B.TECH MECHANICAL ENGINEERING SYLLABUS.

BHAGWANT UNIVERSITY

Sikar Road, Ajmer

Rajasthan

Syllabus

(1^{st} & 2^{nd} Semesters)

Institute of Engineering & Technology

B. Tech.

(Common to all branches of Engineering)

1st Semester

Subject Code	Subject Name	Teaching Hours Per Week				Distribution of Maximum Marks						
						Theory Exam				Practical Exam		
						Internal						
		L	T	P	Total	Mid Terms marks	Assignments / Seminar Presentation / Group Discussion	External	Total	Internal	External	Total
01BTC101	Communication Techniques	3	0	0	3	15	25	60	100	-	-	-
01BTC102	Engg. Mathematics-I	3	1	0	4	15	25	60	100	-	-	-
01BTC103	Engineering Physics-I	3	1	0	4	15	25	60	100	-	-	-
01BTC104	Chemistry & Environmental Engineering-I	3	1	0	4	15	25	60	100	-	-	-
01BTC105	Engg. Mechanics	3	1	0	4	15	25	60	100	-	-	-
01BTC107 / 01BTC108	Instrumentation Engg / Agriculture Engineering-I	3	0	0	3	15	25	60	100	-	-	-
01BTC201	Communication Lab (English)	0	0	2	1	-	-	-	-	50	50	100
01BTC202	Engineering Physics Lab-I	0	0	4	2	-	-	-	-	50	50	100
01BTC203	Chemistry & Environmental Engineering Lab-I	0	0	4	2	-	-	-	-	50	50	100

01BTC205	Practical Geometry	0	0	3	2	-	-	-	-	50	50	100
01BTC301	Discipline & Co-Curricular Activities	0	0	4	1	-	-	-	-	100	-	100
GRAND TOTAL		**18**	**4**	**8**	**30**	**90**	**150**	**360**	**600**	**300**	**200**	**1100**

Grand Total Marks - 1100

2nd Semester

Subject Code	Subject Name	Teaching Hours Per Week				Distribution of Maximum Marks						
						Theory Exam				Practical Exam		
						Internal		External	Total	Internal	External	Total
		L	T	P	Total	Mid Terms marks	Assignments / Seminar Presentation / Group Discussion					
02BTC101	Communicative English	3	0	0	3	15	25	60	100	-	-	-
02BTC102	Engg. Mathematics-II	3	1	0	4	15	25	60	100	-	-	-
02BTC103	Engineering Physics-II	3	1	0	4	15	25	60	100	-	-	-
02BTC104	Chemistry & Environmental Engineering-II	3	1	0	4	15	25	60	100	-	-	-
02BTC105	Computer System And Programming	3	0	0	3	15	25	60	100	-	-	-
02BTC106 / 02BTC107	Electrical & Electronics Engineering / Agriculture Engineering-II	3	0	0	3	15	25	60	100	-	-	-
02BTC201	Engineering Physics Lab-II	0	0	4	2	-	-	-	-	50	50	100
02BTC202	Chemistry & Environmental Engineering Lab-II	0	0	2	1	-	-	-	-	50	50	100

02BTC203	Computer Programming Lab	0	0	2	1	-	-	-	-	50	50	100
02BTC204	Workshop Practice	0	0	4	2	-	-	-	-	50	50	100
02BTC205/ 02BTC206	Electrical & Electronics Lab / Agriculture Engg Lab	0	0	3	2	-	-	-	-	50	50	100
02BTC301	Discipline & Co-Curricular Activities	0	0	4	1	-	-	-	-	100	-	100
GRAND TOTAL		**18**	**3**	**9**	**30**	**90**	**150**	**360**	**600**	**350**	**250**	**1200**

Grand Total Marks - 1200

01BTC101 COMMUNICATION TECHNIQUES

Course Objectives:

To encourage students t actively involve in participatve learning of English and to help them acquire communication skills.

Unit 1 Elements of Communication
1. Communication: Meaning, Importance and Process
2. Objectives of Communication
3. Media and Types of Communication

Unit 2 Basics of Communication
1. Verbal and Non-Verbal Communication
2. Formal and Informal Channels of Communication
3. Qualities of Good Communication

Unit 3 Skills of Communication
1. Barriers to Communication
2. Professional Communication
3. Interpersonal Communication and methods to improve it

Unit 4 Grammar
1. Subject-Verb Agreement (Concord)
2. Linking Words (Conjunctions)
3. Relative Clauses
4. Common Errors

Unit 5 Composition
1. Resume Writing
2. Business Letter Writing: Sales, Credit, Enquiry, Order, Claim, Complaint, Job Applications, etc.
3. E-mail messages
4. Telephone Etiquettes

REFERENCE BOOKS:

1. Communication Skills for Engineers and Scientists, Sangeeta Sharma and Binod Mishra, PHI Learning Pvt. Ltd.(New Delhi)
2. English Grammar and Composition, Gurudas Mukherjee, Ane Books Pvt. Ltd.(New Delhi)
3. Current English Grammar and Usage with Composition, R.P. Sinha, Oxford University Press (New Delhi)
4. Effective Technical Communication, M Ashraf Rizvi, Tata McGraw Hill (New Delhi)

5. Business Communication, Meenakshi Raman & Prakash Singh, Oxford University Press (New Delhi)
6. Professional Communication, Aruna Koneru, Tata McGraw Hills, New Delhi.
7. A Practical Course for Developing Writing Skills in English, J.K. Gangal, PHI Learning Pvt. Ltd., New Delhi.
8. "Communicative English for Engineers and Professionals", by Nitin Bhatnagar & Mamta Bhatnagar, Pearson (New Delhi).
9. "The Ace of Soft Skills", by Gopalswamy Ramesh & Mahadevan Ramesh, Pearson (New Delhi)

Course Outcome

CO Statement	K	P01	P02	P03	P04	P05	P06	P07	P08	P09	P10	P11	P12	PS01	PS02
At the end of the course the student will											3		1		
C01Develop listening skills for academic and professional purposes	K2										3		1		
C02Acquire the ability to communicate in real life situations.	K2										3		1		
C03Inculcate reading habit and develop effective reading skills.	K2										3		1		
C04Improve active and passive vocubalory	K2										3		3		
C05Convey the ideas in the written medium effectively	K3										3		3		

3: High 2: Medium 1: Low

01BTC102 ENGINEERING MATHEMATICS-I

Course Objective :

The main objective of the course is to develop the basic knowledge in Mathematics of the students that are imperative and important for effective understanding of Enggineering students.

Unit 1

Differential Calculus:Asymptotes(Cartesian Coordinates Only), Curvature(Cartesian Coordinates Only), Concavity, Convexity and Point of Inflexion (Cartesian Coordinates Only), Curve Tracing (Cartesian and Standard Polar Curves-Cardioids, Lemniscates of Bernoulli, Limacon, Equiangular Spiral).

Unit 2

Differential Calculus: Partial Differentiation, Euler's Theorem on Homogeneous Functions, Approximate Calculations, Maxima & Minima of Two and More Independent Variables, Lagrange's Method of Multipliers.

Unit 3

Integral Calculus: Surface and Volumes of Solids of Revolution, Double Integral, Double Integral by changing into polar form , Areas & Volumes by Double Integration ,Change of Order of Integration, Beta Function and Gamma Function (Simple Properties).

Unit 4

Differential Equations: Differential Equations of First Order and First Degree - Linear Form, Reducible to Linear form, Exact Form, Reducible to Exact Form, Linear Differential Equations of Higher Order with Constant Coefficients Only.

Unit 5

Differential Equations: Second Order Ordinary Differential Equations with Variables Coefficients, Homogeneous and Exact Forms, Change of Dependent Variable, Change of Independent Variable, Method of Variation of Parameters.

REFERENCE BOOKS:

1. Engineering Mathematics II , Adarsh Mangal, Anil Maheswari, Dhanpat Rai & co Delhi
2. Engg Mathematics II, Dr Gokhroo & others ,Unique Books Ajmer

Course Outcome

CO Statement	K	P01	P02	P03	P04	P05	P06	P07	P08	P09	P10	P11	P12	PS01	PS02
At the end of the course the student will															
C01Be capable of solving eigen value problems and diagonalising a	K2	3	2	1	1										

matrix.															
C02 Have grasped the idea of three dimensional geometry about lines and planes in space along with sphere	K2	2	1												
C03Have understood the geometrical aspects of curvature ,involucates and evolutes of plane curves in differential calculus.	K2	2	1												
C04Be enabled to handle functions of more than one variable ,their differentiations ,expansions and extreme values which are encountered in engineering studies.	K2	2	1												
C05 Have learnt the method of double and triple integration.	K3	1	2	3	2										

3: High 2: Medium 1: Low

01BTC103 ENGINEERING PHYSICS-I

Course Objectives:

To introduce the basic physics concepts relevant to different branches of Engineering and Technology.

Unit 1 Interference of light

Michelson's Interferometer: Production of circular & straight line fringes, Determination of wavelength of light, Determination of wavelength separation of two nearby wavelengths. Newton's rings and measurement of wavelength of light.
Optical technology: Elementary idea of anti-reflection coating and interference filters.

Unit 2 Polarization of light

Plane circular and elliptically polarized light on the basis of electric (light) vector, Malus law.

Double Refraction: Qualitative description of double refraction phase retardation plates, quarter and half wave plates, construction, working and use of these in production and detection of circularly and elliptically polarized light.
Optical Activity: Optical activity and laws of optical rotation, Specific rotation and its measurement using half-shade and bi-quartz devices.

Unit 3 Diffraction of light

Single slit diffraction: Quantitative description of single slit, position of maxima / minima and width of central maximum, intensity variation.
Diffraction Grating: Construction and theory, Formation of spectrum by plane transmission grating, Determination of wavelength of light using plane transmission grating.
Resolving power: Geometrical & Spectral, Raleigh criterion, Resolving power of diffraction grating and telescope.

Unit 4 Elements of Material Science

Bonding in Solids: Covalent bonding and Metallic bonding. Classification of Solids as Insulators, Semiconductors and Conductors.
Semiconductors: Conductivity in Semiconductors, Determination of Energy gap of Semiconductor.
X-Ray diffraction and Bragg's Law.
Hall Effect: Theory, Hall Coefficient and applications.

Unit 5 Special Theory of Relativity

Postulates of special theory of relativity, Lorentz transformations, relativity of length, mass and time.
Relativistic velocity addition and mass-energy relation, Relativistic Energy and momentum.

REFERENCE BOOKS:

1. Fundamental of Optics, Jenkins and White, Fourth Edition, McGraw Hill.
2. Optics, Ajoy Ghatak, Third Edition, Tata McGraw Hill.
3. Concept of Modern Physics, A. Baiser, Fifth Edition, McGraw Hill.
4. Modern Physics, J. Morrison, Edition 2011, Elsevier.
5. Elements of Material Science and Engineering, Van Vlack, Sixth Edition, Pearson.

Course Outcome

CO Statement	K	P01	P02	P03	P04	P05	P06	P07	P08	P09	P10	P11	P12	PS01	PS02
At the end of the course the student															

will															
C01Understand the behavior of materials under stress and properties of fluids.	K2	1	2												
C02 Gain knowledge about reverbeand absorption in buildings and also ultrasonic applications.	K2	1	2												
C03 Understand the various types of LASERS and transmission of light signals through optic fibres.	K2	1	2												
C04 Gain knowledge on the basics of physics related to matter properties ,optics ,crystals ,quantum concepts.	K2	1	2												
C05 Understand properties of waves.	K3	1	2												

3: High 2: Medium 1: Low

01BTC104 CHEMISTRY & ENVIRONMENTAL ENGINEERING-I

Course Objectives :

To intoduce the basic concepts of chemistry and environment relevant to different branches of Engineering and Technology.

Unit 1

General Aspects of Fuel: Organic fuels, Origin, classification and general aspects of fossil fuels. Solid fuels, Coal, carbonization of coal, manufacturing of coke by Beehive oven and by product oven method. Liquid fuels, Composition of petroleum, advantages and refining of petroleum. Cracking, reforming, polymerization and isomerization of refinery products. Synthetic petrol, Bergius and Fischer Tropsch process. Knocking, octane number and anti-knocking agents. Gaseous fuels, Advantages, manufacturing, composition and calorific value of coal, gas and oil gas.

Unit 2

Fuels Analyses: Ultimate and proximate analysis of coal, Determination of calorific value of solid and gaseous fuels by bomb and Junker's Calorimeter respectively. Calculations of calorific value based on Dulong's formula. Combustion, requirement of oxygen/ air in combustion process. Flue gas analysis by Orsat's apparatus and its significance.

Unit 3

Polymers: Different methods of classification, basic ideas of polymerization mechanisms.
Elastomers: Natural rubber, vulcanization, Synthetic Rubbers viz. Buna-S, Buna-N, Butyl and neoprene rubbers. Applications of elastomers & plastics.
New Engineering Materials: Fullerenes: Introduction, properties, preparation and applications. Organic Electronic Materials (including conducting polymers- poly (p-phenylene), polythiophenes,Polyphenylene, vinylenes, polypyroles, polyaniline).
Lubricants: Introduction, classification and uses of lubricants. Types of lubrication. Viscosity & viscosity index, flash and fire point, cloud and pour point, steam emulsification number, precipitation number and neutralization number

Unit 4

Basics of Environment: Environmental Pollution, Environmental Acts and Regulations, Environmental Impact Assessment (EIA), Necessity and methodology of EIA. Renewable sources of energy, Potential & present status of renewable sources of energy in India. Functional concepts of Ecology, Basics of species, Ecosystem, Hydrological and chemical cycles, Energy flow in ecosystems. Biodiversity, population dynamics.

Unit 5

Solid Waste Management, Classification of solid waste, Collection, transportation, treatment, and disposal of solid waste. Economic recovery of solid waste. Sanitary landfill, on site sanitation.

Course Outcome

CO Statement	K	P01	P02	P03	P04	P05	P06	P07	P08	P09	P10	P11	P12	PS01	PS02
At the end of the course the student will															
C01Acquire knowledge about fuels and their analysis.	K2	2	1												
C02 Understand the behavior of flue analysis and its importance.	K2	2	1												

C03 Understand various types of polymers and its applications.	K2	2	1												
C04 Understand the various chemical properties by analytical techniques.	K2	1	1												
C05 Understand the green chemistry and its applications.	K3	2	21												

3: High 2: Medium 1: Low

01BTC105 ENGINEERING MECHANICS

Course Objectives:

To understand the basic concepts of forces ,laws of mechanics ,energy conversion and generation related to Engineering and Technology

Unit 1

System of forces, Fundamental laws of mechanics, Composition of forces
Free body diagram, Lami's theorem
Moments and couple, Varign on'stheorem, condition of equilibrium
Types of support and loading, reaction, Analysis of simple trusses by methods of joints and method of sections

Unit 2

Laws of Coulomb fraction, Ladder, Wedges
Belt friction and rolling
Principle of virtual work and its applications

Unit 3

Location of centroid and center of gravity, area moment of inertia, mass moment of inertia
Law of machines, Variation of mechanical advantages, efficiency, reversibility of machine
Pulleys, wheel and axle, wheel and differential axle
Transmission of power through belt and rope

Unit 4 Kinematics of Particle
Rectilinear motion, plane curvilinear motion
Projectile motion
Constrained motion of connected particles
Dynamics of Particle and Rigid Body
Newton's law of motion
D'Alembert's principle

Unit 5 Work and Energy
Work, energy (Potential, Kinetic and Spring)
Work Energy relation
Law of conservation of energy
Impulse and Momentum
Impulse, momentum
Impulse Momentum relation, Impact
Vibration
Un-damped Free vibrations

REFERENCE BOOKS:

Engineering Mechanics : R.K.Bansal,Laxmi Publication
Engineering Mechanics: R.S.Khurmi,S Chand Publishers
Engineering Mechanics: Domkundwar& Domkundwar,Dhanpat Rai Publishers
Engineering Mechanics: ashish Dutt Sharma ,CBC Publishers
Engineering Mechanics: sanjeev sipani ,CBC Publishers
Engineering Mechanics

Course Outcome

CO Statement	K	P01	P02	P03	P04	P05	P06	P07	P08	P09	P10	P11	P12	PS01	PS02
At the end of the course the student will															
C01Understand the of laws of mechanics and different types of forces	K2	1	2												
C02 Gain knowledge about virtual work and its applications.	K2	1	2												
C03 Understand the various laws of machines ,centre of gravity .	K2	1	2												

C04 Gain knowledge on the basics of kinematics and dynamics of particles.	K2	1	2												
C05 Understand the law of conservation of energy and its applications.	K3	1	2												

3: High 2: Medium 1: Low

01BTC107 INSTRUMENTATION ENGINEERING

Couse Objectives:

To develop skills to becme professional with capability to measure electrical parameters using various digital /analog instruments.

Unit 1 Theory of Errors
Accuracy and precision, repeatability, limits of errors
Systematic & random errors. modeling of errors, probable errors & standard deviation
Gaussian error analysis, combination of errors

Unit 2 Electronic Instruments for Measuring Basic Parameters
Electronic voltmeter, electronic multi-meters, digital voltmeters, vector impedance meter
RF power & voltage measurement, introduction to shielding and grounding

Unit 3 Oscilloscopes
CRT construction, basic CRO circuits, CRO probes
Oscilloscope techniques for measurement of frequency, phase angle and time delay

Unit 4 Signal Generation
Introduction to oscillators, sine wave generators
Frequency synthesized signal generator, sweep frequency generators

Unit 5 Transducers
Classification, selection criteria, characteristic, construction, working principle, application of following transducers RTD, thermocouples, thermistors, LVDT, strain gauges, bourdon tubes, tacho generators, load cell, piezoelectric transducers

REFERENCE BOOKS:

Electronic Instrumentation: H.S.Kalsi—Tata Mc-Graw Hill Publishing Ltd.,New Delhi MC

Graw Hill New Delhi
Fundamental Of Instrumentation: R.A. Gupta Ajay Bansal V.Sangtani –Neel kanth publishers Jaipur
Instrumentation: Sandeep Joshi –College Book Centre
Instrumentation: Dr. Rajeev Gupta,Vikash Soni ,--Genius Publication Jaipur

Course Outcome

CO Statement	K	P01	P02	P03	P04	P05	P06	P07	P08	P09	P10	P11	P12	PS01	PS02
At the end of the course the student will															
C01Understand the different theories of errors.	K2	2	1	3											
C02 Gain knowledge about various instruments required in measurements.	K2	1	2												
C03 Acquire knowledge about different oscilloscopes like CRO,DSO	K2	1	2	2											
C04 Gain knowledge on the basics of signal generations.	K2	1	2												
C05 Understand properties and principles of transducers	K3	1	2												

3: High 2: Medium 1: Low

01BTC108 AGRICULTURE ENGINEERING-I

Course Objectives :

To understand the basic concepts of agriculture , farming modern techniques of farming related to Engineerineering branch of Agriculture.

Unit 1

Introduction to the agriculture farm mechanization –Introduction ,Sources of farm power ,status of farm power in India concept of farm mechanization ,scope of farm mechanization .benefits &

limiting factors in farm mechanization. Status of farm mechanization in India, Energy efficient equipments, Mechanization in farming operations

Unit II

Thermodynamics Cycle, Principle & Working of I. C. Engines
Engine Components :- Cylinder, Cylinder block, cylinder head, cylinder liner, piston, piston ring, connecting rod, crankshaft, flywheel, camshaft

Unit III

Measurement of engine power:-Bore, Stroke, Stroke Bore ratio, Swept volume, Compression Ratio, Power, Brake Power, Belt Power, Drawbar power, Mechanical efficiency.

Unit IV

Tillage Implements:- Introduction ,Classification& Types of Tillage ,Mould board ploygle, forcing acting on Tillage ,Implements
Seeding and Fertilizer Equipments: - Seedling methods Harvesting and threshing equipments and processing equipments

Unit V

Soil plant water relationship:- water relation of soils, soil moisture and plant growth, water requirement.
Water resources utilization in India: - surface water resources, ground water resources, need for planned utilization of water resources, economic of water resources utilization

REFERENCE BOOKS:

Elements of Agriculture Engg : Jagdishwar Sahay , Slandered Publishers

Course Outcome

CO Statement	K	P01	P02	P03	P04	P05	P06	P07	P08	P09	P10	P11	P12	PS01	PS02
At the end of the course the student will															
C01Understand the different agriculture farm mechanization.	K2	2	1									2			
C02 Gain knowledge about internal combustion engines.	K2	1	2												

C03 Acquire knowledge about measurement of engine power.	K2	1	2	2											
C04 Gain knowledge on the Tilage implementation	K2	1	2												
C05 Understand water resources utilization in India.	K3	1	2												

3: High 2: Medium 1: Low

01BTC201 COMMUNICATION LAB

Couse Objectives :

To develop communication skills particularly Speaking and listening.

1. Phonetic symbols and transcription
2. One word for many
3. Synonyms and antonyms
4. Word forms
5. Words commonly mis-spelt and mis-pronounced
6. Affixes
7. Seminar Presentations
8. Group Discussions

Course Outcome

CO Statement	K	P01	P02	P03	P04	P05	P06	P07	P08	P09	P10	P11	P12	PS01	PS02
At the end of the course the student will															
Co1 Be able to express thoughts in English.	K2	2	1									2			
C02 Able to make oral presentation.	K2	1	2												
C03 Gain ability to take up international English Level Examination.	K2	1	2	2											

C04 Gain knowledge about creative thinking in critical situations.	K2	1	2												
C05 Able to manage time ,stress ,career planning .work in team.	K3	1	2												

9. 3: High 2: Medium 1: Low

01BTC202 ENGINEERING PHYSICS LAB-I

Course Objectives :

To introduce different experiments to test basic understanding of physics concepts applied to optics ,electric , magnetic, thermal physics and properties of matter.

1. To determine the wave length of monochromatic light with the help of Fresnel's biprism.
2. To determine the wave length of sodium light by Newton's Ring.
3. To determine the specific rotation of Glucose (Sugar) solution using a polarimeter.
4. To determine the wave length of prominent lines of mercury by plane diffraction grating with the help of spectrometer.
5. To convert a Galvanometer in to an ammeter of range 1.5 amp. and calibrate it.
6. To convert a Galvanometer in to a voltmeter of range 1.5 volt and calibrate it.
7. To study the variation of a semiconductor resistance with temperature and hence determine the Band Gap of the semiconductor in the form of reverse biased P-N junction diode.
8. To study the variation of thermo e.m.f. of iron copper thermo couple with temperature.
9. To determine coherent length and coherent time of laser using He-Ne Laser.

Course Outcome

CO Statement	K	P01	P02	P03	P04	P05	P06	P07	P08	P09	P10	P11	P12	PS01	PS02
At the end of the course the student will															
Co1 Be able to calculate specific resistance experimentally.	K2	2	1									2			
C02 Able to understand spectrometer.	K2	1	2												
C03 Gain ability to calculate thermal conductivity	K2	1	2	2											

experimentally.															
C04 Obtain B-H curves of materials.	K2	1	2												
C05 Able to calibrate voltmeter and ammeter.	K3	1	2												

1. 3: High 2: Medium 1: Low

01BTC203 CHEMISTRY & ENVIRONMENTAL ENGINEERING-I LAB

Course Objectives :

To introduce different experiments to test basic understanding of chemistry concepts applied to fuels ,polymers , properties of different engineering matter.

Any Seven to be prformed by the students

1. Proximate analysis of solid fuel.
2. Experiments based on Bomb Calorimeter.
3. To determine the strength of Ferrous Ammonium sulphate solution with the help of K2Cr2O7 solution.
4. To determine the strength of CuSO4 solution with the help of hypo solution.
5. To determine the strength of NaOH and Na2CO3 in a given alkali mixture.
6. Determination of Na/K/Ca by flame photometer in a given sample.
7. Determination of turbidity in a given sample.
8. To determine the flash and fire point of a given lubricating oil.
9. To determine the viscosity of a given lubricating oil by Redwood viscometer.
10. To determine Flash & Fire point of lubricants.

Course Outcome

CO Statement	K	P01	P02	P03	P04	P05	P06	P07	P08	P09	P10	P11	P12	PS01	PS02
At the end of the course the student will															
Co1 Be able to understand different properties of fuels	K2	2	1									2			

C02 Able to calculate viscosity of liquids and lubricants.	K2	1	2												
C03 Gain ability to calculate different properties of lubricants.	K2	1	2	2											
C04 Obtain normality and strength of different unknown solutions.	K2	1	2												
C05 Able to understand titrimetry and gravimetry.	K3	1	2												

1. 3: High 2: Medium 1: Low

01BTC205 PRACTICAL GEOMETRY

Course Objectives :

To introduce different experiments to test basic understanding of geometry concepts applied to lines ,scales and projections.

