Bharati Vidyapeeth

(Deemed to be University)

College of Engineering, Pune- 411043

The Structure of the Curriculum: 2014 Course

Choice Based Credit System (CBCS)

B. TECH. MECHANICAL: SEMESTER- III & IV

Bharati Vidyapeeth
(Deemed to be University)
College of Engineering, Pune
Department of Mechanical Engineering

Vision of the Bharati Vidyapeeth (Deemed to be University) College of Engineering is:

To be a World Class Institute for Social Transformation through Dynamic Education

Missions of the Bharati Vidyapeeth (Deemed to be University) College of Engineering are:

- *To provide quality technical education with advanced equipment, qualified faculty members, infrastructure to meet needs of profession & society.*
- *To provide an environment conducive to innovation, creativity, research and entrepreneurial leadership.*
- *To practice and promote professional ethics, transparency and accountability for social community, economic & environmental conditions.*

Goals of the Bharati Vidyapeeth (Deemed to be) University College of Engineering are:

- *Recruiting experienced faculty.*
- *Organizing faculty development programs.*
- *Identifying socio-economically relevant areas & emerging technologies.*
- *Constant review &up gradation of curricula.*
- *Up gradation of laboratories, library & communication facilities.*
- *Collaboration with industry and research & development organizations.*
- *Sharing of knowledge, infra-structure and resources.*
- *Training, extension, testing and consultancy services.*
- *Promoting interdisciplinary research.*

Vision of the Mechanical Engineering Department is:

To develop, high quality Mechanical Engineers through dynamic education to meet social and global challenges.

Mission Statements of the Mechanical Engineering Department are:

- *To provide extensive theoretical and practical knowledge to the students with well-equipped laboratories and ICT tools through motivated faculty members.*
- *To inculcate aptitude for research, innovation and entrepreneurial qualities in students.*
- *To acquaint students with ethical, social and professional responsibilities to adapt to the demands of working environment.*

Program Educational Objectives (PEOs) of the B. Tech. Mechanical are:

Graduates will be able,

- *To fulfill need of industry and society with theoretical and practical knowledge.*
- *To engage in research, innovation, lifelong learning and continued professional development.*
- *To fulfill professional ethics and social responsibilities.*

PROGRAM OUTCOMES

Engineering Graduates will be able to:

1. ***Engineering knowledge****: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.*
2. ***Problem analysis****: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.*
3. ***Design/development of solutions****: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.*
4. ***Conduct investigations of complex problems****: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.*
5. ***Modern tool usage****: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.*
6. ***The engineer and society****: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.*
7. ***Environment and sustainability****: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.*
8. ***Ethics****: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.*
9. ***Individual and team work****: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.*
10. ***Communication****: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.*

11. ***Project management and finance****: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.*
12. ***Life-long learning****: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.*

Statements of Programme Specific Outcomes (PSOs)

PSO1: *Apply the knowledge of thermal, design, manufacturing engineering and computational sciences to solve Mechanical Engineering problems.*

PSO2: *Apply Mechanical Engineering principles for research, innovation and develop entrepreneurial skills.*

PSO3: *Apply concepts of mechanical engineering to asses' societal, environmental, health and safety issues with professional ethics.*

B. TECH. MECHANICAL: SEMESTER- III (2014 Course)

S.N	Course	Teaching Scheme (Contact Hrs./week)			Examination Scheme (Marks)							Total Credits		
		L	P/D	T	End Sem. Exam	Continuous Assessment					Total	TH	TW	Total
						Unit Test	Attendance	Assignments	TW/OR	TW/ PR				
C201	Solid Mechanics	4	-	-	60	20	10	10	-	-	100	4	-	4
C202	Fluid Mechanics	4	2	-	60	20	10	10	-	50	150	4	1	5
C203	Engineering Thermodynamics	3	2	-	60	20	10	10	50	-	150	3	1	4
C204	Engineering Mathematics III	3	-	-	60	20	10	10	-	-	100	3	-	3
C205	Computer Programming and Simulation	3	2	-	60	20	10	10	-	50	150	3	1	4
C206	Professional skill Development-III	4	-	-	100	-	-	-	-	-	100	4	-	4
C207	Production Practice- II #	-	2	-	-	-	-	-	-	50	50	-	1	1
	Total	21	08	0	400	100	50	50	50	150	800	21	4	25

L: Lectures, P/D: Practical/ drawing, T: Tutorial, TH: Theory, TW: Term work

Practical examination of duration 3 Hours.

B. TECH. (MECHANICAL) SEM.-IV (2014 COURSE)

S.N	Course	Teaching Scheme (Contact Hrs./week)			Examination Scheme (Marks)							Total Credits		
		L	P/D	T	End Sem Exam	Continuous Assessment					Total	TH	TW	Total
						Unit Test	Attendance	Assignments	TW/OR	TW/PR				
C208	Mechanisms of Machines*	4	2	-	60	20	10	10	50	-	150	4	1	5
C209	Manufacturing Process	3	-	-	60	20	10	10	-	-	100	3	-	3
C210	Material Science	3	2	-	60	20	10	10	-	50	150	3	1	4
C211	Turbomachinery	3	-	-	60	20	10	10	-	-	100	3	-	3
C212	Numerical. Methods. and Optimization Techniques	3	2	1	60	20	10	10	--	50	150	3	2	5
C213	Professional skill Development -IV	4	-	-	100	-		-	-	-	100	4	-	4
C214	Production Practice – III #	-	2	-	-	-	-	-	-	50	50	-	1	1
	Total	20	8	1	400	100	50	50	50	150	800	20	5	25

L: Lectures, P/D: Practical/ drawing, T: Tutorial, TH: Theory, TW: Term work

* End Semester examination of duration 4 Hours.

Practical examination of duration 3 Hours.

Total Credits Sem. III– 25

Total Credits Sem. IV – 25

Grand Total - 50

Rules for Conducting Tests

Mode of the test

- In each semester for each subject three tests shall be conducted. The schedule for the same will be declared at the commencement of academic year in the academic calendar.
- Each test shall carry 20 marks.
- University examination pattern has given weightage of 20 marks for the tests.
- To calculate these marks following procedure is followed:

  i) Out of the three tests conducted during the semester, the marks of only two tests in which the candidate has shown his/her best performance shall be considered, to decide the provisional marks in each subject.

  ii) Average marks obtained in two tests in which students have performed well, shall be considered as provisional marks obtained by the student in the tests.

  iii) If the candidate appears only for two tests conducted during the semester, he/ she will not be given benefit of the best performance in the tests.

  iv) If the candidate appears only for one test conducted during the semester, to calculate the marks obtained in the tests it will be considered that the candidate has got 0 (zero) marks in other tests.

  v) The provisional marks obtained by the candidate in class tests should reflect as proportional to theory marks. In cases of disparity of more than 15% it will be scaled down accordingly; these marks will be final marks obtained by the student. No scaling up is permitted.

  vi) If the candidate is absent for theory examination or fails in theory examination his final marks for tests of that subject will not be declared. After the candidate clears the theory, the provisional marks will be finalized as above.

- Paper pattern for tests

i) All questions will be compulsory with weightage as following

Question 1	-	7 marks
Question 2	-	7 marks
Question 3	-	6 Marks

ii) There will not be any sub-questions.

- For granting the term it is mandatory to appear for all three tests conducted in each semester.
- Roll nos. allotted to students shall be the examination nos. for the tests.

B. TECH. MECHANICAL: SEMESTER- III

Solid Mechanics

(Course Code:- C201)

Designation of Course	**Solid Mechanics**		
Teaching Scheme:	**Examination Scheme:**		**Credits Allotted**
Theory:- 03Hours/ Week Tutorial:- 01 Hours/Week	End Semester Examination	60 Marks	Theory:- 04
	Unit Test Assignments Internal Evaluation	20 Marks 10 Marks 10 Marks	
	Term Work / Oral	00 Marks	
	Total	100 Marks	04

Course Prerequisites:-	Student should have knowledge of 1. Engineering Mathematics 2. Engineering Mechanics 3. Engineering Science
Course Objectives:-	To provide the knowledge of 1. To acquire basic knowledge of stress, strain due to various types of loading. 2. To draw Shear Force and Bending Moment Diagram for transverse loading. 3. To determine Bending, Shear stress, Slope and Deflection on Beam. 4. To solve problems of Torsional shear stress for shaft and Buckling for the column. 5. To apply the concept of Principal Stresses and Theories of Failure.
Course Outcomes:-	Students should be able to 1. Understand the concept of various types of stresses and strain developed in materials and analyze stress strain. 2. Understand the concept of principal stresses and theories of failure to analyze determine stresses. 3. Understand the concept of SFD and BMD and evaluate the forces acting on components. 4. Understand the concept of Torsional, bending and axial force acting on the shaft and evaluate torsional shear stress in shaft and buckling on column. 5. Understand the concept of Bending stresses and shear stresses and analyze bending stress distribution and shear stress distribution for various cross sections of beam. 6. Understand the basic concept of Design process and apply it to design a simple machine components

Course Contents

Unit 1	**Simple stresses & strains**	**(08 Hrs)**

Revision of Concept of stresses & strains (linear, lateral, shear, thermal & volumetric). Hooke's law, Poisson's ratio, Modulus of Elasticity, Modulus of Rigidity, Bulk Modulus. Stress-strain diagrams for ductile & brittle materials. Various strengths of material- Yield strength, Ultimate tensile strength etc, Concept of 3D stress state. Interrelation between elastic constants, Proof stress & True stress & strain. Axial force diagrams, stresses and strains in determinate & indeterminate homogeneous & composite bars under concentrated loads & self weight. Temperature stresses in simple & composite members. Strain energy due to axial load (gradual, sudden & impact), strain energy due to self weight.

