Cherotar Publishing house, Anand, New Delhi, 49th edition, 2014.

Suggested Reading:

1. K.L. Narayan, P. Kanniah, K. Venkat Reddy, Machine Drawing, New Age International (P) Ltd., 2nd 2009.
2. K.C. John, Text book of Machine Drawing, PHI Learning, 2010.
3. Ajeet Singh, Machine Drawing, Galgotia Publications, 2010.

16MB C01

ENGINEERING ECONOMICS AND ACCOUNTANCY

Instruction	3 Hours per week
Duration of Semester End Examination	3 Hours
Semester End Examination	70 Marks
CIE	30 Marks
Credits	3

Course Objectives: Students will:

1. Introduce managerial economics and demonstrate its importance in managerial decision making.
2. Develop an understanding of demand and relevance of its forecasting in the business.
3. Provide the basics of market structure and the concept of equilibrium in different market structures.
4. Examine the economic analysis of production process, types of inputs and to explain different costs and their relationship with the output.
5. Understand the importance of project evaluation in achieving a firm's objective.
6. Explain the concept of Accountancy and provided knowledge on preparation and analysis of Final accounts.

Course Outcomes: After completion of the course, student will be able to:

1. Apply fundamental knowledge of Managerial economics concepts and tools.
2. Understand various aspects of demand analysis and forecasting.
3. Understand price determination for different markets.
4. Study production theory and analyze various costs and benefits involved in it so as to make best use of resources available.
5. Analyze different opportunities and come out with best feasible capital investment decisions.
6. Apply accountancy concepts and conventions, Final accounts and financial analysis.

UNIT-I:

Introduction to Managerial Economics: Introduction to Economics and its evolution - Managerial Economics - its scope, importance, Its usefulness to engineers - Basic concepts of Managerial economics.

UNIT-II:

Demand Analysis: Demand Analysis - Concept of demand, determinants, Law of demand, its assumptions, Elasticity of demand, price, income and cross elasticity, Demand Forecasting – Types of Market structures. (Simple numerical problems).

UNIT-III:

Production and Cost Analysis: Theory of Production - Firm and Industry - Production function - input-out relations - laws of returns - internal and external economies of scale. Cost Analysis: Cost concepts - fixed and variable costs - explicit and implicit costs - out of pocket costs and imputed costs - Opportunity cost - Cost output relationship - Break-even analysis. (Theory and problems).

UNIT-IV:

Accountancy: Book-keeping, principles and significance of double entry book keeping, Journal, Subsidiary books, Ledger accounts, Trial Balance concept and preparation of Final Accounts with simple adjustments.

UNIT-V:

Capital Budgeting: Introduction to capital budgeting, Methods: traditional and discounted cash flow methods. Introduction to Working capital management. (Numerical problems).

Text Books:

1. Mehta P.L., Managerial Economics – Analysis, Problems and Cases, Sultan Chand and Son's Educational publishers, 2013.
2. Maheswari S.N., Introduction to Accountancy, Vikas Publishing House, 2013.
3. Panday I.M., Financial Management, Vikas Publishing House, 11th Edition, 2015.

Suggested Reading:

1. Varshney and KL Maheswari, Managerial Economics, Sultan Chand, 2014.
2. M.Kasi Reddy and S.Saraswathi, Managerial Economics and Financial Accounting, Prentice Hall of India Pvt Ltd, 2007.
3. A.R.Aryasri, Managerial Economics and Financial Analysis, McGraw-Hill, 2013.

16ME C08

MATERIAL SCIENCE AND METALLURGY LAB

Instruction	3 Hours per week
Duration of Semester End Examination	3 Hours
Semester End Examination	50 Marks
CIE	25 Marks
Credits	2

Course Objectives: Students will

1. Acquire basic knowledge by understanding iron-carbide diagram and its application in engineering.
2. Expose to Metallographic study and analysis of various metals.
3. Acquire knowledge in determining the hardness of metals before and after various Heattreatment operations.
4. Understand differences between different heat treatment methods.
5. Expose to T-T-T curve and its application in engineering metallurgy.
6. Understand the relation between micro structure and properties.

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Course Outcomes: On successful completion of this course the students will be able to:

1. identify crystal structure of various metals.
2. measure hardness and can correlate with microstructure.
3. perform a suitable heat treatment operation based on desired properties.
4. underlines the importance of grain size in evaluating the desired mechanical properties.
5. Understand the process of heating and cooling for various heat treatment methods.
6. Correlate the heat treatment methods and the mechanical properties obtained.

