

KURUKSHETRA UNIVERSITY KURUKSHETRA
SCHEME OF STUDIES & EXAMINATIONS
B.Tech. 1ST YEAR (SEMESTER-I) COMMON FOR ALL BRANCHES (2004-2005)

Course No.	Course title	Teaching Schedule				Allotment of marks				Duration of Exams.
		L	T	P	Total	Sessional	Theory	Practical	Total	
MATH-101E	Mathematics-I	4	1	-	5	50	100	--	150	3
PHY-101E	Physics-I	3	1	-	4	50	100	--	150	3
BT-101E	Introduction to Biotechnology	3	1	-	4	50	100	--	150	3
HUM-101E	OR Communication skills in English	3	1	-	4	50	100	--	150	3
ME-101E/ CE-101E / EL-101E	Elements of Mechanical Engineering / Elements of Civil Engg./ Elements of Electronics Engg. *	3	1	-	4	25	75	--	100	3
ME-105E	OR Engg. Graphics and Drawing	-	--	3	3	50	--	100	150	3
ME-103E	Manufacturing Processes	4	--	--	4	50	100	--	150	3
CH-101E	OR Chemistry	3	1	-	4	50	100	--	150	3
CSE-101E	Fundamentals of Computer & Programming in c	3	2	-	5	50	100	--	150	3
EE-101E	OR Electrical Technology	3	2	-	5	50	100	--	150	3
ES-101E	Environmental Studies**	4	-	-	4	25	75	--	100	3
PHY-103E	Physics Lab.-I	-	-	-	2	25	--	25	50	3
ME-107E	Workshop Practice	--	--	3	3	25	--	25	50	3
CH-103E	Or Chemistry Lab.	--	--	2	2	25	--	25	50	3
CSE-103E	Computer Programming Lab.	--	--	2	2	25	--	25	50	3
EE-103E	OR Electrical Technology Lab.	--	--	2	2	25	--	25	50	3
ME-109E CE-109E EL-109E	Elements of Mechanical Engineering / Elements of Civil Engg./ Elements of Electronics Engg. *	--	--	2	2	25	--	25	50	3
	Total	24/20	6/6	9/9	35/35	375/375	575/500	100/175	1050/1050	

Note:- 1. Students will study either Group A (BT-101E, ME-101E/ CE-101E/ EL-101E, ME-103E, CSE-101E, ME107E, CSE-103E, ME-109E/ EL-109E/ CE-109E) OR Group B (HUM-101E, ME-105E, CH-101E, EE-101E, ES-101E, CH-103E, EE-103E) SEMESTER-I/SEMESTER-II branches to be decided by the concerned institution.

Students are allowed to use single memory, non-programmable scientific calculator during examination.

Practical Examination will consist of 10 marks for viva-voce and 15 marks for Experiment.

*Institutes will offer one of these electives

**Subject is qualifying. It shall carry 25 sessional marks for field work (to be conducted by the institute) report.

KURUKSHETRA UNIVERSITY KURUKSHETRA
SCHEME OF STUDIES & EXAMINATIONS
B.Tech. 1ST YEAR (SEMESTER –II) COMMON FOR ALL BRANCHES (2003-2004)

Course No.	Course title	Teaching Schedule				Allotment of marks				Duration of Exams.
		L	T	P	Total	Sessional	Theory	Practical	Total	
MATH-102E	Mathematics-II	4	1	-	5	50	100	--	150	3
PHY-102E	Physics-II	3	1	-	4	50	100	--	150	3
BT-101E	Introduction to Biotechnology	3	1	-	4	50	100	--	150	3
HUM-101E	OR Communication skills in English	3	1	-	4	50	100	--	150	3
ME-101E / CE-101E / EL- 101E	Elements of Mechanical Engineering / Elements of Civil Engg./ Elements of Electronics Engg. *	3	1	-	4	25	75	--	100	3
ME-105E	OR Engg. Graphics and Drawing	--	--	3	3	--	--	75	125	3
ME-103E	Manufacturing Processes	4	--	--	4	50	100	--	150	3
CH-101E	OR Chemistry	3	1	-	4	50	100	--	150	3
CSE-101E	Fundamentals of Computer & Programming in C	3	2	-	5	50	100	--	150	3
EE-101E	OR Electrical Technology	3	2	-	5	50	100	--	150	3
ES-101E	Environmental Studies**	4	-	-	4	25	75	--	100	3
PHY-104E	Physics Lab.-II	-	-	2	2	25	--	25	50	3
ME-107E	Workshop Practice Or	--	--	3	3	25	--	25	50	3
CH-103E	Chemistry Lab.	--	--	2	2	25	--	25	50	3
CSE-103E	Computer Programming Lab. OR	--	--	2	2	25	--	25	50	3
EE-103E	Electrical Technology Lab.	--	--	2	2	25	--	25	50	3
ME-109E CE- 109E EL-109E	Elements of Mechanical Engineering / Elements of Civil Engg./ Elements of Electronics Engg. *	--	--	2	2	25	--	25	50	3
	Total	20/16	6/6	9/9	35/35	375/375	575/500	100/150	1050/1025	

Note:- 1. Students will study either Group A (BT-101E, ME-101E/ CE-101E/ EL-101E, ME-103E, CSE-101E, ME107E, CSE-103E, ME-109E/ EL-109E/ CE-109E) OR Group B (HUM-101E, ME-105E, CH-101E, EE-101E, ES-101E, CH-103E, EE-103E) SEMESTER-I/SEMESTER-II branches to be decided by the concerned institution.

Students are allowed to use single memory, non programmable scientific calculator during examination.

3. Practical Examination will consist of 10 marks for viva-voce and 15 marks for Experiment.

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MATH-101E
MATHEMATICS-I
(COMMON FOR ALL BRANCHES)

L T P
4 1 -

Theory: 100 Marks
Sessional: 50 Marks
Total: 150 Marks
During of exam : 3 Hrs.

UNIT-I

Applications of Differentiation : Taylor's & Maclaurin's series, Expansion by use of known series, Expansion by forming a differential equation, Asymptotes, Curvature, Radius of Curvature for Cartesian, Parametric & polar curves, Centre of curvature & chord of curvature, Tracing of Cartesian & polar curves (standard curves).

UNIT – II

Partial Differentiation & its Applications : Functions of two or more variables Partial derivatives, Total differential and differentiability, Derivatives of composite and implicit functions, change of variables.

Homogeneous functions, Euler's theorem, Jacobian, Taylor's & Maclaurin's series for functions of two variables, (without proof), Errors and approximations, Maxima-minima of functions of two variables, Lagrange's method of undetermined multipliers, Differentiation under the integral sign.

UNIT – III

Multiple Integrals and their Applications : Double integral, change of order of integration Double integral in polar coordinates, Applications of double integral to find area enclosed by plane curves and volume of solids of revolution.

Triple integral, volume of solids, change of variables, Beta and gamma functions and relationship between them.

UNIT – IV

Vector Calculus : Differentiation of vectors, scalar and vector point functions Gradient of a scalar field and directional derivative, divergence and curl of a vector field and their physical interpretations, Del applied twice to point functions, Del applied to product of point functions.

Integration of vectors, line integral, surface integral, volume integral, Green's, Stoke's and Gauss divergence theorems (without proof), and their simple applications.

TEXT BOOKS:

1. Advanced Engineering Mathematics : F. Kreyszig.
2. Higher Engineering Mathematics : B.S. Grewal.

REFERENCE BOOKS:

1. Engineering Mathematics Part-I : S.S. Sastry.
2. Differential and Integral Calculus : Piskunov.
3. Advanced Engineering Mathematics : R.K. Jain and S.R.K. Iyengar
4. Advanced Engg. Mathematics : Michael D. Greenberg

Note: The Examiners will set eight questions, taking two from each unit. The students are required to attempt five questions in all selecting at least one from each unit. All questions will carry equal marks.

HY-101E
PHYSICS-I
(COMMON FOR ALL BRANCHES)

L T P
3 1

Theory: 100 marks
Sessional: 50 marks
Total: 150 marks
Time: 3 Hrs.

UNIT-I

PHYSICAL OPTICS

Interference: Division of wave front-Fresnel's biprism, Division of amplitude-Newton's rings, Michelson interferometer, applications.

Diffraction: Difference between Fraunhofer and Fresnel diffraction. Fraunhofer diffraction through a slit. Plane transmission diffraction grating, its dispersive and resolving powers.

Polarization: Polarised and unpolarized light, double refraction; Nicol prism, quarter and half wave plates, Polarimetry; Biquartz and Laurent's half-shade polarimeters, Simple concepts of photoelasticity.

UNIT-II

LASER: Spontaneous and stimulated emissions, Laser action, characteristics of laser beam-concepts of coherence, He-Ne and semiconductor lasers (simple ideas), applications.

FIBRE OPTICS: Propagation of light in fibres, numerical aperture, single mode and multi mode fibres, applications.

UNIT-III

EM Theory : E.M. wave theory-review of basic ideas, Gauss's Law, Ampere's Law and its applications to infinite line charge & Infinite plane, Maxwell's equations, simple plane wave equations, simple concepts of wave guides and co-axial cables, Poynting vector. **DIELECTRICS:** Molecular theory, polarization, displacement, susceptibility, dielectric coefficient, permittivity & various relations between these, Gauss's law in the presence of a dielectric, Energy stored in an electric field. Behavior of dielectrics in a.c. field-simple concepts, dielectric losses.

UNIT-IV

SPECIAL THEORY OF RELATIVITY: Michelson-Moreley experiment, Lorentz transformations, variation of mass with velocity, mass energy equivalence.

NUCLEAR PHYSICS: Neutron Cross-section, Nuclear fission, Moderators, Nuclear reactors, Reactor criticality, Nuclear fusion. Interaction of radiation with matter-basic concepts, radiation detectors-ionisation chamber, G.M. Counter, Scintillation and solid state detectors, cloud chamber and bubble chamber.

TEXT BOOKS: 1. Physics of the Atom - Wehr, Richards & Adair (Narosa)
2. Perspectives of Modern Physics - Arthur Beiser (TMH)
3. Modern Engineering Physics – A.S. Vasudeva (S. Chand)

REFERENCE BOOKS:

1. Electricity and Magnetism – F.W. Sears (Narosa)
2. Physics Vol-I & II – Resnick & Halliday (Wiley Eastern)
3. A Text Book of Optics – Brij Lal & Subramanyam

Ist YEAR B.TECH INTRODUCTION TO BIOTECHNOLOGY (BT-101 E)

L T P/D
3 1

Theory: 100 marks
Sessional : 50 marks
Total: 150 marks
Time: 3 Hrs.

UNIT - I

Introduction to life: Characteristics of living organisms. Hierarchy of organisation and factors responsible for regulating different levels of organisations. Structure of Prokaryotic and Eukaryotic cell. Basic concept of State and Homeostasis.

Introduction to Biomolecules: Definition, general classification and important functions of carbohydrates, lipids, proteins, nucleic acids and vitamins.

Enzymes as biocatalysts: General characteristics, nomenclature and classification of Enzymes. Effect of temperature, pH, enzyme and substrate concentrations on the activity of enzymes. Elementary concept of cofactors and coenzymes.

UNIT - II

Biodiversity :

- (i) **Plant System :** Basic concepts of plant growth, nutrition, photosynthesis and nitrogen fixation. Types of Growth regulators and their physiological effects.
- (ii) **Animal System :** Elementary Study of Digestive, Respiratory, Circulatory, Excretory systems and their functions.
- (iii) **Microbial System :** History of Microbiology, types of microbes and properties. Economic importance and control of microbes.

UNIT - III

Evolution: Theories of evolution. Mendel's laws of inheritance. Variation and speciation.

Genetic: Cell division – Mitosis and Meiosis. Evidence of nucleic acids as a genetic material. Central Dogma.

Genetic Engineering : Elementary knowledge of Recombinant DNA Technology, Bioinformatics and Genomics.

UNIT – IV

Introduction to Biotechnology : Definition, scope and achievements. Tools used in biotechnology.

Applications of Biotechnology in Agriculture, Medicine and Environment – an elementary knowledge.

Prospects and public perception of Biotechnology.

Text/ Reference Books:

1. Cell Biology and Genetics. 9th edition. Starr, C. and Taggard; R. (2001) Thomson Learning USA.
2. Life Science of Biology 6th edition Purves W.K.; Sadava, D.; Orians, G.H. and Heller, H.C. (2001). W.H. Freeman & company, USA.

3. Basic Biotechnology. Ratledge, C. and Kristiansen, B. (2001) Cambridge University Press.
4. Basic Biotechnology. Ignacimuthu, S.J. (2002) Tata McGraw-Hill Pub., New Delhi
5. Genes VII Lewis Benjamin (2002). Oxford Univ. Press Oxford.
6. Biotechnology 3rd Edition. Smith, J.E. (2003) Cambridge University Press.

HUM-101-E
COMMUNICATION SKILLS IN ENGLISH
B.E. Semester-I

L T P
3 1

Theory: 100 marks
Sessional: 50 marks
Total: 150 marks
Time: 3 Hrs.

This course is designed for the students of Engineering and Technology who need English for specific purposes in specific situations. It aims at imparting the communication skills that are needed in their academic and professional pursuits. This is achieved through an amalgamation of traditional lecture-oriented approach of teaching with the task based skill oriented methodology of learning.

Unit-I

Communicative Grammar

Part A : Spotting the errors pertaining to nouns, pronouns, adjective and adverbs; Concord - grammatical concord, notional concord and the principle of proximity between subject and verb.

Part B : Changing the voice : from Active to Passive and Passive to Active.

Unit-II

Lexis: Idioms and phrases; Words often confused; One-Word Substitutes; Formation of words (suffixes, prefixes and derivatives);

Unit-III

Oral Communication:

Part-A: Introduction to principal components of spoken English – Transcription, Word-accent, Intonation, Weak forms in English

Part-B: Developing listening and speaking skills through various activities, such as (a) role play activities, (b) Practising short dialogues (c) Group discussion (d) Debates (e) Speeches (f) Listening to news bulletins (g) Viewing and reviewing T.V. programmes etc.

Unit-IV

Written Communication: Developing reading and writing skills through such tasks/activities as developing outlines, key expressions, situations, slogan writing and theme building exercises, dialogue writing, interpreting pictures/cartoons.

Unit-V

(For Internal Evaluation Only):

Book Review – Herein the students will be required to read and submit a review of a book (Literary or non-literary) of their own choice. This will be followed by a presentation of the same in the class

Unit-VI

Technical Writing:

- (a) Business Letters, Format of Business letters and Business letter writing
- (b) E-mail writing
- (c) Reports, Types of Reports and Format of Formal Reports
- (d) Press Report Writing

SUGGESTED READING:

Language in Use (Upper intermediate Level), Adrian Doff Christopher Jones, Cambridge University Press

Common Errors in English, Abul Hashem, Ramesh Publishing House, New Delhi.

Objective English, Tata Mc. Graw Hill Publishing Company Ltd., New Delhi.

Spoken English for India, R.K. Bansal & J.B. Harrison, Orient Longman, Delhi.

The sounds of English, Veena Kumar, Makaav Educational Software, New Delhi.

English Phonetics & Phonology, P. Roach, Cambridge University Press, London.

English for Engineers and Technologists: A Skill Approach, Vol. 2, Orient Longman, Delhi.

Business Communication, M.S. Ramesh and C.C. Pattanshetti, R.Chand and Company, Delhi

Group Discussion, Sudha Publications/Ramesh Publishing House, New Delhi.

English Grammar & Composition. By Rajinder Pal & Prem Lata Suri, Sultan Chand Pub. New Delhi.

SCHEME OF EXAMINATION:

All questions will be compulsory and will cover all the aspects of the syllabus **except unit V**. There will be sufficient internal choice.

Unit-I: 20 Marks

Questions No. 1 will require the students to carefully read the sentences given and trace the errors, if any, and then supply the correct alternatives/answers.

Unit-II: 20 Marks

Question No. 2 may have four or five parts testing knowledge of different items of vocabulary.

Unit-III: 20 Marks

Question No. 3 will have four parts of 5 marks each from part A of the unit.

Note: Speaking and listening skills of part B will primarily be tested orally through internal assessment.

Unit-IV: 20 Marks

Question No. 4 may have many parts. The questions will be framed to test students' composition skills on the elements prescribed in the unit. For example, the students may be required to develop a hypothetical situation in a dialogue form, or to develop an outline, key expression etc.