Unit 2	Principal stresses & strains	(08 Hrs)

Normal & shear stresses on any oblique plane. Concept of principal planes derivation of expression for principal stresses & maximum shear stress, position of principal planes & planes of maximum shear, graphical solution using Mohr's circle of stresses, combined effect of axial force, bending moment & torsional moment on circular shafts (solid as well as hollow)

Theories of elastic failure: Maximum principal stress theory, maximum shear stress theory, maximum distortion energy theory, maximum strain theory – their applications & limitations.

Unit 3	Shear Force & Bending Moment Diagrams	(08 Hrs)

Shear forces & bending moments of determinate beams due to concentrated loads, uniformly distributed loads, uniformly varying loads & couples, relation between SF & BM diagrams for cantilevers, Simply supported beam. Maximum bending movement & positions of points of contra flexure, construction of loading diagrams & BMD from SFD & construction of loading Diagram & SFD from BMD. Slope & deflection of beams - relation between BM & slope, slope & deflection of determinate beams, double integration method (Macaulay's method), derivation
of formula for slope & deflection for standard cases

Unit 4	Torsion and Buckling of columns	(08 Hrs)

Stresses, strain & deformations in determinate shafts of solid & hollow, homogeneous & composite circular cross section subjected to twisting moment, derivation of torsion equation, stresses due to combined torsion, bending & axial force on shafts .Concept of buckling of columns, derivation of Euler's formula for buckling load for column with hinged ends, concept of equivalent length for various end conditions. Limitations of Euler's formula, Rankine's formula, safe load on columns

Unit 5	Stresses in Machine Elements	(08 Hrs)

Bending stresses: Theory of simple bending, assumptions, derivation of flexural formula, second moment of area of common cross sections(rectangular, I,T,C) with respective centroidal & parallel axes, bending stress distribution diagrams, moment of resistance & section modulus calculations.

Shear stresses: Concept, derivation of shear stress distribution formula, shear stress distribution diagrams for common symmetrical sections, maximum and average shears stresses, shear connection between flange & web

Unit 6	Design Process	(08 Hrs)

Machine Design, Traditional design methods, Basic procedure of Machine Design, Forming Design specifications, Design for:- 1) functional requirement, 2) customer orientation 3) Safety requirement & 4) Analysis for use.

Requisites of design engineer, Design of machine elements, Sources of Design data, Use of Design data book, Use of standards in design, Selection of preferred sizes, Design Synthesis, Creativity in design. Use of internet for gathering information & Consideration of energy requirement, product life cycle & design for environment.

Design of Simple Machine parts:

Factor of safety, Service factor, Design of simple machine parts - Cotter joint, Knuckle joint and Levers, Eccentric loading , Stresses in curved beams (for circular cross-section only).

Assignments:

1. Minimum five to six theory questions on simple stresses and strains.
2. Minimum five to six problems on simple stresses and strains
3. Minimum five to six theory questions of principle stresses and strains.
4. Minimum five to six problems of principle stresses and strains.
5. Minimum five to six problems on shear force and bending moment diagrams.
6. Minimum five to six theory questions on shear force and bending moment diagrams.
7. Minimum five theory questions on torsion and deflection of beam.
8. Minimum five problems on torsion and deflection of beam.

9. Minimum five to six problems on bending stresses and shear stresses.
10. Minimum five theory questions on bending stresses and shear stresses.
11. Minimum five to six problems on design of simple machine parts.
12. Minimum five to six theory on design of simple machine parts.

Text Books/ Reference Books

1. Timoshenko & Young, Engineering Mechanics, Tata McGraw Hill Book Publishing co. Ltd. 1981.
2. James Gere, Mechanics of Materials, Thomson Learning
3. S Ramamrutham, Strength of Materials
4. V. B. Bhandari, Design of Machine Elements, Tata McGraw Hill Publication
5. J. E. Shigley, Mechanical Engineering Design, McGraw Hill

Unit Tests

Unit Test-I	Unit-I,II, III
Unit Test-II	Unit-IV, V, VI

Fluid Mechanics

(Course Code :- C 202)

Designation of Course	**Fluid Mechanics**		
Teaching Scheme:	**Examination Scheme:**		**Credits Allotted**
Theory:- 04Hours/ Week Practical:- 02 Hours/Week	End Semester Examination	60 Marks	Theory:- 03
	Unit Test	20 Marks	
	Assignments	10 Marks	
	Internal Evaluation	10 Marks	
	Term Work / Oral	50 Marks	Practical:- 01
	Total	150 Marks	04

Course Prerequisites:-	Student should have knowledge of 1. Basic knowledge of Fundamentals of Mechanical Engineering. 2. Basic knowledge of Physics and Engineering Mechanics. 3. Basic knowledge of Calculas.
Course Objectives:-	To provide the knowledge of 1. To provide knowledge of fluid properties and hydrostatic law 2. To teach about fluid kinematics and dynamics. 3. To provide knowledge of laminar and turbulent fluid flows 4. To explain about flow through pipes, flow over immersed bodies and dimensional analysis.
Course Outcomes:-	Students should be able to 1. **understand** the concepts of fluid kinematics and **analyze** related phenomena. 2. **understand** the concepts of fluid statics; and **analyze** related phenomena. 3. **understand** the concepts of fluid dynamics; and **analyze** related phenomena. 4. **understand** the concepts of laminar fluid flows and flow around immersed bodies; and also **analyze** related phenomena. 5. **understand** the concepts of fluid flow through pipes; and also **analyze** head losses through pipes. 6. **understand** the concepts of turbulent fluid flows, boundary layer theory and dimensional analysis; and also **analyze** related phenomena.

Course Contents

Unit 1	**Fluid Kinematics:**	**(08 Hrs)**
Types of flow- steady, unsteady, uniform, non-uniform, laminar, turbulent, One, Two and Three dimensional, compressible, incompressible, rotational, Irrotational. Stream lines, path lines, streak lines, velocity components, convective and local acceleration, velocity potential, stream function, continuity equation in Cartesian co-ordinates, flow net.		
Unit 2	**Fluid Statics:**	**(08 Hrs)**
H Hydrostatic law, Pascal's law, Pressure at a point, Total Pressure, Centre of pressure, Liquid pressure on a plane(Horizontal, Vertical, Inclined) & Curved surfaces, Archimedes Principle, Buoyancy and stability of floating and submerged bodies, Metacentric height.		
Unit 3	**Fluid Dynamics:**	**(08 Hrs)**
Introduction to Navier-Stoke's Equation, Euler equation of motion along a stream line, Bernoulli's equation, application of Bernoulli's equation to Pitot tube, Venturimeter, Orifices, Orifice meter, Triangular Notch & Rectangular Notch .(Without considering Velocity of Approach)		

Unit 4	Laminar Flow & Flow around Immersed Bodies:	(08 Hrs)
Definition, relation between pressure and shear stresses, laminar flow through round pipe, fixed parallel plates. Introduction to CFD Methodology (Elementary Treatment).Lift and Drag, Classification of Drag, Flow around circular cylinder and Aerofoil, Development of lift on Aerofoil.		
Unit 5	**Flow through Pipes:**	**(08 Hrs)**
TEL, HGL , Energy losses through pipe, Darcy-Weisbach equation, Moody diagram, Minor losses in pipes, pipes in series and parallel, Syphon, Transmission of power, Water hammer in pipes ,		
Unit 6	**Turbulent Flow, Boundary Layer** & Dimensional Analysis**:**	**(08 Hrs)**
Turbulent Flow, Velocity Distribution, Development of Boundary Layer on a flat plate, Laminar and Turbulent Boundary Layers, Laminar sub layer, Separation of Boundary Layer and Methods of Controlling. Dimensions of physical quantities, dimensional homogeneity, Buckingham pi Theorem, Important dimensionless numbers, Model analysis (Reynolds, Froude and Mach).		

Assignment

1. At least Five theory questions on Fluid Kinematics.
2. At least theory questions on Fluid Statics.
3. At least Five theory questions on Fluid Dynamics.
4. At least Five theory questions on flow and flow around immersedbodies.
5. At least Five theory questions on flow though Pipes.
6. At least Five theory questions on turbulent flow.
7. At least Five numerical questions on Fluid Kinematics.
8. At least Five numerical questions on Fluid Statics.
9. At least Five numerical questions on Fluid Dynamics.
10. At least Five numerical questions on flow and flow around immersed bodies.
11. At least Five numerical questions on flow though Pipes.
12. At least Five numerical questions on turbulent flow.

Text Books/ Reference Books

1. Dr. P.N. Modi and Dr. S.M. Seth, "Hydraulics and Fluid Mechanics including Hydraulic Machines", Standard
2. Book House.
3. Dr. R.K. Bansal, "Fluid Mechanics and Hydraulic Machines – l", Laxmi Publication Pvt. Ltd., New Delhi.
4. Streeter V. L. and Wylie E. B. Fluid Mechanics McGraw Hill International Book Co.
5. Garde R. J. and Mirajgaonkar,Engineering Fluid Mechanics, Nem Chand & Bros, Roorkee, SCITECH, Publication
6. (India) Pvt. Ltd.
7. Cengel & Cimbla Fluid Mechanics, TATA McGraw-Hill.
8. Irving Shames, "Mechanics of Fluid", McGraw Hill Publication.