List of the Experiments

1. Study of: Metallurgical Microscope, Allotropes of Iron, Iron-Iron carbide diagram, Procedure for specimen preparation.
2. Observations for the following specimens - i) Low carbon steels, ii) Medium carbon steels, iii) Eutectoid steels, iv) High Carbon steels, v)Stainless steels, vi) Case carburized, vii)HSS, viii) White, cast iron, ix) Gray cast iron, x) Malleable cast iron, xi)Spheroidal cast iron, xii) Al–Si alloy and determination of grain size using Image Analyzer.
3. Preparations of the following specimens : i) $\alpha - \beta$ Brass, ii)Normalised steel iii)Medium carbon steel iv)Nodular cast iron v) Grey cast iron.

4. Heat Treatment Processes i) Annealing, ii) Normalizing, iii) Hardening.

Text Books:

1. V. Raghavan, Materials Science and Engineering, Prentice Hall of India Ltd., 4th Edn., 2005.
2. S.H. Avner, Introduction to Physical Metallurgy, Tata McGraw Hill Publishers, 2nd Edn., 2005.

Suggested Reading:

1. S.P. Nayak, Engineering Metallurgy and Material Science, Charoter Publishing House, 6th Edn., 2005.
2. E. Dieter, Mechanical Metallurgy, Metric Edition, Tata McGraw Hill, 3rd Edn, 2005.
3. K.L. Kakani, Material Science, New Age Publications (P) Ltd, 2008.

16ME C09

MECHANICS OF MATERIALS LABORATORY

Instruction	3 Hours per week
Duration of Semester End Examination	3 Hours
Semester End Examination	50 Marks
CIE	25 Marks
Credits	2

Course Objectives:

1. To apply mechanics of materials theory on real specimens and learn the practical testing procedures and concepts.
2. Demonstrate an understanding of tension, and the relationship between stress, strain and application of Hooke's law.
3. Demonstrate an understanding of types of beams, deflections and measurement of material property through deflections.
4. Demonstrate an understanding of torsion and deformations resulting from torsion.
5. To demonstrate the understanding of hardness and its measurement using different scales like Brinnel and Rockwell.
6. To demonstrate an understanding of measurement of shear modulus and young's modulus for machine members like helical and leaf springs through loading respectively.

Course Outcomes: Students who successfully complete this course will have demonstrated ability to:

1. Draw stress-strain curve for an isotropic material and understand the salient features of it.
2. Demonstrate in determining the Young's modulus of various beam materials by conducting load-deflection test.
3. Evaluate rigidity modulus of a given shaft specimen by torsion test.
4. Able to find out Young's modulus and shear modulus for mechanical components like leaf spring and closely coiled helical spring through load-deflection test respectively.
5. Evaluate hardness of different materials using different scales and also estimate the impact resistance of a material by conducting impact tests.

6. Find the compressive and crushing strengths of concrete cubes and bricks.

List of Experiments

1. Uni-axial tension test using UTM.
2. Brinnel's and Rockwell's hardness tests.
3. Deflection test on propped cantilever.
4. Deflection test on a helical spring to determine the rigidity modulus.
5. Torsion of shaft to determine the rigidity modulus of shaft material.
6. Defection test on a cantilever beam to determine the Young's modulus.
7. Deflection test on a simply supported beam to determine the Young's modulus.
8. Deflection test on continuous beam to determine the Young's modulus.
9. Load-deflection test on a leaf spring to find out the young's modulus of leaf material.
10. Crushing and compression test on bricks and concrete cubes.

Text Books:

1. S.S.Rattan, Strength of materials, Tata Mc-Graw Hill, 3rd Edition, 2016.
2. S. Ramamrutham, Strength of Materials, Dhanpatrai and Sons, 1993.
3. G.H.Ryder, Strength of Materials, 3rd Edition in SI Units, Macmillan India Limited, Delhi 2002.

Suggested Reading:

1. S.S. Bhavakatti, Strength of Materials, Vikas Publication, 2003.
2. B.C. Punmia, Strength of Materials and Theory of Structures, Laxmi Pub., 1992.
3. G.H. Ryder, Strength of Materials, Third Edition in SI units, Macmillan India Limited, Delhi, 2002

16ME C10

COMPUTER DRAFTING LAB

Instruction	3 Hours per week
Duration of Semester End Examination	3 Hours
Semester End Examination	50 Marks
CIE	25 Marks
Credits	2

Course Objectives: Students will

1. Student will acquire knowledge in solid modeling by exposing to Solid works.
2. Student will acquire knowledge in graphic communication.
3. Student is exposed to design methodologies.
4. Student will acquire knowledge in concept of layers.

Course Outcomes On successful completion of this course the students will be able to:

1. demonstrates Graphics and design competencies.
2. apply CAD techniques for 2D modeling.
3. develops an ability to think 3D and interpret data from blue prints and sketches, layers concepts.
4. apply and draw orthographic projections with the knowledge of correct graphics communication (drawings).
5. draw 2D drawings and sectional views of part models.
6. draw 2D drawings and sectional views of assembly models.