Unit-V is for internal assessment only.

Unit-VI: 20 Marks

Question No. 5 may have two parts. While the one part may require the students to frame either a press/news report for the print media or write the given business letter, or e-mail a message, the second part will have a theory question on the format of formal report and business letter.

ME-101E
ELEMENTS OF MECHANICAL ENGINEERING

L T P
3 1

Theory: 75 marks
Sessional: 25 marks
Total: 100 marks
Time: 3 Hrs.

Unit-I

Properties of Steam & Boilers: Formation of steam at constant pressure, Thermodynamics properties of steam, Condition of steam, Steam tables, Measurement of dryness fraction by throttling calorimeter, Classification of boilers, Comparison of water and fire tube boilers mounting and accessories with their functions, Constructional and operational details of Cochran and Babcock and Wilcox boilers, Problems.

Steam Turbines and Condensers: Classification of turbines, Working principle of impulse and reaction turbine, Compounding of impulse turbine, Comparison of impulse and reaction turbines, Types of condensers, Cooling ponds and cooling towers, Condenser and vacuum efficiencies.

Unit-II

I.C. Engines and Gas Turbines: Introduction, Classification, Constructional details and working of two-stroke and four-stroke diesel and petrol engines, Otto, Diesel and Dual cycles, Working principle of gas turbine, Constant pressure gas turbine cycle.

Water Turbines, Pumps and Hydraulic Devices: Introduction, Classification, Construction details and working of Pelton, Francis and Kaplan turbines, Specific speed and selection of turbines, Classification of water pumps and their working, Hydraulic jack and lift.

Unit-III

Simple Lifting Machines: Definition of machine, Velocity ratio, Mechanical advantage, Efficiency, Laws of machines, Reversibility of machine, Wheel and axle, Differential pulley block, Single, double and triple start worm and worm wheel, Single and double purchase winch crabs, Simple and compound screw jacks. Problems.

Power Transmission Methods and Devices: Introduction to Power transmission, Belt drive, Rope drive, Chain drive, Pulley, Gear drive, Types of gears, Gear train, Clutches, Types and function of clutches, Types and function of brakes, Power measurement by dynamometer, Types of dynamometers.

Unit-IV

Stresses and Strains: Introduction, Concept & types of Stresses and strains, Poisson's ratio, stresses and strains in simple and compound bars under axial loading, Stress-strain diagrams, Hooke's law, Elastic constants & their relationships, Principle stresses & strains and principal-planes, Mohr's circle of stresses. Numerical problems.

Bending Moment & Shear Force: Definitions, SF and BM diagrams for cantilever and simply supported beam. Calculation of maximum SF, BM and point of contraflexure under the loads of (i) concentrated load (ii) uniformly distributed load (iii) combination of concentrated and uniformly distributed loads. Problems.

Text Books:

1. Strength of Materials - R.C. Hibbeler, Pub.- ELBS.
2. Hydraulic and Fluid Mechanics – Modi and Seth, Pub. – Standard Book House, New Delhi
3. Engineering Thermodynamics – P. Arora, Pub. - TMH, New Delhi
4. Thermal Engineering – A.S. Sarad, Pub. - Satya Prakashan, New Delhi.
5. Engineering Mechanics – K.L. Kumar, Pub. - TMH, New Delhi.
6. Theory of Machines – S.S. Rattan, Pub. - TMH, New Delhi.

Reference Books:

1. Strength of Materials – Popov, Pub. - PHI, New Delhi.
2. Hydraulic Machines – Jagdish Lal, Pub.- Metropolitan, Allahbad.
3. Thermal Science and Engineering – D.S. Kumar, Pub. – Katerina & Sons, New Delhi.

Note: The Examiners will set eight questions, taking two from each unit. The students are required to attempt five questions in all selecting at least one from each unit. All questions will carry equal marks.

ELEMENTS OF CIVIL ENGINEERINGS

L T P
3 1 -

Sessional: 25 Marks
Exam.: 75 Marks
Total: 100 Marks
Time: 3 Hrs.

UNIT-I

Building Materials & Construction: Cement, sand, aggregate, bricks, reinforcing bars, structural steel sections.

Brick masonry: Bonds in brick work, reinforced brick work, load bearing walls, damp-proofing and water proofing, doors and windows

Making of concrete, reinforced concrete: columns, beams, lintels, floors and roofs, staircases, water retaining structures, foundations.

UNIT-II

Structural Steel: Properties, design of tension and compression members, beams and roof Trusses, constructions- riveted bolted and welded, industrial buildings and towers

UNIT-III

Soils and Foundations: Types of soils, bearing capacity of soils, improving the bearing capacity, earth pressure, foundation for walls, columns, machines and transmission towers, pile foundation.

UNIT-IV

Water supply and treatment: Water needs, estimation of water demand, impurities in water and their sanitary significance, water quality standards, water treatment systems, distribution systems- gravity, pumping and dual system, need for sanitation, systems of sanitation-water borne and conservancy methods of sanitation, sewerage systems-partial, combined and separate systems.

References:

1. Building Construction by Sushil Kumar, Standard Pub., New Delhi.

2. Reinforced Concrete by I.C.Syal & A.K.Goyal, A.H Wheeler & Co., Delhi
3. Design of steel Structures by A.S.Arya & J.L.Ajonani Nem Chand & Bros.
4. Basics & Applied Soil Mechanics by Gopal Ranjan & ASR Rao, New Age Int. Pub., New Delhi
5. Water Supply Enggi. By S.K. Garg.

Note: The Examiners will set eight questions, taking two from each unit. The students are required to attempt five questions in all selecting at least one from each unit. All questions will carry equal marks.

EL-101E

ELEMENTS OF ELECTRONICS ENGINEERING

L T P
3 1 -

Sessional: 25 Marks
Exam.: 75 Marks
Total: 100 Marks
Time: 3 Hrs.

UNIT-I

Semiconductors p-type, n-type, pn junction diodes, pn junction as a circuit element, its characteristics, half wave and full wave and bridge type rectifier circuits basic filter circuits, Diode as voltage multiplier, clipper, clamper circuit. Zener diode as a voltage regulator. LED its characteristics construction & applications

UNIT-II

Characteristics of transistors in different configuration. Concept of d.c. and a.c. load line and operating point selection. Various amplifiers configurations their h-parameter equivalent circuits determination of voltage gain current gain input resistance and output resistance & power gain. Concept of feedback in amplifiers, different oscillators circuits (without analysis)

UNIT-III

Differential amplifier and its transfer characteristics. IC Op-Amps, its ideal & practical specifications and measurement of parameters. Op-Amp in different modes as inverting amplifier non inverting amplifier scale changer, differentiator & integrator.

UNIT-IV

Characteristics of JFET, MOSFET, Various amplifier configurations using FET. Characteristics and Construction of SCR, TRIAC, UJT. Their basic areas applications.

Reference :

1. Electronic Devices & Circuits - Boylstad & Nashelsky.
2. Integrated Electronics By Millman & Halkias.
3. Electronic Principles – Malvino
4. Principles of Electronics – V.K. Mehta, Shalu Melta.

5. Electronic Circuits – Donald L. Shilling & Charles Belowl

Note: The Examiners will set eight questions, taking two from each unit. The students are required to attempt five questions in all selecting at least one from each unit. All questions will carry equal marks.

ME-105E

ENGINEERING GRAPHICS AND DRAWING

L T P
marks
- 3

Examination : 100

Sessional: 50 marks

Total: 150 marks

Time: 3 Hrs.

Unit-I

Various types of projections, First and Third angle systems of orthographic projections. Projections of points in different quadrants. Projections of straight lines – parallel to one or both reference planes, contained by one or both planes, perpendicular to one of the planes, inclined to one plane but parallel to the other plane, inclined to both the planes, true length of a line and its inclinations with reference planes, traces of a line.

Unit-II

Projections of Polyhedra Solids and solids of Revolution – in simple positions with axis perpendicular to a plane, with axis parallel to both planes, with axis parallel to one plane and inclined to the other. Development of surface of various simple solids such as cubes, cylinders, prisms, pyramids etc. orthographic views, orthographic drawings of Bolts, Nuts, Bolted joints, screw threads, screwed joints.

Note : Some simple exercise may be attempted with AUTOCAD.

Text Book

1. Engineering Drawing Plane and Solid Geometry : N.D. Bhatt and V.M.Panchal, Forty-Fourth Edition 2002, Charotar Publishing House.

Reference Books

1. Engineering Graphics and Drafting : P.S. Gill, Millennium Edition, S.K. Kataria and Sons.
2. A Text Book of Engineering Drawing : S.B. Mathur, Second Revised and Enlarged Edition 2000, Vikas Publishing House.
3. Engineering Graphics using AUTOCAD 2000 : T. Jeyapoovan, First Edition 2002, Vikas Publishing House.

www.uniqueinstitutes.org

ME- 103E

MANUFACTURING PROCESSES

L T P

4

Theory : 100 marks

Sessional : 50 marks

Total: 150 marks

Time: 3 Hrs.

Unit-I

Introduction: Introduction to Manufacturing Processes and their Classification. Industrial Safety; Introduction, Types of Accidents, Causes and Common Sources of Accidents, Methods of Safety, First Aid.

Engineering Materials: General Properties and Applications of Engineering Materials, Mild Steel, Medium Carbon Steel, High Carbon Steel, High Speed Steel and Cast Iron.

Unit-II

Foundry: Introduction to Casting Processes, Basic Steps in Casting Process, Pattern, Types of Patterns, Pattern Allowances, Risers, Runners, Gates, Moulding Sand and its composition, Sand Preparation, Molding Methods, Core Sands and Core Making, Core Assembly, Mold Assembly, Melting (Cupola) and Pouring, Fettling, Casting Defects and Remedies.

Unit-III

Cold Working (Sheet Metal Work): Sheet Metal Operations, Measuring, Layout Marking, Shearing, Punching, Blanking, Piercing, Forming, Bending and Joining Advantages and Limitations.

Hot Working Processes: Introduction to Hot Working, Principles of Hot Working Processes, Forging, Rolling, Extrusion, Wire Drawing, Plant Layout, Objectives of Layout, Types of Plant Layout and their Advantages.

Unit-IV

Introduction to Machine Tools: Specifications and Uses of commonly used Machine Tools in a Workshop such as Lathe, Shaper, Planer, Milling, Drilling, Slotter, Introduction to Metal Cutting. Nomenclature of a Single Points Cutting Tool and Tool Wear. Mechanics of Chips Formations, Type of Chips , Use of Coolants in machining.

Welding: Introduction to Welding, Classification of Welding Processes, Gas Welding: Oxy-Acetylene Welding, Resistance Welding; Spot and Seam Welding, Arc Welding: Metal Arc, TIG & MIG Welding, Welding Defects and Remedies, Soldering & Brazing.

Text Books :

Workshop Technology Vol. I &II - Hazra & Chaudhary, Asian Book Comp., New Delhi.

Process and Materials of Manufacture-Lindberg, R.A. Prentice Hall of India, New Delhi.

Principles of Manufacturing Materials and Processes- Campbell, J.S.- McGraw- Hill.

Reference Books:

1. Manufacturing Science-Amitabha Ghosh & Ashok Kumar Malik, - East-West Press.
2. Manufacturing Process and Systems - Ostwald, Munoz , John Wiley.
3. Workshop Technology, Vol. 1, 2 & 3 – Chapman, WAJ, Edward Arnold.

Note: The Examiners will set eight questions, taking two from each unit. The students are required to attempt five questions in all selecting at least one from each unit. All questions will carry equal marks.

**CH-101E
CHEMISTRY**

(COMMON FOR ALL BRANCHES)

L T P
3 1 -

Sessional : 50 Marks
Exam.: 100 Marks
Total: 150 Marks
Time: 3 Hrs.

Unit-1

Thermodynamics - Second law, concept of Entropy, Entropy change for an ideal gas, free energy and work functions, Free energy change, Chemical Potential, Gibb's Helmholtz equation, Clausius - Clapeyron equation, Related numerical problems with above topics. Phase-Rule - Terminology, Derivation of Gibb's Phase Rule Equation, One Component System (H₂O System), Two Components systems, Eutectic system (Pb-Ag), system with congruent m.pt. (Zn-Mg), systems with incongruent m.pt. (Na-K), Applications of above Systems.

Unit-2

Water & its treatment : Part I – Sources of water, impurities in water, hardness of water and its determination, units of hardness, alkalinity of water and its determination, Related numerical problems, scale and sludge formation (composition properties and methods of prevention). Water and its treatment : Part II – Treatment of water for domestic use, coagulation, sedimentation, filtration and dis-infection, water softening, Ion-exchange process, mixed bed demineralisation, Desalination (reverse osmosis) (electrodialysis).

Unit-3

Corrosion and its prevention - Galvanic & concentration cell, Dry and wet corrosion, Electrochemical theory of corrosion, Galvanic corrosion, pitting corrosion, water-line corrosion, differential aeration corrosion, stress corrosion, factors affecting corrosion, Preventive measures (proper design, Cathodic protection, protective coatings). Lubrication and Lubricants-Friction, mechanism of lubrication, classification and properties of lubricants, Additives for lubricants, synthetic lubricants, Greases – Preparation & properties (consistency, drop point) and uses.

Unit-4

Polymers and Polymerization-Organic polymers, polymerisation, various types of polymerisation, effect of structure on properties of polymers, preparation properties and technical applications of thermo-plastics (PVC,PVA), thermosets (PF,UF), and elastomers (SBR,GR-N), Silicones, Introduction to polymeric compsites. Analytical methods;its needs and different methodes;Spectroscopy; its defination and scope;salient features of spectrophotometer,brief introduction of titrimetric methodes,Elementry discussion on flame photometry

TEXT BOOKS:

1. Engineering Chemistry, P.C. Jain, Monica Jain (Dhanpat Rai & Co.).
2. Chemistry in Engineering & Tech., Vol.I & II, Rajaram, Kuriacose (TMH).

REFERENCE BOOKS:

1. Instrumental methods of Chemical Analysis, MERITT & WILLARD (East-West Press).
2. Physical Chemistry, P.W. Atkin (ELBS, Oxford Press).
3. Physical Chemistry, W.J. Moore (Orient-Longman).

Note: The Examiners will set eight questions, taking two from each unit. The students are required to attempt five questions in all selecting at least one from each unit. All questions will carry equal marks.

CSE -101E
FUNDAMENTALS OF COMPUTERS & PROGRAMMING IN C

L T P
3 2

Theory: 100 marks
Sessional : 50 marks
Total: 150 marks
Time: 3 Hrs.

Unit-1

An Overview of Computer System: Anatomy of a digital Computer, Memory Units, Main and Auxiliary Storage Devices, Input Devices, Output Devices, Classification of Computers. Radix number system: Decimal, Binary, Octal, Hexadecimal numbers and their inter-conversions; Representation of information inside the computers. Operating System Basics: Introduction to PC operating Systems: DOS, Unix/Linux, Windows 2000.

Unit-2

Programming Languages: Machine-, Assembly-, High Level- Language, introduction to Assembler, Compiler, Interpreter, Debuggers, Linker and Loader. Programming fundamentals: problem definition, algorithms, flow charts and their symbols.

Internet basics: How Internet works, Major features of internet, Emails, FTP, Using the internet.

Unit-3

C Programming language: C fundamentals, formatted input/ output, expressions, selection statements, loops and their applications; Basic types, arrays, functions, including recursive functions, program organization: local and external variables and scope & arrays.

Unit-4

Strings: strings literals, string variables, I/O of strings, arrays of strings; applications. Structures, Unions and Enumerations: Structure variables and operations on structures; Structured types, nested array structures; unions; enumeration as integers, tags and types. Standard library: Input / output; streams, file operations, formatted I/O, character I/O, line I/O, block, string I/O, Library support for numbers and character data, error handling:

Text Books:

1. Using Information Technology, 5th Edi, Brian K Williams & Stacey C. Sawyer, 2003, TMH
2. The C Programming Language by Dennis M Ritchie, Brian W. Kernigham, 1988, PHI.
3. C Programming - A modern approach by K.N. King, 1996, WW Norton & Co.