Unit Tests-

Unit Test-I	Unit-I, II, III
Unit Test-II	Unit- IV, V, VI

Engineering Thermodynamics
(Course Code :- C 203)

Designation of Course	**Engineering Thermodynamics**		
Teaching Scheme:	**Examination Scheme:**		**Credits Allotted**
Theory:- 04Hours/ Week Practical:- 02 Hours/Week	End Semester Examination	60 Marks	Theory:- 03
	Unit Test Assignments Internal Evaluation	20 Marks 10 Marks 10 Marks	
	Term Work / Oral	50 Marks	Practical:- 01
	Total	150 Marks	04

Course Prerequisites:-	Student should have knowledge of 1. Fundamentals of Mechanical Engineering 2. Higher Secondary Physics 3. Engineering Mathematics
Course Objectives:-	To provide the knowledge of 1. laws of thermodynamics and their applications 2. steam generators and their performance analaysis. 3. reciprocating and rotary compressors. 4. fuels, combustion and introduce availability.
Course Outcomes:-	Students should be able to 1. **understand** concepts of second law of thermodynamics and entropy 2. **understand** construction and working of steam generators; and **analyze** their performance. 3. **apply** the knowledge of properties of steam for different vapour processes and power cycles. 4. **understand** construction and working of reciprocating air compressors and **analyze** their performance. 5. **understand** operations of rotary air compressors and **analyze** their performance. 6. **understand** the concept of availability and **analyze** exhaust gas composition.

Course Contents

Unit 1	**Second Law of Thermodynamic and Entropy:**	**(06 Hrs)**
Second Law of Thermodynamics: Limitations of first law of thermodynamics, heat engine, refrigerator and heat pump, Kelvin-Planck's statement & clausius statement, equivalence of Kelvin-Planck's and clausius statements, perpetual motion machine of second kind, carnot cycle & carnot heat engine. Entropy: Entropy as a property, second law analysis for entropy, clausius inequality, principle of increase of entropy, irreversibility		
Unit 2	**Steam Generators:**	**(06 Hrs)**
Classification, constructional details of process and power boiler, boiler mountings and accessories, equivalent evaporation, boiler efficiency, energy balance, boiler controls, boiler draught.		
Unit 3	**Ideal Gas and Properties of Steam and Vapour Power Cycle:**	**(06 Hrs)**
Ideal Gas definition, Gas Laws: Boyle's law, Charle's law, Avagadro's Law, Equation of State, Specific Gas constant and Universal Gas constant, Ideal gas processes- on P-V and T-S diagrams, Formation of steam, Phase changes, Properties of steam, Use of Steam Tables, Study of P-V, T-S and Mollier diagram for steam,. Non flow and steady flow vapor processes, work transfer & heat transfer, use of P-V, T-S, H-S diagrams for steam, determination of dryness fraction, and study of calorimeters. Vapour Power Cycle: Carnot cycle using steam, ideal rankine cycle, calculation of thermal efficiency, specific steam consumption, work ratio, comparison of carnot and rankine cycle, effect of superheat.		

Unit 4	Single Stage and Multi stage Reciprocating Air Compressor:	(06 Hrs)
Uses of compressed air, classification, constructional details of single stage compressor, computation of work done, isothermal work done, isothermal efficiency, effect of clearance, volumetric efficiency, FAD, theoretical and actual indicator diagrams, method of improving volumetric efficiency. Need of multi staging, multi stage compressor, work done, volumetric efficiency, condition for maximum efficiency, intercooling, actual indicator diagram.		
Unit 5	**Rotary Compressor:**	**(06 Hrs)**
Introduction, classification and working principles of different types of compressors, comparison between reciprocating and rotary compressors, positive displacement and rotodynamic compressors, static and total head, work done efficiencies, surging, and choking, stalling, characteristics curves for rotodynamic compressors. selection of compressors for various applications.		
Unit 6	**Fuels and Combustion and Availability:**	**(06 Hrs)**
Mass fraction, mole fraction, combustion equation, theoretical air , excess and deficient air, stoichiometric and actual air to fuel ratio, analysis of products of combustion, gravimetric and volumetric analysis and their conversions, method to determine flue gas analysis - CO, CO2, O2, HC, NOx, smoke. Availability: High and low grade energy, available and unavailable energy, loss of available energy due to heat transfer through a finite temperature difference.		

Assignments

1. At least five theory questions based on Second law of thermodynamic.
2. At least five numerical questions based on Second law of thermodynamic.
3. At least five theory questions based on cannot cycle& cannot heat engine.
4. At least five theory questions based on boiler mounting & accessories. boiler mounting & accessories.
5. At least five numerical questions based on equivalent evaporation and boiler efficiency.
6. At least five theory questions based on Ideal gas and properties of steam.
7. At least five numerical questions based on properties of steam.
8. At least five theory questions based on single stage & multistage reciprocating Air compressor.
9. At least five numerical questions based on reciprocating air compressor.
10. At least five theory questions based on rotary compressor.
11. At least five numerical questions based on rotary compressor.
12. At least five theory questions based on fuels and combustion.
13. At least five theory questions based on availability.

Term work

1. Determination of calorific value using bomb calorimeter.
2. Demonstration of exhaust gas analysis by using any commercially available test rig.
3. Test on reciprocating air compressor to determine volumetric efficiency, isothermal efficiency and FAD.
4. Determination of dryness fraction using any commercial available test rig.
5. Study of boiler mounting and accessories
6. Study of package boiler / modern boiler
7. Report on visit to any process industry, which uses boiler.
8. Performance test on rotary air compressor/ blower.
9. Trial on boiler to determine boiler efficiency, equivalent evaporation and energy balance sheet.
10. Study of rotary type positive displacement compressor.

Text Books

1. P. K. Nag, Engineering Thermodynamics, Tata McGraw Hill Publications
2. P. L. Ballany, Thermal Engineering, Khanna Publications
3. V. P. Vasandani and D. S. Kumar, Heat Engineering Metropolitan book Company, New Delhi
4. R.K.Rajput, Engineering Thermodynamics, EVSS Thermo Laxmi Publications

5. Y. Cengel & Boles, Thermodynamics -An engineering approach, Tata McGraw Hill Publications
6. Kothandarman & Domkundwar, Thermodynamics & Heat Engines
7. Rayner Joel, Engineering Thermodynamics, ELBS Longman
8. Hawkins G. A., "Engineering Thermodynamics", John Wiley and Sons.

Unit Tests-

Unit Test-I	Unit-I,II ,III
Unit Test-II	Unit-IV,V,VI

Engineering Mathematics -III
(Course Code :- C 204)

Designation of Course	**Engineering Mathematics -III**		
Teaching Scheme:	**Examination Scheme:**		**Credits Allotted**
Theory:- 03 Hours/ Week	End Semester Examination	60 Marks	Theory:- 03
	Unit Test	20 Marks	
	Assignments	10 Marks	
	Internal Evaluation	10 Marks	
	Total	100 Marks	03

Course Prerequisites:-	Student should have knowledge of 1. Student should have Basic Knowledge of differential and Integral calculus 2. Student should have Basic Knowledge of statistics and Probability
Course Objectives:-	To provide the knowledge of 1. Effectively formulate mathematical model using PDE 2. Analyze numerical data using statistical methods 3. Obtain z- score of normal distribution
Course Outcomes:-	Students should be able to 1. **Understand** the mathematical modeling of systems using differential equations and ability to solve linear differential equations with constant coefficient. imaginary points using argand diagram. 2. **Understand** the concepts of Laplase Transform and **Apply** to formulate mathematical model using PDE. 3. **Understand** various forms of Partial differential equation 4. **Understand** Statistical methods and **Apply** to analyze the numerical data 5. **Understand** the concept of Correlation and Regression coefficient. 6. **Understand** the concept of Normal distribution

Course Contents

Unit 1	**Linear Differential Equations (LDE):**	**(06 Hrs)**
LDE with constant coefficients, Method of variation of parameters, Homogeneous Equations, Cauchy's and Legendre's DE. Simultaneous & Symmetric Simultaneous DE. Application to mechanical systems.		
Unit 2	**Transforms:**	**(06 Hrs)**
Laplace Transform (**LT**): LT of standard functions, properties and theorems, Inverse LT, method of finding Inverse LT , Application of LT to solve LDE. Fourier Transform (**FT**): Fourier Integral theorem, Fourier transform Fourier Sine &Cosine transform, Inverse Fourier Transform.		
Unit 3	**Partial Differential Equations (PDE):**	**(06 Hrs)**
Basic concepts, modeling: Vibrating String, Wave equation. Method of separation of variables, Use of Fourier series, Heat equation: one and two dimensional heat flow equations, Solution by Fourier Transforms, modeling of two dimensional wave equation		
Unit 4	**Measures of central value:**	**(06 Hrs)**
Arithmetic mean , median and mode, geometric mean and harmonic mean, dispersion, mean deviation, standard deviation, skeweness, Moments and kurtosis.		

Unit 5	Correlation and Regression:	(06 Hrs)
Significance of the study of correlation, types of correlation, coefficient of correlation, difference between correlation and regression . Regression euations, standard error of estimate.		
Unit 6	**Probability and Distribution :**	**(06 Hrs)**
Basics of probability, conditional probability, bayes theorem, mathematical expectations, random variable and Binomial, Poisson , normal probability distribution. Testing of hypothesis- Z test, chi square test and goodness of fit, F test.		

Assignment

1. At least Five numerical questions on Linear Differential Equations
2. At least Five numerical questions on Transforms.
3. At least Five numerical questions on Partial Differential Equations
4. At least Five numerical questions on Measures of central value
5. At least Five numerical questions on Correlation and Regression
6. At least Five numerical questions on Probability and Distribution

Text Books

1. Advanced Engineering Mathematics by Peter V. O'Neil (Cengage Learning).
2. Advanced Engineering Mathematics by Erwin Kreyszig (Wiley Eastern Ltd.).
3. Engineering Mathematics by B.V. Raman (Tata McGraw-Hill).
4. Advanced Engineering Mathematics, 2e, by M. D. Greenberg (Pearson Education).
5. S. P. Gupta: statistical methods- schand and sons.
6. Higher Engineering Mathematics by B. S. Grewal (Khanna Publication, Delhi).
7. Applied Mathematics (Volumes I and II,III) by P. N. Wartikar& J. N. Wartikar (Pune VidyarthiGrihaPrakashan, Pune).