1. 1. Lines, Lettering and Dimensioning
   2. Scales: Representative factor, plain scales, diagonal scales, scale of chords
   3. Conic Sections: Construction of ellipse, parabola and hyperbola by different methods. Normal and Tangents
   4. Special Curves: Cycloid, Epicycloids, Hypo-cycloid, Involutes, Archemedian and logarithmic spirals
2. 1. Projections: Types of projection, Orthographic projection, First angle and third angle projection
3. Projection of points and lines, True inclinations and true length of straight lines, Traces of straight lines, Auxiliary planes
4. Projection of planes and solids: Projection of planes, Projection of polyhedra, Pyramids, Cylinder and Cone
5. • Sections of Solids: Section of right solids by normal and inclined planes
6. Development of Surfaces: Parallel line and radial line method for right solids
7. • Isometric Projections: Isometric Scale, Isometric axes, Isometric projections of planes and solids

Course Outcome

CO Statement	K	P01	P02	P03	P04	P05	P06	P07	P08	P09	P10	P11	P12	PS01	PS02

At the end of the course the student will															
Co1 Be able to understand different types of lines and scales.	K2	2	1									2			
C02 Able to know about development of surfaces.	K2	1	2												
C03 Gain ability about different sections of solids.	K2	1	2	2											
C04 To understand different types of projections	K2	1	2												
C05 Able to understand isomeric projections..	K3	1	2												

1. 3: High 2: Medium 1: Low

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2nd Semester

02BTC101 COMMUNICATIVE ENGLISH

Course Objectives:

To encourage students t actively involve in participatve learning of English and to help them acquire communication skills.

Unit 1 Grammar

1. Tenses
2. Passive Voice
3. Indirect Speech
4. Conditional Sentences
5. Modal Verbs

Unit 2 Composition
1. Dialogue Writing
2. Paragraph and Precis Writing
3. Report, its importance and Report Writing

Unit 3 Short Stories
1. The Luncheon: W.S. Maugham
2. How Much Land Does a Man Need?: Leo Tolstoy
3. The Last Leaf: O. Henry

Unit 4 Essays
1. On the Rule of the Road: A. G. Gardiner
2. The Gandhian Outlook: S. Radhakrishnan
3. Our Own Civilisation: C.E.M. Joad

Unit 5 Poems
1. The Unknown Citizen: W. H. Auden
2. The Character of A Happy Life: Sir Henry Wotton
3. No Men are Foreign: James Kirkup
4. If : Rudyard Kipling

REFERENCE BOOKS:

1. Communication Skills for Engineers and Scientists, Sangeeta Sharma & Binod Mishra, PHI Learning Pvt. Ltd.
2. English for Engineers: Made Easy, Aeda Abidi & Ritu Chaudhary, Cengage Learning, (New Delhi)
3. A Practical Course for Developing Writing Skills in English, J.K. Gangal, PHI Learning Pvt. Ltd., New Delhi.
4. Intermediate Grammar, Usage and Composition, Tickoo, A. E. Subramaniam & P. R. Subramaniam, Orient Longman (New Delhi)
5. The Written Word , Vandana R. Singh, Oxford University Press (New Delhi)
6. The Great Short Stories edited by D.C. Datta, Ram Narain Lal Publishers (Allahabad)
7. Professional Communication, Kavita Tyagi & Padma Misra,PHI Learning Pvt. Ltd., New Delhi.
8. “Learn Correct English: Grammar, Usage and Composition” by Shiv K. Kumar & Hemalatha Nagarajan, Pearson (New Delhi).
9. “Current English Grammar and Usage with Composition” by R.P. Sinha, Oxford University Press (New Delhi).
10. “Grammar of the Modern English Language”, by Sukhdev Singh & Balbir Singh, Foundation Books (New Delhi).

Course Outcome

CO Statement	K	P01	P02	P03	P04	P05	P06	P07	P08	P09	P10	P11	P12	PS01	PS02
At the end of the course the student will											3		1		
C01Develop listening skills for academic and professional purposes	K2										3		1		
C02Acquire the ability to communicate in real life situations.	K2										3		1		
C03Inculcate reading habit and develop effective reading skills.	K2										3		1		
C04Improve active and passive vocubalory	K2										3		3		
C05Convey the ideas in the written medium effectively	K3										3		3		

3: High 2: Medium 1: Low

02BTC102 ENGINEERING MATHEMATICS-II

Course Objective :

The main objective of the course is to develop the basic knowledge in Mathematics of the students that are imperative and important for effective understanding of Enggineering students.

Unit 1

Coordinate Geometry of Three Dimensions: Equation of a sphere, Intersection of a sphere and a plane, tangent plane, Intersection of two spheres, orthogonality of two spheres, Right circular cone. Right circular cylinder.

Unit 2

Matrices: Rank of a matrix, Rank of matrix by reducing to normal forms, Consistency of systems of linear simultaneous equations and its solution, Eigen values and Eigen vectors, Cayley Hamilton theorem (without proof), Diagonalization of matrix.

Unit 3

Vector Calculus: Scalar and vector field, differentiation & integration of vector functions, Gradient, Divergence, Curl and Differential Operator, Line, Surface and volume Integrals.

Unit 4

Application of Vector Calculus: Green's Theorem in a Plane, Gauss's and Stoke's Theorem (without proof) and their Applications.

Fourier Series: Expansion of simple functions in Fourier Series, half range Fourier sine and cosine series, change of interval. Harmonic Analysis.

Unit 5

Differential Equations: Series Solutions of Second Order Linear Differential Equations with Variable Coefficients (Complementary Functions only), Partial Differential Equations of First Order : Lagrange's Form, Standard Forms, Charpit's Method .

REFERENCE BOOKS:

1. Engineering Mathematics I , Adarsh Mangal, Anil Maheswari, Dhanpat Rai & co Delhi
2. Engg Mathematics I Dr Gokhroo & others ,Unique Books Ajmer

Course Outcome

CO Statement	K	P01	P02	P03	P04	P05	P06	P07	P08	P09	P10	P11	P12	PS01	PS02
At the end of the course the student will															
C01Be capable of solving eigen value problems and diagonalising a matrix.	K2	3	2	1	1										
C02 Have grasped the idea of three dimensional geometry about lines and planes in space along with sphere	K2	2	1												
C03Have understood the geometrical aspects of curvature ,involucates and evolutes of plane curves in differential calculus.	K2	2	1												

C04Be enabled to handle functions of more than one variable ,their differentiations ,expansions and extreme values which are encountered in engineering studies.	K2	2	1												
C05 Have learnt the method of double and triple integration.	K3	1	2	3	2										

3: High 2: Medium 1: Low

02BTC103 ENGINEERING PHYSICS-II

Course Objectives:

To introduce the basic physics concepts relevant to different branches of Engineering and Technology

Unit 1

Quantum Mechanics: Compton effect & quantum nature of light, Derivation of time dependent and time independent Schrödinger's Wave Equation, Physical interpretation of wave function and its properties, boundary conditions, Particle in one-dimensional box.

Unit 2

Applications of Schrödinger's Equation, Particle in three-dimensional box and Degeneracy, Barrier penetration and tunnel effect, Tunneling probability, Alpha Decay, Summerfield's Free electron gas model Postulates, Density of energy states, Fermi energy level.

Unit 3

Coherence and Optical Fibres, Spatial and temporal coherence, Coherence length, Coherence time and 'Q' factor for light, Visibility as a measure of coherence, Spatial Coherence and size of the source, Temporal coherence and spectral purity, Optical fiber as optical wave-guide, Numerical aperture , maximum angle of acceptance and applications of Optical Fiber.

Unit 4

Lasers and Holography: Theory of laser action, Einstein's coefficients, Components of a laser, Threshold conditions for laser action; Theory, Design and applications of He-Ne and

semiconductor lasers; Holography versus photography, Basic theory of holography, Basic requirement of a holographic laboratory; Applications of holography in microscopy and interferometry.

Unit 5

Nuclear Radiation Detectors, Characteristics of gas filled detectors: general considerations, Constructions, Working and properties of: Ionization chamber, proportional counter, G. M. Counter and Scintillation Counter.

REFERENCE BOOKS:

1. Fundamental of Optics, Jenkins and White, Fourth Edition, McGraw Hill.
2. Optics, Ajoy Ghatak, Third Edition, Tata McGraw Hill.
3. Quantum Mechanics, Schiff, Third Edition, McGraw Hill.
4. Quantum Mechanics, Merzbacher, Third Edition, Wiley India.
5. Nuclear Physics: Principles and Applications, John Lilley, Wiley India.

Course Outcome

CO Statement	K	P01	P02	P03	P04	P05	P06	P07	P08	P09	P10	P11	P12	PS01	PS02
At the end of the course the student will															
C01Understand the behavior of materials under stress and properties of fluids.	K2	1	2												
C02 Gain knowledge about reverbeand absorption in buildings and also ultrasonic applications.	K2	1	2												
C03 Understand the various types of LASERS and transmission of light signals through optic fibres.	K2	1	2												
C04 Gain knowledge on the basics of physics related to matter properties ,optics ,crystals ,quantum concepts.	K2	1	2												

C05 Understand properties of waves.	K3	1	2												

3: High 2: Medium 1: Low

02BTC104 CHEMISTRY & ENVIRONMENTAL ENGINEERING-II

Course Objectives :

To intoduce the basic concepts of chemistry and environment relevant to different branches of Engineering and Technology.

Unit 1

Water: Common Impurities of water Hardness of water, Determination of hardness by Clark's test and complexometric (EDTA) method, Numerical based on hardness and EDTA method, Municipal Water Supply: Requisites of potable water, Steps involved in purification of water, Sedimentation, coagulation, Filtration and Sterilization, Break point chlorination.

Unit 2

Water Treatment: Softening of water, Lime-Soda, Permutit (Zeolite) and Deionization (Demineralization) methods, Boiler troubles their causes, disadvantages and prevention: Formation of solids (Scale and Sludge), Carry over (Priming and Foaming), Corrosion and Caustic, Embrittlement. Numerical problems based on Lime-Soda and Zeolite softening methods.

Unit 3

Cement: Definition, Composition, basic constituents and their significance, Manufacturing of Portland cement by Rotary Kiln Technology, Chemistry of setting and hardening of cement and role of gypsum.

Glass: Definition, Properties, Manufacturing of glass and importance of annealing in glass making, Types of silicate glasses and their commercial uses and industrial applications. Optical fiber grade glass.

Unit 4

Refractory: Definition, classification, properties, Requisites of good refractory and manufacturing of refractory. Preparation of Silica and fire clay refractory with their uses. Seger's (Pyrometric) Cone Test and RUL Test

Corrosion: Definition and its significance. Mechanisms of Chemical (Dry) and Electrochemical (Wet) corrosion. Protection from corrosion, Protective coatings, cathodic protection, sacrificial anode and modification in designs.

Unit 5

Air Pollution, Noise Pollution and Solid Waste Management: Air Pollution, Harmful effects of Air Pollution, Control of Air Pollution. Noise Pollution, Harmful effects of noise pollution, control of noise pollution. Global warming, Acid rain, Ozone depletion.

Water Pollution: Water pollution, Harmful effects of water pollution, control of water pollution. Waste water management, Treatment & disposal of wastewater. Reuse and saving in use of water, rain water harvesting. anode and modification in designs.

REFERENCE BOOKS:

1. Chemistry of water treatment, Samuel Faust & Osman M Aly, CRC Press
2. Boilers water treatment. Principles and Practice, Colin Frayne, CRC Press
3. Corrosion Understanding the Basic, by Joseph R Davis, ASM International
4. Atmospheric pollution, by W Buch , Tata McGraw Hill(TMH)
5. Introduction to Environmental Science, by G Tyler Miller and Scott Spoolman, Cengage Learning
6. Introduction to Environmental Engineering, by Mackenzie L Davis and David A Cornwell, Tata McGraw Hill(TMH)

Course Outcome

CO Statement	K	P01	P02	P03	P04	P05	P06	P07	P08	P09	P10	P11	P12	PS01	PS02
At the end of the course the student will															
C01Acquire knowledge of water hardness and its estimation.	K2	2	1												
C02 Understand the methods of water treatment.	K2	2	1												
C03 Understand various types of polymers and its applications.	K2	2	1												
C04 Understand the various chemical properties by analytical techniques.	K2	1	1												
C05 Understand the green chemistry and its applications.	K3	2	21												

3: High 2: Medium 1: Low

02BTC105 COMPUTER SYSTEMS AND PROGRAMMING

Course Objectives :

To understand major components of computer systems and basics of computers.

Unit 1

Types of computers and generations
Basic architecture of computers and its building blocks
Input-Output devices, Memories

Unit 2 Number Systems

Binary, octal, decimal and hexadecimal representation of numbers
Integers and floating point numbers
Representation of characters, ASCII and EBCDIC codes
Binary Arithmetic: addition, subtraction, complements

Unit 3 Classification of Computer Languages

Machine, assembly and high level languages
Brief idea of operating system
Assembler, compiler and interpreter Programming in 'C'
Need of programming languages, Defining problems
Flowcharts and algorithm development

Unit 4

Data types, constants, variables, operators and expressions
Input and output statements, Conditional and control statements, Arrays

Unit 5

Structures and unions
Pointers
File handling

REFERENCE BOOKS:

Computer Programming : E. Balaguruswamy ,ANSI C" TMH
Let Us C : Yaswant Kometkar, CBC Publishers

Course Outcome

CO Statement	K	P01	P02	P03	P04	P05	P06	P07	P08	P09	P10	P11	P12	PS01	PS02
At the end of the course the student will															
C01 Understand the digital concepts and number systems.	K2	2	1												

C02 Know the major components of computer systems.	K2	2	1												
C03 Analyse and solve problems efficiently.	K2	2	1												
C04 Understand office automation tools	K2	1	1												
C05 Understand effectively perform operations on files and develop C programs.	K3	2	21												

02BTC106 ELECTRICAL AND ELECTRONICS ENGINEERING

Couse Objectives:

To develop skills to becme professional with capability to measure electrical parameters using various digital /analog instruments

Unit 1

DC Networks: Kirchoffs Laws, Node Voltage and Mesh Current Analysis; Delta-Star and Star-Delta Transformation, Source Conversion. Classification of Network Elements, Superposition Theorem, Thevenin's Theorem.

Unit 2

Single Phase AC Circuits: Generation of Single Phase AC Voltage, EMF Equation, Average, RMS and Effective Values. RLC Series, Parallel and Series- Parallel Circuits, Complex Representation of Impedances. Phasor Diagram, Power and Power Factor.

Three Phase A.C. Circuits: Generation of Three-Phase AC Voltage, Delta and Star-Connection, Line & Phase Quantities, 3-Phase Balanced Circuits, Phasor Diagram, Measurement of Power in Three Phase Balanced Circuits.

Unit 3

Transformer: Faraday's Law of Electromagnetic Induction, Construction and Operation of Single Phase Transformer, EMF Equation, Voltage & Current Relationship and Phasor Diagram of Ideal Transformer.

Electrical DC Machine: Principle of DC Machines, Types, Different Parts of DC Machines.

Unit 4

Transistor: Bipolar Junction Transistor, Transistor Current Components, Characteristics of CE, CB and CC Transistor Amplifiers.

Thyristors: The four layer diode, Bi-directional thyristors, the uni-junction transistor and its application in thyristor circuits.

Unit 5

Communication System: Introduction to modulation (AM, FM&PM) demodulation, multiplexing. Superhetrodyne radio receiver, television. Elementary concepts of optical, satellite & mobile communication.

REFERENCE BOOKS:

Electrical & Electronics Engg : J.B.Gupta, Katson publication New Delhi
Electrical & Electronics Engg : LK. C. Jain S.Surana –Jain Brothers New Delhi
Dr. K. R. Niazi—genius Publication Jaipur
Electrical & Electronics Engg Work shop : S. K Bishnoi , M.L.Meena& Mahendra Bhadu – Ashirwad Publication Jaipur

Course Outcome

CO Statement	K	P01	P02	P03	P04	P05	P06	P07	P08	P09	P10	P11	P12	PS01	PS02
At the end of the course the student will															
C01 Be able to fabricate electricall house wiring..	K2	2	1												
C02 Be able to know the proper earthing.	K2	2	1												
C03 Understand the operation of different electrical equipments.	K2	2	1												
C04 Understand the measurements of electrical quantities.	K2	1	1												
C05 Understand the CRO and logic gates.	K3	2	21												

3: High 2: Medium 1: Low

02BTC201 ENGINEERING PHYSICS LAB-II

Course Objectives :

To introduce different experiments to test basic understanding of physics concepts applied to optics ,electric , magnetic, thermal physics and properties of matter.

1. To determine the height of water tank with the help of a Sextant.
2. To determine the dispersive power of material of a Prism for Violet Red and yellow colours of Mercury light with the help of a spectrometer.
3. To measure the Numerical Aperture of an Optical Fibre.
4. To determine the ferromagnetic constants retentivity, permeability and susceptibility by tracing B-H curve using C.R.O.
5. To study the Charge & Discharge of a condenser and hence determine time constant (Both current and voltage graphs are to be plotted.
6. To determine the high resistance by method of leakage, using a Ballistic galvanometer.
7. To verify the expression for the resolving power of a Telescope.
8. To determine the specific resistance of the material of a wire by Carey Fosters bridge.
9. To determine the specific resistance of the material of a wire by Carey Fosters bridge.

Course Outcome

CO Statement	K	P01	P02	P03	P04	P05	P06	P07	P08	P09	P10	P11	P12	PS01	PS02
At the end of the course the student will															
Co1 Be able to calculate specific resistance experimentally.	K2	2	1									2			
C02 Able to understand Carey Fosters Bridge.	K2	1	2												
C03 To measure numerical aperature of optical fibre	K2	1	2	2											
C04 Obtain B-H curves of materials.	K2	1	2												
C05 Able to calibrate voltmeter and ammeter.	K3	1	2												

1. 3: High 2: Medium 1: Low

02BTC202 CHEMISTRY & ENVIRONMENTAL ENGINEERING-II LAB

Course Objectives :

To introduce different experiments to test basic understanding of chemistry concepts applied to water ,polymers , properties of different engineering matter.

1. To determine the hardness of water by HCL method.
2. To determine the hardness of water by EDTA method.
3. Determination of CO2 in a water sample.
4. Measurement of pH of a given sample by pH-meter.
5. To determine free and residual chlorine in a given water sample.
6. Measurement of dissolves oxygen in water.
7. Measurement of conductivity of a given sample by conductivity meter.

R.T.U., Kota Scheme and Syllabus B.Tech. (1st and 2nd Semesters) effective from Session 2012-13

8. Measurement of fluoride in water.
9. Measurement of nitrate in water.
10. Determination of sulphate in water.
11. Evaluation of Reverse Osmosis(RO) Process by TDS measurement.

Course Outcome

CO Statement	K	P01	P02	P03	P04	P05	P06	P07	P08	P09	P10	P11	P12	PS01	PS02
At the end of the course the student will															
Co1 Be able to understand different types of harness.	K2	2	1									2			
C02 Able to calculate Ph and conductivity.	K2	1	2												
C03 Gain ability to calculate different properties of water.	K2	1	2	2											
C04 Obtain normality and strength of different unknown solutions.	K2	1	2												
C05 Able to understand titrimetry and gravimetry.	K3	1	2												

1. 3: High 2: Medium 1: Low

02BTC203 COMPUTER PROGRAMMING LAB

Course Objectives :

To introduce different experiments to test basic understanding of computers.

1. Simple input output program integer, real character and string. (Formatted & Unformatted)
2. Conditional statement programs (if, if-else-if, switch-case)
3. Looping Program. (for, while, do-while)
4. Program based on array (one, two and three dimensions)
5. Program using Structure and Union.
6. Program using Function (with and without recursion)
7. Simple programs using pointers.
8. File handling.

Course Outcome

CO Statement	K	P01	P02	P03	P04	P05	P06	P07	P08	P09	P10	P11	P12	PS01	PS02
At the end of the course the student will															
Co1 Be able to acquire knowledge about word document	K2	2	1									2			
C02 Able to gain the knowledge about expressions and statements in C.	K2	1	2												
C03 Gain ability to do programming using structures and functions of C.	K2	1	2	2											
C04 Do programming using arrays in C.	K2	1	2												
C05 Able to write user defined functions in C.	K3	1	2												

1. 3: High 2: Medium 1: Low

02BTC204 WORKSHOP PRACTICE

Course Objectives :

To introduce different experiments to know basics of workshop involving carpentary ,foundary,

1. Carpentry Shop

1. Timber, definition, engineering applications, seasoning and preservation

2. Ply wood and ply boards

2. Foundry Shop

1. Moulding Sands, constituents and characteristics
2. Pattern, definition, materials types, core prints
3. Role of gate, runner, riser, core and chaplets
4. Causesandremediesofsomecommoncastingdefectslikeblowholes,cavities,inclusions

3. Welding Shop

1. Definition of welding, brazing and soldering processes and their applications
2. Oxyacetylenegasweldingprocess,equipmentandtechniques,typesofflamesandtheirapplications
3. Mould of any pattern
4. Casting of any simple pattern

WELDING SHOP

1. Gas welding practice by students on mild steel flat
2. Lap joint by gas welding
3. MMA welding practice by students
4. Square butt joint by MMA welding
5. Lap joint by MMA welding
6. Demonstration of brazing

MACHINE SHOP PRACTICE

1. Job on lathe with one step turning and chamfering operations
2. Job on shaper for finishing two sides of a job
3. Drillingtwoholesofsize5 and12mmdiameteronjobused/tobeusedforshaping
4. Grinding a corner of above job on bench grinder

FITTINGANDSMITHYSHOP

1. Finishing of two sides of a square piece by filing
2. Tin smithy for making mechanical joint and soldering of joint
3. To cut a square notch using hacksaw and to drill three holes on PCD and tapping

Course Outcome

CO Statement	K	P01	P02	P03	P04	P05	P06	P07	P08	P09	P10	P11	P12	PS01	PS02
At the end of the course the student will															
Co1 Be able to understand timber ,plywood and ply board	K2	2	1									2			
C02 Able to understand basics of foundary shops	K2	1	2												

C03 To gain knowledge about different types of weldings like gas welding.	K2	1	2	2											
C04 Soldering of joints	K2	1	2												
C05 Able to understand different types of joints.	K3	1	2												

1. 3: High 2: Medium 1: Low

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B.TECH MECHANICAL ENGINEERING (2nd Year 3-Semester)

03BME 101 - MECHANICS OF SOLID

L	P	T
3	0	0

COURSE OBJECTIVES: To develop analytical skill, laws of mechanics are applied to parts of bodies and skill is developed to get solution to engineering problems maintaining continuity of the parts.

UNIT 1: STRESS & STRAIN

Tension, compression, shearing stress & strain; Poisson's ratio: Stress-strain Relationship, Hooke's law; equations of static = w for 2D & 3D cars Elastic constants and their relations for a isotropic hookean material, anisotropy & orthotropic, thermal stresses, composite bars; simple Elastic, plastic & visco-elastic behavior of common materials in tension and compression test, stress- strain curves. Concept of factor of safety & permissible stress. Conditions for equilibrium. Concept of free body diagram; Introduction to mechanics of deformable bodies.

UNIT 2: MEMBERS SUBJECTED TO FLEXURAL LOADS

Theory of simple bending, bending moment and shear force diagrams for different types of static loading and support conditions on beams. Bending stresses, Section modulus and transverse shear stress distribution in circular, hollow circular, I, Box, T, angle sections etc.

UNIT 3: PRINCIPAL PLANES, STRESSES & STRAINS

Members subjected to combined axial, bending & Torsional loads, maximum normal & shear stresses; Concept of equivalent bending & equivalent twisting moments: Mohr's circle of stress & strain. Theories of Elastic Failures: The necessity for a theory, different theories, significance and comparison, applications.

UNIT 4: TORSION

Torsional shear stress in solid, hollow and stepped circular shafts, angular deflection and power transmission capacity. Stability of equilibrium: Instability & elastic stability. Long & short columns, ideal strut, Euler's formula for crippling load for columns of different ends, concept of equivalent length, eccentric loading, Rankine formulae and other empirical relations.

UNIT 5: DEFLECTION OF BEAMS

Transverse deflection of beams: Relation between deflection, bending moment, shear force and load, Transverse deflection of beams and shaft under static loading, area moment method, direct integration method: method of superposition and conjugate beam method. Variation approach to determine deflection and stresses in beam. Elastic strain energy: Strain energy due to axial, bending and Torsional loads; stresses due to suddenly applied loads; use of energy theorems to determine deflections of beams and twist of shafts. Castiglione's theorem. Maxwell's theorem of reciprocal deflections

TEXT BOOK:

1. Mechanics of Solid: S. H Crandall, N.C Dahi & T.J Lardner. Mcgraw Hill International Edition.
2. Strength of Materials: G.H Ryder. Elbs Publications Co., London
3. Elements of Strength Of Materials. J.P Tinnoshnko & G.H Young, Affiliated East West Press, New Delhi

REFERENCE:

1. Solid Mechanics. G.M.A Kazmi. Tata Mcgraw Hill Publishing Co. Ltd.. New Delhi
2. Strength of Materials: S. Ramamrutham. Dhanpat Rai And Publications, New Delhi.