Reference Books:

1. Information technology, Dennis P. Curtin, Kim Foley, Kunal Sen, Cathleen Morin, 1998, TMH
2. Theory and problem of programming with C, Byron C Gottfried, TMH
3. Teach yourself all about computers by Barry Press and Marcia Press, 2000, IDG Books India.
4. Using Computers and Information by Jack B. Rochester, 1996, Que Education & Training.

Note: The Examiners will set eight questions, taking two from each unit. The students are required to attempt five questions in all selecting at least one from each unit. All questions will carry equal marks.

EE-101E
ELECTRICAL TECHNOLOGY

L T P
3 2

Theory: 100 marks
Sessional : 50 marks
Total: 150 marks
Time: 3 Hrs.

UNIT-I

D.C. CIRCUITS: Ohm's Law, Kirchoff's Laws, D.C. Circuits, Nodal and Loop methods of analysis. A.C. CIRCUITS: Sinusoidal signal, instantaneous and peak values, RMS and average values, phase angle, polar & rectangular, exponential and trigonometric representations; R,L and C components, behaviors of these components in A.C. circuits. Concept of complex power, power factor.

UNIT-II

TRANSIENT RESPONSE: Transient response of RL, RC and RLC Circuits with step input. NETWORK THEOREMS: Thevenin's theorem, Norton's theorem, superposition theorem, maximum power transfer theorem, Star to Delta & Delta to Star transformation. SERIES AND PARALLEL A.C. CIRCUITS: Series and parallel A.C. circuits, series and parallel resonance, Q factor, cut-off frequencies and bandwidth.

UNIT-III

THREE PHASE CIRCUITS: Phase and line voltages and currents, balanced star and delta circuits, power equation, measurement of power by two wattmeter method, Importance of earthing. TRANSFORMERS: Principle, construction & working of transformer, Efficiency and regulation.

UNIT-IV

ELECTRICAL MACHINES: **D.C. Machine:** Principle, construction, EMF equation, Torque Equation, Types of Machine, internal & external characteristics, speed control. **Induction motor:** Principle, construction, EMF equation, Types of motors, slip concept, **Synchronous motor:** Principle, construction, Types of motors

TEXT BOOKS:

1. Basic Electrical Engg (2nd Edition) : Kothari & Nagarath, TMH
2. Electrical Technology (Vol-I) : B.L Theraja & A K Theraja, S.Chand

REFERENCE BOOKS:

1. Electrical Engineering Fundamentals : Deltoro, PHI
2. Network Analysis : Valkenburg, PHI

Note: The Examiners will set eight questions, taking two from each unit. The students are required to attempt five questions in all selecting at least one from each unit. All questions will carry equal marks.

ENVIRONMENTAL STUDIES (For Under-Graduate Students)

Unit 1 : The Multidisciplinary nature of environmental studies

Definition, scope and importance.

Need for public awareness.

Unit 2 : Natural Resources

Renewable and non-renewable resources :

Natural resources and associated problems.

- a) Forest resources : Use and over-exploitation, deforestation, case studies. Timber extraction, mining, dams and their effects on forests and tribal people.
- b) Water resources : Use and over-utilization of surface and ground water, floods, drought, conflicts over water, dams-benefits and problems.
- c) Mineral resources : Use and exploitation, environmental effects of extracting and mineral resources, case studies.
- d) Food resources : World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies.
- e) Energy resources : Growing energy needs, renewable and non-renewable energy sources, use of alternate energy sources. Case studies.
- f) Land resources : Land as a resource, land degradation, man induced landslides, soil erosion and desertification.
 - Role of an individual in conservation of natural resources.
 - Equitable use of resources for sustainable lifestyles.

Unit 3 : Ecosystems

- Concept of an ecosystem.
- Structure and function of an ecosystem.
- Producers, consumers and decomposers.
- Energy flow in the ecosystem.
- Ecological succession.
- Food chains, food webs and ecological pyramids.
- Introduction, types, characteristic features, structure and function of the following ecosystem :
 - a) Forest ecosystem
 - b) Grassland ecosystem
 - c) Desert ecosystem
 - d) Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries).

Unit : 4 Biodiversity and its conservation

- Introduction – Definition : genetic, species and ecosystem diversity.
- Biogeographical classification of India.
- Value of biodiversity : consumptive use, productive use, social, ethical, aesthetic and option values.
- Biodiversity at global, National and local levels.
- India as a mega-diversity nation.
- Hot-spots of biodiversity.
- Threats to biodiversity : habitat loss, poaching of wildlife, man-wildlife conflicts.
- Endangered and endemic species of India.
- Conservation of biodiversity : in-situ and ex-situ conservation of biodiversity.

Unit 5 : Environmental Pollution

Definition

- Causes, effects and control measures of :
 - a) Air pollution
 - b) Water pollution
 - c) Soil pollution
 - d) Marine pollution
 - e) Noise pollution
 - f) Thermal pollution
 - g) Nuclear hazards
- Solid waste Management : Causes, effects and control measures of urban and industrial wastes.
- Role of an individual in prevention of pollution.
- Pollution case studies.
- Disaster management : floods, earthquake, cyclone and landslides.

Unit 6 : Social Issues and the Environment

- From Unsustainable to Sustainable development
- Urban problems related to energy
- Water conservation, rain water harvesting, watershed management
- Resettlement and rehabilitation of people; its problems and concerns. Case studies.
- Environmental ethics : Issues and possible solutions.
- Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust. Case studies.
- Wasteland reclamation.
- Consumerism and waste products.
- Environment Protection Act.
- Air (Prevention and Control of Pollution) Act.
- Water (Prevention and Control of Pollution) Act
- Wildlife Protection Act

- Forest Conservation Act
- Issues involved in enforcement of environmental legislation
- Public awareness.

Unit 7 : Human Population and the Environment

- Population growth, variation among nations
- Population explosion – Family Welfare Programme
- Environment and human health.
- Human Rights.
- Value Education.
- HIV/AIDS
- Women and Child Welfare.
- Role of Information Technology in Environment and human health.
- Case Studies.

Unit 8 : Field Work

- Visit to a local area to document environmental assets-river / forest / grassland / hill / mountain.
- Visit to a local polluted site – Urban / Rural / Industrial / Agricultural.
- Study of common plants, insects, birds.
- Study of simple ecosystems – pond, river, hill slopes, etc.

Examination Pattern : The question paper should carry 100 marks
The structure of the question paper being.

PART – A	:	Short Answer Pattern	25 Marks
PART – B	:	Essay type with inbuilt choice	50 Marks
PART – C	:	Field Work	25 Marks

INSTRUCTIONS FOR THE EXAMINERS

Part – A Question 1 is compulsory and will contain ten short-answer type question of 2.5 marks each covering the entire syllabus.

Part – B Eight essay type questions (with inbuilt choice) will be set from the entire syllabus and the candidates will be required to answer, any four of them. Each essay type question will be of the 12½ marks.

The examination will be conducted by the college concerned at its own level earlier than the annual examination and each student will be required to score minimum of 35% marks each in theory and Practical. The marks obtained in this qualifying paper will not be included in determining the percentage of marks obtained for the award of degree. However, these will be shown in the detailed marks certificate of the student.

PHY-103E

PHYSICS LAB.-I

(COMMON FOR ALL BRANCHES)

L T P
- - 2

Sessional Work: 25 Marks
Examination: 25 Marks
Total: 50 Marks
Duration of Exam: 3 Hrs.

Note: Students will be required to perform atleast 10 experiments out of the list in a semester.

LIST OF EXPERIMENTS

The experiments in Ist semester will be based mainly upon optics, electrostatics, wave and oscillations which are the parts of the theory syllabus of Ist semester.

1. To find the wavelength of sodium light by Newton's rings experiment.
2. To find the wavelength of sodium light by Fresnel's biprism experiment.
3. To find the wavelength of various colours of white light with the help of a plane transmission diffraction grating.
4. To verify Newton's formula and hence to find the focal length of convex lens
5. To find the wavelength of sodium light by Michelson interferometer.
6. To find the resolving power of a telescope.
7. To find the specific rotation of sugar solution by using a polarimeter.
8. To compare the capacitances of two capacitors by De'sauty bridge and hence to find the dielectric constant of a medium.
9. To find the frequency of A.C. mains by using sonometer.
10. To find low resistance by Carey Foster Bridge
11. To find the resistance of a galvanometer by Post office Box
12. To Find Value of high Resistance by substitution method
13. To Find the value of high resistance by leakage method
14. To Convert a galvanometer into an Ammeter of given range.

RECOMMENDED BOOKS:

1. Advanced Practical Physics – B.L. Worshnop and H.T. Flint (KPH)
2. Practical Physics – S.L.Gupta & V.Kumar (Pragati Prakashan).
3. Advanced Practical Physics Vol.I & II – Chauhan & Singh (Pragati Prakashan).

ME-107E

WORKSHOP PRACTICE

L T P
Marks
- - 3

Sessional Work:25

Examination: 25 Marks
Total: 50 Marks
Duration of Exam: 3

Hrs.

NOTE :

1. At least ten experiments/ jobs are to be performed/ prepared by students in the semester.
2. At least 8 experiments/ jobs should be performed / prepared from the above list, remaining two may either be performed/ prepared from the above list or designed & set by the concerned institution as per the scope of the syllabus of Manufacturing Processes and facilities available in the Institute.

List of Experiments / Jobs

1. To study different types of measuring tools used in metrology and determine least counts of vernier calipers, micrometers and vernier height gauges.
2. To study different types of machine tools (lathe, shape or planer or slotter, milling, drilling machines)
3. To prepare a job on a lathe involving facing, outside turning, taper turning, step turning, radius making and parting-off.
4. To study different types of fitting tools and marking tools used in fitting practice.
5. To prepare lay out on a metal sheet by making and prepare rectangular tray, pipe shaped components e.g. funnel.
6. To prepare joints for welding suitable for butt welding and lap welding.
7. To perform pipe welding.
8. To study various types of carpentry tools and prepare simple types of at least two wooden joints.
9. To prepare simple engineering components/ shapes by forging.
10. To prepare mold and core assembly, to put metal in the mold and fettle the casting.
11. To prepare horizontal surface/ vertical surface/ curved surface/ slots or V-grooves on a shaper/ planner.
12. To prepare a job involving side and face milling on a milling machine.

B.E. I/II Semester
CH-103E
CHEMISTRY LAB
(COMMON FOR ALL BRANCHES)

L T P
Marks
- - 2

Sessional Work:25

Examination: 25 Marks
Total: 50 Marks
Duration of Exam: 3

Hrs.

Note: At least ten experiments are to be performed by the students.

LIST OF EXPERIMENTS

1. Determination of Ca^{++} and Mg^{++} hardness of water using EDTA solution.
2. Determination of alkalinity of water sample.
3. Determination of dissolved oxygen (DO) in the given water sample.
4. To find the melting & eutectic point for a two component system by using method of cooling curve.
5. Determination of viscosity of lubricant by Red Wood viscometer (No. 1 & No. 2).
6. To determine flash point & fire point of an oil by Pensky -Marten's flash point apparatus.
7. To prepare Phenol-formaldehyde and Urea formaldehyde resin.
8. To find out saponification No of an oil.
9. Estimation of calcium in lime stone and dolomite.
10. 10. Determination of concentration of KMnO_4 solution spectrophotometrically.
11. Determination of strength of HCl solution by titrating it against NaOH solution conductometrically.
12. To determine amount of sodium and potassium in a, given water sample by flame photometer.
13. Estimation of total iron in an iron alloy.

SUGGESTED BOOKS :

1. A Text Book on Experimental and Calculation – Engineering Chemistry, S.S. Dara, S. Chand & Company (Ltd.)
2. Essential of Experimental Engineering Chemistry, Shashi Chawla, Dhanpat Rai Publishing Company.
3. Theory & Practice Applied Chemistry – O.P. Virmani, A.K. Narula (New Age)

EE-103E

ELECTRICAL TECHNOLOGY LAB

L T P

Marks

- - 2

Sessional Work:25

Examination: 25 Marks

Total: 50 Marks

Duration of Exam: 3

Hrs.

LIST OF EXPERIMENTS

1. To verify KCL and KVL.
2. To verify Thevenin's & Norton's Theorems.
3. To verify Superposition theorems.
4. To study frequency response of a series R-L-C circuit and determine resonant frequency & Q-factor for various values of R,L,C.
5. To study frequency response of a parallel R-L-C circuit and determine resonant frequency & Q-Factor for various values of R,L,C.
6. To perform direct load test of a transformer and plot efficiency Vs load characteristic.
7. To perform O.C. and S.C. tests on transformer.
8. To perform speed control of DC motor.
9. To perform O.C. and S.C. tests of a three phase induction motor.
10. Measurement of power in a 3 phase system by two watt meter method.

CSE-103E

COMPUTER PROGRAMMING LAB.

L T P
- - 2

Sessional Work: 25 Marks
Examination: 25 Marks
Total: 50 Marks
Duration of Exam: 3 Hrs.

Note: At least 5 to 10 more exercises to be given by the teacher concerned.

Representative programming problems:-

1. Write a program to find the largest of three numbers. (if-then-else)
2. Write a program to find the largest number out of ten numbers (for-statement)
3. Write a program to find the average male height & average female heights in the class (input is in form of sex code, height).
4. Write a program to find roots of quadratic equation using functions and switch statements.
5. Write a program using arrays to find the largest and second largest no. out of given 50 nos.
6. Write a program to multiply two matrices
7. Write a program to read a string and write it in reverse order
8. Write a program to concatenate two strings
9. Write a program to sort numbers using the Algorithm.
10. Represent a deck of playing cards using arrays.
11. Write a program to check that the input string is a palindrome or not.

EL-109E
ELEMENTS OF ELECTRONICS ENGINEERING LAB.

L T P
Marks
- - 2

Sessional Work:25

Examination: 25 Marks
Total: 50 Marks
Duration of Exam: 3

Hrs.

LIST OF EXPERIMENTS:

1. To study the half wave & full wave rectifier.
2. To study the effect of various filters circuits.
3. To study the characteristics of pnp & npn transistor in common emitter & determine H- parameter from characteristics.
4. To study the characteristics of pnp & npn transistor in CB & determine h-parameter from characteristics
5. To determine the A_v , A_i of RC coupled CE transistor amplifier
6. Determine the frequency of oscillation in Hartley oscillator
7. Determine the frequency of oscillation in phase shift oscillator
8. Determine the effect of negative feedback on bandwidth & gain in CE, RC coupled amplifier
9. Study TC Op-Amp as a inverting amplifier & scale changer
10. Study IC Op-Amp as a non inverting amplifier
11. Study IC Op-Amp as an integrator
12. Study IC Op-Amp as a differentiator

ME-109E

ELEMENTS OF MECHANICAL ENGINEERING LAB.

L T P
- - 2

Sessional Work: 25 Marks
Examination: 25 Marks
Total: 50 Marks
Duration of Exam: 3 Hrs.

Note:

1. Total ten experiments are to be performed in the Semester.
2. At least seven experiments should be performed from the above list. Remaining three experiments should be performed as designed & set by the concerned Institution as per the scope of the syllabus.

LIST OF EXPERIMENTS

1. To study Cochran & Babcock & Wilcox boilers.
2. To study the working & function of mountings & accessories in boilers.
3. To study 2-Stroke & 4-Stroke diesel engines.
4. To study 2-Stroke & 4-Stroke petrol engines.
5. To calculate the V.R., M.A. & efficiency of single, double & triple start worm & worm wheel.
6. To calculate the V.R., M.A. & efficiency of single & double purchase winch crabs.
7. To find the percentage error between observed and calculated values of stresses in the members of a Jib crane.
8. To draw the SF & BM diagrams of a simply supported beam with concentrated loads.
9. To study the simple & compound screw jacks and find their MA, VR & efficiency.
10. To study the various types of dynamometers.
11. To the constructional features & working of Pelton/Kaplan/Francis.
12. To prepare stress-strain diagram for mild steel & cast iron specimens under tension and compression respectively on a Universal testing machine.
13. To determine the Rockwell / Brinell /Vickers hardness no. of a given specimen on the respective machines.

MATH-102E
MATHEMATICS-II
(COMMON FOR ALL BRANCHES)

L T P
4 1

Theory : 100 marks
Sessional : 50 marks
Total : 150 marks
Duration of exam : 3 Hrs.