Application Software Tool: Auto CAD / Solid Works

1. INTRODUCTION TO SOLIDWORKS DRG EDITOR/ AUTOCAD :

XY Coordinate system, Angular measurement, Setting of Units, Limits, Absolute, Relative and Polar Coordinates, zoom Text, Multiline Text, Creating Title Block – Title, Drawing Number, Drawn, Checked, Approved, Angle of Projection, Scale, Basic Toolbars and commands - Format, View, Draw, Dimension, Modify Tool bars, Draw tool bar options - line, Circle, Rectangle, Ellipse, Spline and Arc , Modify tool bar options - Trim, Extend, Offset, Fillet, Chamfer, Mirror, Break, Array, Polar, Rectangular, Move, Copy, Stretch, Rotate ESNAP, SNAP, Grid, Ortho, Dimension Tool bar –aligned, angular, linear and annotations, leader line. Setting Dimension Style. View Tool bar - Orbit, Render, 3D Views (SW, SE, NE, NW Isometric Views).

2. **EXERCISES FOR PRACTICE:**
   Square headed spanner, circular, rectangular components, concentric squares, circle inscribed in a square and rectangle. Fork, Depth Stop, Pump Housing, Geneva Wheel. Importance of Layer - Layer and object properties; construction line, object line, hidden line, centre line, hatching, dimensioning, leader, Options like - Region, Extrude.

3. **EXERCISES FOR PRACTICE:** 2D drawings and sectional views - Shaft support, Sliding Block, Bearing Bracket, Shaft bracket, Anchor bracket, Piston of Petrol Engine, Petrol Engine Connecting Rod.

4. **EXERCISES FOR PRACTICE**: 2D drawings of Components of Screw Jack, and Components of Plummer Block.

Text Books:

1. Machine Drawing, K L Narayana.
2. Solidworks Drawing and Training Manual.
3. Autocad Command Reference manual.

CHAITANYA BHARATHI INSTITUTE OF TECHNOLOGY(A)
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SEMESTER – IV

S.No.	Course Code	Title of the Course	Scheme of Instruction		Scheme of Examination			Credits
			Hours per week		Duration of See in Hours	Maximum Marks		
			L/T	P/D		CIE	SEE	
THEORY								
1	16ME C14	Kinematics of Machines	3/1	-	3	30	70	4
2	16ME C15	Thermodynamics	4	-	3	30	70	4
3	16PE C01	Metal Casting and Welding	4	-	3	30	70	4
4	16PE C02	Metal Forming Technology	4	-	3	30	70	4
5	16EE C14	Electrical Machines and Microcontroller Applications	4	-	3	30	70	4
PRACTICALS								
6	16PE C03	Metal Casting and Welding Lab	-	3	3	25	50	2
7	16PE C04	Metal Forming Technology Lab	-	3	3	25	50	2
8	16EG C03	Soft Skills and Employability Enhancement Lab	-	2	2	15	35	1
Total			**20**	**8**	**-**	**215**	**485**	**25**

L: Lecture T: Tutorial D: Drawing P: Practical

CIE - Continuous Internal Evaluation **SEE - Semester End Examination**

AssessmentProcedures for Awarding Marks

The distribution of marks is based on CIE by concerned teacher and the Semester end examination shall be as follows:

Course (in terms of credits)	CIE	Semester end Examination(Marks)	Remarks	Duration of SemesterEnd Examination
Three(3) Credits/ Four(4) Credits	30*	70**	Theory Course/ Engg.Graphics	3 Hours
Two(2) Credits	20*	50***	Theory	2 Hours
Two(2) Credits	25	50	Lab Course/ Workshop	3 Hours
One(1) Credit	15	35	Lab Course	2 Hours
Two(2) Credits	50	—-	Project Seminar/ Seminar	——
Six(6) Credits	50	100	Project	Viva
One(1) Credit	—-	50***	Environmental Studies,Profess-ional Ethics and Human values	2 Hours
One(1) Credit	50		Mini Project	——-

CIE: Continuous Internal Evaluation

*Out of 30/20 sessional marks(CIE), 10/5 marks are allotted for slip-tests (Three slips test will be conducted, each of 10/5 marks, best two average is considered) and the remaining 20/15 marks are based on the average of two tests, weightage for each test is 20/15 marks.

**The question paper will be in two parts, Part-A and Part-B. Part A is for Ten(10) questions and is compulsory, covers the entire syllabus, and carries 20 marks. Part-B carries 50 marks and covers all the units of the syllabus (student has to answer five out of seven questions).

***The question paper will be in two parts, Part-A and Part-B. Part A is for Ten(10) questions and is compulsory, covers the entire syllabus, and carries 15 marks. Part-B carries 35 marks and covers all the units of the syllabus (student has to answer five out of seven questions).