COURSE OUTCOME

CO Statement	K	P01	P02	P03	P04	P05	P06	P07	P08	P09	P10	P11	P12	PS01	PS02
At the end of the course the student will															
C01: Acquire knowledge about stress & strain	K2														
C02: Gain the knowledge of bending moment and shear force diagrams for different types of loading	K2														
C03: Understand about the principal planes, stresses & strains	K2														
C04: Gain the knowledge about various thermodynamics cycles	K2														
C05: Studied about the torsional shear stress in solid, hollow and stepped circular	K2														

shafts															

3: High 2: Medium 1: Low

03BME 102 - MATERIAL SCIENCE AND ENGINEERING

L P T
3 0 0

COURSE OBJECTIVES: To understand structure-properties properties relationship and manipulate atomic/microstructural processes to create desired structure & processes to create desired structure & properties.

UNIT 1: ATOMIC STRUCTURE OF METALS

Crystal structure, crystal lattice of (i) Body centred cubic (ii) Face centred cubic (iii) Closed packed hexagonal, crystallographic Notation of atomic planes and Directions (Miller Indices), polymorphism and allotropy, Crystal imperfection.

UNIT 2: THEORIES OF PLASTIC DEFORMATION

Theories of plastic deformation. Phenomenon of slip, twinning and dislocation. Identification of crystallographic possible slip planes and direction in FCC, BCC, HCP. Recovery and recrystallization, preferred orientation causes and effects on the property of metals.

UNIT3: CLASSIFICATION OF ENGINEERING MATERIALS

Solidification of metals and of some typical alloys: Mechanism of crystallization (I) nuclear formation (ii) crystal growth. General principles of phase transformation in alloys, phase rule and equilibrium diagrams, Equilibrium diagram of binary system having complete Mutual solubility in liquid state and limited solubility in solid state, Binary isomorphism alloy system, Hume-Rothery rule, Binary system with limited solid solubility of terminal phase and in which solubility decreases with temperature and also alloy with a peristaltic transformation. Equilibrium diagram of a system whose components are subject to allotropic change. Iron carbon Equilibrium diagram, phase transformation in the iron carbon diagram (I) Formation of Austenite (ii) Transformation of Austenite into partite (iii) Marten site transformation in steel, TTT curves.

UNIT 4: ENGINEERING MATERIAL PROPERTIES AND THEIR MEASUREMENTS

Principles and applications of annealing, normalizing, hardening, tempering. Recovery and recrystallization. Harden ability - its measures, variables, effecting Harden ability, methods, for

determination of Harden ability. Over-heated and Burnt steel, its causes and remedies. Temper brittleness - its causes and remedies. Basic principles involved in heat treatment of plain carbon steel, alloy steels, cast iron and Non-ferrous metals and their alloys. Chemical Heat treatment of steels: Physical principles involved in chemical heat treatment procedure for carburizing, Nitrating, Cyaniding, carbo-nitriding of steel.

UNIT 5: ALLOYING ELEMENT ON THE STRUCTURES AND PROPERTIES

Effects produced by Alloying element on the structures and properties of steel Distribution of alloying Elements (Si, Mn, Ni, Cr, Mo, Co, Wr, Ti, Al) in steel, structural classes of steel. Classification of steels, BIS Standards. Fibre reinforced plastic composites**:** Various fibres and matrix materials, basic Composite manufacturing methods, applications of composite materials.

TEXT BOOK:

1. Material Science & Engineering By V. Raghavan. Pub Phi
2. Engineering Materials By B. K. Agarwal. Pub. Tmh
3. Material Science & Process By S.K. Hazra: Chowdhary , Media Promoters & Publications Pvt. Ltd. Bombay

REFERENCE:

1. Engg. Metallurgy. Part – I By Raymond A. Higgins. Elbs
2. Heat Treatment Principles And Technologies By T.V Rajan, O.P. Sharma & Ashok Sharma

COURSE OUTCOME

CO Statement	K	P01	P02	P03	P04	P05	P06	P07	P08	P09	P10	P11	P12	PS01	PS02
At the end of the course the student will															
C01: Acquire knowledge about atomic structure of metals	K2														
C02: Gain the knowledge of theories of plastic deformation	K2														
C03: Understand about the various engineering material	K2														
C04: Gain the knowledge about engineering material properties and their measurements	K2														

C05: Understand about the alloying, structures and their effects	K2														

3: High 2: Medium 1: Low

03BME 103 - ENGINEERING THERMODYNAMICS

L P T
3 0 0

COURSE OBJECTIVES: The main objective of this Subject to understand Basic Laws of Thermodynamics and demonstration of how these laws are used in practical situation.

UNIT 1: BASIC CONCEPTS OF THERMODYNAMICS

Thermodynamics system, control volume Properties, state, processes and cycle, equality of temperature, Zeroth Law of thermodynamics, temperature scale, laws of perfect gas, Pure substances, vapour-Liquid –solid-phase equibrium in a pure substances, thermodynamic surfaces

UNIT 2: WORK AND HEAT

Law of conservation of mass and energy, First law of thermodynamics, steady state Processes, Second law of thermodynamics, Heat engine, Carnot cycle, thermodynamic temperature scale, entropy, change of entropy for different processes, equivalence of Kelvin plank and clausius statements, clausius inequality.

UNIT 3: AVAILABLE AND UNAVAILABLE ENERGY AND THERMODYNAMIC RELATIONS

Availability of a non flow and steady flow system, Helmbeltz and Gibb's functions: Important mathematical relations, Maxwell relations, Tds Relations, Joule- Thomson coefficient, Clayperon relation.

UNIT 4: AIR – STANDARD POWER CYCLE

Brayton cycle, Otto cycle, diesel cycle, Dual cycle, Stirling cycle, Ericssion cycle and Atkinson cycle, Mean effective pressure and efficiencies, Four stroke petrol and diesel engine, Two stroke Petrol and diesel engine.

UNIT 5: PROPERTIES OF STEAM AND RANKINE CYCLE

phase change process, use of steam table & molier char. Rankine cycle, Reheat cycle, Regenerative cycle, cogeneration vapour compression refrigeration cycle.

TEXT BOOK:

1. Engineering Thermodynamics, P.K Nag Tata Mcgraw Hills
2. Engineering Thermodynamics, C.P Gupta, Rajendra Prakash Nemi Chand & Bros.

REFERENCE:

1. Engineering Thermodynamics, R.S Khurmi, J.K Gupta Publisher S. Chand
2. Principles Of Thermal Engg., Narman E. Harris, Tata Mcgraw Hill.

COURSE OUTCOME

CO Statement	K	P01	P02	P03	P04	P05	P06	P07	P08	P09	P10	P11	P12	PS01	PS02
At the end of the course the student will															
C01: Acquire knowledge about temperature and thermometer	K2														
C02: Gain the knowledge of Work and heat	K2														
C03: Understand about the available/ unavailable energy and various thermodynamics relations	K2														
C04: Gain the knowledge about various thermodynamics cycles	K2														
C05: Understand the steam property and phase change	K2														

3: High 2: Medium 1: Low

03BME 104 - MANUFACTURING PROCESS

L P T
3 0 0

COURSE OBJECTIVES: The aim of this subject to study about various manufacturing process and their technology.

UNIT 1: FOUNDRY TECHNOLOGY AND CASTING PRACTICES

Importance of manufacturing, economic and technological definition of manufacturing, survey of Manufacturing processes.

Foundry Technology: Patterns practices: Types of patterns, allowances and material used for patterns, moulding materials, moulding sands, Moulding sands; properties and sand testing; grain fineness; moisture content, clay content and permeability test, core materials and core making, core print; core boxes, chaplets, gating system design. Moulding practices**:** Green, dry and loam sand moulding, pit and floor moulding; shell moulding; permanent moulding; carbon dioxide moulding.

Casting practices: Fundamental of metal casting, sand casting, Shell-Mould casting, mold casting (plaster and ceramic), investment casting, vacuum casting, Permanent mould casting, slush casting, pressure casting, die casting, centrifugal casting, continuous casting, squeeze casting, casting alloys, casting defects, design of casting, gating system design, and riser design. Melting furnaces-rotary, pit electric, tilting and cupola.

UNIT 2: METAL JOINING PROCESSES

Principle of welding, soldering, brazing and adhesive bonding. Survey of welding and allied processes. Arc welding: power sources and consumables. Gas welding and cutting: Processes and equipments. Resistance welding: principle and equipments. Spot, projection and seam welding process. Atomic hydrogen, ultrasonic, plasma and laser beam welding, electron beam welding, and special welding processes e.g. TIG, MIG, friction and explosive welding, welding of C.I. and Al, welding defects. Electrodes and Electrode Coatings

UNIT 3: FORMING AND SHAPING PROCESSES

Metal working, elastic and plastic deformation, concept of strain hardening, hot and cold working, rolling, principle and operations, roll pass sequence, forging, forging operations, extrusion, wire and tube drawing processes. Forging: Method of forging, forging hammers and presses, principle of forging tool design, cold working processes- Shearing, drawing, squeezing, blanking, piercing, deep drawing, coining and embossing, metal working defects, cold heading, riveting, thread rolling bending and forming operation.

UNIT 4: POWDER METALLURGY AND RAPID PROTOTYPING OPERATIONS

Powder manufacturing, mechanical pulverization, sintering, Electrolytic Process, chemical reduction, atomization, properties of metal powders, compacting of powders sintering, advantages and applications of P/M.

Rapid Prototyping Operations: Introduction, subtractive processes, additive processes, Virtual Prototyping and applications

UNIT 5: PLASTIC TECHNOLOGY

Introduction, Classification of Plastics, Ingredients of Moulding compounds, General Properties of Plastics, Plastic part manufacturing processes such as compression moulding, transfer

moulding, injection moulding, extrusion moulding, blow moulding, calendaring, thermoforming, slush moulding, laminating**.**

BOOKS:

1. Production Technologies By P.C Sharma By S.Chand And Co. Ltd.
2. Manufacturing Process By Begeman
3. Manufacturing Processes And Material: I. E Doyle, Carl Kayser, Schrade Leech.

REFERENCE:

1. Manufacturing Process. Schey.
2. Production Technologies: Ashish Dutt Sharma, Cbc

COURSE OUTCOME

CO Statement	K	P01	P02	P03	P04	P05	P06	P07	P08	P09	P10	P11	P12	PS01	PS02
At the end of the course the student will															
C01: Acquire knowledge about foundry technology and casting practices	K2														
C02: Gain the knowledge of metal joining processes	K2														
C03: Understand about the forming and shaping processes	K2														
C04: Gain the knowledge about powder metallurgy and rapid prototyping operations	K2														
C05: Understand about the plastic technology	K2														

3: High 2: Medium 1: Low

03BME205 – OBJECT ORINTED PROGRAMMING IN C^{++}

L P T
3 0 0

COURSE OBJECTIVES: The main objective of this Subject to understand High level programming language and used in practical situation.

UNIT 1 INTRODUCTION TO OBJECT ORIENTED PROGRAMMING:

Basic concepts: Class, Object, Method, Message passing, Inheritance, Encapsulation, Abstraction, Polymorphism.

UNIT 2 BASICS OF C++ ENVIRONMENT:

Variables; Operators; Functions; user defined, passing by reference, passing an array to the function, inline function, scope, overloading; Pointers: objects and value, arrays and pointers, the new and delete operators, dynamic arrays, arrays of pointers and pointers to arrays, pointers to pointers and functions; Strings: String I/O, character functions in c type h. String functions in string. h.

UNIT3 OBJECT ORIENTED CONCEPTS USING C++ AND OVERLOADING:

Classes: Member functions, Friend functions, Constructors, Access functions, Private member functions, class destructor, static data and function members;

Overloading: inline functions, this operator, overloading various types of operators, conversion operators; the String Class; Composition and Inheritance: Hierarchy and types of inheritance, protected class members, private versus protected access, virtual functions and polymorphism, virtual destructors, abstract base classes.

UNIT 4 TEMPLATES AND ITERATORS:

Function and class templates, container classes, subclass templates, iterator classes; Libraries: standard C++ library, contents of a standard C headers, string streams, file processing: Files and streams classes, text files, binary files, classification of files, the standard template library.

UNIT 5 DATA STRUCTURES USING C++:

Linked lists – Singly linked list, Doubly linked lists, Circular lists, Stacks and Queues priority Queues, Stacks, Queues.

BOOKS:

1. Programming In C: C. Gottfried, Schaum Series.
2. Programming In C: E. Balagruswamy.

REFERENCE:

1. Object Oriented Programming In C++: E. Balagruswamy

COURSE OUTCOME

CO Statement	K	P01	P02	P03	P04	P05	P06	P07	P08	P09	P10	P11	P12	PS01	PS02
At the end of the course the student will															
C01: Acquire knowledge about basic concept of programme and class	K2														
C02: Gain the knowledge of high level language of c^{++}	K2														
C03: knowledge about using c++ and overloading	K2														
C04: Gain the knowledge about various Function and class templates	K2														
C05: Understand the data structures using c++:	K2														

3: High 2: Medium 1: Low

03BME 106 - ADVANCE ENGINEERING MATHEMATICS

L P T
3 0 0

COURSE OBJECTIVES: The main objective of this Subject to understand Advance Mathematical calculation and used in practical situation.

UNIT 1 FOURIER SERIES:

Fourier series, Half-range series, Harmonic analysis. Integral Transforms: Fourier integral theorem, Fourier transforms, Convolution theorems, Inversion theorem for Fourier and Laplace transforms, Simple applications of these transforms to one dimensional problems.

UNIT 2 METHOD OF SEPARATION OF VARIABLES:

Applications to the solution of wave equation in one dimension, laplace's equation in two dimensions, Diffusion equation in one dimension. Transform calculus : Laplace transform with its simple properties, applications to the solutions of ordinary and partial differential equations having constant co-efficient with special reference to wave and diffusion equation.

UNIT 3 COMPLEX VARIABLE:

Functions of a complex variable; Exponential, trigonometric, hyperbolic and logarithmic functions; Differentiation, Analytic functions, Cauchy-Riemann equations, conjugate functions; Application to two dimensional potential problems; Conformal transformations, Schwartz-

Christoffel transformation; Cauchy's Integral theorem. Taylor's and Laurent's expansions; Branch points, zeros, poles and residues; Simple problems on contour integration

UNIT 4 BOUNDARY VALUE PROBLEMS:

Equations for vibrations of strings, heat flow and electrical transmission lines; Laplace's equation in Cartesian, cylindrical polar and spherical polar coordinates; Solution by separation of variables. Solution in Series: Differentiation and integration of infinite series, Series solution of differential equations; Bessel and Legendre equations, their series solution, elementary properties of Bessel functions and Legendre polynomials

UNIT 5 NUMERICAL METHODS:

Difference operators: forward, backward, central shift and average operators and relations between them. Newton Backward and Interpolation; Lagrange's interpolation and the error formula for interpolation. Numerical differentiation and integration. Trapezoidal rule and Simpson's one-third rule including error formula.

BOOKS:

1. Mathematics Statistics By J. N Kapur & H.C Saxena, S. Chand & Co., New Delhi
2. Mathematical Statistics, M Ray & H.S. Sharma, Ram Prasad & Sons , Agra

REFERENCE:

3. Mathematical Statistics, John E. Freund, Prentice Hall Of India, New Delhi
4. Advanced Mathematics For Engineers, Chandrika Prasad, Prasad Mudranalaya

COURSE OUTCOME

CO Statement	K	P01	P02	P03	P04	P05	P06	P07	P08	P09	P10	P11	P12	PS01	PS02
At the end of the course the student will															
C01: Acquire knowledge about Fourier series	K2														
C02: Gain the knowledge of laplace's equation in two dimensions	K2														
C03: knowledge about using Functions of a complex variable	K2														
C04: Gain the knowledge about boundary value problems	K2														
C05: Understand the forward, backward, central	K2														

shift and average operators and relations															

3: High 2: Medium 1: Low

03BME201 - STRENGTH OF MATERIALS LAB

L P T
0 2 0

PRE- REQUISITES:

1 Specimen (Work piece) 2. Machine
3. Measuring instruments 4. Electric Power

COURSE OBJECTIVES:

1. To understand Strength and properties of Different Materials.
2. It also deals with measurement of the capacity to recover quickly from difficulties; toughness of the Materials.

LIST OF EXPERIMENTS:

1. Izod Impact testing.
2. Rockwell Hardness Testing.
3. Spring Testing
4. Column Testing for buckling
5. Torsion Testing
6. Tensile Testing
7. Compression Testing
8. Shear Testing
9. Brinell Hardness Testing
10. Bending Test on UTM.
11. Study of Fatigue Testing Machine.

COURSE OUTCOMES:

CO Statement	K	P01	P02	P03	P04	P05	P06	P07	P08	P09	P10	P11	P12	PS01	PS02
At the end of the course the student will															

C01: To be understand stress and strain Diagram of different materials	K2														
C02: To be understand stress and strain Diagram of different materials	K2														
C03: Calculate Stress, Strain and Modulus of rigidity.	K2														
C04: To understand different column or pillar buckling loads.	K2														
C05: To understand torsion and bending equation and its applications.	K2														

03BME202 - MATERIAL SCIENCE AND HEAT TREATMENT LAB

L P T
0 2 0

PRE- REQUISITES:

1. Specimen (Work piece) 2. Material testing setup 3. Electric Power
4. Furnace 5. Apron and Gloves

COURSE OBJECTIVES: The aim of material science and heat treatment lab is to know how material is tested using different type of testing machine as well as know about the heat treatment.

LIST OF EXPERIMENTS:

1. Study of Engineering Materials and crystals structures and study of models BCC, FCC, HCP and stacking sequence, tetrahedral and octahedral voids.

2. To calculate the effective number of atoms, co-ordination number, packing factors, c/a ratio for HCP structure.

3. Study of brittle and ductile fracture.

4. To prepare metallic samples for metallographic examination and to study the principle and construction of the Metallurgical Microscope.

5. Study of the following Micro structures: Hypo, Hyper and Eutectoid Steel, Grey, White, Nodular and Malleable Cast Iron.

6. Annealing of Steel - Effect of annealing temperatures and time on hardness.

7. Study of Microstructure and hardness of steel at different rates of cooling and examination of microstructure of white cast iron.

8. Hardening of steel, effect of quenching medium on hardness.

9. Effect of Carbon percentage on the hardness of Steel.

10. Study of various crystal structures and dislocations through models.

11. Study of Iron-Carbon Equilibrium diagram and sketch the various structures present at room temperature.

COURSE OUTCOMES:

CO Statement	K	P01	P02	P03	P04	P05	P06	P07	P08	P09	P10	P11	P12	PS01	PS02
At the end of the course the student will															
C01: To be understand about various testing methods and heat treatment process.	K2														
C02: Studied about microstructure of materials and various crystal structures and dislocations.	K2														
C03: Understand about iron-carbon equilibrium diagram.	K2														
C04: Understand about effect of Carbon percentage on the hardness of Steel.	K2														

03BME203 - THERMAL ENGINEERING LAB

L P T
0 2 0

PRE- REQUISITES:

1. Experimental setup
2. Model of Engines and Boiler
3. Basic knowledge of thermodynamics

COURSE OBJECTIVES: The Aim thermal engineering lab, to give the detail knowledge how to run engine and about working principle of boiler and Multi Stage Air Compressors and Dynamometers.

LIST OF EXPERIMENTS:

1. Comparative study of four stroke diesel and petrol engines.

2. Comparative study of two stroke petrol and diesel engines.

3. Studies of fuel supply systems of diesel and petrol engines.
4. Study of cooling, lubrication and ignition system in diesel and petrol engines.
5. To study various types of Boilers and to study Boiler mounting and accessories.
6. To study various types of Dynamometers.
7. To study Multi Stage Air Compressors.
8. To find the BHP, Thermal efficiency of four stroke diesel engine.
9. Study of Brakes, Clutches, and Transmission System.
10. To prepare a comparison sheet of various automobiles (4 Wheeler and 2 Wheeler).

COURSE OUTCOMES:

CO Statement	K	P01	P02	P03	P04	P05	P06	P07	P08	P09	P10	P11	P12	PS01	PS02
At the end of the course the student will															
C01: Students understand about the four stroke diesel and petrol engines, two stroke petrol and diesel engines, fuel supply systems of diesel and petrol engines.	K2														
C02: Studied about Boilers and to study Boiler mounting and accessories, Dynamometers, Multi Stage Air Compressors, Brakes, Clutches, and Transmission System.	K2														

03BME204 - PRODUCTION ENGINEERING PRACTICE LAB

L P T
0 3 0

PRE- REQUISITES:

1. Lathe, Shaper Machine 2. Electric Power 3. Basic knowledge of Machine
4. Apron and Gloves 5. Tool and Work piece

COURSE OBJECTIVES:

1. To operate Lathe, Shaper Machine and also gain the knowledge of Strength Test, Permeability Test, Moisture test and clay content test, A.F.S. Sieve analysis Test.
2. To understand Design and making of the pattern to observe the response of engineering materials during tensile and impact tests. Learn Molding Melting and Casting, Learn molding of plastics

LIST OF EXPERIMENTS:

1. Study of lathe machine, lathe tools cutting speed, feed and depth of cut.
2. To perform step turning, knurling and chamfering on lathe machine as per drawing.
3. Taper turning by tailstock offset method as per drawing.
4. To cut metric thread as per drawing.
5. To perform square threading, drilling and taper turning by compound rest as per drawing.
6. To study shaper machine, its mechanism and calculate quick return ratio.

Foundry Shop

1. To prepare mould of a given pattern requiring core and to cast it in aluminum.
2. Moisture test and clay content test.
3. Strength Test (compressive, Tensile, Shear Transverse etc. in green and dry conditions) and Hardness Test (Mould and Core).
4. Permeability Test.
5. A.F.S. Sieve analysis Test.

COURSE OUTCOMES:

CO Statement	K	P01	P02	P03	P04	P05	P06	P07	P08	P09	P10	P11	P12	PS01	PS02
At the end of the course the student will															
C01: Students understand about Lathe machine and Shaper Machine and its various operation.	K2														
C02: Studied about Strength Test, Permeability Test, Moisture test and clay content test, A.F.S. Sieve analysis Test.	K2														

03BME205 - COMPUTER PROGRAMMING LAB

L P T
0 3 0

PRE- REQUISITES:

1. Computer lab
2. Software
3. Power back-up system

COURSE OBJECTIVES: To implement the object oriented concepts and to learn advanced features of the C++ programming language.

LIST OF EXPERIMENTS:

1. Program for revising control statements, arrays and functions.

2. Program using string handling and various functions described in string.h, ctype.h.

3. Program using structures and sorting algorithm (Insertion, Selection, Quick, Heap sort) and functions described in math.h.

4. Program using file handling and related functions defined in stdio.h, io.h.

5. Program using pointers, array and pointers, pointers to structures, dynamic memory allocation.

6. Program using basic I/O and control statements.

7. Program using class, objects, objects as function parameters.

8. Program using functions and passing reference to a function, inline functions. Program using Inheritance and virtual base class.

9. Program using pointers, arrays, dynamic arrays. Program using functions defined in ctype.h and string.h.

10. Program using constructors, destructors. Program using function and operator over loading

List of program in C++ implementing Data Structures

11. Creating and managing (add, delete, print, insert) nodes of a Linked list.

12. Creating and managing (create, pop, push etc.) stacks and queues.

Note: Students should submit and present a minor project at the end of the lab.

COURSE OUTCOMES:

CO Statement	K	P01	P02	P03	P04	P05	P06	P07	P08	P09	P10	P11	P12	PS01	PS02
At the end of the course the student will															
C01: Students will be able to apply the computer programming techniques to solve practical problems. Students will be able to understand the concepts.	K2														
C02: Students will be able to implement object oriented concepts to solve problems.	K2														
C03: Students will be able to develop applications using object oriented	K2														

concepts.															

03BME206 - MACHINE DRAWING

L P T
0 3 0

PRE- REQUISITES:

1. Drawing Board 2. Drawing instruments 3. Drawing Sheet
4. Mini Drafter Machine 5. French curve

COURSE OBJECTIVES: 1. Provide the fundamental concepts of machine drawing elaborating on how to concretize the idea of new structure such as a machine element.
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.
4. Help the student in the visualization of assembly and sub assembly of various machine elements.
5. Train the students in the preparation of assembly drawings

LIST OF EXPERIMENTS:

1. Detail drawings: Couplings: Pin-type flexible coupling etc,

2. IC. Engine parts: connecting rod, crank shaft, etc, Boiler Mountings: Steam stop valve/ feed check-valve/ safety valve /three way stop valve blow off cock.

3. Bearings: Swivel bearing

4. Machine Tool Parts: Shaper tool head, Lathe Tail Stock, Turret Tool Post, Turret Bar feeding Mechanism / Universal Dividing Head, Swivel machine vice.

5. Miscellaneous: Screw jack and drill-press vice.

6. Free Hand Sketches: Pipes and Pipe fittings, clutches, bearings, bearing puller, valve gear mechanisms, machine arbor and cutter, universal dividing head, jigs and fixtures, Step less drive , sliding gear box.