UNIT-I

Matrices & its Applications : Rank of a matrix, elementary transformations, elementary matrices, inverse using elementary transformations, normal form of a matrix, linear dependence and independence of vectors, consistency of linear system of equations, linear and orthogonal transformations, eigen values and eigen vectors, properties of eigen values, Cayley - Hamilton theorem and its applications.

UNIT-II

Ordinary Differential Equations & its Applications : Exact differential equations. Equations reducible to exact differential equations. Applications of Differential equations of first order & first degree to simple electric circuits, Newton's law of cooling, heat flow and orthogonal trajectories.

Linear differential equations of second and higher order. Complete solution, complementary function and particular integral, method of variation of parameters to find particular Integral, Cauchy's and Legendre's linear equations, simultaneous linear equations with constant co-efficients. Applications of linear differential equations to simple pendulum, oscillatory electric circuits.

UNIT-III

Laplace Transforms and its Applications : Laplace transforms of elementary functions, properties of Laplace transforms, existence conditions, transforms of derivatives, transforms of integrals, multiplication by t^n , division by t . Evaluation of integrals by Laplace transforms. Laplace transform of Unit step function, unit impulse function and periodic function. Inverse transforms, convolution theorem, application to linear differential equations and simultaneous linear differential equations with constant coefficients.

UNIT-IV

Partial Differential Equations and Its Applications : Formation of partial differential equations, Lagrange's linear partial differential equation, First order non-linear partial differential equation, Charpit's method. Method of separation of variables and its applications to wave equation and one dimensional heat equation, two dimensional heat flow, steady state solutions only.

TEXT BOOKS:

1. Advanced Engg. Mathematics F Kreyszig
2. Higher Engg. Mathematics B.S. Grewal

REFERENCE BOOKS :

1. Differential Equations – H.T.H. Piaggio.

2. Elements of Partial Differential Equations – I.N. Sneddon.
3. Advanced Engineering Mathematics – R.K. Jain, S.R.K.Iyengar.
4. Advanced Engg. Mathematics – Michael D. Greenberg.

Note: The Examiners will set eight questions, taking two from each unit. The students are required to attempt five questions in all selecting at least one from each unit. All questions will carry equal marks.

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**PHY-102E PHYSICS-II
(COMMON FOR ALL BRANCHES)**

L T P
3 1

Theory: 100 marks
Sessional: 50 marks
Total: 150 marks
Time: 3 Hrs.

UNIT-I

CRYSTAL STRUCTURE: Space Lattice, unit cell and translation vectors, Miller indices, simple crystal structure, Bonding in solids, Experimental X-ray diffraction method, Laue method, powder Method, Point defects in solids, Elementary idea of quarks and gluons.

UNIT-II

QUANTUM PHYSICS: Difficulties with Classical physics, Introduction to quantum mechanics-simple concepts, discovery of Planck's constant, Group velocity and phase velocity, Schrodinger wave equations - time dependant and time independent Schrodinger equations, Elementary ideas of quantum statistics.

FREE ELECTION THEORY: Elements of classical free electron theory and its limitations, Drude's Theory of Conduction, quantum theory of free electrons, Fermi level, Density of states, Fermi-Dirac distribution function, Thermionic emission, Richardson's equation.

UNIT-III

BAND THEORY OF SOLIDS: Origin of energy bands, Kronig, Penney Model (qualitative), E-K diagrams, Brillouin Zones, Concept of effective mass and holes, Classification of solids into metals, Semiconductors and insulators, Fermi energy and its variation with temperature. Hall effect and its Applications.

UNIT-IV

PHOTOCONDUCTIVITY AND PHOTOVOLTAICS: Photoconductivity in insulating crystals, variation with illumination, effect of traps, applications of photoconductivity, photovoltaic cells and their characteristics.

MAGNETIC PROPERTIES OF SOLIDS: Atomic magnetic moments, orbital diamagnetism, Classical theory of paramagnetism, ferro magnetism - molecular fields and domains.

SUPER CONDUCTIVITY: Introduction (experimental survey), Meissner effect, London equation.

TEXT BOOKS:

1. Introduction to Solid State Physics (VII Ed.) - Charles Kittel (John Wiley).
2. Quantum Mechanics – Powell and Crasemann (Oxford & IBH)
3. Fundamentals of Solid State Physics – B.S.Saxena, R.C.Gupta and P.N.Saxena (Pragati Prakashan).

REFERENCE BOOKS:

1. Solid State Physics – Pillai (New Age).
2. A text book of Engg. Physics – Avadhanulu and Kshirsagar (S.Chand)
3. Quantum Mechanics – Ghatak & Loknathan.

Note: The Examiners will set eight questions, taking two from each unit. The students are required to attempt five questions in all selecting at least one from each unit. All questions will carry equal marks.

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PHY-104E
PHYSICS LAB.-II
(COMMON FOR ALL BRANCHES)

L T P
- - 2

Sessional Work: 25 Marks
Examination: 25 Marks
Total: 50 Marks
Duration of Exam: 3 Hrs.

Note: Students will be required to perform at least 10 experiments out of the list in a semester.

LIST OF EXPERIMENTS

The experiments in Second semester will be based upon electricity, Magnetism, Modern Physics and Solid State Physics, which are the parts of theory syllabus.

1. To study He Ne laser
2. To find the frequency of ultrasonic waves by piezo electric methods
3. To find the value of e/m for electrons by Helical method.
4. To find the ionisation potential of Argon/Mercury using a thyratron tube.
5. To study the variation of magnetic field with distance and to find the radius of coil by Stewart and Gee's apparatus.
6. To study the characteristics of (Cu-Fe, Cu-Constantan) thermo couple.
7. To find the value of Planck's constant by using a photo electric cell.
8. To find the value of co-efficient of self-inductance by using a Rayleigh bridge.
9. To find the value of Hall Co-efficient of semi-conductor.
10. To study the V-I characteristics of a p-n diode.
11. To find the band gap of intrinsic semi-conductor using four probe method.
12. To calculate the hysteresis loss by tracing a B-H curve.
13. To verify richerdson thermionic equation
14. To find the flashing and quenching potential of Argon and to find the cap.of unknown capacitor
15. To find the temp coeff. of resistance by using Pt resistance thermometer by post office box

RECOMMENDED BOOKS :

1. Advanced Practical Physics – B.L. Worshnop and H.T. Flint (KPH)
2. Practical Physics – S.L.Gupta & V.Kumar (Pragati Prakashan).
3. Advanced Practical Physics Vol.I & II – Chauhan & Singh (Pragati Prakashan).

2nd year Mechanical Engg. Semester-III

Course No	Course Title	Teaching Schedule				Marks for Class Work	Marks for Exam		Total Marks
		L	T	P	TOTAL		Theory	Practical	
HUM-201 E/ MATH-201E	Basics of Industrial Sociology, Economics & Management / Mathematics-III	3	1	-	4	50	100	-	150
ME-201 E	Thermodynamics	3	1	-	4	50	100	-	150
ME-203 E	Strength of Materials-I	3	1	-	4	50	100	-	150
ME-205 E	Machine Drawing	2	-	4	6	50	100	-	150
ME-207 E	Kinematics of Machine	-	1	-	4	50	100	-	150
ME-209E	Production Technology-I	3	1	-	4	50	100	-	150
ME-211 E	Kinematics of Machine Lab	-	-	-	3	50	-	50	100
ME-213 E	Thermodynamics Lab	-	-	3	3	50	-	25	75
ME-215 E	Strength of Materials Lab	-	-	3	3	50	-	25	75
	TOTAL	17	5	13	35	450	600	100	1150

Note: Students will be allowed to use Non-Programmable scientific calculator. However, sharing of calculator will not be permitted. Duration of theory as well as practical exams time is three hrs for all courses except ME-205 E for which it is 4 hrs. Course Contents of HUM-201 E to be provided by Humanities Group.

B.Tech. (Third semester) Mechanical engineering
BASICS OF INDUSTRIAL SOCIOLOGY, ECONOMICS
& MANAGEMENT

HUM – 201 E	Sessional	:	50
L T P	Theory	:	100
3 1 -	Total	:	150
	Duration of Exam.	:	3 Hrs.

UNIT-I

Meaning of social change, nature of social change, theories of social change. The

direction of social change, the causes of social change, the process of social change.

Factors of social change – technological factors, the cultural factors, effects of

technology on major social institutions, social need of status system, social relations in industry.

UNIT-II

Meaning of Industrial Economic, Production Function, its types, Least Cost

Combination, Law of Variable Proportion, Laws of Return – Increasing, Constant &

Diminishing. Fixed & variable costs in short run & long run, opportunity costs,

relation between AC & MC, U-shaped short run AC Curve. Price & Output

Determination under Monopoly in short run & long run. Price Discrimination, Price

Determination under Discriminating Monopoly. Comparison between Monopoly &

Perfect Competition.

UNIT – III

Meaning of Management, Characteristics of Management, Management Vs. Administration, Management – Art, Science & Profession, Fayol's Principles of Management. Personnel Management – Meaning & Functions, Manpower – Process of Manpower Planning, Recruitment & Selection – Selection Procedure. Training – Objectives & Types of Training, Various Methods of Training. Labour Legislation in India – Main provisions of Industrial disputes Act 1947;

UNIT – IV

Marketing Management – Definition & Meaning, Scope of Marketing Management, Marketing Research – Meaning, Objectives. Purchasing Management – Meaning & Objectives, Purchase Procedure, Inventory Control Techniques. Financial Management – Introduction, Objectives of Financial decisions, Sources of Finance.

Note : Eight questions are to be set taking two from each unit. The students are required to attempt five questions in all, taking at least one from each unit.

MATH-201 E**MATHEMATICS - III**

L T P
3 1 -

Theory : 100
Sessional : 50
Total : 150
Duration of Exam : 3 Hrs.

UNIT - I

Fourier Series : Euler's Formulae, Conditions for Fourier expansions, Fourier expansion of functions having points of discontinuity, change of interval, Odd & even functions, Half-range series.

Fourier Transforms : Fourier integrals, Fourier transforms, Fourier cosine and sine transforms. Properties of Fourier transforms, Convolution theorem, Parseval's identity, Relation between Fourier and Laplace transforms, Fourier transforms of the derivatives of a function, Application to boundary value problems.

UNIT-II

Functions of a Complex Variables : Functions of a complex variable, Exponential function, Trigonometric, Hyperbolic and Logarithmic functions, limit and continuity of a function, Differentiability and analyticity.

Cauchy-Riemann equations, Necessary and sufficient conditions for a function to be analytic, Polar form of the Cauchy-Riemann equations, Harmonic functions, Application to flow problems, Conformal transformation, Standard transformations (Translation, Magnification & rotation, inversion & reflection, Bilinear).

UNIT-III

Probability Distributions : Probability, Baye's theorem, Discrete & Continuous probability distributions, Moment generating function, Probability generating function, Properties and applications of Binomial, Poisson and normal distributions.

UNIT-IV

Linear Programming: Linear programming problems formulation, Solution of Linear Programming Problem using Graphical method, Simplex Method, Dual-Simplex Method.

Text Book

1. Higher Engg. Mathematics: B.S. Grewal
2. Advanced Engg. Mathematics: E. Kreyzig

Reference Book

1. Complex variables and Applications: R.V. Churchill; Mc. Graw Hill
2. Engg. Mathematics Vol. II: S.S. Sastry; Prentice Hall of India.
3. Operation Research: H.A. Taha
4. Probability and statistics for Engineer: Johnson. PHI.

Note: Examiner will set eight question, taking two from each unit. Students will be required to attempt five questions taking at least one from each unit.

ME- 201 E THERMODYNAMICS

Unit I

Basic Concepts: Thermodynamics: Macroscopic and Microscopic Approach, Thermodynamic Systems, Surrounding and Boundary, Thermodynamic Property – Intensive and Extensive, Thermodynamic Equilibrium, State, Path, Process and Cycle, Quasistatic, Reversible and Irreversible Processes, Working Substance. Concept of Thermodynamic Work and Heat, Equality of Temperature, Zeroth Law of Thermodynamic and its utility.

Ideal and Real Gases: Concept of an Ideal Gas, Basic Gas Laws, Characteristic Gas Equation, Avagadro's law and Universal Gas Constant, P-V-T surface of an Ideal Gas. Vander Waal's Equation of state, Reduced Co-ordinates, Compressibility factor and law of corresponding states. Mixture of Gases, Mass, Mole and Volume Fraction, Gibson Dalton's law, Gas Constant and Specific Heats, Entropy for a mixture of Gases.

Unit II

First Law of Thermodynamics: Energy and its Forms, Energy and 1st law of Thermodynamics, Internal Energy and Enthalpy, 1st Law Applied to Non-Flow Process, Steady Flow Process and Transient Flow Process, Throttling Process and Free Expansion Process.

Second Law Of Thermodynamics: Limitations of First Law, Thermal Reservoir Heat Source and Heat Sink, Heat Engine, Refrigerator and Heat Pump, Kelvin- Planck and Clausius Statements and Their Equivalence, Perpetual Motion Machine of Second Kind. Carnot Cycle, Carnot Heat Engine and Carnot Heat Pump, Carnot's Theorem and its Corollaries, Thermodynamic Temperature Scale.

Unit III

Entropy: Clausius Inequality and Entropy, Principle of Entropy Increase, Temperature Entropy Plot, Entropy Change in Different Processes, Introduction to Third Law of Thermodynamics.

Availability, Irreversibility and Equilibrium: High and Low Grade Energy, Availability and Unavailable Energy, Loss of Available Energy Due to Heat Transfer Through a Finite Temperature Difference, Availability of a Non-Flow or Closed System, Availability of a Steady Flow System, Helmholtz and Gibb's Functions, Effectiveness and Irreversibility.

Unit IV

Pure Substance: Pure Substance and its Properties, Phase and Phase Transformation, Vaporization, Evaporation and Boiling, Saturated and Superheat Steam, Solid – Liquid – Vapour Equilibrium, T-V, P-V and P-T Plots During Steam Formation, Properties of Dry, Wet and Superheated Steam, Property Changes During Steam Processes, Temperature –

Entropy (T-S) and Enthalpy – Entropy (H-S) Diagrams, Throttling and Measurement of Dryness Fraction of Steam.

Thermodynamic Relations: T-Ds Relations, Enthalpy and Internal Energy as a Function of Independent Variables, Specific Heat Capacity Relations, Clapeyron Equation, Maxwell Relations.

www.uniqueinstitutes.org

B.Tech. (Third semester) Mechanical engineering

ME- 203 E STRENGTH OF MATERIALS –I

L	T	P	Sessional	: 50 Marks
3	1		Theory	: 100 Marks
			Total	: 150 Marks
			Duration of Exam.	: 3 Hrs.

Unit 1

Simple stresses & strains : Concept & types of Stresses and strains, Poisson's ratio, stresses and strain in simple and compound bars under axial loading, stress strain diagrams, Hooke's law, elastic constants & their relationships, temperature stress & strain in simple & compound bars under axial loading, Numerical.

Compound stresses & strains: Concept of surface and volumetric strains, two dimensional stress system, conjugate shear stress at a point on a plane, principal stresses & strains and principal- planes, Mohr's circle of stresses, Numerical.

Unit II

Shear Force & Bending Moments : Definitions, SF & BM diagrams for cantilevers, simply supported beams with or without over-hang and calculation of maximum BM & SF and the point of contraflexure under (i) concentrated loads, (ii) uniformly distributed loads over whole span or a part of it, (iii) combination of concentrated loads and uniformly distributed loads, (iv) uniformly varying loads and (v) application of moments, relation between the rate of loading, the shear force and the bending moments, Problems.

Torsion of circular Members : Torsion of thin circular tubes, Solid and hollow circular shafts, tapered shaft, stepped shaft & composite circular shafts, combined bending and torsion, equivalent torque, effect of end thrust. Numericals.

Unit III

Bending & shear Stresses in Beams: Bending stresses in beams with derivation & application to beams of circular, rectangular, I,T and channel sections, composite beams, shear stresses in beams with derivation combined bending torsion & axial loading of beams. Numericals.

Columns & Struts: Column under axial load, concept of instability and buckling, slenderness ratio, derivation of Euler's formulae for the elastic buckling load, Euler's, Rankine, Gordon's formulae Johnson's empirical formula for axial loading columns and their applications, eccentric compression of a short strut of rectangular & circular sections, Numerical.