Unit Test

Unit Test-I	Unit-I,II ,III
Unit Test-II	Unit-IV,V,VI

Computer Programming & Simulation
(Course Code :- C 205)

Designation of Course	**Computer Programming & Simulation**		
Teaching Scheme:	**Examination Scheme:**		**Credits Allotted**
Theory:- 03 Hours/ Week Practical:- 02 Hours / Week	End Semester Examination	60 Marks	Theory : 03
	Unit Test Assignments Internal Evaluation	20 Marks 10 Marks 10 Marks	
	Term Work / Oral	50 Marks	Practical:-01
	Total	150 Marks	04

Course Prerequisites:-	Student should have knowledge of 1. Engineering Mathematics II
Course Objectives:-	To provide the knowledge of 1. To provide the fundamental knowledge of modeling, system and simulation 2. To provide the knowledge of monte carlo methods of simulation 3. To provide knowledge of random variable and distributions 4. To provide knowledge of time and event based simulation with real life applications
Course Outcomes:-	Students should be able to 1. **Understand** the fundamental knowledge of Programming, modeling, system and simulation 2. **Understand** monte carlo methods of simulation and **apply** them in real life problems 3. **Understand** concept of random variable, distributions and **apply** them in probalistic engineering models 4. **Understand** concepts of time based simulation and **apply** them in real life problems 5. **Understand** concepts of event based simulation and **apply** them in real life problems 6. **Understand** concept of simulation experiments

Course Contents

Unit 1	**Concept of System and Type of Models**	**(08 Hrs)**
Physical model, Mathematical model, Types of mathematical model, Dynamic Versus Static Models, Continuous-Time Versus Discrete-Time, Dynamic Models, Quantitative Versus Qualitative Models, Mechanical system modeling examples.		
Unit 2	**Concept of Simulation**	**(08 Hrs)**
Simulation Basics, When Simulation Is the Appropriate Tool, when Simulation Is Not Appropriate, Advantages and Disadvantages of Simulation, Areas of Application, Steps in a Simulation Study Simulation and analytical methods, Basic nature of simulation, The simulation process, Types of system simulation, Generation of random numbers .Monte Carlo Simulation.		
Unit 3	**Probability Used in Simulation**	**(08 Hrs)**
Basic Probability Concepts, Discrete Random Variable, Expected Value and Variance of a Discrete Random Variable, Measure of Probability Function, Continuous Random Variable, Exponential Distribution, Mean and Variance of Continuous Distribution, Normal Distribution.		
Unit 4	**Continuous an Discrete Systems Simulation**	**(08 Hrs)**
Introduction, Simulation of Pure pursuit problem, exponentional growth model, simulation of water reservoir system, Trajectory simulation, suspension system, simulation of pendulum.		

Unit 5	Simulation of Queuing Systems and Inventory Systems and inventory systems	(08 Hrs)
Discrete Simulation, Continuous System Simulation. Simulation of Queuing Systems, Inventory Control Models		
Unit 6	**Design of Simulation Experiments**	**(08 Hrs)**
Introduction, development of simulation experiments, principles of verification, validation and accreditation, Simulation experimentation, classical experimental design, validation of simulation experiments, evaluation of simulation experiments. Simulation Languages		

Term work

Following assignment using MATLAB

1. Creating a One-Dimensional Array (Row / Column Vector) Creating a Two-Dimensional Array
2. Performing matrix manipulations – Concatenating, Indexing, and Sorting Normal Distribution
3. Simulation of water reservoir system
4. Trajectory simulation
5. Suspension system
6. Simulation of pendulum
7. Simulation of any one Discrete Simulation, Continuous System Simulation, Simulation of Queuing Systems, Inventory Control Models.

Assignments

1. At least five theory questions on basics of simulation.
2. At least five theory questions on Monte-Carlo simulation.
3. At least five theory questions on various distributions.
4. At least five simulation questions on various continuous models.
5. At least five simulation questions on various discrete models.
6. At least five theory questions on advanced simulation and simulation language.
7. At least five numerical questions on Monte-Carlo simulation.
8. At least five numerical questions on various distribution
9. At least five numerical questions on various continuous models.
10. At least five numerical questions on various discrete models.
11. At least five MATLAB programs on continuous models.
12. At least five MATLAB programs on discrete models.

Text Books/ Reference Books

1. Robert E. Shannon, "System Simulation The art and science", Prentice Hall, New Jersey, 1995.
2. D.S. Hira, "System Simulation", S. Chand and company Ltd, New Delhi, 2001.
3. Geoffrey Gordon, System Simulation; Prentice Hall.
4. Robert E. Shannon ; System Simulation: The Art and Science ;Prentice Hall
5. J. Schwarzenbach and K.F. Gill Edward Arnold; System Modelling and Control
6. M Close and Dean K. Frederick; Modeling and Analysis of Dynamic Systems ;Houghton Mifflin

Unit Tests-

Unit Test-I	Unit-I,II
Unit Test-II	Unit-III,IV

Professional Skills Development-III
(Course Code :- C 206)

Designation of Course	**Professional Skills Development-III**		
Teaching Scheme:	**Examination Scheme:**		**Credits Allotted**
Theory:- 04 Hours/ Week	End Semester Examination	100 Marks	Theory : 04
	Unit Test Assignments Internal Evaluation	-- Marks -- Marks -- Marks	
	Term Work / Oral	-- Marks	
	Total	100 Marks	04

Course Prerequisites:-	Student should have knowledge of 1. Knowledge of basic Math and reasoning 2. Awareness of phrasal verbs 3. Basic knowledge of writing techniques taught to them in the earliear semester 4. Basic knowledge of self awareness 5. Awareness about leadership skills and presentation skills
Course Objectives:-	To provide the knowledge of 1. To develop students' skills in aptitude and reasoning whereby enhancing employability skills. 2. To flourish the skills of learning advance vocabulary and use them for professional communication 3. To promote grooming skills in graduates and make them competent to excel in business communication and presentation
Course Outcomes:-	Students should able to understand 1. **Understand** short tricks of the aptitude and reasoning and **apply** them in recruitment and competitive examinations 2. **Understand** the advance idioms, phrases and **apply** them to present themselves with finesse for corporate ventures 3. **Understand** the process conversion of thoughts and ideas into written communication in an effective coherent and logical way 4. **Understand** the self appraisal process and **apply** the techniques of SWOT to accelerate conversion of weaknesses into strengths 5. **Understand** the kinds of leaderships and **apply** them to groom themselves into potential leader 6. **Understand** the trick and techniques of power point presentation and **apply** them in designing an effective business presentation

Course Contents

Unit 1	**Aptitude (Maths, Logical Reasoning, English)**	**(18 Hrs)**

- Maths
  - Enjoy maths + Number system
  - Number system
  - Percentage, profit and loss
- Logical Reasoning
  - Coding, Decoding, Number series,
  - Blood relation Directions, cubes & dices

• English ▪ Vocabulary-1 ▪ Confusing words-1(Homonyms)		
Unit 2	**Essential Grammar - III**	**(06 Hrs)**
• Idioms and phrases • Usage of Idioms & phrases in daily conversation • Activities • Academic word list- Words to be used in business communication		
Unit 3	**Written Communication- II**	**(04 Hrs)**
• Essay writing • Mnemonics to develop ideas and write essays • Structure of essays • Technical writing • Report writing		
Unit 4	**SWOT Analysis**	**(06 Hrs)**
• Introduction to SWOT • Importance to SWOT • Individual & Organizational SWOT Analysis • Identifying strengths, weaknesses, threats & opportunities • Short term goals& Long term goals, Career planning		
Unit 5	**Interpersonal Skills - III**	**(04 Hrs)**
• Introduction to leadership skills • Importance of leadership skills • Types of leadership skills • Are leaders born or made?		
Unit 6	**Presentation Skills**	**(04 Hrs)**
• Introduction to PowerPoint presentation • Structure & flow of presentation • Importance of body language • Presentation by students-evaluation& feedback by trainers		

Text Books/ Reference Books

1. **APAART:** Verbal Ability.
2. **APAART:** Logical Reasoning.
3. **APAART:** Quantitative Aptitude.
4. **APAART:** Speak Well 1 (English Language and Communication).
5. **APAART:** Speak Well 2 (Soft Skills).
6. **APAART:** Verbal Ability

Production Practice-II
(Course Code :- C 207)

Designation of Course	**Production Practice-II**		
Teaching Scheme:	**Examination Scheme:**		**Credits Allotted**
Practical:- 4 Hours/ Week	End Semester Examination	-- Marks	
	Unit Test Assignments Internal Evaluation	-- Marks -- Marks -- Marks	
	Term Work	50 Marks	Practical:- 01
	Total	50 Marks	01

Course Prerequisites:-	Student should have knowledge of 1. Basic knowledge of Engineering Graphics 2. Basic knowledge of workshop Technology and Production practice I
Course Objectives:-	To provide the knowledge of 6. To acquire the skills of TIG/MIG and arc welding process. 7. To acquire the skills of pattern making. 8. To acquire the skills of sand testing. 9. To acquire the skill of sand moulding.
Course Outcomes:-	Students should able to understand 1. **Understand** the TIG, MIG and arc welding processes and **apply** for welding joints. 2. **Understand** the pattern making operations to **create** the patterns using wood turning operation. 3. **Understand** the different core making practices and **apply** them in pattern making. 4. **Understand** the properties of sand by caring out sand testing and **apply** them for sand molding processes. 5. **Understand** the sand moulding processes and **create** a sand mould. 6. Apply the moulding process to **create** the sand casting.