COURSE OUTCOMES:

CO Statement	K	P01	P02	P03	P04	P05	P06	P07	P08	P09	P10	P11	P12	PS01	PS02
At the end of the course the student will															

C01: Helping the student in drafting their technical ideas	K2														
C02: Creating knowledge about the various practices with regard to the dimensioning, sectioning and development of views.	K2														
C03: Understanding the importance of the linking functional and visualization aspects in the preparation of the part drawings	K2														
C04: Preparation of the part or assembly drawings as per the conventions.	K2														
C05: Interpretation of machine drawings that in turn help the students in the preparation of the production drawings	K2														

B.TECH MECHANICAL ENGINEERING (2nd Year 4-Semester)

04BME 101 - DESIGN OF MACHINE ELEMENTS-I

L	P	T
3	0	0

COURSE OBJECTIVES:

1. Understand the design procedure and selection of material for a specific application.
2. Apply failure theories in evaluating strength of machine elements.
3. Analyze machine components subjected static and variable loads.
4. Design machine elements like Riveted and welded joints, Bolted joints, Keys, cotters and knuckle joints, shafts and their couplings and springs

UNIT 1: MATERIALS

Properties and IS coding of various materials, Selection of material from properties and economic aspects. Manufacturing aspects in Design: Selection of manufacturing processes on the basis of design and economy, Influence of rate of production, standard size, Influence of limits, fits tolerances and surface finish. Change in the shape of the designed element to facilitate its production, Design of castings, working drawing.

UNIT 2: DESIGN FOR STRENGTH

Allowable stresses, detailed discussion on factor of safety (factor of ignorance): Stress concentration. Causes & mitigation. Introduction of various design considerations like strength, stiffness, weight, cost, space etc. Concept of fatigue failures. Design of machine elements subjected to direct stress, Pin, cotter and keyed joints, Design of screw fastening.

UNIT 3: DESIGN OF MEMBERS IN BENDING

Beams, levers and laminated springs.

UNIT 4: DESIGN OF MEMBERS IN TORSION

Shafts and shaft couplings.

UNIT 5: DESIGN OF SHAFTS, BRACKETS

Design of shafts, brackets under combined stresses, Calculation of transverse & torsional Deflections. Screw fasteners subjected to eccentric loading.

TEXT BOOK:

1. Elements Of Machine Design: N.C Pandey, C.S Shah Charotar Book Stall And
2. Design Of Machine Element: V. B Bhandari Tata Mcgraw Hill Pub Co. Ltd.
3. Mechanical Machine Design: R.C Bahl, V.K Goel, Standard Pub. Distributers Delhi.

REFERENCE:

1. Mechanical Engineering Design: J.E Shigley Mcgraw Hill Co.
2. Machine Design : K K Pujara, B I Junega, Dhanpat Rai Publications.

COURSE OUTCOME

CO Statement	K	P01	P02	P03	P04	P05	P06	P07	P08	P09	P10	P11	P12	PS01	PS02
At the end of the course the student will															
C01: Acquire knowledge about Properties and IS coding of various materials	K2														
C02: Gain the knowledge of design for strength	K2														
C03: Gain the knowledge of design of members in torsion	K2														
C04: Gain the knowledge about Shafts and shaft couplings	K2														
C05: Studied Design machine tool elements including shafts, brackets and Screw fasteners	K2														

3: High 2: Medium 1: Low

04BME 102- AUTOMOBILE ENGINEERING

L	P	T
3	0	0

COURSE OBJECTIVES:

Learn about the frames & body, gears boxes battery construction and Air conditioning system Components etc.

UNIT 1: FRAME & BODY AND TRANSMISSION SYSTEM

Layout of chassis, types of chassis frames and bodies, their constructional features and materials. Transmission System: Clutch; single plate, multiplate, cone clutch, semi centrifugal, electromagnetic, vacuum and hydrautic clutches. Fluid coupling.

UNIT 2: GEAR BOXES

Gear boxes, Sliding mesh, constant mesh, synchromesh and epicyclic gear boxes, Automatic transmission system; Hydraulic torque converter; overdrive, propeller shaft, universal joints, front wheel drive, differential; Rear axle drives. Hotchkiss and torque tube drives; rear axle types; Two wheel and four wheel drive.

UNIT 3: RUNNING GEAR

Types or wheels and tyres. Tyre construction; tyre inflation pressure, tyre wear and their causes; re-treading of the tyre, Steering system, steering gear boxes, Steering linkages, steering mechanism, under and over steering. Steering Geometry, effect of camber, caster, king pin inclination, toe in and toe out; power steering; integral and linkage types suspension system; objects and requirements, suspension spring, front and rear suspension systems, Independent suspension system shock absorber. BRAKES; Classification and function; Mechanical, hydraulic, vacuum air and self engineering brakes; Brake shoes and lining materials.

UNIT 4: AUTOMOTIVE ELECTRICAL SYSTEM

Battery construction, Charging and testing, battery types, Starting and Battery Charging System Starter motor construction, types of drive, Alternator construction, regulation and rectification. Ignition System: magneto and coil ignition systems, System components and requirements, Automotive lighting Wiring systems Electrical instruments; head lamp, electric horn, fuel level indicator.

UNIT 5: AUTOMOTIVE AIR CONDITIONING AND AUTOMOTIVE SAFETY

Introduction, Loads, Air conditioning system Components, Refrigerants, Fault Diagnosis. Automotive Safety: Safety requirements, Safety Devices, Air bags, belts, radio ranging, NVS (Night Vision System) GPS (Global Positioning System) etc.

COURSE OUTCOME

CO Statement	K	P01	P02	P03	P04	P05	P06	P07	P08	P09	P10	P11	P12	PS01	PS02
At the end of the course the student will															
C01: Acquire knowledge about Layout of chassis	K2														
C02: Gain the knowledge of Gear boxes	K2														
C03: Gain the knowledge of Types or wheels and tyres	K2														
C04: Gain the knowledge about Battery construction, Charging and testing	K2														
C05: Studied about air conditioning system components	K2														

3: High 2: Medium 1: Low

TEXT BOOK:

1. Automobile Engineering By R K Sharma
2. Automobile Engineering By Kirpal Singh
3. Vehical Engine And Technology By Heisler Elbs

REFERENCE:

1. Automatic Transmission By Mathias F. Brejcha, Prentice Hall
2. Auto Mechanics Webster J. Glenwne Publishing Co.

04BME 103 - FLUID MECHANICS

L P T
3 0 0

COURSE OBJECTIVES: Learn about the fluids and fluid properties, Flow classifications, flow through pipes, laminar flow, the boundary layer etc

UNIT 1: BASIC DEFINITIONS AND FLUID PROPERTIES

Definition of Fluid, Incompressible and compressible fluids, Fluid as a continuum, Mass, Density, specific weight, relative density, specific volume, Bulk modulus, velocity of sound Ideal fluid Viscosity. Newtonian and Non - Newtonian fluid, Kinematic viscosity, Effect of temperature and pressure on viscosity, surface tension capillarity, vapour pressure and cavitation. Fluid Statics : General differential equation, Hydrostatics Manometry, Fluid forces on

submerged surfaces. Curved surfaces, Aerostatics, Isothermal atmosphere, polytropic atmosphere. The international standard atmosphere, static stability The international standard atmosphere submerged bodies. Floating bodies.

UNIT 2: KINEMATICS AND CONSERVATION OF MASS

Flow classifications. Fluid velocity and acceleration, streamlines and the stream function. Pathlines and streak lines. Deformation of a fluid element, verticity and circulation. Irrotational and Rotational flow. Flownet, Laplace equation. Conservation of mass and the continuity equation for three dimensions. Fluid Momentum : The Momentum theorem Applications of the momentum theorem Equation of motion, Euler's equation of motion Integration of Euler's equation of motion. Bernoulli's equation. Applications of Bernoulli's Pitot tube, Equation of motion for Viscous fluid, Navier Stoke's equation.

UNIT 3: FLOW THROUGH PIPES

Orifice discharging free, Jet, vena contracts, co-efficient of contraction, velocity and discharge, coefficient of resistance. Orifices and mouthpieces Nozzles and weires. Flow Through Pipes : Reynold's experiment Darcy's Weisback equation. Loss of head due to sudden enlargements, contraction, entrance, exit obstruction, bend, pipe fittings. Total and Hydraulic grandient lines, Flow through pipe line. Pipes in series, parallel Transmission of power through pipes.

UNIT 4: LAMINAR FLOW

Simple solution of Navier Stokes equations. Hagen – Poiseuille flow. Plans Poiseuille flow and coutte flow. Turbulent Flow; Variation of friction factor with Reynold's number. The Prandt Mixing length hypothesis applied to pipe flow, velocity distribution in smooth pipes, sough pipes. The Universal pipe friction laws, Colebrook. White formula. Dimensional Analysis: Buckingham variables, Model Similitude, Force ratio, Reynolds, Froude's Mach, Weber and Euler numbers and their applications. Undistorted model distorted model scale effect.

UNIT 5: THE BOUNDARY LAYER

Description of the boundary layer. Boundary Layer thickness boundary layer separation and control. The Prandtl boundary layer equation. Solution for cominar boundary layer. The momentum equation for the boundary layer. The flat plate in uniform free stream with no pressures gradients. Approximate momentum analysis laminar boundary Aerofoils Theory. Flow round a body ; Drag skin friction drag, pressure drag, combined skin friction & pressure drag (Profile drag) wave drag, lift induced drag. Flow past sphere & Cylinder.

COURSE OUTCOME

CO Statement	K	P01	P02	P03	P04	P05	P06	P07	P08	P09	P10	P11	P12	PS01	PS02

At the end of the course the student will															
C01: Acquire knowledge about basic definitions and fluid properties	K2														
C02: Gain the knowledge of kinematics and conservation of mass	K2														
C03: Gain the knowledge of flow through pipes	K2														
C04: Gain the knowledge about laminar flow	K2														
C05: Studied about description of the boundary layer	K2														

3: High 2: Medium 1: Low

TEXT BOOK:

1. Engineering Fluuid Mechanics: K L Kumar, Euresia Publishing House
2. Fluid Mechanics And Machines: F M White, John Willy And Sons
3. Fluid Mechanics : R.K.Rajput S. Chand Company Ltd

REFERENCE:

1. Fluid Mechanics Vm Streeter Mcgraw Hill
2. Engineering Fluid Mechanics By D S Kumar

04BME 104 - MACHINING AND MACHINE TOOLS

L P T
3 0 0

COURSE OBJECTIVES:

1. Understand about the tool nomenclature, mechanish of chip formation, Machinability, Special Purpose Machine Tools, Thread Manufacturing, Gear Manufacturing Processes and High Velocity Forming Methods etc.
2. Impart the fundamental aspects of the metal cutting principles and their application in studying the behavior of various machining processes.

UNIT 1: MECHANICS OF METAL CUTTING

Classification of metal removal process and machines Mechanics of metal cutting: Geometry of single point cutting tool and tool angles. Tool nomenclature in ASA, ORS, NRS and interrelationship. Mechanism of chip formation and types of chips, chip breakers. Orthogonal

and oblique cutting, cutting forces and power required, theories of metal cutting. Thermal aspects of machining and measurement of chip tool interface temperature. Friction in metal cutting.

UNIT 2: MACHINABILITY AND GENERAL PURPOSE MACHINE TOOLS

Concept and evaluation of Machinability, tool life, mechanisms of tool failure, tool life and cutting parameters, Machinability index, factors affecting Machinability. Cutting fluids: Types, properties, selection and application methods

General Purpose Machine Tools: Classification and constructional details of lathe, drilling, milling, shaping and planning machines. Tooling, attachments and operations performed selection of cutting parameters, calculation of forces and time for machining. Broaching operation.

UNIT 3: SPECIAL PURPOSE MACHINE TOOLS

Automatic lathes, capstan and turret lathe machines. Swiss automatic, operational planning and turret tool layout, sequence of operations. Tracer attachment in Machine Tools: mechanical-copying machines; Hydraulic Tracing Devices; Electric Tracing systems; Automatic tracing. Abrasive processes: Abrasives; natural and synthetic, manufacturing, nomenclature. Selection of grinding wheels, wheel mounting and dressing, characteristic terms used in grinding. Machines for surface and cylindrical grinding, their constructional details and processes. Surface finishing: Honing, lapping, super finishing, polishing and buffing processes.

UNIT 4: THREAD MANUFACTURING

Casting; thread chasing; thread cutting on lathe; thread rolling, die threading and tapping; thread milling; thread grinding.

Gear Manufacturing Processes: hot rolling; stamping; powder metallurgy; extruding etc. Gear generating processes: gear hobbling, gear shaping. Gear finishing processes: shaving, grinding, lapping, shot blasting, phosphate coating, Gear testing.

UNIT 5: HIGH VELOCITY FORMING METHODS

(High-energy rate forming processes) Definition; Hydraulic forming, Explosive forming, Electro-hydraulic forming, Magnetic pulse forming. Industrial Safety: Human factor in machine equipment safety; reducing industrial noise; precautions to be taken by operators for safe working on different machine tools.

COURSE OUTCOME

CO Statement	K	P01	P02	P03	P04	P05	P06	P07	P08	P09	P10	P11	P12	PS01	PS02

At the end of the course the student will															
C01: Acquire knowledge about basic definitions and fluid properties	K2														
C02: Gain the knowledge of kinematics and conservation of mass	K2														
C03: Gain the knowledge of flow through pipes	K2														
C04: Gain the knowledge about laminar flow	K2														
C05: Studied about description of the boundary layer	K2														

3: High 2: Medium 1: Low

TEXT BOOK:

1. Production Engineering Sciences By Pc Pandey & C K Singh Std Pub & Dist.
2. Production Engineering By P C Sharma By S Chand & Co.

REFERENCE:

1. Fundamentals' Of Tool Design: F W Wilson

04BME 105 - KINEMATICS OF MACHINES

L P T
3 0 0

COURSE OBJECTIVES:

1. Understand the concept of machines, mechanisms and related terminologies
2. Expose the students to various mechanisms and motion transmission elements used in Mechanical Engineering
3. Analyze a mechanism for displacement, velocity and acceleration at any point in a moving link.
4. Understand the theory of cams, gears and gear trains.
5. Understand the role of friction in belt, rope and chain drives.

UNIT 1: KINEMATICS

Elements, pairs , mechanisms, four bar chain and its inversions, velocity and acceleration, Klein's construction, coriolis component, instantaneous center method, synthesis

UNIT 2: AUTOMOTIVE VEHICLE MECHANISMS

Overhead valve mechanism, Davis and Ackerman steering mechanism, Trifler suspension and Hookes joint. Power transmission: Belts and ropes, effect of centrifugal force, creep, chain drive

UNIT 3: FRICTION

Laws of static, dynamic and rolling friction, dry and viscous friction, inclined plane and screw jack, pivots and friction axis, bearing, Clutches. Theory of film lubrication.

UNIT 4: BRAKES AND DYNAMOMETERS

Band, block and band & block brakes, braking action, absorption and transmission type dynamometers, prony, rope and hydraulic dynamometers braking system of automobiles.

UNIT 5: CAMS

Type of cams, displacement, velocity and acceleration curves for different cam followers, consideration of pressure angle and wear, analysis of motion of followers for cams with specified contours.

COURSE OUTCOME

CO Statement	K	P01	P02	P03	P04	P05	P06	P07	P08	P09	P10	P11	P12	PS01	PS02
At the end of the course the student will															
C01: Acquire knowledge about Understand the basic principles of mechanisms in mechanical engineering.	K2														
C02: Gain the knowledge of Apply the kinematic analysis in subsequent courses in the design and analysis of various machine components.	K2														
C03: Gain the knowledge of Laws of static, dynamic and rolling friction, dry and viscous friction	K2														
C04: Gain the knowledge about brakes and dynamometers	K2														
C05: Studied about different cam followers	K2														

3: High 2: Medium 1: Low

TEXT BOOK:

1. Kinetics & Dynamics Of Machines : G.H.Martin M Cgrawhill Publishing Co Ltd
2. Elements Of M/C Design: N.C. Pandya & C.S Shah Charotar Book Stall Anand
3. Design Of M/C Elements: V.B. Bhandari,Tata Mc-Graw Hill Publishing Ltd.,New Delhi M Cgrawhill Publishing Co Ltd
4. Mechanical Engg Design : J.E. Shigley, M C Graw Hill Publishing Co Ltd

REFERENCE:

1. Fundamental Of Machine Component Design : R.C.Juvinall&K.M. Marshek,John Vilay & Sons
2. Theory & Problms Of Machine Design ,Haltetschaum"S Outline Series, M Cgrawhill Publishing Co Ltd
3. "Design Data" Psg College Of Technology/S Dpv Printers
4. Machine Design ,Rajendra Karva

04BME 106 - MECHANICAL MEASURMENTS & CONTROL

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COURSE OBJECTIVES:

UNIT 1: SYSTEM CONFIGURATION

System configuration, basic characteristic, calibration, classification and performance characteristics of a instrumentation system, Specification and testing of dynamic response. Strain Measurement : Electric Strain Gauges - Types ; Selection and Installation, Strain gauge circuits; temperature compensation and calibration; Use of Strain Gauges on Rotating Shafts, Load Cells, Mechanical and Optical Strain Gauges.

UNIT 2: MECHANICAL, ELECTRO- MECHANICAL & PHOTOELECTRICAL SENSORS FOR SENSING

Various Mechanical, Electro- Mechanical & Photoelectrical Sensors for sensing of Displacement, Velocity, Acceleration, Torque, Force, Temperature from Low to High Range, flow, level of fluid , pressure, angular speed, voltage, frequency and current.

UNIT 3: INTRODUCTION TO MULTI-CHANNEL DATA-ACQUISITION SYSTEM

Measurement Pods, Interface Hardware, Data Analysis Software, Interfacing. Concepts and examples of automatic control systems, systems by differential equations, transfer function, block diagram, open and feedback control systems, signal flow graphs & its constructions. Control System components, error sensing devices and servo motors.

UNIT 4: CONTROL FOR MECHANICAL SYSTEMS & PROCESSES

Speed control system for steam/gas turbines. A constant tension ;reeling system, Electro mechanical systems. Thermal systems, Pneumatic systems; Mathematical Models of physical systems, Feed back characteristics of Control Systems. Time response analysis; transient response analysis, time response specifications, steady state-error.

UNIT 5: CONCEPTS OF STABILITY

Routh-Hurwiz stability criterion, relative stability. The root locus technique, use of construction rules without any derivation. Frequency response analysis, Polar plots; stability in frequency domain, Bode / Logrithmic plots. Nyquist stability criterion.

COURSE OUTCOME

CO Statement	K	P01	P02	P03	P04	P05	P06	P07	P08	P09	P10	P11	P12	PS01	PS02
At the end of the course the student will															
C01: Acquire knowledge about Understand the basic principles of mechanisms in mechanical engineering.	K2														
C02: Gain the knowledge of Apply the kinematic analysis in subsequent courses in the design and analysis of various machine components.	K2														
C03: Gain the knowledge of Laws of static, dynamic and rolling friction, dry and viscous friction	K2														
C04: Gain the knowledge about brakes and dynamometers	K2														
C05: Studied about different cam followers	K2														

3: High 2: Medium 1: Low

TEXT BOOK:

1. Mechanical Mesurements, T Thomas G. Backwith, N Lewis Buck, Roy, Narosa Publishing House.
2. Mechanical Measuements And Instrumentations , A K Sawhney , Dhanpat Rai And Co.

REFERENCE:

1. Industrial Instrumentation And Control. S K Singh, Tata Mcgraw Hill

04BME201: DYNAMICS OF MACHINES LAB.

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PRE- REQUISITES:

1. Model of coupling rod 2. Model of Beam Engine 3.Working model of Steering Mechanism 4. Working model of Steering mechanism 5. Various cam- follower arrangements 6. dynamometers, Brakes and Clutches

COURSE OBJECTIVES:

1. To equip students with understanding of the fundamental principles and techniques for Identify different types of dynamic systems and classify them by their governing equations.
2. To develop a model of a mechanical system using a free body diagram.
3. To develop equations of motion for translational and rotational mechanical systems.

LIST OF EXPERIMENTS:

1. To study inversion of four bar chain

2. Coupling Rod

3. Beam Engine

4. Steering Mechanism

(a) Study of quick return mechanism.(Crank and Slotted lever mech.)

(b) To draw velocity and acceleration diagram for Crank and slotted lever mechanism.

5. Study of inversion of Double slider chain Oldhan Coupling Scotch Yoke Elleptical Trammel

6. To plot displacement v/s curve for various cams.

7. Study of various cam- follower arrangements.

8. To determine co-efficient of friction.

9. Study of various types of dynamometers, Brakes and Clutches.

10. To determine moment of inertia of the given object using of Trifler suspension.

COURSE OUTCOMES:

CO Statement	K	P01	P02	P03	P04	P05	P06	P07	P08	P09	P10	P11	P12	PS01	PS02
At the end of the course the student will															
C01: Acquire knowledge about Understand the basic principles of mechanisms in mechanical engineering.	K2														
C02: Gain the knowledge of Apply the kinematic analysis in subsequent courses in the design and analysis of various machine components.	K2														
C03: Gain the knowledge of Laws of static, dynamic and rolling friction, dry and viscous friction	K2														
C04: Gain the knowledge about brakes and dynamometers	K2														
C05: Studied about different cam followers	K2														

04BME202: FLUID MECHANICS LAB

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PRE- REQUISITES:

1. Experimental Set-up for Orifice meter
2. Experimental Set-up for pitot tube
3. Experimental Set-up for Bernoulli's
4. Experimental Set-up for Venturi meter
5. Experimental Set-up for Metacentric height
6. Working model of Kaplan, Pelton turbine

COURSE OBJECTIVES:

1. The students completing this course are expected to understand the importance and theory of Fluid mechanics.

2. Finding head loss due to friction in pipes and verifying Bernoulli‘s principle.
3. The course will train the students in understanding the construction of metallurgical microscope
4. The course will allow the student to study the metallographic structures of various kinds of steels and cast irons and non-ferrous materials like copper
5. It will allow the students to compare the practically observed metallographic structure, details with that of the theoretical metallographic picture
6. It will help the student to observe the hardness of heat treated steel and compare the hardness w.r.t untreated steel.

LIST OF EXPERIMENTS:

1. Determine Metacentric height of a given body.
2. Determine Cd, Cv & Cc for given orifice.
3. Determine flow rate of water by V-notch.
4. Determine velocity of water by pitot tube.
5. Verify Bernoulli’s theorem.
6. Determine flow rate of air by Venturi meter
7. Determine flow rate of air by orifice meter
8. Determine head loss of given length of pipe.
9. Determine flow rate of air by nozzle meter.
10. Study of Pelton, Kaplan Turbine models.

COURSE OUTCOMES:

CO Statement	K	P01	P02	P03	P04	P05	P06	P07	P08	P09	P10	P11	P12	PS01	PS02
At the end of the course the student will															
C01: Students are able to perform the verification Bernoulli‘s theorem.	K2														
C02: Finding head loss due to friction in pipes based on Dracyweisbach equation.	K2														
C03: The student would appreciate the construction of an optical metallurgical microscope	K2														
C04: The student will demonstrate the ability to perform the metallography and to prepare coherent reports of his/her	K2														

findings.															
C05: The student will demonstrate the ability to compare the practical findings with the theoretical data	K2														

1. The student will be able to discuss orally or in writing ethical issues that relate to the experiments
2. The students will demonstrate the ability to synthesize appropriate concepts and methods from different experiment.

04BME203: THERMAL ENGINEERING LAB. – II

L P T
0 2 0

PRE- REQUISITES:

1. Multi-cylinder petrol and diesel engines
2. 2-stroke petrol engine
3. Rope brake dynamometer
4. Carburettors
5. Fuel injection pump

COURSE OBJECTIVES: Students will have the opportunity to study the working principle of IC engines (both SI and CI engines), performance and characteristics in terms of heat balancing, economical speed variations, air fuel ratio influence on the engine to reinforce classroom theory by having the student perform required tests, analyze subsequent data, and present the results in a professionally prepared report. The machines and equipment used to determine experimental data include cut models of 4stroke diesel engine, 2stroke petrol engine, 4stroke and two stroke petrol engines with required specifications, Multi cylinder SI engine, Single cylinder Diesel engine for performance and speed test which is suitable to tests on variable compression ratios.

LIST OF EXPERIMENTS:

1. Disassembling and assembling of multi-cylinder petrol and diesel engines and study of their parts.
2. To disassemble and assemble a 2-stroke petrol engine.
3. To disassemble and assemble a 4-stroke motor cycle engine and study of various engine parts.
4. Load test on a single cylinder 4-stroke diesel engine using a rope brake dynamometer and calculate volumetric and thermal efficiency and draw a heat balance-sheet.
5. Study of carburettors and MPFI system and disassembling and assembling of their parts.

6. To calculate valve timing of a multi-cylinder petrol engine and valve tappets adjustment.
7. Disassemble all the parts of a fuel injection pump and its parts study.
8. To disassemble the governor and study its various parts.