Unit IV

Slope & Deflection : Relationship between bending moment, slope & deflection, Mohr's theorem, moment area method, method of integration, Macaulay's method, calculations for slope and deflection of (i) cantilevers and (ii) simply supported beams with or without overhang under concentrated load, Uniformly distributed loads or combination of concentrated and uniformly distributed loads, Numerical.

Fixed Beams: Deflections, reactions and fixing moments with SF & BM calculations & diagrams for fixed beams under (i) concentrated loads, (ii) uniformly distributed load and (iii) a combination of concentrated loads & uniformly distributed load.

Text Books:

1.Strength of Materials – G.H.Ryder - Third Edition in S I units 1969 Macmillan India

2.Strength of Materials – Andrew Pytel and Fredinand L.Singer Fourth Edition, Int. Student Ed. Addison – Wesley Longman

Reference Books:

Strength of Materials – Popov, PHI, New Delhi.

Strength of Materials – Sadhu Singh, Khanna Publications

Strength of Materials A Rudimentary Approach – M.A. Jayaram, Revised Ed.2001, Sapna Book House, Bangalore

Strength of Materials – U.C.Jindal

Strength Materials – I. Kripal Singh

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B.Tech. (Third semester) Mechanical engineering

ME- 205 E

MACHINE DRAWING

Unit I Introduction to BIS Specification SP : 46 – 1988 Code of Engineering drawing – Limits, fits and Tolerance (Dimensional and Geometrical tolerance) , Surface finish representation. Gear : Gear terminology, I.S. convention , representation of assembly of spur gears, helical gears, bevel gears , worm and worm wheel.

Unit II

Orthographic view from isometric views of machine parts / components. Dimensioning , Sectioning. Exercises on Coupling , Crankshaft , pulley , piston and Connecting rod , Cotter and Knuckle joint. Riveted Joint and Welded Joint.

Unit III

Assembly drawing with sectioning and bill of materials from given detail drawings of assemblies : Lathe Tail stock , machine vice , pedestal bearing , Steam stop valve , drill jigs and milling fixture.

NOTE :

- (1) In the semester examination , the examiner will set two questions from each unit. The students have to attempt three questions taking one from each unit.
- (2) The questions from Unit I and Unit II will carry 20 marks each. Question from Unit III will carry 60 marks.

Text Books: Machine Drawing by N D Bhat and V M Panchal
Charotar Publishing House

2. A Text Book of Machine Drawing P S Gill Pub.: S K Kataria & Sons

Reference Books :

1. A Text Book of Machine Drawing : Laxmi narayana and Mathur Pub. : M/s. Jain Brothers, New Delhi.

ME 207 E KINEMATICS OF MACHINES

L	T	P	Sessional	: 50 Marks
3	1		Theory	: 100 Marks
			Total	: 150 Marks
			Duration of Exam.	: 3 Hrs.

UNIT I Kinematics, introduction to analysis and synthesis of mechanisms, Kinematics' pairs, Degree of freedom, Dynamic chain mechanism, Machine, Four-bar chain, inversions, Single and double slider crank chain, Quick return mechanisms, Introduction to function generation, Path generation and rigid bodied guidance.
Velocity determination; Relative velocity methods, Instantaneous center method Acceleration determination, Kennedy's Space cent rode and body cent rode,

UNIT II Centripetal and tangential accelerations, Acceleration determination by graphical method using velocity polygons, Cariole's component of acceleration, Klein's and other constructions.

Analytical methods to find velocity and acceleration of four –link mechanism, slider crank mechanism, freumdenstein's equation, Coordinate a angular displacements of input and output links (Path generation function generation), Least square technique, Rigid body guidance.

UNIT III Pantograph, straight-line motion mechanisms (Peculiar, Hart, Scott Russell, Grasshopper, Watt, Kemp's Tchybishev, Parallel linkages) Indicator mechanisms (Simplex Crosby , Thomson, etc) Automobile steering gears (Davis and Ackerman), Hooks joint (universal coupling), Double hooks joints.

Types of friction, Laws of dry friction, Motion along inclined plane Screw threads, Wedge, Pivots and collars, Plate and cone clutches, Antifriction bearings, friction circle and friction axis, bearings and lubrication. Motion along inclined plane and screws, Pivots and Collars Thrust Bearings lubrication

UNIT IV Types of cams and followers, various motions of the follower, Construction of cam profiles, Analysis for velocities and accelerations of tangent and circular arc cams with roller and flat –faced followers.

Open and crossed belt drives, velocity ratio, slip , material for belts, crowning of pulleys, law of belting, types of pulleys, length of belts ratio Of tensions, centrifugal tension, power transmitted by belts and ropes, initial tension, creep, chain drive, chain length, classification of chains

Suggested reading:

Theory of machines: S. S. Rattan, Tata McGraw Hill Publications.

Theory of Mechanism and Machines: Jagdish Lal, Metropolitan Book Co.

ME-209 E PRODUCTION TECHNOLOGY-1

L T P
3 1 -

Sessional: 50 Marks
Theory : 100 Marks
Total: 150Marks
Duration of Exam. : 3 Hrs.

UNIT I Metal cutting & Tool life

Basic tool geometry, single point tool nomenclature, chips-various types and their characteristics, mechanism of chip formation, theoretical and experimental determination of shear angle, orthogonal and oblique metal cutting, metal cutting theories, relationship of velocities, forces and power consumption.

Effect of operating parameters life tool geometry, cutting speed, feed depth of cut, coolant, materials etc on forces temp. tool life, surface finish etc., tool life relationship, Taylor equation of tool life, tool material and mechanism.

UNIT II Economics of metal machining & Multi edged tools

Element of machining cost, tooling economics, machines economics and optimization.

Broach tools-types materials and applications, geometry of twist drills, thrust torque and power calculation in drills, form tools-application.

UNIT III Metal forming & Jigs and fixtures

Metal blow condition, theories of plasticity conditions of plane strains, friction condition in metal working, wire drawing-extension of rods, theory of forging, rolling of metals and elementary rolling theory, no slip angle and forward slip.

Tool engineering, types of tools, usefulness, principles of location, locating and clamping devices, Jigs bushes, drilling Jigs, milling fixtures, turning fixtures, boring and broaching fixtures, different materials for Jigs and fixtures, economic of jigs and fixtures.

UNIT IV Metrology

Measurements, linear and angular simple measuring instruments various clampers, screw gauge, sine bar, auto-collimator, comparator-mechanical, electrical, optical, surface finish and its measurement, micro and macro deviation, factors influencing surface finish and evaluation of surface finish.

Suggested reading:

1. Manufacturing science: Ghosh and Malik, E.W. Press

B.Tech. (Third semester) Mechanical engineering
ME 211 E KINEMATICS OF MACHINES (LAB.)

			Class Work	: 50 Marks
			Exam	: 50 Marks
L	T	P	Total	: 100Marks
-	-	3	Duration of exam	: 3 Hrs

List of experiments

1. To determine the modulus of rigidity of the material of a closed coil helical spring and the stiffness of a spring
2. To determine the value of coefficient of friction for a given pair of surfaces using friction apparatus
3. To determine the modulus of rigidity of horizontal shaft
4. To determine experimentally the ratio of the cutting time to idle time (cutting stroke to idle stroke) of the crank and slotted lever (QRM)/ Whitworth and compare the result to theoretical values plot the following
 - a. θ v/s X (displacement of slider).
 - b. θ v/s velocity.
 - c. θ v/s Acceleration and to compare the values of velocities (Take angles $\theta = 45^\circ, 90^\circ, 135^\circ, 225^\circ, 270^\circ$ & 335° , $\omega = 1$ rad/s)
5. To determine the value of coefficient of friction between the screw and nut of the jack, while:
 - a. Raising the load
 - b. Lowering the load
6. To draw experimentally a curve of the follower-displacement v/s cam-angle. Differentiate the above curve to get velocity and acceleration plot and compare the values with those obtained analytically.
7. To determine the coefficient of friction between belt and pulley and plot a graph between $\log_{10} T_1/T_2$ v/s, θ .
8. To determine the displacement, velocities, & accelerations of the driven shaft of a Hooke's joint for a constant speed of the driver shaft.
9. To determine velocity & acceleration of slider in slider-crank mechanism and plot the following:
 - a. θ v/s x (displacement of slider)
 - b. θ v/s velocity and
 - c. θ v/s acceleration.

Compare the values of velocities & acceleration with those obtained theoretically.(Assume $\omega=1$ rad/sec.).
10. Study of the inversions of the single slider crank mechanism.

B.Tech. (Third semester) Mechanical engineering
ME-213 E THERMODYNAMICS (LAB.)

			Class Work	: 50 Marks
			Exam	: 25 Marks
L	T	P	Total	: 75 Marks
-	-	3	Duration of exam	: 3 Hrs.

List of Experiments

1. Study of 2 stroke petrol and diesel engine models.
2. Study of 4-stroke petrol/diesel engine model.
3. Study of boilers.
4. Study of Babcock-Wilcox boiler (Model).
5. Study of locomotive boiler (Model).
6. Study of Lancashire boiler (Model).
7. To study the Red wood viscometer and measure the viscosity of fluid.
8. To measure the flash point of the given fuel.
9. To study the Nestler's boiler.
10. To study various parts of the vertical steam engine.
11. To study the diesel engine and make a trial on it.

Note : Any 8 experiments from the above list and other 2 from others developed by institute) are required to be performed by students in the laboratory.

B.Tech. (Third semester) Mechanical engineering

ME- 215 E STRENGTH OF MATERIALS LAB

L T P
- - 3

Class Work: 50 Marks

Exam: 25 Marks

Total: 75 Marks

Duration of exam: 3 Hrs.

List of Experiments:

1. To study the Brinell hardness testing machine & perform the Brinell hardness test.
2. To study the Rockwell hardness testing machine & perform the Rockwell hardness test.
3. To study the Vickers hardness testing machine & perform the Vickers hardness test.
4. To study the erichsen sheet metal testing machine & perform the erichsen sheet metal test.
5. To study the Impact testing machine and perform the Impact tests (Izod & Charpy).
6. To study the Universal testing machine and perform the tensile test.
7. To perform compression & bending tests on UTM.
8. To perform the sheer test on UTM.
9. To study the torsion testing machine and perform the torsion test.
10. To draw shear Force, Bending Moment Diagrams for a simply Supported Beam under Point and Distributed Loads.
11. To determine Mechanical Advantage and Efficiency of Single and Double Purchase Winch Crab.
12. To determine Mechanical Advantage and Efficiency of Worm and Worm Wheel.
13. To determine Mechanical Advantage, Efficiency of Simple and Compound Screw Jack.
14. To find Moment of Inertia of a Fly Wheel.

Note: Any 8 experiments from the above list and other 2 from others (developed by institute) are required to be performed by students in the laboratory.

**DEPARTMENT OF MECHANICAL ENGINEERING
HARYANA COLLEGE OF TECHNOLOGY & MANAGEMENT, KAITHAL**

**Scheme of examination for B. Tech Degree Course
2nd YEAR (SEMESTER – IV) MECHANICAL ENGINEERING (2004-2005)**

Course No.	Course Title	Teaching Schedule				Marks for Class work	Marks for Examination		Total Marks
		L	T	P	Total		THEORY	Practical	
HUM-201 E/ MATH-201E	Basics of Industrial Sociology, Economics & Management / Mathematics-III	3	1	-	4	50	100	-	150
ME-202 E	Production technology-II	3	1	-	4	50	100	-	150
ME-204 E	Material Science	4	-	-	4	50	100	-	150
ME-206 E	Strength of Materials – II	3	-	-	4	50	100	-	150
ME-208 E	Fluid Mechanics	3	1	-	4	50	100	-	150
ME-210 E	Dynamics of Machine	3	1	-	4	50	100	-	150
ME-212 E	Production technology lab	-	-	4	4	50	-	50	100
ME-214 E	Fluid Mechanics Lab	-	-	3	3	25	-	25	50
ME-216 E	Dynamics of machine lab	-	-	3	3	25	-	25	50
TOTAL		19	5	10	34	400	600	100	1100

- Note:
1. Practical training of 4 weeks duration during summer vacations and its evaluation in 5th Semester.
 2. Students will be allowed to use Non-Programmable Scientific Calculator. However, Sharing of calculator will not be permitted.

B.Tech. (Fourth semester) Mechanical engineering

ME-202 E PRODUCTION TECHNOLOGY

L	T	P	Sessional	: 50 Marks
3	1	-	Theory	: 100 Marks
			Total	: 150 Marks
			Duration of Exam	: 3 Hrs

UNIT I Kinematics of Machine Tools.

Drives in machine tools for rotation movement, stepped and step less drives, mechanical and hydraulic drives, Individual and group drives, selection of extreme values of spindle speed on a lathe, principle of stepped regulation, Layout of spindle speeds. A.P., G.P. and Logarithmic progressions, Kinematics advantage of G. P. for gear box design, selection of common ratio, Number of steps in a given speed range, design of all geared head stock.

UNIT II Manufacturing Methods

Characteristics of turret Lathes, turret-indexing mechanism, tooling equipment for turrets, tool Layout or turrets. Classification of gear production methods, gear generation, gear hobbling gear shaping, gear finishing methods; shaving, burnishing grinding, Lapping gear shaping, gear finishing methods; shaving, burnishing grinding, honing.

UNIT III Unconventional Machining Processes & Press Working Tools

Need for unconventional processes, Ultrasonic machining, electrochemical machining, electrochemical grinding, Laser beam machining their process parameters, principle of metal removal, applications advantages and limitations.

Introduction, classifications of presses and dies, hear, action in die cutting operations, center of pressure, mathematical calculation of center of pressure, clearances, cutting forces, punch dimensioning.

UNIT IV Machine Tools Vibration and Dynamometry

Introduction, effects of vibration no-machine tools, cutting conditions, work piece and tools life, source of vibration, machine tool chatter, Need for measuring forces, basic requirements of measuring techniques, design requirements of dynamometers, 3-divisional turning dynamometer and its calibration, drill dynamometers.

Suggested reading:

1. Manufacturing science: Ghosh and Malik, E.W. Press
2. Principles of metal cutting: Sen and Bhattacharya, New Central Book.

B.Tech. (Fourth semester) Mechanical engineering

ME- 204 E

MATERIAL SCIENCE

L T P
4 - -

Sessional : 50 Marks
Theory : 100 Marks
Total : 150 Marks
Duration of Exam : 3 Hrs

Unit I

Crystallography: Review of crystal structure, space lattice, crystal planes and crystal directions, co-ordination number, number of atoms per unit cell, atomic packing factor, Numericals related to crystallography Imperfection in metal crystals: Crystal imperfections and their classifications, point defects, line defects, edge & screw dislocations, surface defects, volume defects & effects of imperfections on metal properties.

Unit II

Solid solutions and phase diagram: Introduction to single and multiphase solid solutions and types of solid solutions, importance and objectives of phase diagram, systems, phase and structural constituents, cooling curves, unary & binary phase diagrams, Gibbs's phase rule, Lever rule, eutectic and eutectoid systems, peritectic and peritectoid systems, iron carbon equilibrium diagram and TTT diagram. Heat Treatment: Principles, purpose, classification of heat treatment processes, annealing, normalizing, stress relieving, hardening, tempering, carburizing, nitriding, cyaniding, flame and induction hardening. Allotropic transformation of iron and steel, Properties of austenite, ferrite, pearlite, martensite.

UNIT III

Deformation of Metal: Elastic and plastic deformation, mechanism of plastic deformation, twinning, conventional and true stress strain curves for polycrystalline materials, yield point phenomena, strain ageing, work hardening, Bauschinger effect, season cracking. Recovery, recrystallization and grain growth. Failures of metals: Failure analysis, fracture, process of fracture, types of fracture, fatigue, characteristics of fatigue, fatigue limit, mechanism of fatigue, factors affecting fatigue.

UNIT IV

Creep & Corrosion: Definition and concept, creep curve, mechanism of creep, impact of time and temperature on creep, creep fracture, creep testing and prevention against creep. Corrosion: Mechanism and effect of corrosion, prevention of corrosion. Plastic, Composite and Ceramics: Polymers, formation of polymers, polymer structure and crystallinity, polymers to plastics types, reinforced particles-strengthened and dispersion strengthened composites. Ceramic materials: Types of ceramics, properties of ceramic, ceramic forming techniques, mechanical behavior of ceramic.