Note: A course that has CIE (sessional marks) but no semester end examination as per scheme, is treated as Pass/Fail for which pass marks are 50% of CIE.

A candidate has earned the credits of a particular course, if he/she secures not less than the minimum marks/grade as prescribed. Minimum pass marks for theory course is 40% of total marks i.e., CIE plus semester end examinations where as for the lab course/project is 50%.

16ME C14

KINEMATICS OF MACHINES

Instruction	3L+1T Hours per week
Duration of Semester End Examination	3 Hours
Semester End Examination	70 Marks
CIE	30 Marks
Credits	4

Course Objectives: Student will acquire knowledge in

1. analysis of mechanisms.
2. drawing displacement diagrams for followers with various types of motions.
3. cam profile drawing for various followers.
4. estimation of transmission of power by belts and application of various gears and gear trains.

Course Outcomes: Student will demonstrate knowledge in

1. Understanding basic elements of machinery and their motion characteristics.
2. Designing a suitable mechanism depending on application.
3. Drawing displacement diagrams and cam profile diagram for followers.
   Executing different types of motions and various configurations of followers.
4. Drawing velocity and acceleration diagrams for different mechanisms.
5. Selecting gear and gear train depending on application.
6. Selection of suitable clutch, brake.

UNIT–I

Introduction: Definition of link, element, pair, kinematic chain, mechanism and machine, Grubler's criterion, single and double slider chains, inversions of quadratic cycle chain, inversions of single and double slider crank chains. Mechanism with lower pairs and straight line motion mechanism, Pantograph and Geneva mechanisms. Ackerman and Davis steering gear mechanisms and Hooke's Joint. Peaucellier, Hart, Scott-Russel, Watt and Tchebicheff mechanisms.

UNIT–II

Analysis of mechanisms: Graphical methods to find velocities of mechanisms, instantaneous centre, body centre and space centre, Kennedy's theorem, graphical determination of acceleration of different mechanisms including Coriolis component of acceleration, analytical method to find the velocity and acceleration, analysis of four bar mechanism with turning pairs, Freudenstein's method for four bar linkage synthesis.

UNIT–III

Laws of Friction: Friction in screw threads, pivots, collars, Clutches - Single and Multi plate, Cone and centrifugal clutches. Friction circle and friction axis of a link.

Brakes and Dynamometers: Block or shoe, band and block, internal expanding shoe brake, Prony, rope brake, belt transmission, torsion dynamometers.

UNIT–IV

Cams: Types of cams and followers, displacement diagrams for followers, uniform motion, parabolic motion, simple harmonic motion, cycloidal motion, drawing cam profile with knife–edge follower, translating roller follower and translating flat follower. cams of specified contour. Cams of specified contours, tangent cam with roller follower, circular arc (convex) cam with roller follower.

UNIT–V

Gears: Classification of gears, spur gears, nomenclature, law of gear tooth action, involute as gear tooth profile, interference of involute gears, minimum number of teeth to avoid interference, contact ratio, cycloidal tooth profile, comparison of involute and cycliodal tooth profile.

Helical Gears: Helical gear tooth relations, contact of helical gear teeth,

Gear trains: Gear trains–simple and compound, reverted and epicyclic gear trains. Differential of an Automobile.

Text Books:

1. Thomas Bevan, Theory of Machines, CBS Publishers, 2009.
2. S.S. Rattan, Theory of Machines, Tata McGraw Hill Publishers, 4th Edition, 2013.
3. J.E.Shigley, Theory of Machines, Tata Mc.Graw Hill Publishers, New Delhi, 3rd Edition, 2005.

Suggested Reading:

1. C.S. Sharma and Kamlesh Purohit, Theory of Mechanisms and Machines PHI Learning Pvt. Limited, 2006.
2. Amitabh Ghosh and A.K.Mallik, Theory of Machines, East West Publications, 3rd Edition, 2009.

16ME C15

THERMODYNAMICS

Instruction	4 Hours per week
Duration of Semester End Examination	3 Hours
Semester End Examination	70 Marks
CIE	30 Marks
Credits	4

Course Objectives: Student will understand

1. Basic definitions of thermodynamics and significance of Zeroth law of thermodynamics.
2. The importance and application of first law of thermodynamics.
3. The various laws associated with second law of thermodynamics.
4. Properties of pure substances and use of Molier diagram.
5. Various air standard cycles, their importance and their comparison.
6. Calculation procedures of the air-fuel ratio.

Course Outcomes: Student will be able to

1. Estimate the temperature of different scales of thermometers.
2. Apply the first law of thermodynamics process to various thermodynamics processes.
3. Understand the meaning of perpetual motion of machine of second kind and its significance.
4. Read data from the chart of Mollier diagram and its applications.
5. Distinguish working principles of various IC engines like diesel engine, petrol engine.
6. Calculate theoretical air–fuel ratios required for combustion of fuels and also convert from gravimetric analysis to volumetric analysis and vice versa.