COURSE OUTCOMES:

CO Statement	K	P01	P02	P03	P04	P05	P06	P07	P08	P09	P10	P11	P12	PS01	PS02
At the end of the course the student will															
C01: Determine the valve timing diagram of SI engine & CI engine.	K2														
C02: Analyze the influence of variations in TDC and BDC operations.	K2														
C03: Calculate the IP,BP, brake thermal efficiency and the performance characteristics.	K2														
C04: Experiment on IC engine load variations with Air fuel ratio.	K2														
C05: Analyse the efficiency of reciprocating air compressor 8. Determine the principle of various parameters in boilers.	K2														

04BME204: MECHANICAL MEASURMENTS & CONTROL LAB.

L P T
0 2 0

PRE- REQUISITES:

1. Capacitive Pick - up System
2. Inductive Pick-up System
3. Light Dependent Register Set up
4. Speed Measurement System
5. Load Measurement System
6. Thermocouple Wire

COURSE OBJECTIVES:

1. The principles of measurement.
2. The principles of uncertainty of measurements.
3. The principles of Capacity, Inductance, Resistance and the corresponding instrumentation.
4. The principles of digital sampling.

5. The principles of signal conditioning/filtration. 6. Methods of automated data acquisition and data processing.

LIST OF EXPERIMENTS:

1. Displacement Measurement using Capacitive Pick - up System
2. Displacement Measurement Using Inductive Pick-up System
3. Displacement Measurement Using Light Dependent Register Set up

(i) Displacement v/s Registance at Constant Voltage

(ii) Voltage v/s Registance at Constant Displacement

4. Study of Speed Measurement System

(i) Magnetic Pick-up

(ii) Strobometer

5. Study of Load Measurement System Load Cell + Load Indicator
6. Calibration of Thermocouple Wire.

COURSE OUTCOMES:

CO Statement		P01	P02	P03	P04	P05	P06	P07	P08	P09	P10	P11	P12	PS01	PS02
At the end of the course the student will	K														
C01: To understand the basic measurement units and able to calibrate various measuring devices.	K2														
C02: To express error and correction factors of various measuring devices.)	K2														
C03: To use measuring Load Measurement System.	K2														
C04: To understand the thermocouple Wire etc	K2														
C05: To understand the Capacitance, resistance and inductance etc.	K2														

04BME205: MACHINE DESIGN LAB - I

L P T
0 2 0

PRE- REQUISITES:

1. Data Book 2. Model for fit and tolerances
3. Model of Knuckle & Cotter joints

COURSE OBJECTIVES:

1. Understand the design procedure and selection of material for a specific application.
2. Apply failure theories in evaluating strength of machine elements.
3. Analyze machine components subjected static and variable loads.
4. Design machine elements like Riveted and welded joints, Bolted joints, Keys, cotters and knuckle joints, shafts and their couplings and springs

LIST OF EXPERIMENTS:

1. Selection of material & IS coding
2. Selecting fit & assigning tolerances
3. Examples of Production considerations. Problems on
1. Knuckle & Cotter joints
2. Torque: Keyed joints & shaft couplings
3. Design of screw fastening
4. Bending: Beams, Levers etc.
5. Combined stresses: Shafts, brackets, eccentric loading.
6. Design for rigidity (Transverse / Torsional)

COURSE OUTCOMES:

CO Statement	K	P01	P02	P03	P04	P05	P06	P07	P08	P09	P10	P11	P12	PS01	PS02
At the end of the course the student will															
C01: Understand the design procedure and selection of material for a specific application	K2														

C02: Design a component subjected static loads based on strength and stiffness criterion.	K2														
C03: Design a component when it is subjected variable loads.	K2														
C04: Provide alternate design solutions based on requirement.	K2														

MECHANICAL ENGINEERING

B.TECH COURSE 3rd Year 5th SEMESTER

05BME 101 - ADVANCED MECHANICS OF SOLIDS

L P T

3 0 0

Course Objectives: The main objectives of this subject, study of analysis of stress, strain & bending stresses in 3-dimensional body. It is used to analysis of various engineering machine elements.

Course Description:

Unit 1:ANALYSIS OF STRESS IN 3-DIMENSIONS:

Body force, surface force and stress vectors, state of Stress at a point, normal shear stress components, stress component on arbitrary plane, Principal stresses in 3-Dimentions, stress invariants, decomposition of stress matrix into Hydrostatic and pure shear states, Lame's stress ellipsoid, differential equations of Equilibrium.

Unit 2: ANALYSIS OF STRAIN IN 3-DIMENSIONS:

introduction, deformation in neighborhood of a point, change of length of linear element, state of strain at a point, principal axes of strain and principal strains, compatibility conditions.

Unit 3: STRESSES STRAIN RELATIONS:

Stress strain relations for linearity elastic bodies, generalized Hooke's law, stress-strain relations for anisotropic, orthotropic and isotropic materials.

Unit 4: BENDING OF CURVED BEAMS:

Bending of curved beams (Winkler-Bach formula); unsymmetrical bending of beams, Shear centre.

Unit 5: STRESSES IN THICK CYLINDERS:

Stresses in thick cylinders, shrink fit stresses, stresses in rotating discs.

Text Books:

1. Mechanics of Solids By S H Crandall. N C Dacha Mcgraw Hills International Edition
2. Strength of Materials: G.H Ryder. Elba Publications Co., London
3. Elements of Strength Of Materials. J.P Tinnoshnko & G.H Young, Affiliated East West Press, New Delhi
4. Solid Mechanics. G.M.A Kazmi. Tata Mcgraw Hill Publishing Co. Ltd... New Delhi
5. Strength of Materials: S. Ramamrutham. Dhanpat Rai And Publications, New Delhi.

Course Outcome:

CO Statement	K	P01	P02	P03	P04	P05	P06	P07	P08	P09	P10	P11	P12	PS01	PS02
At the end of the course the student will		3	2	1	3	2	1	3	2	1	3	2	1	3	2
C01: Acquire knowledge about Principal stresses in 3-dimesional	K2	3	2	1	1										1
C02: Acquire knowledge about Principal strain in 3-dimesional	K2	3	2	1	1										
C03 Established the relationship between stresses and strains.	K2	3	2	1	1										

C04: Gain the knowledge about Bending of curved beams unsymmetrical beam	K2	3	2	1	1										
C05: Gain the knowledge about stresses in rotating discs	K2	1													

3: High 2: Medium 1: Low

05BME 102- HEAT TRANSFER

L	**P**	**T**
3	**0**	**0**

Course Objectives: The main objectives of this subject are to understand the heat transfer mechanism in solid, liquid & gases. In the heat exchanger students understand how the heat flows from hot fluid to cold fluid.

Course Description:

Unit 1: INTRODUCTION TO HEAT TRANSFER PROCESSES:

Introduction to heat transfer processes, conduction and radiation. Fourier's law of heat conduction, thermal conductivity, thermal conductivity of solids, liquids and gases, effect of temperature on thermal conductivity. Newton's law of cooling, definition of overall heat transfer coefficient. General parameters influence the value of heat transfer coefficient.

Conduction : General 3-Dimensoinal conduction equation in Cartesian , cylindrical and spherical coordinates; different kinds of boundary conditions; nature of differential equations; one dimensional heat conduction with and without heat generation; electrical analogy; heat conduction through composite walls; critical thickness of insulation.

Unit 2: HEAT TRANSFER FROM FINNED SURFACES:

Heat transfer from finned surfaces; fin efficiency and effectiveness, two dimensional steady state heat conduction using analytical and numerical methods, periodic heat conduction. Convection: review of Navier – Stokes and energy equation, hydrodynamic and thermal boundary layers; laminar boundary layer equations; forced convection appropriate non dimensional members; effect of Prandtl number; empirical relations for flow over a flat plate and flow through pipes.

Unit 3: NATURAL CONVECTION:

Natural Convection: Dimensional analysis, Granhoff number, boundary layers in external flows (flow over a flat plate only), boundary layer equations and their solutions, heat transfer correlations.

Heat transfer with change of phase: nature of vaporization phenomena; different regimes of boiling heat transfer; correlations for saturated liquid vaporization; condensation on flat plates; correlation of experimental results, drop wise condensation.

Unit4: HEAT EXCHANGER:

Heat exchanger: Different types of heat exchangers, arithmetic and logarithmic mean temperature differences, heat transfer coefficient for parallel, counter and cross flow type heat exchanger; effectiveness of heat exchanger, N.T.U. method, fouling factor. Constructional and manufacturing aspects of Heat Exchangers.

Unit 5: THERMAL RADIATION:

Thermal Radiation: Plank distribution law, Kirchhoff's law; radiation properties, diffuse radiations; Lambert's law. Radiation intensity, heat exchange between two black bodies heat exchanger between gray bodies. Shape factor; electrical analogy; reradiating Surfaces heat transfer in presence of reradiating surfaces.

Text Books:

1. Fundamentals of Heat And Mass Transfer, R C Sachdeva, New Age Publication
2. Fundamentals of Heat And Mass Transfer, C P Kothandaraman, New Age Publication
3. Heat Transfer , J.P.Holman
4. Heat And Mass Transfer, Kern, Tmh
5. Fundamentals Of Heat And Mass Transfer, Dr. D.S. Kumar

Course Outcome:

CO Statement	K	P01	P02	P03	P04	P05	P06	P07	P08	P09	P10	P11	P12	PS01	PS02
At the end of the course the student will		3	2	1	3	2	1	3	2	1	3	2	1	3	2
C01: Acquire knowledge about heat transfer in solids and basic laws of heat transfer.	K2	3	2	1	1										1
C02: Acquire knowledge about heat flow in finned surfaces.	K2	3	2	1	1										
C03 Gain the knowledge Heat transfer with change of phase & natural convection.	K2	3	2	1	1										
C04: Gain the knowledge about heat exchangers.	K2	3	2	1	1										
C05: Gain the knowledge about thermal radiations and basic laws.	K2	1													

3: High 2: Medium 1: Low

05BME 102- FUNDAMENTALS OF AERODYNAMICS

L P T

3 0 0

Course Objectives: The main objectives of this subject are to understand the Aerodynamic forces and moments over the body surface. students understand Isentropic flow and Adiabatic flow through the Aerofoil.

Course Description:

Unit 1: AERODYNAMIC FORCES AND MOMENTS

Aerodynamic forces and moments over the body surface, concept of lift and drag, dimensionless force and moment coefficient, centre of pressure of an aerofoil, nomenclature of aerofoil, angle of attack, circulation and lift over an-aerofoil, Kutta condition, Kelvin's circulation theorem.

Unit 2: BLADE THEORY

Blade theory; Symmetrical and non-symmetrical aerofoil. Energy transfer in terms of lift and drag, cascade nomenclature, turbine cascade nomenclature, cascade lift and drag Coefficient.

Unit3: ISENTROIC FLOW

Isentropic Flow: Velocity of sound; Mach angle; Mach number, steady isentropic flow through ducts; use of isentropic tables; condition for maximum discharge; choked flow; flow through convergent and convergent-divergent nozzle, supersaturated flow in nozzle.

Unit 4: ADIABATIC FLOW

Adiabatic flow and flow with Heat Transfer: Adiabatic flow; Fanno line tables; entropy change; choking due to friction; flow through long ducts; Adiabatic flow ; Rayleigh line; use of tables; change in entropy; effect of change in stagnation temperature.

Unit 5: NORMAL SHOCK

Normal Shock: Plane stationary normal shock; Ranking-Huguenot relations; increase in; Prandtl's relations; change in stagnation pressure across the shock.

Text Book:

1. Fundamentals of Aerodynamics by Ashish Dutt Sharma, S. Chand & Co.
2. Aerodynamics by R.K.Rajput Dhanpat Rai & Publication

Course Outcome:

CO Statement	K	P01	P02	P03	P04	P05	P06	P07	P08	P09	P10	P11	P12	PS01	PS02
At the end of the course the student will		3	2	1	3	2	1	3	2	1	3	2	1	3	2
C01: Acquire knowledge about Aerodynamic forces and moments concept of lift and drag, circulation theorem	K2	3	2	1	1										1
C02: Acquire knowledge about Blade theory cascade nomenclature, turbine cascade nomenclature	K2	3	2	1	1										
C03 Gain the knowledge about Isentropic Flow:	K2	3	2	1	1										
C04: Gain the knowledge about Adiabatic flow and flow with Heat Transfer:	K2	3	2	1	1										
C05: Gain the knowledge about Normal Shock	K2	1													

3: High 2: Medium 1: Low

05BME 104- INDUSTRIAL ENGINEERING

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Course Objectives: The main objectives of this subject are to understand the Management Theory and Functions. Student capable to understand how to management work in any organization and able to taken decision.

Course Description:

Unit 1: MANAGEMENT THEORY AND FUNCTIONS:

Management Theory and Functions: Evolution of management, scientific management, Contribution to scientific management: Reactions and criticisms of Taylor, Fayol, Mayo, Levels of 'Management Administration and Management, functions of management. Decision-making.

Unit 2: BUSINESS FORMS AND ORGANIZATION:

Business Forms and Organization: Forms of Business:(i)Single proprietorship (ii) Partnership (iii) Joint stock company (iv) Private Ltd- Companies and public limited companies Forming Joint Stock Companies (a) Registration (b) issue of Prospectus (c) Commencement Certificate (iv) co-operative Society choice of Business forms (v) State undertaking. Organization meaning. Types of organization; (i) Line organization (ii) Functional Organization (iii) Line Staff organization (iv) Line Staff Committee organization, span of control.

Unit 3: FINANCE & FINANCIAL STATEMENTS:

Finance & Financial Statements: Introduction, Needs of Finance, Kinds of Capital Sources of fixed capital, Shares - (i) Ordinary Shares (ii) Preference Shares. Borrow capital. Surplus profits. Sources of

Working capital. Management of working capital. Financial Institutions. Profit & Loss Statement, Balance Sheet, Financial ratio: Liquidity ratio, Profits investment ratio, equity ratio, inventory ratio.

Unit4: INTEREST AND DEPRECIATION:

Interest and Depreciation: interest meaning, Compound interest. Annuities capital recovery Annuity present worth annuity sinking funds annuity compound Amount Annuity Nominal and effective rate of interest. Depreciation Meaning and causes. Need of Depreciation calculation, Methods of Depreciation. Straight line Methods. Sinking funds methods. Declining Balance Method, sum of years digits method (Syd Method).

Unit 5: LABOUR RELATIONS AND LEGISLATION:

Labour relations and legislation: Profit sharing, fringe benefits etc.Trade Unions. Methods of setting disputes (i) Collective bargaining (ii) Conciliation (iii) Mediation (iv) Arbitration industrial disputes in India, Machinery for setting disputes. Trade Disputes Acts. The factory Act 1944, payment of wages act. Workman's compensation act.

Text Book:

1. Production And Operations Management, Ews Buffa And S Kapoor
2. Industrial Organisation And Management, Bethel Atwater, Smith Mcgraw Hill
3. Industrial Engg. By M Mahajan, Dhantpat Rai Pub.
4. Principles Of Industrial Management, Alford, Ronald Press

Course Outcome:

CO Statement	K	P01	P02	P03	P04	P05	P06	P07	P08	P09	P10	P11	P12	PS01	PS02
At the end of the course the student will		3	2	1	3	2	1	3	2	1	3	2	1	3	2
C01: Acquire knowledge about scientific management and Decision-making	K2	3	2	1	1										1

C02: Acquire knowledge about Business Forms& Functional Organization.	K2	3	2	1	1										
C03 Gain the knowledge Finance & Financial Statements	K2	3	2	1	1										
C04: Gain the knowledge about Interest and Depreciation.	K2	3	2	1	1										
C05: Gain the knowledge about Labor relations and legislation	K2	1													

3: High 2: Medium 1: Low

05BME 105- DYNAMICS OF MACHINES

L P T

3 0 0

Course Objectives: The main objectives of this subject are to understand the about governors functions, gyroscope, gears, gear trains and balancing of mass of machine elements.

Course Description:

Unit 1: GOVERNORS

Governors: Watt, Porter, Proell, Hartnell and spring controlled governors, governor Effort, power, stability, inertia effects.

Unit 2: GYROSCOPE

Gyroscope: Principle of gyroscopic couple, effect of gyroscopic couple and centrifugal force on vehicle taking a turn, stabilization of sea vessels. Inertia force analysis: Velocity and acceleration of slider crank and four bar mechanism, inertia force, piston thrust and forces on connecting rod, turning moment diagram, flywheel.

Unit 3: GEARS

Gears: Law of gearing, terminology, tooth form, standard interchangeable tooth profile, minimum number of teeth on pinion in contact with gear or rack, interference and undercutting, bevel, helical and spiral gears.

Unit 4: GEAR TRAINS

Gear trains: Simple, compound, reverted and epicyclic gear trains, analytical, tabular, graphical and vector methods for velocity ratio, gear boxes- sliding and constant mesh for automobiles.

Unit 5: BALANCING

Balancing: Balancing of rotating masses, balancing of reciprocating masses, locomotives, IC engines, balancing machines.

Text Book:

1. The Theory Of Machines ,Thoman Bevan ,Cs Publishers& Distributers Delhi
2. Theory Of Mechanism & Machines: Jagdish Lal Metropolitan Book Co.Ltd New Delhi
3. Theory Of Machines : P.L. Ballaney ,Khanna Publishers Delhi
4. Theory Of Mechanism & Machines, A.Kgosh & A.K Malik
5. ,Affilated Wast West Press Pvt Ltd New Delhi
6. Theory Of Machines & Mechanisms : J.E.Shinghley & J.J Uicker,Mc Graw Hill International Edition

7. Kinetics & Dynamics Of Machines: G. H Martin Mc Graw Hill

Course Outcome:

CO Statement	K	P01	P02	P03	P04	P05	P06	P07	P08	P09	P10	P11	P12	PS01	PS02
At the end of the course the student will		3	2	1	3	2	1	3	2	1	3	2	1	3	2
C01: Acquire knowledge about functions of Governors	K2	3	2	1	1										1
C02: Acquire knowledge about Principle of gyroscopic couple and Inertia force	K2	3	2	1	1										
C03 Gain the knowledge about gears functions and applications.	K2	3	2	1	1										
C04: Gain the knowledge about Gear trains.	K2	1													
C05: Gain the knowledge about balancing machines.	K2	1													

3: High 2: Medium 1: Low

05BME 106- PRINCIPLES OF TURBOMACHINES

L	P	T
3	0	0

Course Objectives: The main objectives of this subject are to understand the Basic concepts of Turbo machines. Students understand various parameters in pumps.

Course Description:

Unit 1: BASIC CONCEPTS OF TURBOMACHINES

Basic concepts of turbo machines: Definition of Turbo machine, classification; Basic laws and governing equations; continuity equation, steady flow energy equation(1sl law of thermodynamics),2nci law of thermodynamics applied to turbo machines, Newton's 2nd law of motion applied to turbo machines - Euler's pump equation and Euler's turbine equation, dimensional analysis applied to hydraulic machines, power coefficient, flow coefficient, head coefficient, non-dimensional specific speed; Range of 'specific speeds for various turbo machines. Dimensional analysis applied to compressible flow machines, pressure ratio as am, Function of temperature ratio, mass flow rate parameter and speed parameter.

Unit 2: CENTRIFUGAL PUMPS

Centrifugal pumps: Main parts, work done and velocity triangles, slip and slip factor, pump losses and efficiencies, minimum starting speed, net positive suction head, performance curve.

Unit 3:AXIAL FLOW PUMPS

Axial flow pumps; Description, velocity triangles, work done on the fluid, energy transfer, axial pump characteristics, cavitation.

Unit 4: CENTRIFUGAL COMPRESSORS AND FANS

Centrifugal compressors and fans: Components and description, velocity diagrams, slip factor, energy transfer, power input factor, stage pressure rise and loading coefficient, pressure coefficient, degree of reaction. Centrifugal compressor characteristic, surging, rotating Stall and Choking.

Unit 5: AXIAL FLOW COMPRESSORS AND FANS

Axial flow compressors and fans: Basic constructional features; turbine v/s compressor blades; Advantages of axial flow compressors, working principle, velocity triangle, elementary theory; stage work, work done factor, stage loading, degree of reaction; vortex theory; simple design calculations; introduction to blade design; cascade test; compressibility effects; operating characteristics.

Text Book:

1. Gas Turbine Theory: H Cohan G.F.C Roger And Hih Saravanama Longman Scientific And Technical Pub.
2. Gas Turbine And Jet Propulsion: M L Mathur And R P Sharma, Standard Publisher And Distribtor
3. Gas Turbine And Jet Propulsion: V Ganeshan

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Course Outcome:

CO Statement	K	P01	P02	P03	P04	P05	P06	P07	P08	P09	P10	P11	P12	PS01	PS02
At the end of the course the student will		3	2	1	3	2	1	3	2	1	3	2	1	3	2
C01: Acquire knowledge about Basic concepts of turbo machines	K2	3	2	1	1										1
C02: Acquire knowledge about Centrifugal pumps	K2	3	2	1	1										
C03 Gain the knowledge about Axial flow pumps	K2	3	2	1	1										

C04: Gain the knowledge about Centrifugal compressors and fans	K2	3	2	1	1										
C05: Gain the knowledge about Axial flow compressors and fans .	K2	1													

3: High 2: Medium 1: Low

05BME201 - PROD. ENGG. LAB. - I

L P T

0 2 0

Pre- Requisites:

1 Specimen (Work piece) 2. Machine

3. Measuring instruments 4. Electric Power

Course Objectives:

1. Identify the use of various tools used in the Machining processes.
2. To Study the various machine and their operation.
3. Materials and their structures.

List of Experiments:

Perform any twelve experiments:

1. Study of single point cutting tool geometry & grind the tool as per given tool Geometry.

2. Study the milling machine, milling cutters, indexing heads and indexing methods.

3. Prepare a gear on milling machine.

4. Prepare a hexagonal / octagonal nut using indexing head on milling m/c and to cut BSW/METRIC internal threads on lathe.

5. To cut multi-start square / metric threads.

6. To cut external metric threads & to meet it with the nut

7. To prepare the job by eccentric turning on lathe machine.

8. To prepare a job on shaper from given MS rod.

9. To study the various crystal structures and dislocations through models.

10. To study the Iron-Iron Carbide Equilibrium Diagram and sketch the various Structures present at room temps.

11. Study of capstan lathe and its tooling and prepare a tool layout & job as per given Drawing.

12. Study the principle & construction of the Metallurgical Microscope.

13. Prepare metallic samples for metallographic examination for study of Microstructure

14. Study the hardening of steel in different medium and at different cooling rates.

15. Study the effect of Carbon percentage on the hardness of Steel.

Course Outcome:

CO Statement	K	P01	P02	P03	P04	P05	P06	P07	P08	P09	P10	P11	P12	PS01	PS02
At the end of the course the student will		3	2	1	3	2	1	3	2	1	3	2	1	3	2
C01: To be understand Machine tool and their geometric.	K2	3	2	1	1										1
C02: Prepare the job on machine.	K2	3	2	1	1										
C03 To understand the Hardening of steel in different	K2														

medium and at different cooling rates.		1													

3: High 2: Medium 1: Low

05BME202 - AUTOMOBILE ENGG. LAB

L P T

0 2 0

Pre- Requisites:

1 Model of engines

2. 2& 4 stroke petrol engine and diesel engine

3. Parts of engine

Course Objectives:

1. To understand checking fault in engine and repair engine.

2. It also deals to study steering system and braking system.

List of Experiments:

1. Valve refacing and valve seat grinding and checking for leakage of valves

2. Trouble shooting in cooling system of an automotive vehicle

3. Trouble shooting in the ignition system, setting of contact breaker points and spark Plug gap

4. Demonstration of steering system and measurement of steering geometry angles and their impact on vehicle performance.

5. Trouble shooting in braking system with specific reference to master cylinder, brake shoes, overhauling of system and the adjusting of the system and its testing.

6. Fault diagnosis in transmission system including clutches, gear box assembly and differential.

7. Replacing of ring and studying the method of replacing piston after repair.

Course Outcomes:

CO Statement	K	P01	P02	P03	P04	P05	P06	P07	P08	P09	P10	P11	P12	PS01	PS02
At the end of the course the student will		3	2	1	3	2	1	3	2	1	3	2	1	3	2
C01: To be understand how to check engine fault and repair it	K2	3	2	1	1										1
C02: To understand ignition system steering system and braking system.	K2	3	2	1	1										
C03 : To understand how to replace piston ring and valve refacing.	K2	1													

3: High 2: Medium 1: Low

03BME203 - DYNAMICS OF MACHINES LAB. - II

L P T

0 2 0

Pre- Requisites:

1. Working models
2. Machine
3. Measuring instruments
4. Electric Power

Course Objectives:

1. To teach students concepts of generalized forces and the Principle of Virtual Work.
2. To teach students concepts of static and **dynamic** mass balancing and flywheels.
3. To introducing the approaches and mathematical models used dynamical analysis of machinery.

List of Experiments:

1. To verify the relation T=Iùùp for gyroscope.
2. To plot force vs. radius and lift vs. speed curves for governors.
3. To plot pressure distribution curves on a journal bearing.
4. To perform wheel balancing.
5. To perform static and dynamic balancing on balancing set up.
6. To determine mass moment of inertia of a flywheel.

1- Study of a lathe gear box.