Text Books: Elements of Material Science and Engineering: VanVlack, Wesley Pub. Comp. Material Science - Narula, Narula and Gupta. New Age Publishers

Reference Books:

1. Material Science & Engineering – V. Raghvan, Prentice Hall of India Pvt. Ltd, New Delhi
2. A Text Book of Material Science & Metallurgy – O.P. Khanna, Dhanpat Rai & Sons

3. Material Science and Engineering-An Introduction - Callister; W.D., John Wiley & Sons, Delhi.
4. B.Tech. (Fourth semester) Mechanical engineering

ME- 206 E STRENGTH OF MATERIALS-II

Sessional : 50Marks

L	T	P		Theory	: 100
Marks					
3	1	-		Total	: 150 Marks
				Duration of Exam:	3Hrs.

Unit I

Strain Energy & Impact Loading: Definitions, expressions for strain energy stored in a body when load is applied (i) gradually, (ii) suddenly and (iii) with impact, strain energy of beams in bending, beam deflections, strain energy of shafts in twisting, energy methods in determining spring deflection, Castigliano's & Maxwell's theorems, Numerical. Theories of Elastic Failure: Various theories of elastic failure with derivations and graphical representations, applications to problems of 2- dimensional stress system with (i) Combined direct loading and bending, and (ii) combined torsional and direct loading, Numericals.

Unit II

Unsymmetrical Bending: Properties of beam cross section, product of inertia, ellipse of inertia, slope of the neutral axis, stresses & deflections, shear center and the flexural axis Numericals. Thin Walled Vessels : Hoop & Longitudinal stresses & strains in cylindrical & spherical vessels & their derivations under internal pressure, wire wound cylinders, Numericals.

UNIT III

Thick Cylinders & Spheres : Derivation of Lamé's equations, radial & hoop stresses and strains in thick, and compound cylinders and spherical shells subjected to internal fluid pressure only, wire wound cylinders, hub shrunk on solid shaft, Numericals. Rotating Rims & Discs: Stresses in uniform rotating rings & discs, rotating discs of uniform strength, stresses in (i) rotating rims, neglecting the effect of spokes, (ii) rotating cylinders, hollow cylinders & solid cylinders. Numericals.

UNIT IV

Bending of Curved Bars : Stresses in bars of initial large radius of curvature, bars of initial small radius of curvature, stresses in crane hooks, rings of circular & trapezoidal sections, deflection of curved bars & rings, deflection of rings by Castigliano's theorem stresses in simple chain link, deflection of simple chain links, Problems. Springs: Stresses in open coiled helical spring subjected to axial loads and twisting couples, leaf springs, flat spiral springs, concentric springs, Numericals.

Text Books:

- Strength of Materials – G.H.Ryder, Third Edition in SI Units 1969 Macmillan, India.
 Mechanics of Materials – (Metric Edition) : Ferdinand P. Beer and E. Russel Johnston, Jr. Second Edition, McGraw Hill.

B.Tech. (Fourth semester) Mechanical engineering
ME- 208 E FLUID MECHANICS

L T P
3 1 -

Sessional : 50 Marks
Theory : 100 Marks
Total : 150 Marks
Duration of Exam : 3 Hrs.

Unit I

Fluid Properties and Fluid Statics: Concept of fluid and flow, ideal and real fluids, continuum concept, properties of fluids, Newtonian and non-Newtonian fluids. Pascal's law, hydrostatic equation, hydrostatic forces on plane and curved surfaces, stability of floating and submerged bodies, relative equilibrium. Problems. Fluid Kinematics: Eulerian and Lagrangian description of fluid flow; stream, streak and path lines; types of flows, flow rate and continuity equation, differential equation of continuity in cylindrical and polar coordinates, rotation, vorticity and circulation, stream and potential functions, flow net. Problems.

Unit II

Fluid Dynamics: Concept of system and control volume, Euler's equation, Bernoulli's equation, venturimeter, orifices, orificemeter, mouthpieces, kinetic and momentum correction factors, Impulse momentum relationship and its applications. Problems. Potential Flow: Uniform and vortex flow, flow past a Rankin half body, source, sink, source-sink pair and doublet, flow past a cylinder with and without circulation. Problems.

UNIT III

Viscous Flow: Flow regimes and Reynolds number, Relationship between shear stress and pressure gradient, uni-directional flow between stationary and moving parallel plates, movement of piston in a dashpot, power absorbed in bearings. Problems. Flow Through Pipes: Major and minor losses in pipes, Hagen-Poiseuille law, hydraulic gradient and total energy lines, series and parallel connection of pipes, branched pipes; equivalent pipe, power transmission through pipes. Problems.

UNIT IV

Boundary Layer Flow: Boundary layer concept, displacement momentum and energy thickness, von-karman momentum integral equation, laminar and turbulent boundary layer flows, drag on a flat plate, boundary layer separation and control. Streamlined and bluff bodies, lift and drag on a cylinder and an airfoil, Problems. Turbulent Flow: Shear stress in turbulent flow, Prandtl mixing length hypothesis, hydraulically smooth and rough pipes, velocity distribution in pipes, friction coefficients for smooth and rough pipes. Problems.

Text Books:

Fluid Mechanics – Streeter V L and Wylie E B, Mc Graw Hill
Mechanics of Fluids – I H Shames, Mc Graw Hill

References Books:

Introduction to Fluid Mechanics and Fluid Machines – S.K. Som and G. Biswas, TMH
Fluid Mechanics and Fluid Power Engineering – D.S. Kumar, S.K. Kataria and Sons
Fluid Mechanics and Machinery – S.K. Agarwal, TMH, New Delhi

B.Tech. (Fourth semester) Mechanical engineering
MET –210 E DYNAMICS OF MACHINES

L T P
3 1 -

Sessional : 50 Marks
Theory : 100 Marks
Total : 150 Marks
Duration of Exam : 3 Hrs.

UNIT I

Static force analysis, Static equilibrium, free body diagram, Analysis of static forces in mechanism. D'Alembert's principle, Equivalent offset inertia force, Dynamics of reciprocation parts, Piston effort, Crank effort, Equivalent dynamical systems, and Inertia force in reciprocating engines by graphical and analytical method. Turning moment and crank effort diagrams for single cylinder and multi-cylinder engines, coefficient of fluctuation of energy, coefficient of fluctuation of speed, flywheel and its function.

UNIT II

Types of gears, terminology, condition for correct gearing, cyclical and involute profiles of gear teeth, pressure angle, path of contact, arc of contact, Interference, undercutting, minimum number of teeth, number of pairs of teeth in contact, helical, spiral, worm and worm gear, bevel gear. Gear trains; simple, compound, reverted, and epicyclical, Solution of gear trains, sun and planet gear, bevel epicyclical gear, compound epicyclical gear, pre-selective gearbox, differential of automobile, torque in gear trains

UNIT III

Types of brakes, friction brakes, external shoe brakes, band brakes, band and block brakes, internal expanding shoe brake, dynamometers; absorption, and tensional. Types of governors; watt, Porter, Proell, spring loaded centrifugal, Inertia, Sensitiveness, Stability, Isochronism's, Hunting, Effort and power of governor, controlling force, Static and dynamic balancing of rotating parts, balancing of I. C. Engines, balancing of multi-cylinder engine; V-engines and radial engines, balancing of machines.

UNIT IV

Gyroscope, Gyroscopic couple and its effect on craft, naval ships during steering, pinching and rolling, Stability of an automobile (2-wheeled), Introduction, open and closed loop control, terms related to automatic control, error detector, actuator, amplification, transducers, lag in responses, damping, block diagrams, system with viscous damped output, transfer functions, relationship between open-loop and closed loop transfer function.

**B.TECH. (FOURTH SEMESTER) MECHANICAL ENGINEERING
ME- 212 E PRODUCTION TECHNOLOGY LAB**

L	T	P	Sessional	: 50 Marks
-	-	4	Practical/Viva	: 50 Marks
			Total	: 100 Marks
			Duration of Exam	: 4 Hr

List of Experiments:

Introduction to milling machines its types functions applications etc.

1. Practice of slab milling on milling machine.
2. Practice of slotting on milling machine.
3. To cut gear teeth on milling machine using dividing head.
4. Introduction to gear hobber, demonstration of gear hobbing and practice.
5. Introduction to various grinding wheels and demonstration on the surface grinder.
6. Introduction to tool and cutter grinder and dynamometer.
7. Study the constructional detail and working of CNC lathes Trainer.
8. To carry out welding using TIG/MIG welding set.
9. Introduction, demonstration & practice on profile projector & gauges.
10. To make a component on lathe machine using copy turning attachment.
11. To cut external threads on a lathe.
12. To cut multi slots on a shaper machine.
13. To perform drilling and Boring operation on a Component.

At least eight experiments should be performed from the above list. Remaining two experiments may either be performed from the above list or designed & set by the concerned institute as per the scope of the syllabus.

B.Tech. (Fourth semester) Mechanical engineering
ME 216 E DYNAMICS OF MACHINE (LAB.)

L	T	P	Sessional	: 25 Marks
-	-	3	Practical/Viva	: 25 Marks
			Total	: 50 Marks
			Duration of Exam	: 3 Hr

LIST OF EXPERIMENT

1. To determine experimentally, the moment of inertia of a flywheel and axle compare with theoretical values.
2. To find out critical speed experimentally and to compare the whirling speed of a shaft with theoretical values.
3. To find experimentally the Gyroscopic couple on motorized gyroscope and compare with applied couple.
4. To perform the experiment of balancing of rotating parts and finds the unbalanced couple and forces.
5. To determine experimentally the unbalance forces and couples of reciprocating parts.
6. To calculate the torque on a planet carrier and torque on internal gear using epicyclic gear train and holding torque apparatus.
7. To study the different types of centrifugal and inertia governors and demonstrate any one.
8. To study the automatic transmission unit.
9. To study the differential types of brakes.
10. To find out experimentally the corli and component of acceleration and compare with theoretical values.

At least eight experiments should be performed from the above list. Remaining two experiments may either be performed from the above list or designed & set by the concerned institute as per the scope of the syllabus.

B.Tech. (Fifth semester) Mechanical engineering

ME 301 E

I.C.ENGINE AND GAS TURBINES

L	T	P/D	Total
3	1	-	4

Theory	: 100 Marks
Sessional	: 50 marks
Duration of Exam	: 03 hours

UNIT 1

Heat engines; Internal and external combustion engines; Classification of I.C. Engines; Cycle of operations in four strokes and two-stroke IC engines; Wankle Engine.

Assumptions made in air standard cycles; Otto cycle; Diesel cycle; Dual combustion cycle; Comparison of Otto, diesel and dual combustion cycles; Sterling and Ericsson cycles; Air standard efficiency, Specific work output. Specific weight; Work ratio; Mean effective pressure; Deviation of actual engine cycle from ideal cycle.

UNIT II

Mixture requirements for various operating conditions in S.I. Engines; Elementary carburetor, Calculation of fuel air ratio; The complete carburetor; Requirements of a diesel injection system; Type of injection system; Petrol injection; Requirements of ignition system; Types of ignition systems, ignition timing; Spark plugs.

S.I. engines; Ignition limits; Stages of combustion in S. I. Engines; Ignition lag; Velocity of flame propagation; Detonation; Effects of engine variables on detonation; Theories of detonation; Octane rating of fuels; Pre-ignition; S.I. engine combustion chambers. Stages of combustion in C.I. Engines; Delay period; Variables affecting delay period; Knock in C.I. Engines; Cetane rating; C.I. Engine combustion chambers.

UNIT III

Functions of a lubricating system, Types of lubrication system; Mist, Wet sump and dry sump systems; Properties of lubricating oil; SAE rating of lubricants; Engine performance and lubrication; Necessity of engine cooling; Disadvantages of overcooling; Cooling systems; Air-cooling, Water-cooling; Radiators.

Performance parameters; BHP, IHP, Mechanical efficiency; Brake mean effective pressure and indicative mean effective pressure, Torque, Volumetric efficiency; Specific fuel consumption (BSFG, ISFC); Thermal efficiency; Heat balance; Basic engine measurements; Fuel and air consumption, Brake power, Indicated power and friction power, Heat lost to coolant and exhaust gases; Performance curves;

UNIT IV

Pollutants from S.I. and C.I. Engines; Methods of emission control, Alternative fuels for I.C. Engines; The current scenario on the pollution front.

Working of a single stage reciprocating air compressor; Calculation of work input; Volumetric efficiency; Isothermal efficiency; Advantages of multi stage compression; Two stage compressor with inter-cooling; Perfect inter cooling; Optimum intercooler pressure; Rotary air compressors and their applications; Isentropic efficiency.

Brayton cycle; Components of a gas turbine plant; Open and closed types of gas turbine plants; Optimum pressure ratio; Improvements of the basic gas turbine cycle; Multi stage compression with inter-cooling; Multi stage expansion with reheating between stages; Exhaust gas heat exchanger; Application of gas turbines.

Recommended books

Internal combustion engine by Ramalingam scitech publication

www.uniqueinstitutes.org

B.Tech. (Fifth semester) Mechanical engineering

ME 303 E

FLUID MACHINES

L	T	P/D	Total	Theory	: 100 Marks
3	1	-	4	Sessional	: 50 marks
				Duration of Exam	: 03 hours

UNIT I

Impact of jet stationary and moving flat and curved plates, Force on series of vanes, Radial vanes, Vortex motion, Free and forced vortex, jet propulsion of ships Units and dimensions; Dimensional homogeneity; Dimensional analysis' methods; Ray Leigh and Buckingham methods, Applications and limitations of dimensional analysis Dimensionless numbers, Similitude laws.

UNIT II

Introduction; Development of hydraulic turbines; Components of hydropower plant; Classification of turbines; Surge tank and its type. Pelton turbine, Its components, Number and dimension of buckets, Speed ratio, Jet ratio, Energy conversion, Condition for maximum efficiency; Design considerations. Governing etc. Francis turbine, its components, working principles. Draft tube, Types of draft tube, Design considerations; Outward vs. Inward flow reaction turbines, Introduction to Deriaz turbine, Evolution of axial flow turbines, Kaplan turbine, Operation at off-design loads, Governing etc. it quantities, Specific speed, Runway speed, Characteristics of turbines.

UNIT III

Introduction, Classification, Components, Principle of working, various heads, Energy conversion, Euler's head and its variation with vane shape, Effect of finite number of vanes, Losses and efficiencies, Minimum starting speed, Limitation of suction lift, Net Positive Suction Head (NPSH); Multistage pumps, Specific speed and performance. Working principles, Classification, Components, Discharge, Discharge slip, Power input, Indicator diagram, Effect of friction, Acceleration and pipe friction, Maximum speed, Air vessels, Comparison with centrifugal pumps. Model testing of pumps.

UNIT IV

Cavitations and its effects, Cavitation parameters, Detection and Prevention of cavitations. Model testing of turbine

Propeller pump, Jet pump, Airlift pump, Gear pump, Screw pump, Vane pump, Radial piston pump, Submersible pump, Pump problems Hydraulic accumulators, Hydraulic intensifier, Hydraulic lift, Hydraulic crane. Hydraulic coupling, Torque converter, Hydraulic ram.

B.Tech. (Fifth semester) Mechanical engineering
ME 305 E

HEAT - TRANSFER

L	T	P/D	Total	Theory	: 100 Marks
3	1	-	4	Sessional	: 50 marks
				Duration of Exam	: 03 hours

UNIT I

Definition of heat; Modes of Heat Transfer; Basic Laws of heat transfer, Electrical Analogy of heat conduction; Conduction through composite Walls; Overall heat transfer coefficient. The general conduction equation in Cartesian, cylindrical and spherical coordinates Steady one dimensional heat conduction without internal heat generation; The plane slab; The cylindrical shell; The spherical shell; Critical thickness of insulation; Variable thermal conductivity, Steady one dimensional heat conduction with uniform internal heat generation the plane slab; Cylindrical and spherical systems; Fins of uniform cross section; Governing equation; Temperature distribution and heat dissipation rate; Efficiency and effectiveness of fins.