UNIT–I

Introduction: Thermodynamics, Macroscopic and Microscopic approaches, thermodynamic systems, properties, processes and cycles, thermodynamic equilibrium, quasi – static process, measurement of pressure, Zeroth law of thermodynamics and its significance, measurement of temperature, reference points, ideal gas equation.

UNIT–II

First Law of Thermodynamics: Concept of heat and work, first law of thermodynamics for closed system, energy- a property of the system, application of first law to various thermodynamic processes like isobaric, isochoric, isothermal, adiabatic and polytropic, definition of enthalpy, PMM1, first law applied to flow processes, application of SFEE to nozzle and diffuser, throttling device, turbine and compressor.

UNIT–III

Second Law of Thermodynamics: Limitations of first law of thermodynamics, Kelvin–Planck and Clausius statements of second law of thermodynamics, PMM2, equivalence of Kelvin-Planck and Clausius statement, reversible and irreversible processes, Carnot theorem, Clausius inequality, calculation of entropy change during various thermodynamic processes, principle of entropy increase, T–S diagrams, application of entropy principle for mixing of two fluids. Helmholtz and Gibb's functions.

UNIT–IV

Thermodynamic Properties of Fluids: Properties of pure substances, p–v diagram, p–T diagram, p–v–T surface, T–s diagram, h–s diagram, dryness fraction, use of steam tables, Maxwell relations.

UNIT–V

Air Standard Cycles: Air standard cycles - Otto, Diesel, Dual Combustion Cycles, working principle, derivation of expression for air standard efficiency, comparison of otto, diesel and dual cycles-for the same compression ratio, for the same maximum pressure and temperature.

Vapour Power Cycles: Vapour power cycles - Carnot cycle, Simple Rankine cycle.

Fuels and Combustion: Characteristics of an ideal fuel, classification of fuels, Stoichiometric air-fuel ratio, equivalence ratio, relation between volumetric and gravimetric analysis.

Text Books:

1. P.K. Nag, Engineering Thermodynamics, Tata McGraw Hill Publishers, 5th edition, 2013.
2. D.S. Kumar, Thermal science and Engineering, S.K.Kataria and Sons, 4th edition, 2013.
3. D.P.Mishra, Engineering Thermodynamics, Cengage Learning, 2012.
4. Y.A. Cengel and M.A. Boles, Thermodynamics: An Engineering Approach, Tata McGraw Hill Publishers, 7th edition, 2014.

Suggested Reading:

1. R.K. Rajput, Thermal Engineering, Laxmi Publications (P) Ltd, 8th edition, 2011.
2. Mahesh M Rathor, Thermal Engineering, Tata McGraw-Hill Publishers, 2013.

16PE C01

METAL CASTING AND WELDING

Instruction	4 Hours per week
Duration of Semester End Examination	3 Hours
Semester End Examination	70 Marks
CIE	30 Marks
Credits	4

Course Objectives: To enable the students to

1. select the suitable manufacturing process for a given component.
2. design the pattern, gating system and rises for a simple casting.
3. identify the defect and suggest remedy for the same.
4. describe various welding processes.
5. illustrate the terminology of welding, the characteristics of power sources used for welding and the consumables required.
6. compare various arc, resistance, solid state and other welding processes.

Course Outcomes: Student will be able to

1. select the suitable manufacturing process for a given component.
2. design the pattern, gating system and rises for a simple casting.
3. identify the defect and suggest remedy for the same.
4. describe various welding processes.
5. illustrate the terminology of welding, the characteristics of power sources used for welding and the consumables required.
6. compare various arc, resistance, solid state and other welding processes.

UNIT–I

Pattern design and methoding: Introduction, classification, pattern design: types of patterns pattern materials, pattern allowances, gating system, propose, elements, requirements, types of gates, choke, gating ratio, types of gating systems, gating system design, Risering: purpose, requirements, chvorinov's rule, optimum shape and dimensions of riser, riser design by Caine's method, modules method and NRL method.

UNIT–II

Moulding, melting, defect analysis and inspection techniques: Moulding sand: ingredients, types of sand clays, additives, moulding sand preparation, required properties, Core: purpose, core prints, core sand preparation, core preparation, chaplets, types of cores, net force on the core Melting furnaces: Cupola, Inductionand Arc furnace, casting defects and remedies, inspection and testing of castings.

UNIT–III

Special casting processes: Gravity die casting pressure die casting, centrifugal casting, shell moulding, investment casing, continuous casting, slush casting, lost foam process, squeeze casting, vacuum moulding CO_2 moulding and ceramic moulding.