8. Study of a sliding mesh automobile gear box.
9. Study of a planetary gear box.

Course Outcomes:

CO Statement	K	P01	P02	P03	P04	P05	P06	P07	P08	P09	P10	P11	P12	PS01	PS02
At the end of the course the student will		3	2	1	3	2	1	3	2	1	3	2	1	3	2

C01: To be understand static and dynamic mass balancing and flywheels Masses.	K2	3	2	1	1										1
C02: Analyze stabilization of sea vehicles, aircrafts and automobile vehicles.	K2	3	2	1	1										
C03 : Compute frictional losses, torque transmission of mechanical systems.	K2	3	2	1	1										
C04: Understand how to determine the natural frequencies of continuous systems starting from the general equation of displacement.		3	2	1	1										
C05 : Understand balancing of reciprocating and rotary masses.	K2	1													

3: High 2: Medium 1: Low

03BME204 MATLAB AND COMPUTER GRAPHICS

L P T

0 2 0

Pre- Requisites:

1. Computer.
2. M File program.

Course Objectives:

The aim of this tutorial is to introduce students to the software MATLAB for numerical computations and in particular familiarizing with the Mat lab Desktop, basic commands through the Command window and output through the Graph window.. At the end of the tutorial students should be able to access MATLAB in the Department and College, be able to use the MATLAB help facility, do simple (but large) calculations and print out graphs.

List of Experiments:

1. MATLAB: Use of MATLAB and its application to Mechanical Engineering Problems.
2. Turbo C Graphics: To make C programs to animate different mechanisms and system: Such as Slider Crank Mechanism, Quick Return Mechanism, Cam Follower, Solar system, ball motion in billiard, Rolling of wheel from Inclined plane, Seesaw motion, Projectile motion of a wheel, etc.

Course Outcomes:

CO Statement	K	P01	P02	P03	P04	P05	P06	P07	P08	P09	P10	P11	P12	PS01	PS02
At the end of the course the student will		3	2	1	3	2	1	3	2	1	3	2	1	3	2
C01: To be understand how to draw graph using mathematical formula.	K2	3	2	1	1										1
C02: 2. To understand C programs to animate different mechanisms and system .	K2	3	2	1	1										
C03 3. To understand how to draw	K2														

graph Projectile motion of a wheel.		1													

3: High 2: Medium 1: Low

3rd Year 6th SEMESTER

06BME 101- DESIGN OF MACHINE ELEMENTS- II

L P T

3 0 0

Course Objectives: The main objectives of this subject are to understand the Design of machine members subjected to various stress and strain. Students understand how to design machine part according loading.

Course Description:

Unit 1: FATIGUE CONSIDERATIONS IN DESIGN

Fatigue Considerations in Design: Variable load, loading pattern, Endurance stresses, and influence of size, surface finish, notch sensitivity & stress concentration. Goodman line, Soderberg, Design of machine members subjected to combined, steady and alternating stresses. Design for finite life. Design of Shafts under Variable Stresses.

Unit 2 :PRE LOADING OF BOLTS

Pre loading of bolts; effect of initial tension & applied loads, Bolts subjected to variable stresses. Design of members which are curved like crane hook, body of C-clamp, machine frame etc. Power screws like lead screw, screw jack.

Unit 3: DESIGN OF HELICAL COMPRESSION, TENSION, TORSIONAL SPRINGS

Design of helical compression, tension, torsional springs. Springs under variable stresses. Design of belt, rope and pulley drive system, selection of chain & sprocket drive systems.

Unit 4 :DESIGN OF GEAR TEETH

Design of gear Teeth, Lewis and Buckingham equations; wear and dynamic load considerations, Design and force analysis of spur, helical, bevel and worm gears. Bearing reactions due to gear tooth forces.

Unit 5: DESIGN OF SLIDING & JOURNAL BEARING

Design of sliding & journal bearing; method of lubrication, hydrodynamic, hydrostatic, boundary etc. Minimum film thickness and thermal equilibrium. Selection of anti-friction bearings for different loads and load cycles. Mounting of the bearings. Method of lubrication, selection of oil seals.

Text Book:

1. The Theory Of Machines ,Thoman Bevan ,Cs Publishers& Distributers Delhi
2. Theory Of Mechanism & Machines: Jagdish Lal Metropolitan Book Co.Ltd New Delhi
3. Theory Of Machines : P.L. Ballaney ,Khanna Publishers Delhi
4. Theory Of Mechanism & Machines, A.Kgosh & A.K Malik
5. ,Affilated Wast West Press Pvt Ltd New Delhi
6. Theory Of Machines & Mechanisms : J.E.Shinghley & J.J Uicker,Mc Graw Hill International Edition
7. Kinetics & Dynamics Of Machines: G. H Martin Mc Graw Hill

Course Outcome:

CO Statement	K	P01	P02	P03	P04	P05	P06	P07	P08	P09	P10	P11	P12	PS01	PS02
At the end of the course the student will		K3	K4	K5	K5	K5	A3	A3	A3	P5	P5	K3	A3	K3	K5
C01: Acquire knowledge about Fatigue Considerations in Design	K2	3	2	1	1										1
C02: Acquire knowledge about Pre loading of	K2														

bolts.		3	2	1	1										
C03 Gain the knowledge about Design of helical compression, tension, torsional springs.	K2	3	2	1	1										
C04: Gain the knowledge about Springs under variable stresses.	K2	3	2	1	1										
C05: Gain the knowledge about Design of gear teeth, Design of sliding & journal bearing;	K2														

3: High 2: Medium 1: Low

06BME 102- MANUFACTURING SCIENCE AND TECHNOLOGY

L P T

3 0 0

Course Objectives: The main objectives of this subject are to understand the Jig and a Fixtures and Manufacturing Science. Students understand how to reduce production cost in manufacturing process.

Course Description:

Unit 1: JIGS AND FIXTURES

Jigs And Fixtures: Introduction, definition and difference; usefulness of jigs and fixtures; design considerations; materials used; principles and methods of location; clamping elements; jig bushes; drilling jigs; fixtures for milling turning, boring and welding; assembly fixtures; indexing devices; economics of jigs and fixtures; complete design of a jig and a fixtures; complete design of a jig and a fixtures.

Unit 2: NEW MACHINING METHODS

New Machining Methods: Types of machining methods; hot machining; electric discharge machining (E.D.M.) ultrasonic machining (U.S.M.) ; Electron beam machining (E.B.M.) laser beam Machining (L.B.M.); abrasive jet machining (A.J.M.) ; plasma arc machining (PAM); economics of machining! ,

Unit 3: PRECISION MEASUREMENT

Precision Measurement : Standards of linear measurements; linear and angular measurements; screw thread measurement; measurement of effective diameter, pitch and thread angles; Gear measurement, measurement of tooth profile, tooth thickness and pitch, Measurement of surface roughness. Quantitative methods of roughness measurements, Stylus and profilograph methods.

Precision Measuring Instruments: Comparators types; working principles applications and limitations of various comparators; optical flat; autocollimator indicators, slip gauges, bevel protector.

Unit 4: DESIGN OF SINGLE POINT CUTTING TOOLS

Design of Single Point Cutting Tools: Introduction; functions of various tool angles; design of single point turning too]; parting tool; empirical determination of force components; optimum value of tool angles.

Design of Multipoint Cutting Tool: Introduction; Angle of Contact; Force Analysis; Approach through dimensional analysis; force and power consumption; tooth forn1 and cutter design.

Unit 5: DESIGN OF MACHINE TOOL ELEMENT

Design of Machine Tool Element: Design of Lathe bed, Material and construction feature, various bed sections, designing for torsional rigidity, use of reinforcing stiffener in lathe bed. Theoretical aspect of design of guide ways, Material and construction features, Antifriction guide ways.

Text Book:

1. Production Engineering Sciences By P.C.Pandey & C.K.Singh, Standard Publishers & Distributors Delhi
2. Production Engineering By P.C.Sharma, S.Chand & Co.Pvt Ltd. New Delhi
3. Fundamentals Of Tool Design: F.W.Willson; Astme

Course Outcome:

CO Statement	K	P01	P02	P03	P04	P05	P06	P07	P08	P09	P10	P11	P12	PS01	PS02
At the end of the course the student will		K3	K4	K5	K5	K5	A3	A3	A3	P5	P5	K3	A3	K3	K5
C01: Acquire knowledge about Jigs and Fixtures.	K2	3	2	1	1										1
C02: Acquire knowledge about New Machining Methods.	K2	3	2	1	1										
C03 Gain the knowledge about Precision Measurement .	K2	3	2	1	1										
C04: Gain the knowledge about Design of Single Point Cutting Tools.	K2	3	2	1	1										
C05: Gain the knowledge about Design of Machine Tool Element.	K2														

3: High 2: Medium 1: Low

06BME 103- NOISE, VIBRATION & HARSHNESS

L	P	T
3	0	0

Course Objectives: The main objectives of this subject are to understand the Noise, Vibration & Harshness. Students understand sound level, frequency and how to reduce vibration.

Course Description:

Unit 1: SOUND LEVEL AND SUBJECTIVE RESPONSE TO SOUND

Sound level and subjective response to sound; Frequency dependent human response to sound, Sound pressure dependent human response. Decibel scale; Decibel addition, subtraction and averaging. Relationship among sound power, sound intensity and sound pressure level. Sound spectra. Octave band analysis. Loudness.

Noise: Effects, Ratings and Regulations; Non-auditory effects of noise on people, Auditory Effects of noise, Noise standards and limits in India. Major sources of the noise; Industrial noise sources. Industrial noise control-strategies; Noise control at the source, Noise control along the path, Acoustic barriers, Noise control at the receiver.

Unit 2: SCOPE OF VIBRATION

Scope of vibration, important terminology and classification, Degrees of freedom, Harmonic motion; vectorial representation, complex number representation, addition. Derivation of equation of motion for one dimensional longitudinal, transverse and torsional vibrations without damping using Newton's second law, D' Alembert's principle and Principle of conservation of energy. Compound pendulum and centre of percussion. Damped vibrations of single degree of freedom systems. Viscous damping; underdamped, critically damped and overdamped systems, Logarithmic decrement. Vibration characteristics of Coulomb damped and Hysteretic damped systems.

Unit 3: FORCED VIBRATIONS OF SINGLE DEGREE OF FREEDOM SYSTEMS

Forced vibrations of single degree of freedom systems. Forced vibration with constant harmonic excitation. Steady state and transient parts. Frequency response curves and phase angle plot. Forced vibration due to excitation of support. Vibration Isolation and transmissibility; Force transmissibility, Motion transmissibility. Forced vibration with rotating and reciprocating unbalance. Materials used in vibration isolation.

Unit 4: SYSTEM WITH TWO DEGREES OF FREEDOM

System with two degrees of freedom; principle mode of vibration, Mode shapes. Undamped forced vibrations of two degrees of freedom system with harmonic excitation. Vibration Absorber; Undamped dynamic vibration absorber and centrifugal pendulum absorber. Many degrees of freedom systems: exact analysis.

Unit 5: MANY DEGREES OF FREEDOM SYSTEMS

Many degrees of freedom systems: approximate methods; Rayleigh's, Dunkerley's, Stodola's and Holzer's methods. Vibrations of continuous systems; Transverse vibration of a string, Longitudinal vibration of a bar, Torsional vibration of a shaft.

Text Book:

1. Mechanical Vibration, G K Grover, Nemi Chand And Bros.
2. Vibration Theory And Applications. W T Thomson
3. Vibrations & Noise For Engineering ; K.K.Pujara, Dhanpat Rai & Sons,Delhi
4. Mechanical Vibrations, Den Hartog
5. Vibration Problems In Engineering , Timshenko

Course Outcome:

CO Statement	K	P01	P02	P03	P04	P05	P06	P07	P08	P09	P10	P11	P12	PS01	PS02
At the end of the course the student will		3	2	1	3	2	1	3	2	1	3	2	1	3	2
C01: Acquire knowledge about Sound level and subjective response to	K2	3	2	1	1										1

sound															
C02: Acquire knowledge about Scope of vibration	K2	3	2	1	1										
C03 Gain the knowledge about Forced vibrations	K2	3	2	1	1										
C04: Gain the knowledge about System with two degrees of freedom	K2	3	2	1	1										
C05: Gain the knowledge about Many degrees of freedom systems	K2	1													

3: High 2: Medium 1: Low

06BME 104- INTERNAL COMBUSTION ENGINES AND DIESEL POWER PLANT

L P T

3 0 0

Course Objectives: The main objectives of this subject are to understand the Internal Combustion Engines and Diesel power plant. Students understand how to supply fuel to the engine and Engine design.

Course Description:

Unit 1: INTRODUCTION

Introduction: Historical & Modern Development, Nomenclature, Classification & Comparison: SI & CI, 4 strokes – 2 stroke, First Law analysis, Energy Balance. Testing & Performance: Performance parameters, Measurement of operating parameters e.g. Speed, fuel & air consumption, Powers IHP, BHP, FHP, Efficiencies Thermal, Mechanical, Volumetric, Emission Measurement, Numerical problems, India & International standards of Testing, Emission.

Unit 2: FUELS & COMBUSTION, COMBUSTION IN CI & SI ENGINES

Fuel & Combustion, Combustion in CI & SI engines: Ignition Limits, Stages of combustion, Combustion parameters. Delay period and Ignition Lag, Turbulence and Swirl, Effects of engine variables on combustion Parameters, Abnormal combustion in CI & SI engines, Detonation & knocking, , Theories of detonation, Control of abnormal combustion, Combustion chamber Design principles, Types of combustion chamber.

Fuel:- Conventional : Petroleum, structure, Refusing Fuels for SI & CI engines, Knock rating, Additives, Fuels for Turbine & Jet Propulsion.

Alternative: Methanol, Ethanol, Comparison with gasoline, Manufacturing, Engine performance with pure Methanol, Ethanol & blends, Alcohols with diesel engine, Vegetable oils, Bio gas.

Unit 3: ENGINE SYSTEMS & COMPONENTS FUEL SYSTEMS

Engine Systems & Components Fuel Systems: SI Engine: Combustion & Injection, process & parameters properties of A/F mixture, Requirements of A/F per different operating conditions, Carburetion & Carburetors, types, Aircraft carburetor, comparison of carburetion & injection, F/A ratio calculations, Numerical Problems.

CI engine: Mixture requirements & constraints, Method of injection, Injection systems, CRDI etc. system components, pumps injectors. Ignition system : Conventional & Modern ignition systems Magneto v/s Battery, CB point v/s Electronic ignition, Fuel Ignition Energy requirements. Spark galvanic, centrifugal, vacuum Firing order, spark plugs.

Unit 4: ENGINE FRICTION & LUBRICATION

Engine Friction & Lubrication : Determination of friction, Lubrication principles, Types of lubrication, Places of lubrication Bearings and piston rings etc., Functions of Lubrication, Properties, Rating and Classification of lubricating oil, Additives, Lubrication systems. Engine Cooling : Requirements of cooling, Areas of heat flow, High temperature regions of combustion chamber. Heat Balance, Cooling Systems, Air, Water Cooling, Cooling system components. Supercharging : Objectives, Thermodynamic

cycle & performance of super charged SI & CI engines Methods of super charging, Limitations Two stroke engines : Comparison of 4s & 2s engines construction & valve lining scavenging. Process parameters, systems, supercharging of 2 stroke engines.

Unit 5: DUAL & MULTI FUEL ENGINES

Dual & Multi fuel engines : Principle, fuels, Combustion, performance Advantages, Modification in fuel system. Working principles of . Rotary, Stratified charge, Free piston, Variable compression ratio engines. Diesel Power plant: Requirements, capacity, operation, safety, Engine Generator Coupling,

Electrical load, Switching.

Text Book:

1. I.C.Engines M.L.Mathur,R.P.Sharma, Dhanpat Rai Publiations
2. I.C.Engine Edward F. Orbet , Harper And Row
3. I.C.Engines, Heywood
4.

Course Outcome:

CO Statement	K	P01	P02	P03	P04	P05	P06	P07	P08	P09	P10	P11	P12	PS01	PS02
At the end of the course the student will		3	2	1	3	2	1	3	2	1	3	2	1	3	2
C01: Acquire knowledge about Introduction SI & CI, 4 strokes – 2 stroke	K2	3	2	1	1										1
C02: Acquire knowledge about Fuel & Combustion, Combustion in CI & SI engines	K2	3	2	1	1										
C03 Gain the knowledge about Engine Systems & Components	K2														

Fuel Systems		3	2	1	1										
C04: Gain the knowledge Friction & Lubrication in Engine	K2	3	2	1	1										
C05: Gain the knowledge about Dual & Multi fuel engines	K2	1													

3: High 2: Medium 1: Low

06BME 105- HYDRAULIC MACHINES AND HYDRO ELECTRIC POWER PLANT

L P T

3 0 0

Course Objectives: The main objectives of this subject are to understand Hydraulic machines and Hydro electric Power plant. Students understand how to produce Maximum Power from this Plant.

Course Description:

Unit 1: EULER'S TURBINE EQUATIONIMPACT OF FREE JETS

Euler's turbine equation, principles of similarity applied to hydraulic machines, non-dimensional specific speed. Classification of turbines on the basis of non-dimensional specific speed. Unit and specific quantities.

Impact of Free Jets

Impulse momentum principle, force exerted by the jet on stationary flat and curved plate, hinged plate, moving plate and moving curve vanes.

Unit 2: IMPULSE TURBINE

Impulse Turbine

Classification of turbine, impulse turbines, Pelton wheel, Construction, working. Work done, Head, efficiency and design aspects. Governing of impulse turbine.

Unit 3: REACTION TURBINE AXIAL FLOW REACTION TURBINE

Reaction Turbine

Radial flow reaction turbine, Francis turbine: construction and working. Work done, efficiency, design aspects.

Axial flow reaction turbine

Propeller and Kaplan turbine, bulb or tubular turbine- construction and working. Draft tube, governing of reaction turbine. Performance characteristics and comparison of all the turbines.

Cavitation Phenomenon in hydraulic machines

Unit 4: RECIPROCATING PUMPS FLUID SYSTEM

Reciprocating Pumps

Classification, component and working, single acting and double acting, discharge, work done and power required, coefficient of discharge, indicator diagram, slip, effect of friction and acceleration theory of air vessels.

Fluid system

Hydraulic accumulator, Hydraulic intensifier, Hydraulic Press, hydraulic crane, hydraulic lift, hydraulic Ram, hydraulic coupling, hydraulic torque converter, air lift pump, jet pump.

Unit 5: HYDRO ELECTRIC POWER STATION (HEPP)

Hydro Electric power station (HEPP) – Advantages and disadvantages of water power, selection of site for HEPP, hydrological cycle, hydrographs, essential elements of HEPP. Types of dams, conduits, spillways, surge tanks. Classification of HEPP. Major, mini and micro power plants- present scenario in Rajasthan and India. Selection of turbine.

Text Book:

1. Engineering Fluid Mechanics, K.L.Kumar, Eurasia Publishing House P.Ltd.
2. Fluid Mechanics And Fluid Power Engg.: D S Kumar, S K Kataria And Sons.
3. Fluid Mechanics And Machines: F M White, John Willy And Sons
4. Fluid Mechanics : R.K.Rajput S. Chand Company Ltd

5. Fluid Mechanics Vm Streeter Mcgraw Hill

Course Outcome:

CO Statement	K	P01	P02	P03	P04	P05	P06	P07	P08	P09	P10	P11	P12	PS01	PS02
At the end of the course the student will		3	2	1	3	2	1	3	2	1	3	2	1	3	2
C01: Acquire knowledge about Euler's turbine equation, Impact of Free Jets	K2	3	2	1	1										1
C02: Acquire knowledge about Impulse Turbine	K2	3	2	1	1										
C03 Gain the knowledge about Reaction Turbine Axial flow reaction turbine	K2	3	2	1	1										
C04: Gain the knowledge about Reciprocating Pumps	K2	3	2	1	1										
C05: Gain the knowledge about Fluid system Hydro Electric power station (HEPP)	K2	1													

3: High 2: Medium 1: Low

06BME 106- NUMERICAL METHODS AND APPLIED STATISTICS

L P T

3 0 0

Course Objectives: The main objectives of this subject are to understand Numerical methods and Applied Statistics by using Math's application. Students understand how to find Error using various math's formula.

Course Description:

Unit 1: ERRORS AND SIGNIFICANT DIGITS

Errors and significant digits, Roots of algebraic equations Bisection method, secant method, Newton Rap son method, Graff's root- squaring method, Iterated synthetic division with quadratic factors method for finding complex roots,

Unit 2: SOLUTIONS OF SYSTEMS OF EQUATIONS

Solutions of systems of equations (Gauss elimination, Gauss Jordan, and Partition method for linear system of equations, power method for partition, method for linear system of equations, power method for finding Eigen values), Forward, backward , central and Divided differences, Newton's formula of interpolation for equal and unequal intervals. Lagrange's interpolation formula, Stirling's and Bessel's formula,

Unit 3: NUMERICAL DIFFERENTIATION, NUMERICAL INTEGRATION

Numerical differentiation, Numerical Integration:- Trapezoidal, Simpson's rule and Gaussian integration (only formula applications) Differential equations and their solutions. Numerical methods for ordinary

differential equations (Picard method, Taylor series method, Euler's method, Ranga Kutta Method, Predictor- corrector method, Adams- Bashforth method).

Unit 4: SAMPLING THEORY

Sampling theory: Introduction: Moments, Moment generating functions, Skewness, Kurtosis, Correlation and Regression, Normal sampling distributions; Binomial distribution, Poisson distribution, Normal distribution; Sampling distribution of the means; sampling distribution of the differences of the means; sampling distributions of proportions.

Unit 5: TESTS OF SIGNIFICANCE

Tests of Significance; t-distributions, chi square distributions, F-distributions. Regression And Correlation; Linear regression; correlation, multiple correlation & partial correlation Confidence Limits; Large samples, small samples, error bands in regression

Text Book:

1. Mathematics Statistics By J. N Kapur & H.C Saxena, S. Chand & Co., New Delhi

2. Mathematical Statistics, M Ray & H.S. Sharma, Ram Prasad & Sons , Agra

3. Mathematical Statistics, John E. Freund, Prentice Hall Of India, New Delhi

4. Advanced Mathematics For Engineers, Chandrika Prasad, Prasad Mudranalaya.

Course Outcome:

CO Statement	K	P01	P02	P03	P04	P05	P06	P07	P08	P09	P10	P11	P12	PS01	PS02
At the end of the course the student will		3	2	1	3	2	1	3	2	1	3	2	1	3	2
C01: Acquire knowledge about Errors and	K2														

significant digits		3	2	1	1										1
C02: Acquire knowledge about Solutions of systems of equations	K2	3	2	1	1										
C03 Gain the knowledge about Numerical differentiation, Numerical Integration	K2	3	2	1	1										
C04: Gain the knowledge about Sampling theory	K2	3	2	1	1										
C05: Gain the knowledge about Tests of Significance	K2	1													

3: High 2: Medium 1: Low

06BME201 - MACHINE DESIGN – II SESSIONAL LAB

L P T

0 2 0

Pre- Requisites:

1 Specimen (Work piece) 2. Machine

3. Measuring instruments 4. Electric Power

Course Objectives:

1. To understand Strength and properties of Different Materials.

2. It also deals with measurement of the capacity to recover quickly from difficulties; toughness, variable stresses of the Materials.

List of Experiments:

1. Fatigue loading
2. Helical compression, tension and torsional springs design
3. Curved Beams
4. Preloaded bolts and bolts subjected to variable stresses
5. Belt, Rope and Chain drive system
6. Gear Design
7. Sliding contact bearing design
8. Anti-friction bearing selection

Course Outcomes:

CO Statement	K	P01	P02	P03	P04	P05	P06	P07	P08	P09	P10	P11	P12	PS01	PS02
At the end of the course the student will		3	2	1	3	2	1	3	2	1	3	2	1	3	2
C01: To be understand Fatigue loading and tension in different springs.	K2	3	2	1	1										1
C02: To understand bolts subjected to variable stresses.	K2	3	2	1	1										
C03 : To understand Sliding contact bearing design	K2														

and Anti-friction bearing selection its applications.		3	2	1	1										

3: High 2: Medium 1: Low

06BME202 HEAT TRANSFER LAB

L P T

0 2 0

Pre- Requisites:

1 Specimen (Work piece) 2. Machine

3. Measuring instruments 4. Electric Power

Course Objectives:

Heat Transfer laboratory provides fundamental and industrial knowledge about modes of heat transfer, like conduction, convection and radiation, and their application. A blower is provided on one side of duct to conduct experiments under forced convection heat transfer mode.

List of Experiments:

EXPERIMENTS TO BE PERFORMED (MINIMUM TEN NUMBERS)

1. To Determine Thermal Conductivity of Insulating Powders.

2. To Determine Thermal Conductivity of a Good Conductor of Heat (Metal Rod).

3. To Measure the thermal Conductivity of Liquid.

4. To determine the transfer Rate & Temperature Distribution for a Pin Fin.

5. To Measure the Emmissivity of the Test plate Surface.

6. To Determine Stefan Boltzman Constant of Radiation Heat Transfer.

7. To Determine the Surface Heat Transfer Coefficient For Heated Vertical Cylinder in Natural Convection.

8. Determination of Heat Transfer Coefficient in Drop Wise & Film Wise condensation.

9.To Determine Critical Heat Flux in Saturated Pool Boiling.