Course Contents

Term Work
Each candidate shall be required to complete and submit the following jobs:

1. Welding-TIG / MIG OR Arc Welding (One Job)
2. Pattern making: A solid pattern consisting of wood turning or a core box. (One Job)
It should follow the colour code in pattern making..
3.Sand Testing.(Any Two)
3.Sand Moulding.. (One Job)

Note
Practical examination of 3 hours duration based on above term work will be
Conducted at the end of semester.

B. TECH. MECHANICAL: SEMESTER- IV

Mechanisms of Machines
(Course Code:- C208)

Designation of Course	**Mechanisms OF Machines**		
Teaching Scheme:	**Examination Scheme:**		**Credits Allotted**
Theory:- 04Hours/ Week Practical:- 02 Hours/Week	End Semester Examination	60 Marks	Theory: 04 Practical: 01
	Unit Test	20 Marks	
	Assignments	10 Marks	
	Internal Evaluation	10 Marks	
	Term Work / Oral	50 Marks	
	Total	150 Marks	05

Course Prerequisites:-	Student should have knowledge of 1. Engineering Mathematics 2. Engineering Mechanics
	To provide the knowledge of 1. To make the students conversant with kinematic analysis of mechanisms applied to real life and industrial applications. 2. To give basic knowledge on kinematic, kinetic and dynamic design of machinery. 3. To develop the competency to analyze the velocity and acceleration in mechanisms using analytical and graphical approach. 4. To develop the skill to propose and synthesize the mechanisms using graphical and analytical technique.
Course Outcomes:-	Students should be able to 1. **Understand** the concept of kinematics, Kinematic pair, kinematic chains, mechanisms and inversions and Evaluate DOF. 2. **Understand** the concept velocity and acceleration of any planar mechanism and **Analyze** it by using relative velocity or acceleration method and ICR method. 3. **Understand** the concept of velocity and acceleration and Analyze it by using Coriolis component and Klein's construction. 4. **Understand** the concept kinematic analysis of mechanisms and **evaluate** it by using analytical method. 5. **Understand** the fundamental concept of synthesis of linkages and **Analyze** by using the graphical and analytical techniques. 6. **Understand** the basic concept of static and dynamic force analysis and **Evaluate** forces acting on reciprocating engine.

Course Contents

Unit 1	**Basic Kinematics:**	**(08 Hrs)**
Kinematic link, Types of links, Kinematic pair, Types of constrained motions, Types of Kinematic pairs, Kinematic chain, Mechanism, Machine, Degree of freedom (Mobility), Kutzbach criterion, Grubler's criterion. Four bar chain and its inversions, Grashoff's law, Slider crank chain and its inversions, Double slider crank chain and its inversions. Pantograph, Steering gear mechanisms: Condition for correct steering, Davis steering gear mechanism, Ackermann steering gear mechanism.		

Unit 2	Velocity and Acceleration Analysis of Mechanisms: Graphical Methods-I	(08 Hrs)
Relative velocity method: Relative velocity of a point on a link, Angular velocity of a link, Sliding velocity, Velocity polygons for simple mechanisms. Relative acceleration method: Relative acceleration of a point on a link, Angular acceleration of a link, Acceleration polygons for simple mechanisms. Instantaneous center of rotation (ICR) method: Definition of ICR, Types of ICRs, Methods of locating ICRs, Kennedy's Theorem, Body and space centrode.		
Unit 3	**Velocity and Acceleration Analysis of Mechanisms: Graphical Methods-II**	**(08 Hrs)**
Velocity and acceleration diagrams for the mechanisms involving Coriolis component of acceleration. Klein's construction		
Unit 4	**Kinematic Analysis of Mechanisms : Analytical Methods**	**(08 Hrs)**
Analytical method for displacement, velocity and acceleration analysis of slider cranks mechanism. Position analysis of links with vector and complex algebra methods, Loop closure equation, Chace solution, Velocity and acceleration analysis of four bar and slider crank mechanisms using vector and complex algebra methods. Hooke's joint, Double Hooke's joint.		
Unit 5	**Introduction to Synthesis of Linkages**	**(08 Hrs)**
Steps in synthesis process: Type, number and dimensional synthesis.Tasks of Kinematic synthesis: Path, function and motion generation (Body guidance). Precision Positions, Chebychev spacing, Mechanical and structural errors, Branch defect and order defect, Crank Rocker mechanisms. Graphical synthesis: Two and three position synthesis using relative pole method and inversion method for single slider crank and four bar mechanism, three position motion synthesis of four bar Mechanism. Analytical synthesis: Derivation of Freudenstein's equation, three position function generation using Freudenstein's equation.		
Unit 6	**Static and Dynamic Force Analysis**	**(08 Hrs)**
Theory and analysis of Compound Pendulum, Concept of equivalent length of simple pendulum, bifilar suspension, Trifilar suspension. Dynamics of reciprocating engines: Two mass statically and dynamically equivalent system, correction couple, static and dynamic force analysis of reciprocating engine mechanism (analytical method only), Crank shaft torque, Introduction to T-θ diagram.		

Assignments

1 At least five theory questions on Basic Kinematics.
2 At least five theory questions on Steering gear mechanism.
3 At least five problems on velocity and Acceleration analysis of Mechanism: Graphical Method –I.
4 At least five problems based on Instantaneous center of rotation (ICR) method.
5 At least five problems based on velocity and acceleration diagrams for the mechanisms involving Coriolis component of acceleration
6 At least five problems on velocity and Acceleration analysis of Mechanism: Graphical Method –II.
7 At least five problems on Velocity and acceleration analysis of four bar and slider crank mechanisms using vector and complex algebra methods
8 At least five problems on kinematic analysis of mechanisms: - Analytical Method.
9 At least five problems on introduction to synthesis of linkages.
10 At least five theory questions on introduction to synthesis of linkages.
11 At least five problems on static force analysis and dynamic force analysis.
12 At least five theory questions based on T-θ diagram.

Term work

Any two of the following experiments shall be performed

1. To determine the mass moment of inertia of a connecting rod using a compound pendulum method.
2. To determine the mass moment of inertia of a flat bar using bifilar suspension method.
3. To determine the angular displacements of input and output shafts of single Hooke's joint for different shaft angles and verification of the results using computer programme.

Drawing Assignments (4 sheets of ½ imperial size)

1. To study and draw (any four) mechanisms for practical applications such as: Straight line mechanisms like Peaucellier Mechanism, Hart's Mechanism, Watt's Mechanism and Grasshopper Mechanism etc., for various link positions.
2. Two problems on velocity and acceleration analysis using Graphical methods i.e., polygons or ICR (Based on Unit 2).
3. Two problems on velocity and acceleration analysis using Graphical methods i.e., polygons involving Coriolis component or Klein's construction (Based on Unit 3).
4. Two problems based on graphical three position function generation, using either relative pole method or inversion method.

Text Books/ Reference Books

1. Rattan S. S., "Theory of Machines", Tata McGraw Hill.
2. Ballaney P. L., "Theory of Machines", Khanna Publishers, Delhi.
3. Thomas Bevan, "Theory of Machines", CBS Publishers & Distributors, Delhi.
4. Shigley J.E. and Uicker J.J., "Theory of Machines and Mechanisms", McGraw Hill, Inc.
5. Ghosh Amitabh and Malik A.K., "Theory of Machines and Mechanisms", East-west Press.
6. Groover M.P., "Industrial Robotics", McGraw Hill International.
7. Hall A.S., "Kinematics and Linkages Design", Prentice-Hall.
8. Hartenberg and Denavit, " Kinematic Analysis and Synthesis of Mechanisms".
9. Erdman, A. G. & Sandor, G.N., "Mechanism design, Analysis and synthesis", Vol 1, Prentice –Hall of India.
10. Erdman, A. G. & Sandor, G.N., "Advance Mechanism design", Vol 2, Prentice –Hall of India.

Unit Tests-

Unit Test-I	Unit-I,II, III
Unit Test-II	Unit-IV, V, VI

Manufacturing Processes
(Course Code:- C 209)

Designation of Course	**Manufacturing Processes**		
Teaching Scheme:	**Examination Scheme:**		**Credits Allotted**
Theory:- -03- Hours/ Week	End Semester Examination	60 Marks	Theory:-03
	Unit Test	20 Marks	
	Assignments	10 Marks	
	Internal Evaluation	10 Marks	
	Term Work / Oral	-- Marks	
	Total	100 Marks	03

Course Prerequisites:-	Student should have knowledge of 1. Basic knowledge of manufacturing Processes 2. Basic Knowledge of Joining and Castings 3. Basic knowledge of Materials
Course Objective:-	To provide the knowledge of 1. To acquire knowledge of sheet metal working processes and introduce to use of jigs and fixtures 2. To introduce Various non-conventional machining processes and concepts of CNC programming and robotic applications. 3. To acquire knowledge of heat treatment of steels, alloys and introduce to the procedure of processing composites
Course Outcomes:-	Students should be able to 1. **Understand** the different press working operations, Dies and **evaluate** process parameters in manufacturing of sheet metal components 2. **Understand** the design concepts of Jigs and Fixtures and **apply** for the manufacturing processes . 3. **Understand** the different non-conventional machining processes and **apply** in manufacturing of components. 4. **Understand** the Concepts of CNC programming and robotic applications in manufacturing industries and **apply** for multidisciplinary applications. 5. **Understand** the different heat treatment processes and **apply** it for engineering applications **6. Understand** the stages of powder manufacturing techniques, composite materials and **apply** for manufacturing components.