UNIT–IV

Arc welding: Introduction, classification of welding processes, physics of arc, DCSP, DCRP, AC, arc initiation, arc stability, parts of arc, arc length characteristics, static V-I characteristics of power sources arc, duty cycle, shielded metal arc welding, submerged arc welding, Gas tungsten arc welding, Plasma arc welding, Atomic Hydrogen welding.

UNIT–V

Other welding processes: Resistance welding: spot, projection, seam, butt and percussion welding, Oxy-Acetylene welding, Thermit welding, laser beam welding, electron beam welding, Soldering and Brazing, weld defects, solid state welding, forge welding, friction welding, ultrasonic welding, explosive welding, weldability, effect of various parameters on weldability and weld defects.

Text Books:

1. P.N. Rao, Manufacturing Technology, Vol. 1, Tata McGraw Hill Publishers, 3rd edition, 2011.
2. Amitabh Ghosh and Mallick, Manufacturing science, Assoc. East West Press Pvt. Ltd.,, 4th edition, 2011.
3. Schey, Introduction to Manufacturing Processes, McGraw Hill Education, 2nd edition.

Suggested Reading:

1. Roy A. Lindberg, Materials and Process of Manufacturing, Prentice Hall of India, 5th editin, 1992.
2. Serope Kalpak Jian, Manufacturing Engineering and Technology, Addision, Wesley Publishing company, 2006.
3. Mikeli P. Grover, Fundamentals of Modern Manufacturing Materials, Processes and Systems, 3rd edition, Wiley A.

16PE C02

METAL FORMING TECHNOLOGY

Instruction	4 Hours per week
Duration of Semester End Examination	3 Hours
Semester End Examination	70 Marks
CIE	30 Marks
Credits	4

Objectives:

1. To introduce students to metal forming technology while understanding the fundamentals of theory of plastic deformation and stress strain relations.
2. To explain the working principle of various operations like sheet metal operations, extrusion, drawing, rolling, forging etc with their applications, merits and demerits.
3. To explain different deformation mechanisms and effect of the process variables on different process and product quality.
4. To enable the students to determine loading and energy required for metal forming tools and machines.
5. To enable the students to understand different defects that occurring forming operations with remedial measures.

Outcomes: After learning this course, students will be able to

1. Define what is meant by metal forming and its specific advantages over other manufacturing processes.
2. Apply theory of plasticity to analyze metal forming processes.
3. Understand the basic principles and practical aspects of metal forming operations.
4. Understand various process parameters that affect product quality in various processes under different conditions.
5. Determine load, energy and power required for various processes and machines.
6. Propose suitable metal forming processes for making different products.

UNIT-I

Theory of Plasticity: Plastic deformation, work hardening, cold, warm and hot working with their advantages and disadvantages, true stress and true strain, flow curve, effect of strain-rate and temperature on flow stress. yield criterion: von-Mises and Tresca.

UNIT-II

Forging: Open and closed die forging, Drop, Press and Machine forging operations, types of hammers and presses, their principles of operation and applications, Forging load calculation with slab method and empirical methods, forge ability , forging defects, Methods of heating and types of furnaces, Isothermal forging Hot Isostatic Pressing.

UNIT-III

Extrusion and Drawing: Types of extrusion, Tube extrusion Rod/wire/tube drawing ,load calculation of extrusion and drawing using uniform deformation energy method and slab method. maximum reduction in drawing, effect of friction, die angles, deformation speeds on extrusion/drawing forces, die materials and lubrication in these operations, extrusion and drawing defects.

UNIT-IV

Rolling: Principles of Metal rolling, roll load, torque and mill power calculation for homogenous deformation, classification and description of rolling mills, their applications, rolling defects, shape rolling, ring rolling thread rolling, roll bending and powder rolling.

UNIT-V

Sheet Metal Working: Sheet Metal working operations-shearing, blanking, piercing, bending, drawing and squeezing operations, estimation of loads and energy required for these operations, Formability, FLD, types of presses, specifications and their applications, comparison of simple, compound, progressive and combination dies. Other sheet metal forming operations like Embossing, Stretch forming, Spinning and Flow forming.

Text Books:

1. Serope Kalpakjian, Manufacturing Engineering and Technology, Pearson education INC., 4th Edn, 2015.
2. George.E. Dieter, Mechanical Metallurgy, SI Metric Edition, McGraw –Hill, 1988.
3. P.N. Rao, Manufacturing Technology, TMH, 4th Edn., 2015.

Suggested Readings:

1. Jan R.K. and Gupta S.C, Production Technology, Khanna Publications,17th Edn, 2012.
3. Roy A lindberg, Materials and Process of manufacturing, PHI, 4th edn, 2004.
4. John A Schey, Introduction To Manufacturing Processes Mcgraw Hill education, 3rd Edn, 2012.

16EE C14

ELECTRICAL MACHINES AND MICROCONTROLLER APPLICATIONS

(Common to BE-Mech. and Prod.)