10.To Study Performance of Simple Heat Pipes.

11.To Study and Compare LMTD and Effectiveness in Parallel and Counter Flow Heat Exchangers.

12. To Find the Heat transfer Coefficient in Forced Convection in a tube.

13. To determine the total thermal conductivity and thermal resistance of the given compound resistance in series.

14. To find out the thermal conductivity of given slab material.

15. To determine the individual thermal conductivity of different lagging in a lagged pipe.

16. To study the rates of heat transfer for different materials and geometries

17. To understand the importance and validity of engineering assumptions through the lumped heat capacity method.

18. Testing and performance of different heat insulators.

Course Outcomes:

CO Statement	K	P01	P02	P03	P04	P05	P06	P07	P08	P09	P10	P11	P12	PS01	PS02
At the end of the course the student will		3	2	1	3	2	1	3	2	1	3	2	1	3	2
C01: Experimentally verify the mathematical	K2														

equation governing heat transfer via conduction.		3	2	1	1										1
C02: Measure the thermal conductivity, k, for various metals.	K2	3	2	1	1										
C03 : Varying the input power will affect the heat transfer coefficient.	K2	3	2	1	1										

3: High 2: Medium 1: Low

06BME203 TURBOMACHINERY LAB

L P T

0 2 0

Pre- Requisites:

1 Air Compressor

2. Models of turbo machinery

3. Measuring instruments

4. Electric Power

Course Objectives:

The course aims at giving an overview of different types of turbo machinery used for energy transformation, such as pumps, fans, compressors, as well as hydraulic, steam and gas turbines. It will focus on applications in power generation, transport, refrigeration and the built environment.

List of Experiments:

1. Determination of Mechanical and volumetric efficiency of Reciprocating Air Compressor.
2. Testing of Reciprocating Air Compressor.
3. Determination of efficiency and Pressure distribution of Axial Flow Compressor.
4. Performance testing of Axial Flow Compressor.
5. Study and Performance of Simple Steam Turbine
6. Performance characteristics of Pelton wheel turbine.
7. Performance characteristics of Francis turbine.
8. Performance characteristics of Kaplan turbine.
9. Performance characteristics of variable speed centrifugal pump.
10. Performance characteristics of rated speed centrifugal pump.
11. Performance characteristics of multistage centrifugal pump.

Course Outcomes:

CO Statement	K	P01	P02	P03	P04	P05	P06	P07	P08	P09	P10	P11	P12	PS01	PS02
At the end of the course the student will		3	2	1	3	2	1	3	2	1	3	2	1	3	2
C01: To be understand the main applications of turbo machines and Recognize typical designs of turbo machines .	K2	3	2	1	1										1
C02: To be understand the working principles of turbo machines and apply it to various	K2														

types of machines.		3	2	1	1										
C03 : Calculate the velocity triangles in turbo machinery stages operating at design and off-design conditions	K2	3	2	1	1										

3: High 2: Medium 1: Low

06BME204 COMPUTER ORIENTED NUMERICAL METHODS LAB

L P T

0 2 0

Pre- Requisites:

Basics of Differentiation and Integration.

Course Objectives:

The objective of this course is to provide conceptual understanding of various numerical methods, in particular, with reference to numerical solution of non linear equations and system of linear equations, interpolation, numerical differentiation and integration and numerical solution of ordinary differential equations. Important theorems and different formulae for various numerical methods to be covered with an aim of helping the students to understand the fundamentals, concepts and practical use of these methods in the field of computer sciences and applications.

List of Experiments:

1. To develop computer program to determine roots of a given equation using method of

a. False position

b. Newton -Raphson method,

2. To develop computer programs for solution of system of simultaneous linear equations using:

a. Gauss Elimination Technique, without and with specified boundary conditions, for

Full as well as bounded symmetric and unsymmetrical matrices

b. Gauss Shield iterative technique Successive over Relaxation(S.O.R) Technique

3. Linear and Non-Linear curve fitting technique

4. Numerical Integration with Simpson's rule and Gaussian Integration

5. Solution of ordinary differential equations by (i) Euler Method (ii) Runge-Kutta Method (iii) Taylor Series Methods

6. Solution of partial differential equations using S.O.R. Technique with special reference to heat conclusion equation.

Course Outcomes:

CO Statement	K	P01	P02	P03	P04	P05	P06	P07	P08	P09	P10	P11	P12	PS01	PS02
At the end of the course the student will		3	2	1	3	2	1	3	2	1	3	2	1	3	2
C01: To learn fundamentals and concepts of statistical and optimization methods, in particular, with reference to frequency distribution	K2	3	2	1	1										1
C02: Measures of central tendency, measures of dispersion, skew ness and kurtosis, To solve problems on theory of probability, linear programming problems, transportation, assignment and	K2	3	2	1	1										

game problems.															
C03 : To learn important theorems, different formulae and practical applications of these statistical and optimization methods in the field of Computer Sciences and Applications.	K2	3	2	1	1										

3: High 2: Medium 1: Low

Course B.Tech 4th Year 7th Semester

07BME 101 - COMPUTER AIDED DESIGN

L P T
3 0 0

COURSE OBJECTIVES: The main objective of this Subject to understand drafting in many construction and manufacturing projects. An AutoCAD Drafter is in charge of making technical drawings of the building or product with the help of computer-aided design software.

UNIT I.

Overview of Computer Graphics, Picture representation, Coordinate Systems, OutputGraphics Display devices. Raster Scan Graphics : DDA for line generation and Bresenham's algorithm for line and circle generation.

UNIT II

Wire frame models, Parametric representation of curves, Plane curves : line, circle,ellipse, parabola and hyperbola. Space curves : Cubic spline curve, Bezier Curve and B Spline Curves and Blending of curves.

UNIT III

Surface models and entities Parametric representation of Hermite Bicubic surfaces, Bezier surfaces and B-spline surfaces. Solid Models and entities, Solid Representation : B-rep. and CSG. Comparison between three types of models.

UNIT IV

Two and three dimensional transformation of Geometric models: Translation, ScalingReflection, Rotation and Shearing. Homogeneous Representation, Combined Transformation. Projection of Geometric models: Parallel and Perspective Projection.

UNIT V

Clipping : Point clipping, Line clipping, Cohen- Sutherland algorithm etc. Viewing Transformation, Hidden Line and surface Removal : Techniques and Algorithms.

Reference :

1. Mathematical Elements Of Computer Graphics, Rogers And Adams

2. Cad/Cam Theory And Practice, Zeid Ibrahim, Tata Mc Graw Hill

3. Computer Graphics, Plastock And Kallay

SPECIAL POINT'S APPLICATION TO BHAGWANT UNIVERSITY EXAMINATION ON COMPUTER AIDED DESIGN:

1. There will be five questions each of either or type covering all unit of syllabus.
2. All Questions will carry equal marks of 12 each making a total of 60.
3. Three assignment of given of equal mark making total of 15.
4. There will be average 15 marks out of Two Mid terms Exam.
5. There will be 10 Marks of attendance.

COURSE OUTCOME

CO Statement	K	P01	P02	P03	P04	P05	P06	P07	P08	P09	P10	P11	P12	PS01	PS02
At the end of the course the student will															
C01: Acquire knowledge about Coordinate Systems,OutputGraphicsand Display devices.	K2														
C02: Gain the knowledge of various curves.	K2														
C03: Understand aboutvarious surface models.	K2														
C04: Gain the knowledge about Two and three dimensional transformation of Geometric models	K2														
C05: Understand various Clipping	K2														

3: High 2: Medium 1: Low

07BME 102 - REFRIGERATION AND AIR CONDITIONING

L P T
3 0 0

COURSE OBJECTIVES: The main objective of this Subject to understand Basic knowledge of refrigeration system and air conditioning and how these are used in practical life.

UNIT 1

Introduction

Refrigeration and second law of Thermodynamics, Refrigeration effect and unit of Refrigeration, Heat pump, reversed Carnot cycle.

Vapour Compression Refrigeration SystemAnalysis of simple vapour compression Refrigeration cycle by p-h and T-S diagram. Effect of operating conditions, liquid vapour heat exchangers, actual refrigeration cycle.

Multiple Evaporator and compressor system.Application, air compressor system, Individual compressor, compound compression, cascade system. Application, air compressor systems, individual compressor, compound compression, cascade system.

UNIT 2

Gas cycle Refrigeration:Limitation of Carnot cycle with gas, reversed Brayton cycle, Brayton cycle with regenerative H.E.Air cycle for air craft:Necessity of cooling of air craft, Basic cycle, boot strap, regenerative type air craft refrigeration cycle.

UNIT 3

Vapour Absorption System:Simple Vapour absorption system, Electrolux Refrigerator, Analysis of Ammonia absorption refrigeration system, Lithium Bromide Absorption Refrigeration System.Refrigerants:Classification, Nomenclature, selection of Refrigerants, global warming potential of CFC Refrigerants.Refrigeration Equipments:Compressor, condenser, evaporator, expansion devices – types & working.

UNIT 4

Psychrometry:Psychometric properties, psychometric relations, pyschrormetric charts, psychrometric processes, cooling coils, By-pass factor and air washers.Human Comfort Mechanism of body heat losses, factors affecting human comfort, effective temperature, comfort chart.

UNIT 5

Cooling load calculations:Internal heat gain, system heat gain, RSHF, ERSHF, GSHF, cooling load estimation, heating load estimation, psychometric calculation for cooling, selection of air conditioning, apparatus for cooling and dehumidification, Air conditioning system

Reference

1. Refrigeration And Air Conditioning: C P Gupta
2. Refrigeration And Air Conditioning: Ballaney
3. Refrigeration And Air Conditioning: C P Arora
4. Modern Air Conditioning Practice: Narman E Harris, Tata Mcgraw Hills

SPECIAL POINT'S APPLICATION TO BHAGWANT UNIVERSITY EXAMINATION ON REFRIGERATION AND AIR CONDITIONING:

1. There will be five questions each of either or type covering all unit of syllabus.
2. All Questions will carry equal marks of 12 each making a total of 60.
3. Three assignment of given of equal mark making total of 15.
4. There will be average 15 marks out of Two Mid terms Exam.
5. There will be 10 Marks of attendance.

COURSE OUTCOME

CO Statement	K	P01	P02	P03	P04	P05	P06	P07	P08	P09	P10	P11	P12	PS01	PS02
At the end of the course the student will															
C01: Acquire knowledge about refrigeration,effect and analysis of various refrigeration system.	K2														
C02: Gain the knowledge of Gas cycle Refrigeration	K2														
C03: Understand about the Vapour Absorption System:	K2														
C04: Gain the knowledge about various Psychrometry properties,relations and human comfort.	K2														
C05: Understand the various Cooling load calculations.	K2														

3: High 2: Medium 1: Low

07BME 103 - OPERATIONS RESEARCH

L P T
3 0 0

COURSE OBJECTIVES: The main objective of operations research is optimization, i.e.to do things best under the given circumstances. Following the general optimization paradigm, when applying operations research, a decision-maker selects the key decision variables that will influence the overall quality of decisions.

UNIT 1

Linear Programming-

Introduction & Scope, Problem formulation, Simplex methods, primal & dual problem dual

Simplex, sensitivity analysis

UNIT 2

Transportation, Transshipment & Assignment problems.Dynamic Programming:
Multistage decision problems & solution, Principle of optimality.

UNIT 3

Decision theory:Decision under various conditions.Game Theory:Minimax & maximum strategies. Application of linear programming.Integer Programming:Cutting Plane method and Branch & Bound method

UNIT4

Deterministic and Stochastic inventory models:Single & multi period models with continuous & discrete demands, Service level & reorder policy

UNIT 5

Simulations-Simulation V/S mathematical modeling, Monte Carlo simulation, simulation language ARENA,Example & cases.Queing models:Introduction Model types, M.M. 1 & M/M/S system cost consideration

Reference

1.Introduction To Operationresearch, Hiller F.S & Liberman G.J. Cbs Pub.

2. Operation Research, Taha H.A Mcmillan Publishing Company

3. Fundamentals Of Operation Research, Sasieni , Willey

4. Operation Research, Hira Gupta, Dhanpat Rai & Co.

SPECIAL POINT'S APPLICATION TO BHAGWANT UNIVERSITY EXAMINATION ON OPERATIONS RESEARCH

1. There will be five questions each of either or type covering all unit of syllabus.
2. All Questions will carry equal marks of 12 each making a total of 60.
3. Three assignment of given of equal mark making total of 15.
4. There will be average 15 marks out of Two Mid terms Exam.
5. There will be 10 Marks of attendance.

COURSE OUTCOME

CO Statement	K	P01	P02	P03	P04	P05	P06	P07	P08	P09	P10	P11	P12	PS01	PS02
At the end of the course the student will															
C01:Acquire knowledge about linear programming,simplex method,duality,and sensitivity analysis.	K2														
C02:Gain the knowledge of transporation and assignment problem and dynamic programming.	K2														
C03: Understand about the decision theory and game theory and integer programming.	K2														
C04: Gain the knowledge about various Deterministic and Stochastic inventory models	K2														
C05: Understand the Simulations and queing models.	K2														

3: High 2: Medium 1: Low

07BME 104 - STEAM TURBINES AND STEAM POWER PLANT

L P T
3 0 0

COURSE OBJECTIVES: The main objective of this Subject to understand Basic properties of steam. A steam turbine is used in steam power plants to expand high pressure steam to low pressure and in this process the energy that the steam loses is extracted as useful work.

UNIT 1

Steam Turbines:Principle and working of steam turbines, type of turbines, impulse and reactions, compounding for pressure and velocity. Velocity triangles for various types.

UNIT 2

Stage efficiency, diagram efficiency, steam speed to blade, speed ratio for optimum performance. Energy losses in steam turbine, turbine performance at various loads and governing of steam turbines. Constructional details and description of steam turbine components in brief.

UNIT 3

Regenerative feed heating cycles: Introduction : Most Ideal Regenerative feed heating cycle. Regenerative feed heating cycles and their representation on T-s and h-s Diagram. Representation of actual process on T-s and h-s .Diagram Regenerative cycles.Other types of feed heating arrangements. Optimum feed water temperature and saving in Heat Rate. Feed Heaters, Direct Contact Heaters, Surface Heaters

Reheating – Regenerative and Regenerative water – Extraction Cycles.Reheating of steam, Practical reheating and Non- reheating cycles, advantage & disadvantages of reheating, regenerative water extraction cycles, practical feed heating arrangements.

UNIT 4

Governing and performance of Steam Turbines.Description of back pressure Turbines, pass-out Turbines and Mixed Pressure Turbines.

UNIT 5

Steam Power Plant:Steam power plants selection of location, working medium. Fuels and fuel handling equipments,ash handling equipments. Air pre-heater, feed water treatment. Methods of

combustion and various type of combustors. Types of boilers. Modern developments in steam boilers. Description of cooling tower.

Reference

1. Steam And Gas Turbine, R Yadav Central Pub. House. Allahbad

2. Thermodynamics And Heat Power Engineering. Vol 1, M.L.Mathur And F.S.Mehta, Jain Bros, New Delhi

3. Gas Dynamics, S.M Yaha

SPECIAL POINT'S APPLICATION TO BHAGWANT UNIVERSITY EXAMINATION ON STEAM TURBINES AND STEAM POWER PLANT:

1. There will be five questions each of either or type covering all unit of syllabus.
2. All Questions will carry equal marks of 12 each making a total of 60.
3. Three assignment of given of equal mark making total of 15.
4. There will be average 15 marks out of Two Mid terms Exam.
5. There will be 10 Marks of attendance.

COURSE OUTCOME

CO Statement	K	P01	P02	P03	P04	P05	P06	P07	P08	P09	P10	P11	P12	PS01	PS02
At the end of the course the student will															
C01: Acquire knowledge about various type of turbines, working and principle of steam turbines.	K2														
C02: Gain the knowledge of various efficiencies,lossesa and governing of steam turbine.	K2														
C03: Understand about the various regenerating feed heating cycle.	K2														
C04: Gain the knowledge about various governing system and performance of steam turbines.	K2														
C05: Understand the fuels and fuel handling equipment,various boilers and cooling tower.	K2														

3: High 2: Medium 1: Low

07BME 105 - PRODUCT DEVELOPMENT AND LAUNCHING

L P T
3 0 0

COURSE OBJECTIVES: The main objective of this Subject to understand Basic knowledge of product development. Product goals help achieve the product vision and business objectives. it should relate to the broader product strategy. They should also be easy to understand, actionable, achievable, and measurable.

UNIT 1

Importance of new product-Definition-importance-Development Process.Importance of new product for growth of enterprise. Definition of product and new product. Responsibility for new product development. Demands on product development team. Classification of products from new product development. Point of view- Need based/Market pull products, Tech. push, Platform based, Process based and customized products. New product development process and organization. Generic product development process for Market Pull Products. Modification of this process for other types of products.

UNIT 2

Need analysis- Problem Formulation:Establishing economic existence of need, Need Identification and Analysis, Engineering Statement of Problem, Establishing Target Specification.

UNIT 3

Generation of Alternatives and Concept Selection:Concept generation- a creative process, Creativity, Road Elects to creative thinking- Fear of criticism and Psychological set. Tools of creativity like brain storming, Analogy, Inversion etc., Creative thinking Process.Concept feasibility and Concept Selection, Establishing Engineering Specification of Products.

UNIT 4

Preliminary & detailed design- Design Review:Preliminary design- Identification of subsystems, Subsystem specifications, Compatibility. Detailed design of subsystems, component design, Preparation of assembly drawings. Review of product design from point of view of Manufacturing, Ergonomics and aesthetics.

UNIT 5

Management of New Product – development and Launch.New Product Management's Challenges – Maintaining focus, Promotion of Right Culture, Management of Creativity, Top Management attention.Design Team Staffing and Organization. Setting key mile stone, Identification of Risk Areas, Project Execution and Evaluation Product Launch Strategies.Project Planning – Project Task matrix, estimation of time & resources, project scheduling.

Reference

1. Product Design And Manufacturing: Chital, A K And Gupta R C. Phi
2. Product Design And Manufacturing: Ulrich Ktand Eppinger Sd Mcgraw Hill
3. Product Design And Manufacturing: Lindbeck Jr, Prentice Hall
4. Engg Design, G E Deiter

SPECIAL POINT'S APPLICATION TO BHAGWANT UNIVERSITY EXAMINATION ON PRODUCT DEVELOPMENT AND LAUNCHING:

1. There will be five questions each of either or type covering all unit of syllabus.
2. All Questions will carry equal marks of 12 each making a total of 60.
3. Three assignment of given of equal mark making total of 15.
4. There will be average 15 marks out of Two Mid terms Exam.
5. There will be 10 Marks of attendance.

COURSE OUTCOME

CO Statement	K	P01	P02	P03	P04	P05	P06	P07	P08	P09	P10	P11	P12	PS01	PS02
At the end of the course the student will															
C01: Acquire knowledge about new product and development process.	K2														
C02: Gain the knowledge of, Need Identification and Analysis	K2														
C03: Understand about Creativity, Elects to creative thinking and .Concept feasibility and Concept Selection	K2														
C04: Gain the knowledge about various Preliminary & detailed design	K2														
C05: Understand the Management of New Product development and Launch	K2														

3: High 2: Medium 1: Low

07BME 106 – MECHATRONICS

L P T

3 0 0

COURSE OBJECTIVES: The main objective of this Subject to know Basic knowledge of Mechatronics.it has developed world-wide into a very attractive research area. It combines in a synergetic way the classical engineering disciplines, mechanical and electrical engineering and computer science, leading to new kinds of products.

UNIT 1

Introduction about Mechatronics, scope of Mechatronics, application, process control automation and N/c Machines.

UNIT 2

Sensors and Transducers:Introduction, classification, specification, characteristics of transducers, type of transducers displacement, strain, vibration pressure, flow, temperature, force & torque, tactile.

UNIT 3

Hydraulic Pneumatic & Electrical actuators:Pumps & Compressors, control valves & accessories, actuators, fluid power symbols, fluid power systems, switching devices, solenoids, motors.

UNIT 4

Data Acquisition and Control System:Introduction, Quantizing theory, Analog to Digital Conversion, Digital to Analog (D/A)conversation, transfer function, transient response & frequency response & frequency response, stability criteria.

UNIT 5

Design of Mechatronics systems:Introduction, Automatic front and book and cutting in steel rolling mill, lift control system, CNC lathe, temperature control of a heat treatment furnace, EOT crane control panel, Grey grain separators, electrode arm control in electric arc furnace.

Reference:

1. A Textbook Of Mechatronics : R.K.Rajput S.Chand & Co
2. Mechatronics : Ashish Dutt Sharma

SPECIAL POINT'S APPLICATION TO BHAGWANT UNIVERSITY EXAMINATIO ON MECHATRONICS:

1. There will be five questions each of either or type covering all unit of syllabus.
2. All Questions will carry equal marks of 12 each making a total of 60.
3. Three assignment of given of equal mark making total of 15.
4. There will be average 15 marks out of Two Mid terms Exam.
5. There will be 10 Marks of attendance.

COURSE OUTCOME

CO Statement	K	P01	P02	P03	P04	P05	P06	P07	P08	P09	P10	P11	P12	PS01	PS02
At the end of the course the student will															
C01: Acquire knowledge about mechatronics,application and process control automation.	K2														
C02: Gain the knowledge of various Sensors and Transducers.	K2														
C03: Understand about the Hydraulic Pneumatic & Electrical actuators	K2														
C04: Gain the knowledge about various Data Acquisition and Control System	K2														
C05: Understand the Design of Mechatronics systems.	K2														

3: High 2: Medium 1: Low

07BME201: PRODUCTION ENGINEERING LAB.-II

PRE- REQUISITES:-

1 Specimen (Work piece) 2. Machine
3. Measuring instruments 4. Electric Power

COURSE OBJECTIVES:

1. To understand Strength and properties of Different Materials.
2. It also deals with measurement of the capacity to recover quickly from difficulties; toughness of the Materials.

Minimum any ten experiments can be performed

LIST OF EXPERIMENTS:

1. By using lathe tool dynamometer measure the cutting forces in all directions and calculate the following:

a) Shear plane angle

b) Coefficient of friction

c) Power consumption

2. By using the drill dynamometer measure the torque, and thrust in Drilling operation.

3. By using the tool work thermocouple, measure the tool chip interface temp

4. To determine chip reduction coefficient in turning.

5. To study the different mechanisms of tool wear and their measurements.

6. To determine Taylor Tool life exponents by Facing test

7. To study the effect of cutting variables on surface finish in any cutting (Turning, Drilling, Milling, Shaping, grinding etc) operation

8. Study of the effect of clearance and shear angle on the blanking and piercing operations

9. To determine the effect of percentage of reduction and the semicone angle of the die on the drawing load.

10. To find the effect of percentage of reduction and the die geometry on extruding force.

11. Experimental determination of coefficient of friction for metal forming.

12. Study of the drop forging operation (flow ability, forging load etc by plasticine model.

13. To determine roll load in the sheet rolling process.

14. Students will be given at least one practical problem regarding design and fabrication of Jig, Fixture or Press tool.

15. To measure a gap with help of slip gauges

16. Measurement of angle/taper using a sine bar.

17. Study and use of a bore gauge.

18. Flatness testing of a surface pate and machine tool bed by using a sensitive spirit leve

19. Measurement of screw thread elements by tool Makers microscope and Inspection of various elements of screw thread by optical projector.

20. To measure flatness and surface defects in the given test piece with the help of

monochromatic check light and optical flat.

21. Measurement of chordal thickness of Gear tooth by Gear tooth vernier caliper.

22. Use of three-wire method to determine the effective diameter of external threads.

23. To study the capstan lathe, tool holders and attachments and to prepare the given job as per given drawing.

24. Cutting forces measurement during milling using milling dynamometer.

25. Measurement of flatness and roundness of a given machine/ground/lapped flat and round

surface respectively using dial gauge..

07BME202 MECHANICAL VIBRATIONS LAB

PRE- REQUISITES:-

1. Vibration Meter
2. Vibration Sensor
3. Vibration Analyzer
4. Electric Power

COURSE OBJECTIVES:

1. Identify, formulate and solve SDOF and MDOF forced and free systems
2. Analyze time and frequency domain response behavior
3. Calculate mode shapes for one and two degree of freedom systems

Minimum any ten experiments can be performed

LIST OF EXPERIMENTS:

1. To verify relation T = 2ð / (l/g) for a simple pendulum.

2. To determine radius of gyration of compound pendulum.

3. To determine the radius of gyration of given bar by using bifilar suspension.

4. To determine natural frequency of a spring mass system.

5. Equivalent spring mass system.

6. To determine natural frequency of free torsional vibrations of single rotor system.

(a) Horizontal rotor (b) Vertical rotor

7. To verify the Dunkerley's rule.

8. Study of free damped torsional vibration to performing the experiment to find out damping

co-efficient.