UNIT II

Free and forced convection; Newton's law of cooling, Convective heat transfer Coefficient; Nusselt number; Dimensional analysis of free and forced convection; Analytical solution to forced convection problems; The concept of boundary layer; Hydrodynamic and thermal boundary layer; Momentum and Energy equations for boundary layer; Exact solution for laminar flow over an isothermal plate using similarity transformation; The integral approach; Integral momentum and energy equations; Solution of forced convection over a flat plate using the integral method. Analysis of free convection; governing equations for velocity and temperature fields. Relation between fluid friction and heat transfer, Reynolds analogy Dimensionless numbers; Reynolds, Prandtl Nusselt, Grashoff and Stanton Numbers and their significance, Heat transfer with change of phase; Nusselt theory of laminar film Condensation.

UNIT III

Theories of thermal radiation; Absorption, Reflection and transmission, Monochromatic and total emissive power; Black body concept; Planck's distribution law; Stefan Boltzman law; Wien's displacement law; Lambert's cosine law; Kirchoff's law; Shape factor; Heat transfer between black surfaces.

UNIT IV

Introduction; Classification of heat exchangers; Logarithmic mean temperature Difference; Area calculation for parallel and counterflow heat exchangers; Effectiveness of heat exchangers; N T U method of heat exchanger design; Applications of heat exchangers.

Reference and Text books: A Text book of Heat Transfer by S.P Sukhatme, university press Heat transfer by Holman, TMG

B.Tech. (Fifth semester) Mechanical engineering

ME 307 E

INDUSTRIAL ENGINEERING

L	T	P/D	Total	Theory	: 100 Marks
3	1	-	4	Sessional	: 50 marks
				Duration of Exam	: 03 hours

UNIT I Introduction to work study; Method study; Basic procedure; Recording techniques (charts and diagrams); Elemental breakdown; Micro-motion studies; Therbligs; SIMO-chart; Principles of motion –economy. Introduction; Objectives; technique; (time) information recording; methods of timings; Time study allowances; Work sampling technique; Performance rating and its determination PMTS; M. T. M.; Work factor.

UNIT II Principles of organization, Importance and characteristics of organization, Organization theories; Classical organization theory; Neo-Classical organization theory, Modern organization theory; Types of organization, Military or line organization, Functional organization, Line and staff organization, Committees. Objectives of PPC; Functions of PPC; Preplanning and planning; Routing; Estimating; scheduling-master schedule; Daily schedule; Gantt chart; Dispatching –centralized vs. decentralized; Control; Follow up and progress reporting. Introduction; Product development; Product characteristics; Role of product development; 3Ss – Standardization; Simplification and Specialization.

UNIT III Introduction, Objectives and importance of sales forecasting, Types of forecasting, Methods of sales forecasting-Collective opinion method, Delphi technique, economic indicator method; Regression analysis, Moving average method, Time series analysis. Introduction, Functions of inventory; Types of inventory; Control importance and functions, Inventory costs, Factors affecting inventory control, Various inventory control models. A. B. C. analysis, Lead-time calculations.

UNIT IV Introduction; Objectives; Concept and life cycle of a product and V.E.; Steps in VE., Methodology and techniques, Fast diagram, Matrix method. Various concepts in industrial engineering

- WAGES AND INCENTIVES**; -Concept; Types; Plans; Desirable characteristics.
- ERGONOMICS**; - its importance; Man-machine work place system; Human factors considerations in system design.
- SUPPLY CHAIN MANAGEMENT**; - its definition, Concept, Objectives, Applications, benefits, Some successful cases in Indian Industries.
- JIT**; - Its definition, Concept, Importance, Misconception, Relevance, Applications, Elements of JIT (brief description).
- MRP**; -Introduction, Objectives, factors, Guide lines, Techniques Elements of MRP system, Mechanics of MRP, MRP-II

ME 309 E

Machine Design- 1

L	T	P/D	Total
2	-	5	7

Theory : 100 Marks

Sessional : 50 marks

Duration of Exam : 03 hours

UNIT I Properties: Chemical, Physical, Mechanical and Dimensional; Ferrous metals, Non-ferrous metals, Plastics, Composite materials etc. Selection of Engineering Materials. Design methodology; Design criterion based on fracture; Deformation and elastic stability design stresses; Factor of safety; Significant stress and significant strength; Stresses-concentration; Causes and mitigation; Endurance limit; Effect of concentration; Notch sensitivity; Size and surface finish; Goodman diagram; Gerber's parabola and Soderberg line.

UNIT II Supports and retainment of rotating assemblies; manufacturing considerations of design, design of castings and weldments. Riveted joints for boiler shell according to I. B. R.; riveted structural joint; and riveted joint with eccentric loading; Types of welded joints; strength of welds under axial load; Welds under eccentric loading; Designation of various types of bolts and nuts, Design of Bolted joints, Bolts of uniform strength, Bolted joints with eccentric loads, Design of Keys, Cotter joint and knuckle joints.

UNIT III Design of shafts subjected to pure torsion; Pure bending load; Combined bending and torsion; Combined torsion; Bending and axial loads. Introduction, hand and foot levers, cranked lever, lever for a lever safety valve, Bell crank lever. Miscellaneous levers.

UNIT IV Types of shaft couplings, Design of sleeve or muff coupling; Flange coupling and bush type flexible couplings. Introduction, Design of circular, oval shaped and square flanged pipe joints. Function, types of power screws, stresses in screws, design calculations.

ME 311 E STEAM GENERATION & POWER

L	T	P/D	Total	Theory	: 100 Marks
3	1	-	4	Sessional	: 25 marks

Duration of Exam: 03 hours

UNIT I, Introduction; classification of boilers; comparison of fire tube and water tube boiler; their advantages; description of boiler; Lancashire; locomotive; Babcock; Wilcox etc.; boiler mountings; stop valve; safety valve; blow off valve; feed check etc.; water level indicator; fusible plug; pressure gauge; boiler accessories; feed pump; feed water heater; preheater; superheater; economizer; natural draught chimney design; artificial draught; stream jet draught; mechanical draught; calculation of boiler efficiency and equivalent evaporation (no numerical problem)

UNIT II Carnot cycle; simple and modified Rankine cycle; effect of operating parameters on rankine cycle performance; effect of superheating; effect of maximum pressure; effect of exhaust pressure; reheating and regenerative Rankine cycle; types of feed water heater; reheat factor; binary vapour cycle. Simple steam engine, compound engine; function of various components.

UNIT III Function of steam nozzle; shape of nozzle for subsonics and supersonics flow of steam; variation of velocity; area of specific volume; steady state energy equation; continuity equation; nozzle efficiency; critical pressure ratio for maximum discharge; physical explanation of critical pressure; super saturated flow of steam; design of steam nozzle. Advantage of steam condensation; component of steam condensing plant; types of condensers; air leakage in condensers; Dalton's law of partial pressure; vacuum efficiency; calculation of cooling water requirement; air expansion pump.

UNIT IV Introduction; classification of steam turbine; impulse turbine; working principal; compounding of impulse turbine; velocity diagram; calculation of power output and efficiency; maximum efficiency of a single stage impulse turbine; design of impulse turbine blade section; impulse reaction turbine; working principle; degree of reaction; parsons turbine; velocity diagram; calculation of power output; efficiency of blade height; condition of maximum efficiency; internal losses in steam turbine; governing of steam turbine.

Text Books :

1. Thermal Engineering – P L Ballaney, Khanna Publishers
2. Thermodynamics and Heat Engines vol II – R Yadav, Central Publishing House

Reference Books :

1. Applied Thermodynamics for Engineering Technologists – T D Eastop and A McConkey, Pearson Education

List of Experiments

1. To make a trial on single cylinder 4-stroke Diesel Engine to calculate B. H. P., S.F.C. and to draw its characteristics curves.
2. To make a trial on 4-stroke high-speed diesel engine and to draw its Heat Balance Sheet.
3. To make a trial on Wiley's jeep Engine at constant speed to calculate B. H. P., S. F. C. Thermal efficiency and to draw its characteristic Curves.
4. To make Morse Test to calculate IHP of the multi cylinder petrol engine and to determine its mechanical efficiency.
5. To calculate the isothermal efficiency and volumetric efficiency of a 2 stage reciprocating air compressor.
6. To find out the efficiency of an air Blower.
7. To make a trial on the Boiler to calculate equivalent evaporation and efficiency of the Boiler.
8. To study the following models,
 - a. Gas Turbine.
 - b. Wankle Engine.
9. To study
 - a. Lubrication and cooling systems employed in various I. C. Engines in the Lab
 - b. Braking system of automobile in the lab
10. To study a Carburetor.
11. To study (1) the Fuel Injection System of a C. I. Engine.
 - a. (11) Battery Ignition system of a S. I. Engine
12. To study Cooling Tower.

B.Tech. (Fifth semester) Mechanical engineering

ME 315 E

Fluid Machines (Practical)

L	T	P/D	Total	Theory	: 25 Marks
-	-	2	2	Sessional	: 25 marks

Duration of Exam: 03 hours

List of Experiments

1. To study and perform test on the Pelton wheel and to plot curves Q, P Vs N at full, three fourth gate opening.
2. To study and perform test in the Francis Turbine and to plot curves Q, P Vs N at full, three- fourth gate opening.
3. To study and perform test on the Kaplan Turbine and to plot curves Q, P Vs N at full, three- fourth half opening.
4. To study and perform test on Centrifugal Pump and to plot curves $\eta, Power$ Vs Q
5. To study and perform test on a hydraulic Ram and to find its Rankine, Aubussion η .
6. To study and perform test on a Reciprocating pump and to plot the P and η Vs H
7. To study and perform test on a Gear Pump and to plot the curves Q, P Vs Pressure rise.
8. Study and perform test on a Torque Convertor and to plot the curves η & N_p .

B.Tech. (Fifth semester) Mechanical engineering

ME 317 E

Heat Transfer (Practical)

L T P/D Total

Theory: 25 Marks

- - 2 2

Sessional: 25 marks

list of Experiments

1. Determination of thermal conductivity of a metal rod
2. Determination of thermal conductivity of an insulating powder
3. Determination of thermal conductivity of a liquid using Guard plate method
4. Determination of thermal resistance of a composite wall
5. Temperature distribution of a pin fin in free-convection
6. Temperature distribution of a pin fin in forced-convection
7. Forced convection heat transfer from a cylindrical surface
8. Determination of Effectiveness of a Heat exchanger
9. Determination of Stefan-Boltzmann constant
10. Performance of Solar still
11. Determination of critical heat flux
12. Performance of solar water heater
13. Measurement of solar radiation using solar integrator.

B.Tech. (Fifth semester) Mechanical engineering

ME 319 E

Industrial Engineering (Practical)

List of Experiments

1. To study various Rating Factor systems and find standard time for making small sand mould.
2. To study various plat layouts and suggest improvements in existing Machines Shop layout.
3. To study and draw organizational structure of a near by industry and suggest changes.
4. To draw X and R charts for a given sample of products to check their acceptance.
5. To draw p chart for a given product lot and verify its acceptance
6. Draw a flow process chart with time estimates for a simple welding process.
7. Draw a two handed process chart for a simple process of a job preparation on a lathe.
8. To study various purchase procedures and draw organizational structure of college purchase department.
9. A case study on ABC/VED analysis.
10. A case study on Quality Improvement Techniques (e.g. Hostel Mess/ Workshop / Canteen etc.)
11. A market survey and analysis.
12. A "preliminary project report" preparation for any small-scale unit.

**DEPARTMENT OF MECHANICAL ENGINEERING
HARYANA COLLEGE OF TECHNOLOGY & MANAGEMENT, KAITHAL**

**Scheme of examination for B. Tech Degree Course
Sixth Semester Examination**

Course No.	Subject	Teaching Schedule (Hours)				Examination Schedule Marks			Total Marks	Duration of Exam. Hours
		L	T	P/D	Total	Theory	Sessional	Practical/Viva-Voice		
MET-302	Refrigeration & Air Conditioning	3	1	-	4	75	50	--	125	3
MET-304	Tribology	3	1	-	4	75	50	-	125	3
MET-306	Mechanical Vibrations	3	1	-	4	75	25	-	100	3
HUT-311	Business Management	3	1	-	4	75	50	-	125	3
MET-308	Computer added Design & Manufacturing	3	2	-	5	75	50	-	125	3
MET-310	Machine Design-II	2	-	6	8	100	25	-	125	3
MET-312	Refrigeration & Air Conditioning (Practical)	-	-	2	2	-	-	25	75	3
MET-314	Tribology & Mechanical Vibrations (Practical)	-	-	2	2	-	50	25	75	3
MET-316	Computer added Design & Manufacturing (Practical)	-	-	2	2	-	50	25	75	3
MET-318	Machine Design-II (Viva-voce)	-	-	-	-	-	-	50	50	3
Total		17	06	12	35	475	400	125	1000	-

B.Tech. (Sixth semester) Mechanical engineering

ME 302 E Refrigeration and Air-Conditioning

L	T	P/D	Total
3	1	-	4

Theory: 100 Marks

Sessional: 50 marks

Duration of Exam: 03 hours

(a) Refrigeration

UNIT I

Basics of heat pump & refrigerator; Carnot's refrigeration and heat pump; Units of refrigeration; COP of refrigerator and heat pump; Carnot's COP; ICE refrigeration; evaporative refrigeration; refrigeration by expansion of air; refrigeration by throttling of gas; Vapor refrigeration system; steam jet refrigeration; thermoelectric cooling; adiabatic demagnetization. Basic principles of operation of air refrigeration system, Bell-Coleman air refrigerator; advantages of using air-refrigeration in aircrafts; disadvantages of air refrigeration in comparison to other cold producing methods; simple air refrigeration in air craft; simple evaporative type air refrigeration in aircraft; necessity of cooling the aircraft.

UNIT II

Simple Vapor Compression Refrigeration System; different compression processes(wet compression, dry or dry and saturated compression, superheated compression); Limitations of vapour compression refrigeration system if used on reverse Carnot cycle; representation of theoretical and actual cycle on T-S and P-H charts; effects of operating conditions on the performance of the system; advantages of vapour compression system over air refrigeration system.

Methods of improving COP; flash chamber; flash inter cooler; optimum interstate pressure for two stage refrigeration system; single expansion and multi expansion processes; basic introduction of single load and multi load systems; cascade systems.

Basic absorption system; COP and Maximum COP of the absorption system; actual NH₃ absorption system; functions of various components; Li-Br absorption system; selection of refrigerant and absorbent pair in vapour absorption system; Electro refrigerator; Comparison of Compression and Absorption refrigeration systems; nomenclature of refrigerants; desirable properties of refrigerants; cold storage and ice-plants.

(b) Air conditioning

UNIT III

Difference in refrigeration and air conditioning; Psychometric properties of moist air (wet bulb, dry bulb, dew point temperature, relative and specific humidity of moist air, temperature of adiabatic saturation); empirical relation to calculate P_v in moist air.

Psychometric chart, construction and use, mixing of two air streams; sensible heating and cooling; latent heating and cooling; humidification and dehumidification; cooling with dehumidification; cooling with adiabatic humidification; heating and humidification; by-pass factor of coil; sensible heat factor; ADP of cooling coil; Air washer.

UNIT IV

Classification; factors affecting air conditioning systems; comfort air-conditioning system; winter air conditioning system; summer air-conditioning system; year round air conditioning. unitary air-conditioning system; central air conditioning system; room sensible heat factor; Grand sensible heat factor; effective room sensible heat factor.

Inside design conditions; comfort conditions; components of cooling loads; internal heat gains from (occupancy, lighting, appliances, product and processes); system heat gain (supply air duct, A.C. fan, return air duct); external heat gain (heat gain through building, solar heat gains through outside walls and roofs); solar air temperature; solar heat gain through glass areas; heat gain due to ventilation and infiltration.

Transport air conditioning; evaporative condensers, cooling towers; heat pumps.

References and Text books

Refrigeration and air-conditioning by C.P arora

Basic Refrigeration and air-conditioning by Annanthana and Rayanan, TMG

Refrigeration and air-conditioning BY Arora and Domkundwar, Dhanpat rai

NOTE: In the semester examination, the examiner will set 8 questions in all, at least two question from each unit, and students will be B.Tech. (Sixth semester)

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Mechanical engineering
ME 304 E TRIBOLOGY

	L	T	P/D	Total	
					Theory: 100marks
3	1	-	4		Sessional: 50 marks

Duration of Exam: 03 hours

UNIT I Introduction to tribological systems and their characteristic features; analysis and assessment of surface; topography; deterministic and stochastic tribo-models for asperity contacts; techniques of surface examination; technological properties of surfaces. Quantitative laws of sliding friction, causes of friction, adhesion theory, laws of rolling friction, measurement of friction

UNIT II Introduction, mechanism of wear, types of wear, quantitative laws of wear, measurement of wear, wear resistance materials

UNIT III Introduction, dry friction, boundary lubrication, hydrodynamic, hydrostatic and elasto-hydrodynamic lubrication, functions of lubricants, types and properties, lubricant additives. Principles, application to rolling contact bearings, cams, Gears

UNIT IV Geometry and pressure equation of journal bearing, hydrostatic bearings, thrust bearings, porous bearings and hydrodynamic gas bearings. Journal bearings with specialized applications. General requirements and different types of bearing materials.