Instruction	4 Hours per week
Duration of Semester End Examination	3 Hours
Semester End Examination	70 Marks
CIE	30 Marks
Credits	4

Course Objectives:

1. To understand the concepts of transformers.
2. To comprehend the need of DC and AC machines and their control aspects.
3. To know the features of 3-phase induction motors.
4. To understand the concepts of 8051 of microcontrollers.
5. To understand the basics of interfacing with 8051.

Course Outcomes: The student will be able to

1. Identify the compatibility of DC machines for a given application.
2. Identify the applications of 3-phase induction motor.
3. Know the calculation of Efficiency and regulation of transformer.
4. Program using 8051.
5. Use 8051 for basic applications.

UNIT- I

D.C. Generators: Constructional details, Principle of operation, EMF equation, Classification of generators, Armature reaction, Characteristics of shunt, series and compound generators.

DC Motors: Working Principle, back EMF, Classification of motors, Torque developed in motors, Characteristics of shunt, series and compound motors, Three point starter, Speed control of DC motors.

UNIT- II

Transformers: Construction, Working principle, EMF equation, Ideal transformer, Practical transformer on no load and load conditions, Equivalent circuit of transformer, Efficiency and regulation of transformer, OC and SC tests.

UNIT-III

Three Phase Induction Motors: Production of rotating magnetic field, construction and principle of operation, Torque Calculation, speed-torque characteristics, Speed control of 3-phase induction motors.

UNIT-IV

8051 Microcontrollers: Introduction to microprocessor, microcontroller classification, Internal architecture of 8051 and its pin configuration, Memory organization and expansion. **SFR's:** Counter and timers, serial data I/O, Interrupts.

8051 Instruction set: Addressing modes and Instruction set. Assembly Language Programming with 8051.

UNIT-V

8051 Interfacing: Expansion of I/O ports, A/D converter, D/A converter, Stepper motor interfacing with 8051, DC motor interfacing with 8051.

Text Books:

1. D.P. Kothari and Nagrath, Basic Electrical Engineering, Tata McGraw Hill Publications, 2nd edition, 2007.
2. V.K.Mehta, Principles of Electrical Engineering, S.Chand and Co, 1st edition, 2003.
3. Muhammad Ali Mazidi, Jainice Gilispie Mazidi and Rolin D. MCkinlay, The Microcontroller and Embedded Systems using Assembly and 'C', 2/e Pearson Education, 2007.
4. Ayala K.J, The 8051 Micro Controller Architecture, Programming and Application, Penram International, 2007.

Suggested Reading:

1. B. L.Theraja and A.K. TherajaA Text book of Electrical Technology, S.Chand and Co, 24th revised edition, 2007.
2. P. V. Prasad, S. Sivanagaraju, Electrical Engineering: Concepts and Applications, Cengage Learning, 1st Edition, 2012.

16PE C03

METAL CASTING AND WELDING LAB

Instruction	3 Hours per week
Duration of Semester End Examination	3 Hours
Semester End Examination	50 Marks
CIE	25 Marks
Credits	2

Course Objectives: To enable the students to

1. Prepare the mould for a single piece and split patterns.
2. Test the moulding sand and anlalyse the same.
3. Test the bead geometry and correlate the results to the input parameters.
4. Able construct the cooling curves and analyse the same.
5. Able to distinguish the type of the flame and recommend for different materials.
6. Able use TIG, MIG and Spot welding machines and experiment with them.

Course Out comes: Students are able to

1. Prepare the mould for a single piece and split patterns.
2. Test the moulding sand and anlalyse the same.
3. Test the bead geometry and correlate the results to the input parameters.
4. Construct the cooling curves and analyse the same.
5. Distinguish the type of the flame and recommend for different materials.
6. Use TIG, MIG and Spot welding machines and experiment with them.

EXPERIMENTS

Casting:

1. Design and manufacturing of a simple pattern with various allowances.
2. Green sand moulding practice for a single piece pattern.
3. Green sand moulding practice for a split pattern with a horizontal core.
4. Moulding sand testing: GCS, GSS, DCS and DSS Permeability and shatter index.
5. Finding out the GFN, Moisture content and clay content for a given sand sample.
6. Melting and Pouring of Aluminum.
7. Dimensional inspection and visual inspection of the casting and analysis of dimensional variation and defects.

Welding:

1. Study of gas welding equipment and process. Identification of flames, making Butt joint with gas welding.
2. Study of Arc welding process, comparison of the bead geometry with DCSP, DCRP and A.C.
3. Study of resistance welding process and plot the variation of spot area with time and current variation.
4. Study of TIG welding process and plotting cooling curve in TIG welding process.
5. Study of SAW Welding process and finding out deposition efficiency of the process.
6. Study of MIG welding process and testing of weld bead formed by MIG welding.