9. To conduct experiment of trifler suspension.

10. Harmonic excitation of cantilever beam using electro-dynamic shaker and determination of resonant frequencies.

11. Study of Vibration measuring instruments.

07 BME 203

I. C. ENGINE LAB

SEMESTER VII

PRE- REQUISITES:-

1 I.C. Engine
2. Flash Point And Fire Point Apparatus
3.Stroke Petrol Engine With Electrical Load Box
4. Stroke Diesel Engine With Rope Brake Dynamometer

COURSE OBJECTIVES:

The main objective of this lab is to developed an idea of fuel properties and their Variation with temperature ,determination of kinematic viscosity and calorific Value of fuels ,understanding of basic internal combustion engine performance,determination of friction power and volumetric efficiency of I.C. engine

Perform any 10 experiments

LIST OF EXPERIMENTS:

1. Study of IC Engine models

2. Study of working of four stroke petrol engine and four stroke diesel engine with the help of cut section models.

3. Study of working of two stroke petrol and two stroke diesel engine with the help of cut section models.

4. Study of fuel supply system of a petrol engine (fuel pump and simple carburetor)

5. Study of complete carburetor (Solex carburetor)

6. Study of Petrol Injection System.

7. Study of fuel supply system of a Diesel engine (fuel pump and fuel injector)

8. Study of Ignition systems of an IC Engine (Battery and Magneto ignition system) and Electronic ignition system.

9. Study of Lubrication system of an IC Engine (mist, splash and pressure lubrication)

10. Study of cooling systems of an IC Engine (air cooling and water cooling)

11. To conduct a performance test on diesel engine to draw heat balance sheet for given load and speed

12. To determine friction power of diesel engine by Willan's line or fuel rate extrapolation method.

13. To conduct a performance test on the variable compression ratio engine and to draw the heat Balance sheet for given compression ratio, speed and load and plot the performance curves.

14. To conduct a performance test on a four cylinder four stroke petrol engine and to draw the heat balance sheet and performance curves.

15. To calculate the indicated power, friction power and mechanical efficiency of four stroke four cylinder petrol engine at full load and rated speed by Morse test.

16. To draw the valve timing diagram of a Four stroke S.I. or C.I. Engine using experimental setup.

17. Analysis of engine exhaust gases using Orsat apparatus / gas analyzer.

Course- B.Tech 4th Year 8th Smester

08BME 101 - RENEWABLE ENERGY TECHNOLOGY

L	P	T
3	0	0

COURSE OBJECTIVES: The main objective of this Subject to understand the environment friendly RE sources and to enhance their contribution to the socio-economic development. And supplement efforts in bridging the gap between demand and supply of power, with renewable energy sources and strengthening the grid system and evacuation arrangements for RE projects.

UNIT 1

Solar Energy: Solar radiation, its measurements and prediction. Solar thermal collectors, flat plate collectors, concentrating collectors. Basic theory of flat plate collectors, solar heating of buildings, solar still, solar water heaters, solar driers; conversion of heat energy in to mechanical energy, solar thermal power generation systems.**Solar Photovoltaic**:Principle of photovoltaic conversion of solar energy, types of solar cells and fabrication.photovoltaic applications: battery charger, domestic lighting, street lighting, water pumping, power generation schemes

UNIT 2

Wind Energy: Atmospheric circulations, classification, factors influencing wind, wind shear, turbulence, wind speed monitoring, Betz limit, WECS: classification, characteristics, applications.

UNIT 3

Ocean Energy: Ocean energy resources, ocean energy routes. Principles of ocean thermal energy conversion systems, ocean thermal power plants. Principles of ocean wave energy conversion and tidal energy conversion.

UNIT 4

Other Sources: Nuclear fission and fusion; Geothermal energy: Origin, types of geothermal energy sites, site selection, geothermal power plants; Magneto-hydro-dynamic (MHD) energy conversion. Formation of biomass, photosynthesis; Biomass resources and their classification; Chemical constituents and physicochemical characteristics of biomass; Biomass conversion processes;

UNIT 5

Fuel Cells: Thermodynamics and electrochemical principles; Basic design, types, applications.
Hydrogen Energy: Economics of hydrogen; Production methods.

Reference

1. Renewable Energy Sources: G N Tiwari, Sayesta Suneja Narosa Publishing House
2. Solar Engineering, H.P.Gupta
3. Solar Thermal Engineering By Duffie And Back ran

SPECIAL POINT'S APPLICATION TO BHAGWANT UNIVERSITY EXAMINATION ON RENEWABLE ENERGY TECHNOLOGY:

1. There will be five questions each of either or type covering all unit of syllabus.
2. All Questions will carry equal marks of 12 each making a total of 60.
3. Three assignment of given of equal mark making total of 15.
4. There will be average 15 marks out of Two Mid terms Exam.
5. There will be 10 Marks of attendance.

COURSE OUTCOME

CO Statement	K	P01	P02	P03	P04	P05	P06	P07	P08	P09	P10	P11	P12	PS01	PS02
At the end of the course the student will															
C01:Acquire the knowledge of. Solar radiation, photovoltaic conversion of solar energy,Application	K2														
C02: **:** Atmospheric circulations,. factors influencing wind, classification, characteristics, applications	K2														

C03: Ocean energy resources, Principles of ocean thermal energy conversion systems, ocean thermal power plants	K2														
C04: Nuclear fission and fusion, Formation of biomass,	K2														
C05: Fuel Cells Hydrogen Energy	K2														

3: High 2: Medium 1: Low

08BME 102 - OPERATIONS MANAGEMENT

L P T

3 0 0

COURSE OBJECTIVES: The main objective of this Subject to understand Basic knowledge of **operation management** and concerned with **managing** inputs (resources) through transformation processes to deliver outputs (service or products). The **objectives** of production **management** are to produce goods and services of the right quality, in the right quantities, according to the time schedule and a minimum cost

UNIT 1

Introduction: Scope of Operations Management, operations manager and the management process. Operations Strategy, Competitiveness and Productivity.Demand Forecasting: components of forecasting demand, Approaches to forecasting: Qualitative methods, Time series methods, Regression methods, Accuracy and control of forecasts, Selection of forecasting technique.

UNIT 2

Products and Services, Process, Types of Production Systems: Mass, Batch, Job shop production. Product and process matrix. Process planning and Process analysis. Capacity Planning: Defining and measuring capacity, steps in capacity planning process, determining capacity requirements, Capacity alternatives, Evaluation of alternatives- Cost- Volume analysis etc.

Unit 3

Production Planning: Production planning objective and functions, Bill of material, Capacity and man power requirement planning, Planning levels: long range, Intermediate range and Short range planning, aggregate planning; Objective, Strategies, graphical and mathematical techniques of aggregate planning, master production scheduling, MRP and MRPII Systems

Unit 4

Production Control: Capacity control and priority control, production control functions; Routing, scheduling, dispatching, expediting and follow up. Techniques of production control in job shop production, batch production and mass production systems,

Unit 5

Material Management: Objectives, scope and functions of material management, planning, procurement, storing, ending and inventory control. Purpose of inventory, inventory cost, inventory control systems, Selective inventory control systems, Determination of EOQ, Lead time and reorder point. Methods of physical stock control

Reference

1. Production And Operation Management, Adam Everett E. & Ebert Ronald J. Phi
2. Production And Management: S N Charry. Tmh
3. Operational Mangement: Theory And Problems On Monk J. G Mcgraw Hill
4. Production Systems, Riggs, J.L Wiley Eastern

SPECIAL POINT'S APPLICATION TO BHAGWANT UNIVERSITY EXAMINATION ON OPERATIONS MANAGEMENT:

1. There will be five questions each of either or type covering all unit of syllabus.
2. All Questions will carry equal marks of 12 each making a total of 60.
3. Three assignment of given of equal mark making total of 15.
4. There will be average 15 marks out of Two Mid terms Exam.
5. There will be 10 Marks of attendance.

COURSE OUTCOME

CO Statement	K	P01	P02	P03	P04	P05	P06	P07	P08	P09	P10	P11	P12	PS01	PS02
At the end of the course the student will															
C01: Scope of Operations Management, components of forecasting, Selection of forecasting technique	K2														
C02: Types of Production planning and Process analysis Systems, , Evaluation of alternatives- Cost-Volume analysis	K2														

C03: Production Planning, Planning levels, MRP and MRPII Systems	K2														
C04: production control function, batch production and mass production systems ,,	K2														
C05:. functions of material management, inventory control systems, Lead time and reorder point	K2														

3: High 2: Medium 1: Low

08BME 103 - GAS TURBINES AND GAS POWER PLANT

L P T
3 0 0

COURSE OBJECTIVES: The main objective of Gas Turbines And Gas power Plant, i.e.to do things best under the given circumstances. Following the general optimization paradigm, when applying , a decision-maker selects the key decision variables that will influence the overall quality of decisions

.

Unit1

Review of basic principles and fundamentals of rotating machines. Cycle arrangements, open cycle arrangements, closed cycle arrangements, basic requirement of the working medium, properties of various working media, applications of gas turbine, comparison of gas turbines with reciprocating engines.

Ideal cycles: simple gas turbine cycle, heat exchange cycle, reheat cycle, reheat and heat exchange cycle, intercooled cycle, intercooled cycle with heat exchanger, intercooled and reheat cycle, intercooled cycle with heat exchange and reheat. Comparison of various cycles.

Unit 2

Practical cycles and their analysis, effect of variable specific heat, mechanical losses, loss due to incomplete combustion, polytropic efficiency, performance of actual cycles, comparison of ideal vs actual cycles. Jet propulsion cycles.

Unit 3

Thermodynamic cycles, advantages, disadvantages and performance characteristics of Ramjet engine, pulsejet engine, turboprop engine, turbojet engine, turbofan engine. Calculation of specific thrust and efficiency.

Unit 4

Combustion systems, combustion theory applied to gas turbine combustor, factors affecting combustion chamber design and performance. Combustion chamber geometry, fuel injection and ignition, use of cheap fuels. Impulse and reaction type gas turbines. Velocity triangles and calculation of work done,efficiency etc..

Unit 5

Advantages of a gas turbine power plant, comparison with steam, diesel and hydel power plant. Performance of GT power plant-part load efficiency, airflow rate, thermal efficiency, gas turbine blading and fuels. Gas turbine materials. Free piston engine plant.

Reference

1. Steam And Gas Turbines, R Yadav, Central Pub. House Allahbad
2. Thermodynamics And Heat Power Engineering M L Mathur And F S Mehta Jain Bros. New Delhi

SPECIAL POINT'S APPLICATION TO BHAGWANT UNIVERSITY EXAMINATION ON GAS TURBINE AND GAS POWER PLANT

1. There will be five questions each of either or type covering all unit of syllabus.
2. All Questions will carry equal marks of 12 each making a total of 60.
3. Three assignment of given of equal mark making total of 15.
4. There will be average 15 marks out of Two Mid terms Exam.
5. There will be 10 Marks of attendance.

COURSE OUTCOME

CO Statement	K	P01	P02	P03	P04	P05	P06	P07	P08	P09	P10	P11	P12	PS01	PS02
At the end of the course the student will															
C01:. Review of basic principles and fundamentals of rotating machines, Cycle arrangements, intercooled cycle with heat exchange and reheat. Comparison of various cycles.	K2														
C02: Practical cycles and their analysis, performance of actual cycles,	K2														
C03: Thermodynamic cycles, Calculation of specific thrust and efficiency.	K2														

C04: Combustion systems, Velocity triangles and calculation of work done, efficiency etc..	K2														
C05: hydel power plant, Performance of GT power plant, . Gas turbine materials	K2														

3: High 2: Medium 1: Low

08BME 104 (I) RELIABILITY AND MAINTENANCE ENGINEERING

L P T

3 0 0

COURSE OBJECTIVES: The main objective **Reliability engineering** is a sub-discipline of systems engineering that emphasizes dependability in the lifecycle management of a product. Dependability, or reliability, describes the ability of a system or component to function under stated conditions for a specified period of time. Reliability is closely related to availability, which is typically described as the ability of a component or system to function at a specified moment or interval of time.

Unit 1

Introduction: Maintenance Objectives and Functions; Maintenance Organization and Administration of Maintenance Systems. Need of planned maintenance. Maintenance policies; Breakdown, time based maintenance: Block replacement, age replacement and periodic replacement policy. Corrective and preventive maintenance. Maintenance planning, Scheduled maintenance. Cost of maintenance versus Cost of equipment and production delays. Inspection: Inspection intervals, Inspection reports, card history system.

Unit 2

Predictive maintenance. Equipment wear records, standards. Equipment used in predictive maintenance. Computerized maintenance, Total Productive Maintenance. Methods of condition monitoring, Non-destructive testing, Liquid Penetrate, Magnetic particles, Ultrasonic testing, and Vibration analysis. Oil analysis, Radiographic testing.

Unit 3

Reliability: Definition, failure data analysis, Mean failure rate, mean time to failure (MTTF),mean time between failures (MTBF) , hazard rate, Bathtub curve. Use of Weibull probability chart foe assessing characteristics life, guarantee period etc.

Unit 4

System reliability: Series, parallel and mixed configuration; Simple problems. Reliability improvement: Techniques, use of Pareto analysis-Design for reliability, redundancy unit and stand by redundancy, Optimization of reliability.

Unit 5

Spare Parts Management: Spare parts, features and categorization of spares, cost considerations, Techniques of cost reduction; Selective controls used in spare parts control; ABC analysis, FSN, XYZ, VED and other approaches. Inventory control of spares.

Reference:

1. Bloom Neil B. Reliability centered maintenance: Implementation made simple. McGraw-Hill, New York, 2005.

2. Jardine Andrew KS, Tsang Albert HC. Maintenance, replacement, and reliability: Theory and applications. Taylor and Francis, Boca Raton, FL, 2006.

SPECIAL POINT'S APPLICATION TO BHAGWANT UNIVERSITY EXAMINATION ON RELIABILITY AND MAINTENANCE ENGINEERING

1. There will be five questions each of either or type covering all unit of syllabus.
2. All Questions will carry equal marks of 12 each making a total of 60.
3. Three assignment of given of equal mark making total of 15.
4. There will be average 15 marks out of Two Mid terms Exam.
5. There will be 10 Marks of attendance.

COURSE OUTCOME

CO Statement	K	P01	P02	P03	P04	P05	P06	P07	P08	P09	P10	P11	P12	PS01	PS02
At the end of the course the student will															
C01: Maintenance Objectives and Functions, Inspection intervals,	K2														
C02: **:** Predictive maintenance, Total Productive Maintenance,	K2														
C03 Reliability, Definition, Mean failure rate, mean time to failure	K2														

C04: parallel and mixed, Optimization of reliability configuration,	K2														
C05: Spare Parts Management, Inventory control of spares	K2														

3: High 2: Medium 1: Low

08BME 104 (II) COMPUTATIONAL FLUID FLOW AND HEAT TRANSFER

L P T

3 0 0

Course Objectives: The Primary Objective Of The Course Is To Teach Fundamentals Of Computational Method For Solving Linear And Non-Linear Partial Differential Equations (Pde). The Course Offers Introductory Concepts About Solving Pde Mainly In The Finite Difference (Fd) Framework Though Some Amount Of Finite Volume (Fv) Concept Has Also Been Introduced

Unit1

Review Of Basic Fluid Mechanics And The Governing (Navier-Stokes) Equations. Types Of Partial Differential Equations- Hyperbolic, Parabolic And Elliptic. Traditional Solution Methods- Method Of Characteristics, Separation Of Variables, Greens Function Method.

Unit2

Preliminary Computational Techniques: Discretisation, Converting Derivatives To Discrete Algebric Expressions, Spatial Derivatives, Time Derivatives. Approximation Of Derivatives, Taylor Series Expansion, General Techniques. Accuracy Of Discretisation Process-Higher Order Vs Lower Order Formulae.

Unit3

Finite Difference Method: Conceptual Implementation, Application To Transient Heat Conductionproblem. Convergence, Consistency And Stability Of Fd Equation.

Unit4

Weighted Residual Methods: General Formulation, Introduction To Finite Volume Method.Finite Volume Method: Equations With First Derivatives And Second Derivatives. Fv Method Applied To Laplace's Equation.

Unit5

Finite Element Method: Linear Interpolation, Quadratic Interpolation, Two Dimensional Interpolation. Application To Heat Transfer Problems.

Reference

1. Engineering Fluuid Mechanics: K L Kumar, Euresia Publishing House
2. Fluid Mechanics And Machines: F M White, John Willy And Sons
3. Fluid Mechanics : R.K.Rajput S. Chand Company Ltd
4. Fluid Mechanics Vm Streeter Mcgraw Hill
5. Engineering Fluid Mechanics By D S Kumar

SPECIAL POINT'S APPLICATION TO BHAGWANT UNIVERSITY EXAMINATION ON COMPUTATIONAL FLUID FLOW AND HEAT TRANSFER

1. There will be five questions each of either or type covering all unit of syllabus.
2. All Questions will carry equal marks of 12 each making a total of 60.
3. Three assignment of given of equal mark making total of 15.
4. There will be average 15 marks out of Two Mid terms Exam.
5. There will be 10 Marks of attendance.

COURSE OUTCOME

CO Statement	K	P01	P02	P03	P04	P05	P06	P07	P08	P09	P10	P11	P12	PS01	PS02
At the end of the course the student will															
C01: Review of basic fluid mechanics and the governing, Separation of variables, Greens function method	K2														
C02: Preliminary computational techniques, higher order vs lower order formulae.	K2														

C03: Finite difference method, Convergence, consistency and stability of FD equation	K2														
C04: Weighted residual methods. FV method applied to Laplace's equation.,	K2														
C05: Finite Element method, two dimensional interpolations. Application to heat transfer problems.	K2														

3: High 2: Medium 1: Low

08BME 104 (II)FINITE ELEMENT

L P T

3 0 0

COURSE OBJECTIVES: The FEM Is Particularly Useful For Engineering Problems That Are Too Complicated To Be Solved By Classical Analytical Methods. The Main Objective Of This Course Is To Introduce The Mathematical Concepts Of The Finite Element Method For Obtaining An Approximate Solution Of Ordinary And Partial Differential Equations

UNIT I

Introduction To FEM And Its Applicability, Review Of Mathematics : Matrix Algebra, Gauss Elimination Method, Uniqueness Of Solution, Banded Symmetric Matrix And Bandwidth. Structure Analysis: Two-Force Member Element, Local Stiffness Matrix, Coordinate Transformation, Assembly, Global Stiffness Matrix, Imposition Of Boundary Conditions. Properties Of Stiffness Matrix.

UNIT II

One-Dimensional Finite Element Analysis: Basics Of Structural Mechanics : Stress And Strain Tensor, Constitutive Relation. Principle Ofminimum Potential. General Steps Of FEM, Finite Element Model Concept / Discretization,Derivation Of Finite Elements, Equations Using Potential Energy Approach For Linear And Quadratic 1-D Bar Element, Shape Functions And Their Properties, Assembly, Boundary Conditions, Computation Of Stress And Strain.

UNIT III: Two Dimensional Finite Element Analysis :

Finite Element Formulation Using Three Nodded Triangular (CST) Element And Four Nodded Rectangular Element, Plane Stress And Plain Strain Problems. Shape Functions, Node Numbering And

Connectivity, Assembly, Boundary Conditions. Isoperimetric Formulation Of 1-D Bar Elements, Numerical Integration Using Gauss Quadrature Formula, Computation Of Stress And Strain.

UNIT IV

Finite Element Formulation From Governing Differential Equation : Method Of Weighted Residuals Collocation, Sub Domain Method, Least Square Method Andgalerkin's Method. Application To One Dimensional Problems, One-Dimensional Heat Transfer, Etc. Introduction To Variation Formulation (Ritz Method.)

UNIT V :

Higher Order Elements, Lagrange's Interpolation Formula For One And Two Independent Variable. Convergence Of Solution, Compatibility, Element Continuity, Static Condensation, P And H Methods Of Mesh Refinement, Aspect Ratio And Element Shape. Application Of FEM, Advantages Of FEM. Introduction To Concept Of Element Mass Matrix In Dynamic Analysis.

Reference:

1. Introduction To Finite Element In Engineering, Tirupati R.Chandrapatla & Ashok D. Belegundu, Prentice Hall Of India Ltd.
2. Concepts And Applications Of Finite Analysis, Robert D. Cook, David S. Malkus Michaiel E. Palesha
3. Finite Element Procedures : Klaus Jurgan Batheprentice Hall Of India

SPECIAL POINT'S APPLICATION TO BHAGWANT UNIVERSITY EXAMINATION ON FINITE ELEMENT

1. There will be five questions each of either or type covering all unit of syllabus.
2. All Questions will carry equal marks of 12 each making a total of 60.
3. Three assignment of given of equal mark making total of 15.
4. There will be average 15 marks out of Two Mid terms Exam.
5. There will be 10 Marks of attendance.

COURSE OUTCOME

CO Statement	K	P01	P02	P03	P04	P05	P06	P07	P08	P09	P10	P11	P12	PS01	PS02
At the end of the course the student will															
C01:, Introduction to FEM and its applicability, Assembly, Global stiffness matrix, imposition of Boundary conditions. Properties of	K2														

stiffness matrix.															
C02: **:** Basics of structural mechanics, Computation of stress and strain	K2														
C03: Finite element formulation using three nodded triangular (CST) element and four nodded rectangular elemen	K2														
C04: Element Formulation from Governing Differential Equation	K2														
C05: Higher order elements, Introduction to concept of element mass matrix in dynamic analysis	K2														

3: High 2: Medium 1: Low

08 BME 201: CAD LAB

PRE- REQUISITES:-

1 Computer (with 2GB Graphics) 2. CAD Software
3. Measuring instruments 4. Electric Power

COURSE OBJECTIVES:

1. CAD is used to create the computer aided designs or software applications including drafting.
2. CAD develops the application in both the 2D and 3D formats and provide the information to the application .

EXPERIMENTS TO BE PERFORMED (MINIMUM FIVE EXPERIMENTS)

LIST OF EXPERIMENTS

1. Introduction & different features of the CAD Software

2. 2-D Drafting

3. 3-D Modeling

4. 3-D Advanced Modeling

5. Assembly modeling

6. Feature Modification and Manipulation

7. Detailing

8. Sheet Metal Operations

9. Surface Modeling

10. One Dimensional problems of Finite Element Method.

08 BME 202: CAM AND ROBOTICS LAB

PRE- REQUISITES:-

1 CAM Software
2. NC Machine
3. CNC Machine
4. Electric Power

COURSE OBJECTIVES:

1. To learn the part programming, importance of group technology, computer aided process planning, computer aided quality control
2. To learn the overall configuration and elements of computer integrated manufacturing systems.

EXPERIMENTS TO BE PERFORMED

CAM (Minimum Five Experiments)

LIST OF EXPERIMENTS

1. To prepare part programming for plain turning operation.

2. To prepare part programming for turning operation in absolute mode.

3. To prepare part program in inch mode for plain turning operation.

4. To prepare part program for taper turning operation.

5. To prepare part program for turning operations using turning cycle.

6. To prepare part program for threading operation.

7. To prepare part program for slot milling operation.

8. To prepare part program for gear cutting operation.

9. To prepare part program for gear cutting using mill cycle.

10. To prepare part program for drilling operation.

11. To prepare part program for multiple drilling operation in Z-axis.

12. To prepare part program for multiple drilling in X-axis.

13. To prepare part program for multiple drilling in X and Z axis using drilling cycle.

Robotics (Minimum Five experiments)

1. To detect the sensor scanning system to overcome limitation of fixed sensors on various

Robotic applications, ultrasonic sensor, laser range finders, infrared detectors and miniature.

2. To find the horizontal and vertical movement up to 180o in either direction.

3. To detect objects with infrared ray detector.

4. To determine object distance (3cm – 300cm).

5. To detect distance (10cm to 80 cm) with infrared object detector.

6. To determine 5 Axis Robotic Arm movement and its degree of rotation.

7. To lift the object and place 100m away in various directions.

8. To find the gripper movement (0 to 50mm).

9. To study various Robotic Arm Configurations.

10. To study Pick and Place Robot

08 BME 203: INDUSTRIAL ENGINEERING LAB

PRE- REQUISITES:-

1 Engineering Graphics
2. Electric Circuits
3.Engineering Statics
4.Engineering Dynamics

COURSE OBJECTIVES:

1. Pursue successful careers in a wide range of IE areas or graduate studies

2. Advance in their IE careers through leadership, innovation, analytical and critical thinking, entrepreneurship, life-long learning, and civic responsibility.

LIST OF EXPERIMENTS

1. Determination of time standard for a given job using stopwatch time- study.

2. Preparation of flow process chart, operation process chart and man-machine charts for an Existing setup and development of an improved process.

3. Study of existing layout of a workstation with respect to controls and displays and suggesting improved design from ergonomic viewpoint.

4. to carryout a work sampling study.

5. To conduct process capability study for a machine in the workshop.

6. To design a sampling scheme based on OC curve.

7. To conduct Stewart's experiments on known population

8. Generation of random numbers for system simulation such as facility planning, job shop Scheduling etc.