Course Contents

Unit 1	**Expendable mould and permanent mould casting processes:**	**(06 Hrs)**
Sand casting, Types of pattern materials, pattern making allowances, core prints,Moulding sand- properties and testing, Hand and machine moulding, core, core making melting and pouring, Melting furnaces- Cupola, fuel fired, electric arc, Induction furnaces, Defects in casting, lost foam process, Shell moulding , Investment casting. Die casting low pressure perment mould castings hot and cold chamber processes, Centrifugal casting, Semi-centrifugal casting. Centrifuging, Continuous casting		
Unit 2	**Hot working processes, Cold working processes**	**(06 Hrs)**
A) Hot working processes: Principle, rolling, forging - drops, press, upset. Rolling, forging- extrusion, drawing, spinning, effect of hot working.		

B) Cold working processes

Cold rolling, swaging, forging extrusion- forward backward impact. Roll forging, tube drawing, wire drawing, spinning, shot peening, high energy rate forming, sheet metal, working- types of press, drives, different operations, and types of dies.

Unit 3	Joining process:	(06 Hrs)

a) welding process-

i) Arc welding – theory SMAW, GTAW, GMAW, FCAW, Submerged arc welding stud welding.

ii) Resistance welding- Theory, spot, seam, projection welding processes.

iii) Gas welding

iv) Friction welding, ultrasonic welding, thermit welding, electron beam and laser welding.

b) Use of adhesives for joining.

Classification of adhesives, types of adhesives and their applications, surface preparation and various joints

Unit 4	Turning , boring related process	(06 Hrs)

Introduction, function, types, construction accessories operations, thread cutting, single and multi start thread cutting, different tools, tool materials, Tool Geometry, concept of speed, feed, depth of cut, Introduction to boring machines general arrangement and nature of work done.

Unit 5	Drilling ,milling machines	(06 Hrs)

A) Drilling :

Fundamentals of drilling process, twist drill geometry, tool holders, Types of drilling machines, drilling operations. Types of drills, reaming process.

B) milling machines:

Fundamentals of milling process, cutters-types and geometry, Operations performed on milling machines. Dividing head, methods of indexing. Gear train calculations for helical and cam milling

Unit 6	Abrasive machining processes, Plastics & Plastic Moulding	(06 Hrs)

A) Abrasive machining processes:

Abrasive machining, abrasives -types, size and geometry, Grinding, grinding wheels, wheel marking, wheel selection. Wheel mounting. Types of grinding machines, Grinding faults, Honing, lapping, super finishing, buffing, burnishing process.

B) Plastics & Plastic Moulding:

Moulding characteristics of plastic, Moulding process- compression, transfer, and injection blow moulding. Mould design- Materials and construction, bulk factor, shrinkage, moulding parameters, moulding machines, extruders

Assignment:

1. At least five questions on expendable mould casting processes.
2. At least five questions on Permanent mould casting processes.
3. At least five questions on hot working Processes
4. At least five questions on cold working Processes.
5. At least five questions on different joining processes.
6. At least five questions on turning and related processes.
7. At least five questions on boring and related processes.
8. At least five questions on drilling machines and operations of drilling machines
9. At least five questions on milling machines and operations of milling machines
10. At least five questions on abrasive machining processes.
11. At least five questions on Plastics and Plastic molding process.
12. At least five questions on ceramics & composite manufacturing.

Text Books/ Reference Books

1. Chapman W.A.J.: "workshop technology" volume I, II, III. ELBS.
2. Hajarachoudhary S. K., Bose S. K.: "Elements of Workshop technology" – Volume I, II.
3. Begman: Manufacturing processes.
4. HMT: production technology. TMH Publishing Co. New Delhi.
5. Roy A. Lindberg: processes and metables of manufacturing fourth edition practice Hall of India New Delhi.
6. Manufacturing process, P C Pandey

Unit Tests-

Unit Test-I	Unit-I,II ,III
Unit Test-II	Unit-IV,V, VI

Material Science
(Course Code:- C 210)

Designation of Course	**Material Science**		
Teaching Scheme:	**Examination Scheme:**		**Credits Allotted**
Theory:- -03- Hours/ Week Practical:- 02- Hours/Week	End Semester Examination	60 Marks	Theory:-03
	Unit Test	20 Marks	
	Assignments	10 Marks	
	Internal Evaluation	10 Marks	
	Term Work / Oral	50 Marks	Practical:-01
	Total	150 Marks	04

Course Prerequisites:-	Student should have knowledge of 1. Knowledge of basic concept of Physics and chemistry 2. Basic information of engineering materials. 3. Basic knowledge of manufacturing processes.
Course Objectives:-	To provide the knowledge of 1. To explain basic concepts in plastic deformations of metals. 2. To calculate the mechanical properties of engineering materials. 3. To explain applications of equilibrium phase diagrams in the manufacturing processes. 4. To acquire knowledge of elements of steels, cast irons , non ferrous materials and its multidisciplinary applications.
Course Outcomes:-	Students should be able to 1. **Understand** the concept of basics of crystal structure, mechanism of plastic deformation, and **remember** in annealing and re- crystallization 2. **Understand** mechanical testing of materials and **evaluate** the properties of materials to obtain an engineering system. 3. **Understand** the equilibrium phase diagram and **analyse** the properties of materials from phases . 4. **Understand** the steels ,cast irons properties and **apply** in multidisciplinary applications. 5. **Understand** different nonferrous materials for different components and **apply** in engineering applications 6. **Understand** basics of corrosion and **apply** Prevention of corrosion by different methods for industrial applications

Course Contents

Unit 1	**Study of Engineering materials and Plastic Deformation:**	**(-08-Hrs)**
classification of Engineering materials , Introduction to Non metallic materials, Study of crystal structure, Indexing of planes and directions, Imperfections in crystals, Mechanism of plastic deformation, Polycrystalline metals, , Work Hardening ,Cold and hot working, Annealing and re -crystallization.		
Unit 2	**Mechanical Testing of Metals:**	**(-08-Hrs)**
Study of destructive testing, Tensile test , Engineering stress and true stress strain, Numerical based on Evolution of properties, Hardness testing such as Brinell, Rockwell, Vickers and Micro hardness test, Impact test, Fatigue test, Creep test, Cupping test, Non Destructive testing such as Liquid dye penetrate test, Magnaflux test, Eddy current test , Ultrasonic testing and Radiography testing		
Unit 3	**Study of Equilibrium Diagrams**	**(-08-Hrs)**
Related terms and their definitions, Hume Ruther's rule of solid solubility, Allotropy and polymorphism, Solidification, Dendritic growth, Cooling curves, Plotting of Equilibrium diagrams, Lever rule, Coring, Eutectic system, Partial eutectic and eutectoid system, Non Equilibrium cooling and its effects		

Unit 4	Study of Steel and Cast Irons.	(08--Hrs)
Production of steel and cast Irons, Allotropy of Iron, Iron and Iron Carbide Equilibrium Diagram, Classification of Steels, Specifications of steels, Plain Carbon steel, Applications and microstructure of steels, Study of cast iron, Classification and applications of cast irons, Properties and manufacturing methods, Effect of alloying elements, Alloy cast irons etc.		
Unit 5	**Study of Non Ferrous Materials**	**(08--Hrs)**
Introduction, Copper and it's alloy, Alpha and alpha beta brasses, Zinc Equivalent , Copper Nickel alloy, Bronzes, Aluminum and it's alloy, Precipitation and age hardening ,Dispersion strengthening , Nickel and it's alloy, Metals at High and Low Temperature, Bearing Materials etc.		
Unit 6	**Corrosion and Prevention:**	**(08--Hrs)**
Introduction, Types of corrosion, Oxide film growth laws, Action of hydrogen, Polarization, Stress corrosion, Season Cracking, Prevention of corrosion, Design of component, Modification of environment, Cathodic Protection, Deposition and coating, Ion Implantation, PVD, CVD, Powder coating etc.		

Assignment:

1. At least five theory questions on classification of engineering materials.
2. At least five theory questions on Study of crystal structure.
3. At least five theory questions on plastic deformation
4. At least five theory questions on mechanical testing of methods
5. At least five theory questions on non-destructive testing
6. At least five theory questions on Plotting of Equilibrium diagrams.
7. At least five theory questions on study of equilibrium diagrams
8. At least five theory questions on study of steel and cast irons.
9. At least five theory questions on Iron and Iron Carbide Equilibrium Diagram.
10. At least five theory questions on study of non-ferrous materials
11. At least five theory questions on corrosion and methods of its prevention.
12. At least five theory questions on Powder coating.

Term work

List of Experiments: (Any Eight)

1. Tensile test to determine strength and other mechanical properties.
2. .Hardness test Brinell and Vickers.
3. Rockwell and Poldi hardness test.
4. .Study of Microstructure of plane carbon steel.
5. Study of Microstructure of cast irons.
6. Magnetic Particle test.
7. Liquid penetrate test.
8. Utrasonic Test.
9. Eddy Current test
10. Visual inspection of casting and welded components.
11. Study of nonferrous material and alloys.

Practical Examinations:

Term work and Practical Examinations will be based on above syllabus.

Text Books

1. “Material Science and Physical Metallurgy”,Dr.V.DKodgere, Everest Publication, Pune.
2. “Physical Metallurgy”, S H Avner , McGraw Hill Publication.
3. “Material science and metallurgy”, O P Khanna, Khanna Publication, Delhi.
4. “Material Science and Engineering”, R K Rajput S K Kataria and Sons Publication, Delhi.