Note: Minimum 4 Experiments need to be conducted.

16PE C03

METAL FORMING TECHNOLOGY LAB

Instruction	3 Hours per week
Duration of Semester End Examination	3 Hours
Semester End Examination	50 Marks
CIE	25 Marks
Credits	2

Objectives:

1. To demonstrate various operations like sheet metal operations-blanking, punching, deep drawing, extrusion etc with their applications, merits and demerits.
2. To explain different deformation mechanisms and effect of the process variables on process or bustness and product quality.
3. To enable the students to determine loading and energy required for metal forming tools and machines.
4. To enable the students to understand different defects that occurring forming operations with remedial measures.
5. To make the students understand working principle, types, and applications of forging process.
6. To make students understand working principle, parameters, types and applications of extrusion 1process.

Outcomes: The students will be able to:

1. Understand the practical aspects of metal forming operations.
2. Understand various process parameters that affect product quality under different conditions.
3. Work independently with various presses and dies to produce different components.
4. Determine load, energy and power required for various processes and machines.
5. Propose suitable metal forming processes for making different products.
6. Design and Fabricate various types of dies for sheets metal operations.

List of Experiments:

1. Evaluation of Formability of a given sheet material using Erichsen cupping test.
2. Study of Simple Diedesign for Blanking/ Piercing operations in sheet metal forming and manufacturing of circular blanks using a mechanical press(capacity30Tons) and measurement of forces and comparing with the oretical loads.
3. Study of Progressive die design and manufacturing of washer components using the same on a fly press (capacity6Tons)and estimation of forces.
4. Studyof Compound diedesign and manufacturing of washer components using the same on double body fly press (capacity8 Tons)and estimation of forces.
5. Study of Combination diedesign and manufacturing of cylindricalcup susing the same on a Hydraulic power press(capacity 50Tons) and estimation of drawing force.
6. Study of deep drawing die design and measuring forces with/without blank holder for cylindrical/square cups using 10 T load cell on a Hydraulic power Press and comparing them with theoretical values.
7. Measurement of cutting forcef or Blanking operation using 10T load cell on Mechanical power Press for different materials and comparing the oretical and practical values.
8. Estimation of True stress and True strain for ferrous/ non ferrous materials encounter edin metal forming operations using Universal Testing Machine.
9. Study of extrusion dies and demonstration of extruding lead material.
10 Demonstration of Simulation software for metal forming operations.

16EG C03

SOFT SKILLS AND EMPLOYABILITY ENHANCEMENT LAB

Instruction	2 hours per week
Duration of Semester End Examination	2 Hours
Semester End Examination	35 Marks
CIE	15 Marks
Credits	1

Course Objectives: To help the students

1. Participate in group discussions and case studies with confidence and to make effective presentations. Also to learn the art of communication.
2. With- resume packaging, preparing and facing interviews.
3. Build an impressive personality through effective time management & goal setting, self confidence and assertiveness.
4. Understand what constitutes proper grooming and etiquette in a professional environment. Also to understand academic ethics and value systems.
5. To understand the elements of research and hone their soft skills through a live, mini project.

Course Outcomes: The students will be able to

1. Be effective communicators and participate in group discussions and case studies with confidence. Also be able to make presentations in a professional context.
2. Write resumes, prepare and face interviews confidently.
3. Be assertive and set short term and long term goals. Also learn to mange time effectively and deal with stress.
4. Make the transition smoothly from Campus to Corporate. Also use media with etiquette and know what academic ethics are.
5. To do a live, mini project by collecting and analyzing data and making oral and written presentation of the same.

Exercise 1

Group Discussion and Case studies: Dynamics of group discussion, intervention, summarizing, modulation of voice, body language, relevance, fluency and coherence.

Elements of effective presentation, Structure of presentation, Presentation tools, Body language, Creating an effective PPT.

Exercise 2

Interview Skills: Resume writing, structure and presentation, planning, defining the career objective, projecting ones strengths and skill-sets.

Interview Skills, concept and process, pre-interview planning, opening strategies, answering strategies, mock interviews.

Exercise 3

Personality Development: Effective Time Management, setting realistic goals, self confidence and assertiveness, stress management, moral values.

Exercise 4

Corporate Culture: Grooming and etiquette, communication media etiquette,

Academic ethics and integrity.

Exercise 5

Mini Project: General/Technical. Research, developing a questionnaire, data collection, analysis, written report and project seminar.

Suggested Reading:

1. Dr. Shalini Verma, *Body Language- Your Success Mantra*, S Chand, 2006.
2. Ramesh, Gopalswamy, and Mahadevan Ramesh, *The ACE of Soft Skills*, New Delhi: Pearson, 2010.
3. Covey and Stephen R, *The Habits of Highly Effective People*, New York: Free Press, 1989.