Unit Tests-

Unit Test-I	Unit-I,II III
Unit Test-II	Unit-IV ,V, VI

Turbo Machinery

(Course Code:- C 211)

Designation of Course	**Turbo Machinery**		
Teaching Scheme:	**Examination Scheme:**		**Credits Allotted**
Theory:- 03 Hours/ Week	End Semester Examination	60 Marks	Theory:-03
	Unit Test	20 Marks	
	Assignments	10 Marks	
	Internal Evaluation	10 Marks	
	Term Work / Oral	-- Marks	
	Total	100 Marks	03

Course Prerequisites:-	Student should have knowledge of 1. Fundamentals of Mechanical Engineering 2. Fluid Mechanics 3. Engineering Mathematics
Course Objective:-	To provide the knowledge of 1. To impart students with knowledge of impulse momentum principle and its applications, velocity triangles and their analysis. 2. To inculcate concepts of impulse and reaction water turbines. 3. To provide knowledge of flow through steam nozzles and steam turbines 4. To provide knowledge of pumps and compressors
Course Outcomes:-	Students should be able to 1. **Understand** the concepts of impulse momentum principle and impulse turbine; and **apply** the principle to various cases. 2. **Understand** concepts of reaction turbines and **analyze** their overall performance 3. **Understand** concepts of steam turbines and steam nozzles; and **analyze** their overall performance. 4. **Understand** concepts of centrifugal pump; and **analyze** its overall performance. 5. **Understand** concepts of centrifugal compressor; and **analyze** its overall performance. 6. **Understand** concepts of axial flow compressor; and **analyze** its overall performance.

Course Contents

Unit 1	**Introduction of Turbo Machinery and Impulse Water Turbines**	**(08 Hrs)**

Introduction of Turbo Machinery

Impulse-momentum principle ,fixed and moving flat plates, curved vanes , with jet striking at the centre of vane and jet striking tangentially on to the vane, Impact of jet on hinged plates ,Impact of jets on series of flat plates and vanes, water wheels, velocity ri angles and their analysis, work done and efficiency calculations

Impulse Water Turbines

Main components and constructional features of Pelton wheel, Concept of centrifugal head, general energy equation for turbine, Velocity diagrams and analysis, Important non-dimensional parameters such as speed ratio, jet ratio, flow ratio, Condition for maximum hydraulic efficiency.

Unit 2	**Reaction Water Turbines**	**(08 Hrs)**

Classifications, Francis, Propeller, Kaplan Turbines, construction features, velocity diagrams and analysis, DOR, draft tubes- types and analysis, cavitations causes and remedies, specific speed, performance characteristics and governing of reaction turbines, selection of turbines.

Unit 3	Steam Turbines	(08 Hrs)
Steam nozzles: types and applications, Equation for velocity and mass flow rate [Elementary treatment only] Steam Turbines: Classifications (Axial and Radial), construction details, compounding of steam turbines, velocity diagrams and analysis of Impulse and reaction turbines (single & multi stage), governing, performance characteristics, selection of turbines.		
Unit 4	**Centrifugal Pumps**	**(08 Hrs)**
Classification, components of centrifugal pump, various terms associated with centrifugal pump, various heads, velocity triangle and their analysis, effect of outlet blade angle, capitation, NPSH, Thomas Cavitations factor, priming of pumps, installation, specific speed, Performance characteristics of centrifugal pump, Axial thrust, maintenance, trouble and remedies, series and parallel operation of pumps, system resistance curve, water hammer problem in pumping system, selection of pumps.		
Unit 5	**Centrifugal Compressor**	**(08 Hrs)**
Classification of rotodynamic compressors, blowers, fans. Centrifugal compressor: Construction, flow process on T-S Diagram, velocity diagram and Euler's work, slip factor and its effect on work input, actual work input, dimension parameters, pre-whirl losses, surging, choking, stalling characteristics		
Unit 6	**Axial Compressor**	**(08 Hrs)**
Construction, stage velocity triangles and its analysis, enthalpy entropy diagram, dimensionless parameters, flow through the blade rows, pressure rise across the stage, stage losses and efficiencies, performance characteristics		

Assignments

1. At least Five theory questions on Impulse turbine.
2. At least Five numerical questions on Impulse turbine.
3. At least Five theory questions on Reaction water turbine.
4. At least Five numerical questions on Reaction water turbine.
5. At least Five theory questions on steam turbines.
6. At least Five numerical questions on steam turbines.
7. At least Five numerical questions on centrifugal pumps.
8. At least Five theory questions on centrifugal pumps.
9. At least Five theory questions on centrifugal compressor.
10. At least Five numerical questions on centrifugal compressor.
11. At least Five theory questions on axial compressor.
12. At least Five numerical questions on axial compressor.

Text Books

1. P. N. Modi and Dr. S. M. Seth, "Hydraulics and Fluid Mechanics", Standard Book House, New Delhi.
2. R. K. Rajput, "Hydraulic Machines", S.Chand Publishers, New Delhi.
3. Turbines, Compressors & Fans, S.M. Yahya, Tata-McGraw Hill.
4. Turbomachines, B. U. Pai, Wiley India.
5. Fluid Mechanics & Hydraulic Machines S.C. Gupta 1e Pearson Education.
6. Thermal Turbo machines, Dr. Onkar Singh, Wiley India.
7. Fluid Mechanics and Hydraulic Machines by R.K.Bansal.
8. Basic concepts in Turbo machinery by Grant Ingram.

Unit Tests-

Unit Test-I	Unit-I,II,III
Unit Test-II	Unit-IV,V, VI

Numerical Methods and Optimization Techniques
(Course Code:- C 212)

Designation of Course	**Numerical Methods and Optimization Techniques**		
Teaching Scheme:	**Examination Scheme:**		**Credits Allotted**
Theory:- 03- Hours/ Week Tutorial:- 01Hours/Week Practical:- 02- Hours/Week	End Semester Examination	60 Marks	Theory:-04
	Unit Test Assignments Internal Evaluation	20 Marks 10 Marks 10 Marks	
	Term Work / Oral	50 Marks	Practical:-01
	Total	150 Marks	04

Course Prerequisites:-	Students should have basic knowledge of: 1. Basics of statistics 2. Basics of Probability
Course Objective:-	To provide the knowledge of 1. To find roots of any equation by iterative method 2. To solve simultaneous linear equation by iterative and matrix method 3. To curve fitting and interpolation 4. To numerical differentiation, numerical integration, ordinary differential equation 5. To single variable and multi variable optimization
Course Outcomes:-	Students should be able to 1. **Understand** iterative methods to find the roots of any equation and **apply** them in engineering problems 2. **Understand** matrix and iterative methods to solve simultaneous linear equations and **apply** them in engineering problems 3. **Understand** methods of curve fitting and interpolation and **apply** them in engineering problems 4. **Understand** methods to solve numerical differentiation, numerical integration, ordinary differential equation and **apply** them in engineering problems 5. **Understand** classical and numerical methods to optimize a single variable equation and **apply** these methods in engineering problems 6. **Understand** classical and numerical methods to optimize a multi-variable equation and **apply** these methods in engineering problems

Course Contents

Unit 1	**Roots of Equations:**	**(08 Hrs)**
Significant figures, Accuracy and Precision, Error definition, Round-Off errors, Truncation error, Total numerical error. Bracketing methods-Bisection and False position method. Open methods, Newton Raphson method		
Unit 2	**Linear Algebraic Equation:**	**(08 Hrs)**
Navie Gauss elimination, pitfalls of Gauss Elimination, techniques of improving solutions, complex numbers.		
Unit 3	**Curve Fitting and Interpolation:**	**(08 Hrs)**
Least-Square Regression-Linear regression,. Interpolation-Newton's divided difference interpolating polynomial. Lagrange's interpolating polynomial		

Unit 4	Numerical differentiation and Integration:	(08 Hrs)
Trapezoidal rule, Simson's rules, integration with unequal segment, multiple integral, derivatives of unequally spaced data. Engineering Applications. **Ordinary Differential Equations:** Euler's method, improvement of Euler's method, Runge-Kutta method, system of equations		
Unit 5	**Single Variable Optimization**	**(08 Hrs)**
Optimum problem formulation, Engineering optimization problem, Optimality Criteria, Bracketing methods, region-Elimination method, Point Estimate Method, Gradient Based method		
Unit 6	**Multivariate Variable Optimization**	**(08 Hrs)**
Optimality criteria, Unidirectional search, Direct search method- Evolutionary optimization, simplex search, Gradient Based Methods- Steepest Descent method, Newton's method.		

Assignment

1. At least five MATLAB codes based on Bisection Method
2. At least five MATLAB codes based on Gauss elimination method.
3. At least five MATLAB codes based on Trapezoidal Method.
4. At least five MATLAB codes based on Laplace interpolation.
5. At least five MATLAB codes based on Euler's method.
6. At least five MATLAB codes based on Least square method
7. At least five numerical questions based on Bisection Method
8. At least five numerical questions based on Gauss elimination method.
9. At least five numerical questions based on Trapezoidal Method.
10. At least five numerical questions based on Laplace interpolation.
11. At least five numerical questions based on Euler's method.
12. At least five numerical questions based on Least square method

Term work

Minimum six program on from each unit using Matlab.

Text Books/ Reference Books

1. Optimization for Engineering Design: Algorithms and Examples By Kalyanmoy Deb, Prentice-Hall of India Private Limited, New Delhi.
2. Introduction to Optimum Design, Jasbir S Arora, Elsevier Academic Press.
3. Numerical Methods for Engineers, Steven Chaptra and Raymond Canale, McGraw Hill.
4. Numerical Methods for Scientific and Engineering Computations, M. K. Jain, S.R.K. Ayengar and R. K. Jain.

Unit Tests-

Unit Test-I	Unit-I,II ,III
Unit Test-II	Unit-III,IV ,VI

Professional Skills Development-IV
(Course Code:- C 213)

Designation of Course	**Professional Skills Development-IV**		
Teaching Scheme:	**Examination Scheme:**		**Credits Allotted**
Theory:- -03- Hours/ Week	End Semester Examination	100 Marks	Theory:-04
	Unit Test	-- Marks	
	Assignments	-- Marks	
	Internal Evaluation	-- Marks	
	Term Work / Oral	-- Marks	
	Total	100 Marks	04

Course Prerequisites:-	Students should have basic knowledge of 1. Basic concepts of Maths, Logical reasoning and English Grammar taught in the last semester. 2. An overall idea about the difference in personal and professional communication in terms of vocabulary used 3. Knowledge of writing skills, importance of professionalism in emails and letters 4. They should be aware of concepts of self-esteem, self-assessment and its importance in setting long term and short term goals. 5. Awareness of the interpersonal skills like team work and introduction to Leadership taught during the last semester. 6. Body language and importance of non-verbal communication to maintain professionalism.
Course Objective:-	To provide the knowledge of 1. To acquaint them with the level of complexity presented in recruitment tests and also provide them techniques 2. To learn word list, various strategies of conflicts/disputes and concepts of leadership. 3. To focuses on the higher aspects of soft skills such as grooming them on corporate etiquettes and various formats of email/ letter writing so that can present themselves as professionals further both in oral and written communication.
Course Outcomes:-	Students should be able to 1. **Understand** the concepts of Maths, Logical reasoning and English grammar and apply short cuts/ tricks to solve questions in less time from the recruitment point of view. 2. **Understand and apply** academic word list in the right context of both academically and professionally. 3. **Understand** the importance of email etiquettes, types of letter writing and distinguish between the format of formal and informal emails/letters which are useful in their coroporate life. 4. **Understand and Apply** various strategies of conflict resolution and handling criticism through amicable and positive ways to settle team conflicts/disputes. 5. **Understand** the major concepts of leadership like coaching, mentoring and learn effective time management strategies- Pareto principle (the 80-20 rule of time management) which students can apply in the corporate life. 6. **Understand** the importance of grooming, body language, etiquettes and apply various telephonic interview startergies to conduct themselves in a professional life with impressively and confidently.

Course Contents

Unit 1	**Aptitude (Maths, Logical Reasoning, English)**	**(18 Hrs)**
• Maths ▪ Simple Interest and Compound Interest ▪ Ratio, Proportion and Average ▪ Mixture and Allegation • Logical Reasoning ▪ Data Interpretation ▪ Data Sufficiency • English ▪ Grammar I ▪ Vocabulary - Analogies		
Unit 2	**Essential Grammar - IV**	**(04 Hrs)**
• Vocabulary – Academic word List		
Unit 3	**Written Communication- III**	**(06 Hrs)**
• Email writing and etiquettes – formal and informal email writing, format ofvarious types of email, do's and don'ts of email writing • Letter writing – formal letters, job application letter, and cover letter. • Essay writing – mnemonics top develop ideas and write essays, structure ofessays		
Unit 4	**Self-Awareness and Conflict Resolution**	**(04 Hrs)**
• Self-assessment & Perception & attitudes. • Analyzing skills & weaknesses and habits. • Developing positive attitude & handling criticism positively • Handling conflicts in the personal and corporate sector • Causes of conflicts in work scenario. • Ways and methods for conflict resolution		
Unit 5	**Interpersonal Skills - III**	**(06 Hrs)**
• Mentoring, Difference between Leadership and Management • Leading with examples • Time management -The Time Management Matrix, Pareto Principle		
Unit 6	**Aptitude (Maths, Logical Reasoning, English)**	**(04 Hrs)**
• Maths ▪ Simple Interest and Compound Interest ▪ Ratio, Proportion and Average ▪ Mixture and Allegation • Logical Reasoning ▪ Data Interpretation ▪ Data Sufficiency • English ▪ Grammar I ▪ Vocabulary - Analogies		

Text Books/ Reference Books

1. APAART: Verbal Ability
2. APAART: Logical Reasoning
3. APAART: Quantitative Aptitude
4. APAART: Speak Well 1 (English Language and Communication)
5. APAART: Speak Well 2 (Soft Skills)
6. APAART: Verbal Ability

Production Practice-III
(Course Code:- C 214)

Designation of Course	**Production Practice-III**		
Teaching Scheme:	**Examination Scheme:**		**Credits Allotted**
Practical:- 2 Hours/ Week	End Semester Examination	-- Marks	01
	Unit Test	-- Marks	
	Assignments	-- Marks	
	Internal Evaluation	-- Marks	
	Term Work	50 Marks	
	Total	50 Marks	01

Course Prerequisites:-	Students should have basic knowledge of 1. Basic knowledge of Production practice I and Production practice II 2. Basic knowledge of Material science 3. Basic Knowledge of Manufacturing processes
Course Objectives:-	To provide the knowledge of 1. To acquire skills for different turning operations and its calculations 2. To acquaint the skills for indexing and gear cutting operation on milling machine 3. To understand the CNC lathe machine operations 4. To acquire the knowledge of single spindle automated lathe operations 5. To acquire skills for grinding operations
Course Outcomes:-	Students should be able to 1. **Understand** various operations to be carried out on lathe machine to **create** jobs as per given drawing. 2. **Understand** the indexing mechanisms on milling machine. 3. **Apply** the knowledge of indexing mechanism to create a gear cutting job on milling machine. 4. **Understand** CNC lathe machine, CNC programming and **apply** it to **create** job as per given specification. 5. **Understand** different operations on single spindle automated lathe machine to **create** a job. 6. **Understand** the different operations to be carried out on the grinding machines and **apply** to **create** a job.

Course Contents

Term Work:
Each Candidate shall be required to complete and submit the following jobs (Any Two)

1. One Composite job consisting of 3 to 4 pieces as below Machining of components covering all operations on Lathe (Including Internal and external threading, Taper Matching, Knurling) One Job Grinding operation on Above (Turning) Job
2. Gear Cutting One Job
3. One job on CNC Machine. (Turning).
4. One job on Single Spindle Automate Lathe

Note:
Write a journal/term book based on above syllabus.

Rules regarding ATKT, Continuous Assessment and award of Class A. T. K. T.

- A candidate who is granted term for B. Tech. Semester-I will be allowed to keep term for his/her B. Tech. Semester-II examination even if he/she appears and fails or does not appear at B. Tech. Semester-I examination.
- A candidate who is granted term for B. Tech. Semester - III will be allowed to keep term for his/her B. Tech. Semester-IV examination even if he/she appears and fails or does not appear at B. Tech. Semester-III examination.
- A candidate who is granted term for B. Tech. Semester-V will be allowed to keep term for his/her B. Tech. Semester-VI examination if he/she appear and fails or does not appear at B. Tech. Semester-V examination.
- A candidate who is granted term for B. Tech. Semester-VII will be allowed to keep term for his/her B. Tech. Semester-VIII examination if he/she appears and fails or does not appear at B. Tech. Semester-VII examination.
- A candidate shall be allowed to keep term for the B. Tech. Semester-III course if he/she has a backlog of not more than 3 Heads of passing out of total number of Heads of passing in theory examination at B. Tech. Semester-I & II taken together.
- A candidate shall be allowed to keep term for the B. Tech. Semester-V of respective course if he/she has no backlog of B. Tech Semester-I & II and he/she has a backlog of not more than 3 Heads of passing in theory examination and not more than 3 heads of passing in term work and practical examination or term work and oral examination.
- A candidate shall be allowed to keep term for the B. Tech. Semester-VII course if he/she has no backlog of B. Tech. Semester-III & IV and he/she has a backlog of not more than 3 Heads of passing in theory examination and not more than 3 Heads of passing in term work and practical examination or term work and oral examination.

CONTINUOUS ASSESSMENT

- In respect of Term work at B. Tech. Semester-I & II, B. Tech. Semester-III & IV and B. Tech. Semester-V & VI, target date shall be fixed for the completion of each job, project experiment or assignment as prescribed in the syllabus and the same shall be collected on the target date and assessed immediately at an affiliated college by at least one pair of the concerned teachers for the subject and the marks shall be submitted at the end of each term to the Principal of the college.
- Termwork and performance of Practical/Oral examination shall be assessed on the basis of the depth of understanding of the principles involved, correctness of results and not on ornamental or colorful presentation.
- For B. Tech. Semester-VII & VIII, term work assessment will be done by external and internal examiners

jointly during the examination schedule declared by the university. The record of continuous assessment shall be made available to the examiners during Term work and practical and Term work and oral examinations. Examiner shall use this record for overall assessment of the performance of the student. Every practical/term work assignment shall be assessed on the scale of 25 marks and weightage of 25 marks shall be distributed as follows:

Sr. No.	Activity	Marks
1	Timely Submission	07
2	Presentation	06
3	Understanding	12

- Marks obtained out of 25 for all assignments together will be converted on scale of marks assigned to term work of respective subject in the structure of the course.

CLASS

The class should be awarded to the student on the basis of aggregate marks obtained together in both the semesters of the respective year by him. The award of class shall be as follows.

A	Aggregate 66% or more marks	First Class with Distinction
B	Aggregate 60% or more marks but less than 66%	First Class
C	Aggregate 55% or more marks but less than 60%	Higher Second Class
D	Aggregate 50% or more marks but less than 55%	Second Class
E	Aggregate 40% or more marks but less than 50%	Pass Class