Suggested Reading

- Tribology in Indertrion- By Sushil Kumar Srivastava
- Introduction to Tribology of Bearings- By B.C. Majumdar ; A.H.Wheeler
- Principles of Tribology – By J. Halling, Macmillan
- Mechanics and Chemistry in Lubrication- By Dorinson and Ludema , Elsevier
- Friction and wear of Materials- By E. Robinowicz, Johan Wiley
- Principles of Lubrication-By A. Cameron, Longmans

NOTE: In the semester examination, the examiner will set 8 questions in all, at least two question from each unit, and students will be required to attempt only 5 questions, at least one from each unit.

B.Tech. (Sixth semester) Mechanical engineering

ME 306 E

MECHANICAL VIBRATION

L T P/D Total

Theory: 100 Marks

3 1 - 4

Sessional: 50 marks

Duration of Exam: 03 hours

UNIT I Kinematics of simple vibrating motion, Simple harmonic motions, Vectorial representation of harmonic motion. Degree of freedom, Equations of motions, general solution of free vibration, Phase plane method

UNIT II Damped free vibration, undamped and damped forced vibrations, Vibrating isolation, Vibrating instruments. Undamped free vibration, Principle modes, Influence coefficients, Coordinate coupling, Orthogonality, Vibration absorbers.

UNIT III Geometric method, Stability of equilibrium points, Method of harmonic balance. Influence coefficients, Dunkerleys equation, Matrix iteration, Holzer method, Rayleigh method, and Rayleigh-Ritz method.

UNIT IV Transverse vibration of strings, Longitudinal vibrations of bars, Lateral vibration of beams, Torsional vibration of circular shafts, Whirling of shafts. Introduction, Method of Laplace transformation and response to an impulsive output, response to step-input, pulse-input, and phase plane method.

REFERENCE AND TEXT BOOKS: -

Mechanical vibration - By G.K. Grover; Nemchand Chaud and Sons

Mechanical Vibration – By Thomson; Prentice Hall

Mechanical Vibration - By Den Hartog; Mc Graw Hill

Introductory course to mechanical vibrations – By Rao and Gupta; Wiley Eastern

NOTE: In the semester examination, the examiner will set 8 questions in all, at least two question from each unit, and students will be required to attempt only 5 questions, at least one from each unit.

ME 308 E **B.Tech. (Sixth semester) Mechanical engineering**
COMPUTER AIDED DESIGN AND MANUFACTURING

L T P/D Total

4 1 - 5

Theory: 100 Marks

Sessional: 50 marks

Duration of Exam: 03 hours

UNIT I

Introduction to CAD/CAM, Historical Development, Industrial look at CAD/CAM, Introduction to CIM Basic of Geometric & Solid modeling, Coordinate systems, Explicit, Implicit, Intrinsic and parametric equation
Part families, Part classification and coding, product flow analysis, Machine cell Design, Advantages of GT

UNIT II

Introduction, Transformation of points & line, 2-D rotation, Reflection, Scaling and combined transformation, Homogeneous coordinates, 3-D scaling, shearing, rotation, reflection and translation, combined transformations, Orthographic and perspective projections
Algebraic and geometric forms, tangent & normal blending functions, reparametrization
Straight line, conics, cubic splines, bezier curves and B-spline curves

UNIT III

Algebraic and geometric forms, tangent & twist vectors, normal blending function, reparametrization, Sixteen point form, four Curve form, Plane surface, ruled surface
Surface of revolution, tabulated cylinder Bi-cubic surface, bezier surface, B-spline surface
Solid models and representation scheme B-rep & CSG, sweep representation, Cell decomposition, spatial occupancy enumeration

UNIT IV

Introduction, fixed programmable and flexible automation, Types of NC systems, MCU & other components, Co-ordinate system, NC manual part programming, G & M codes, part program for simple parts, Computer assisted part programming
Introduction, FMS component, Types of FMS, FMS layout, Planning for FMS, advantage and applications

B.Tech. (Sixth semester) Mechanical engineering
ME 312 E Refrigeration and Air Conditioning (Practical)

L	T	P/D	Total	Practical: 25Marks
-	-	2	2	Sessional: 25 marks

Duration of Exam: 03 hours

List of Experiments

1. Study & Performance of basic vapour compression Refrigeration Cycle.
2. To find COP of water cooler.
3. To study the walk in cooler.
4. To study and perform experiment on vapour absorption apparatus.
5. Perform the experiment & calculate various. Performance parameters on a blower apparatus.
6. To find the performance parameter of cooling tower.
7. To study various components in room air conditioner.
8. To find RH of atmosphere air by using sling Psychometric and Psychometric.
9. To find performance of a refrigeration test rig system by using different expansion devices.
10. To study different control devices of a refrigeration system.
11. To study various compressor.
12. To find the performance parameters of Ice Plant.

Note: Total Ten experiments must be performed. At least eight experiments should be performed from the above list. Remaining two experiments may either be performed from the above list or outside the list.

B.Tech. (Sixth semester) Mechanical engineering
ME 314 E TRIBOLOGY & MECHANICAL VIBRATION (PRACTICAL)

L	T	P/D	Total
-	-	-	2

Practical: 25Marks
Sessional: 50 marks

Duration of Exam: 03 hours

LIST OF EXPERIMENT:

1. To study undamped free vibrations of equivalent spring mass system and determine the natural frequency of vibrations
2. To study the free vibration of system for different damper settings. Draw decay curve and determine the log decrement and damping factor. Find also the natural frequency
3. To study the torsional vibration of a single rotor shaft system and to determine the natural frequency
4. To determine the radius of gyration of given bar using bifilar suspension.
5. To verify the dunker ley rule
6. To study the forced vibration of system with damping. Load magnification factor vs. Frequency and phase angle vs frequency curves. Also determine the damping factor.
7. To study the pressure distribution of a journal bearing using a journal bearing apparatus.
8. To determine the rate of wear of a metallic pin from the plot of displacement vs time curves by using friction and wear monitor apparatus.
9. To determine abrasion index of a material with the help of dry abrasion test rig.
10. To evaluate the load wear index and the weld point of a lubricant with the help of a four ball stream pressure tester.
11. To determine the two frequencies of torsional spring type double pendulum & compare them with theoretical values.
12. To determine the radius of gyration of a compound pendulum.
13. To determine the radius of gyration of disc using trifilar suspension.

Note: Total Ten experiments must be performed. At least eight experiments should be performed from the above list. Remaining two experiments may either be performed from the above list or outside the list.

MET - 401 Automobile Engineering

L	T P/D	Total	Theory	: 75 marks
4	1	-	Sessional	: 50 marks
		5	Duration of Exams.	: 03 hours

1. Introduction to Automobile Engineering:

Brief history of automobiles, Main components of an automobile, Brief description of each component.

2. Power requirements in an automobile:

Brief description of constructional details and working of a four stroke I.C. Engine (S.I. Engines and C.I. Engines) including lately developed overhead cam shaft, Multi-cylinder engines, Introduction to recent developments in I.C. Engines- Direct injection systems, Multi-Point fuel injection systems, Microprocessor based fuel supply systems, Multi valve engines, Mechanical balancing, Firing Order, Power balancing, Power overlap, Power flow charts.

3. Transmission System of Automobile:

Introduction, Brief description of different components of Transmission System.

- (a) Clutch: Introduction to Clutch and its different types, Principle of Friction Clutch, Clutch Lining and friction materials used in Friction Clutches, Torque transmitted, Brief description of Cone Clutch, Single Plate and Multiplate Clutches, Dry and wet clutches, Automatic clutch action, Centrifugal clutches, Electromagnetic clutches, Fluid Flywheel.
- (b) Gear Box: Air resistance, gradient resistance and rolling resistance coming across a moving automobile, Tractive effort, Variation of tractive effort with speed, Performance curves (object and need of a gear box), Sliding mesh gear box, Control mechanism, Sliding type selector mechanism, Ball type selector mechanism, Steering column gear shift control, Constant mesh gear box, Synchromesh device, Automatic transmission in general, AP automatic gear box, Torque converter, Torque converter with direct drive, Lubrication of Gear Box.
- (c) Propeller Shaft: Functions and requirements of a propeller shaft, Universal joints, Constructional forms of universal joints, Flexible-ring joints, Rubber-bushed flexible joints. Constant-velocity joints.
- (d) Differential: Principle of operation, Constructional details of a typical –differential Unit, Traction control differentials, Multi-plate clutch' type traction control device Traction control by viscous coupling.
- (e) The back axle: Live back axles, The final drive, single reduction live axle, Torque reaction, Driving thrust, torque & thrust member arrangements, spring serving as torque and thrust members, Hotchkiss drive with torque reaction member, single combined torque - thrust reaction member, with springs taking only vertical and lateral loads. Transverse radius rods, Three radius rods, Axle construction, Effects of wheel bearing layout on axle loading, Some actual bearing arrangements, Axle casing construction, The double reduction axles.

4. Running system:

- (a) Wheel and rim, Tyre and its function and constructional details.
- (b) Brakes. Function and its method of operation, Brake efficiency, Elementary theory of shoe brake, brake shoe adjustment, A modern rear wheel brake, Disk brakes, Brake linkages, Leverages and adjustment of brake linkage, Servo and power-operated brakes, Vacuum brake operation, Hydraulic Brakes-constructional details and working, Bendix Hydrovac, Direct action vacuum

servos, Power operated brakes, A dual power air brakes system, Compressed air systems, Actuating cylinders for air brakes.

5. Suspension System:

Suspension principles, Road irregularities and human susceptibility, Suspension system, Damping, Double tube damper, Single tube damper, Lever arm type damper, Springs-Leaf springs, Coil and torsion springs, variable rate springs, Composite leaf springs, Rubber springs, Air springs, Adjustable and self-adjusting suspensions, Interconnected suspension system, Interconnected air and liquid suspensions, Independent suspension system, Different independent suspension layouts, McPherson strut type. Rear suspension-live axle, Torque reaction and axle guidance, Watt's linkage. Rear suspension-dead axles, Rear suspension-independent, McPherson strut rear suspension.

6. Steering Mechanism:

Steering geometry, Castor, Camber, Kingpin inclination, Combined angle, Toe in, Steering system-basic aims, Ackerman linkage, Steering linkages for independent suspension, Center point steering, Costarring or trailing action Cornering power, Self-righting torque, Steering characteristics-over steer and under steer, Axle beam, Stub-axle construction, Steering column, Reversible and irreversible steering, Rack-and-pinion steering mechanism, Effect of toe-in on steering, Power steering, Vicker's System.

7. Recent trends in Automobile Engineering:

Multi-fuel automobiles, Automobiles running on alternate sources of energy, Emission control through catalytic converter, Double catalytic converter, Aspects of pollution control in Automobiles.

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MET- 403 Measurements and Control

L	T	P/D	Total	Theory	: 75 marks
4	1		5	Sessional	: 50 marks
				Duration of Exams.	: 03 hours

1. Introduction:

Definition, application of measurement instrumentation, functional elements of a generalized measuring system, measuring standards, types of measurement, types of input to measuring instruments and instrument system, classification of measuring instruments, merits and demerits of mechanical measuring systems, comparison of mechanical measuring system with electrical measuring systems, calibration.

2. Generalized performance characteristics of instruments:

Introduction, types of error, types of uncertainties, propagation of uncertainties in compound quantity, Static performance parameters: accuracy, precision, resolution, static sensitivity, linearity, hysteresis, dead band, backlash, and drift., sources of error, selection of a measuring instruments, mechanical and electrical loading, fundamentals dynamic characteristics, generalized mathematical model of measuring systems,

types of input, dynamic performance parameters: dynamic error speed of response, etc, dynamic response of a first order mechanical system with different inputs e.g. step, ramp, sinusoidal and impulse input.

3. Statistical analysis of experimental data:

Introduction, types of measuring data, statistical attributes, various method of presentation, estimation of presentation and uncertainties, confidence level, precision and statistical treatments of single and multi sample type experimental data, Chauvenet's criteria of rejecting a dubious data, curve fitting, best linear calibration and its precision, significant figures and rounding off. Overall uncertainty estimation of measuring systems, common sense approach, and engineering applications.

4. Transducers:

Introduction, primary function, classification, electrostatic transducers: principle theory, types, advantages, and limitations, Fixed contact mechano-resistive transducers: classification, and uses, Metallic resistance strain gauge: types, construction theory of operation, Adhesive: property, selection criteria, mounting of strain gauges, Mathematical analysis of ballast – and DC Wheatstone bridge circuits, characteristic and comparison of ballast and DC Wheatstone bridge circuits, temperature effects and their compensation.

5. Measuring of Non-electrical Physical quantities.

Measurement of load, force, and thrust using resistant strain gauges, Elastic load

cells, proving rings, fluid pressure measurement in pipe and containers, using strain gauges, measuring of torque in transmission shaft under axial and bending loads in varying ambient conditions.

6. Control Systems:

Introduction, classification of control systems, control system terminology, servomechanism, process control and regulators, Manual and automatic control systems, physical systems and mathematical models, linear control systems, Laplace transform, transfer function, block diagram, signal flow graphs, system stability, Time and frequency domain.

7. Hydraulic and Pneumatic control systems:

Introduction, functional operation, desirable characteristics of hydraulic fluids, hydraulic control systems: hydraulic pump, hydraulic control valve, Pneumatic control systems: pneumatic nozzle, relay, advantages and limitation of such control systems.

Reference and Text Books:

1. Mechanical measurements & control- By D.S. Kumar, Metropolitan book
2. Instrumentation and Mechanical measurements - By AX. Tayal, Galgotia Pub!.
3. Measurements systems application and design -By Ernest Doebelin, McGraw-Hili

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MET- 405 Statistical Quality Control and Reliability

L	T	P/D	Total
4	1		5

Theory: 75 marks

Sessional: 50 marks

Duration of Exams. : 03 hours

1. Introduction:

Quality-Basic Concepts: Issues in Quality, factors affecting quality, creating quality by design, product development cycle, economics of quality, Various definitions, ISO definition of quality and its meanings, and various phases till TQM and its meaning to industries, customers. and employees, contribution of quality gurus etc. towards quality concepts. Total Quality Management: its scope, application and implementation. Quality Circle: its objectives, structure and techniques. Variability concept in manufacturing cycle, fish bone diagrams, charts in time philosophy.

2. Quality Control:

Basic statistical concepts, various types of distributions, General theory X and R chart. Decision preparatory to the control charts. Trial control limits. Selection of subgroups. Charts with variable subgroups, Reject and Revoke, limits for average on X charts, modified control limits, specification limits, practical limitations. Control charts for fraction defectives, calculation and plotting of control limits, sensitivity of p chart, applications. Control charts for Defects, difference between defect and defective, calculation and plotting of control limits, applications. pi charts and u charts, plotting of charts. Tests for various control charts. Process capability- inherent and potential capability.

3. Acceptance Sampling:

Purpose of Acceptance by Attributes, Single sampling plans. G.C. curve, selection of sampling plans, Acceptance number, Type A and Type B O.C. curves, Double sampling plan and its analysis, Multiple and sequential sampling, A.O.Q.L., Acceptance sampling plans under risk. Design of various sampling plans, Dodge-Roming type system for acceptance sampling by attributes (use of various tables). Determination of process, average, Acceptance sampling by variables.

4. Reliability:

Control of reliability, factors affecting reliability, patten of failure, mean time to failure. Fundamental of statistical concepts. Consideration of reliability in series and parallel system, effect of redundancy and reliability, method of reliability evaluation, reliability optimization, Availability and Maintainability, Means to improve reliability, Reliability control during manufacture.

MET- 407 Measurements and Control (Practical)

L	T	P/D	Total	Theory	: 25 marks
	2	2		Sessional	: 50 marks
				Duration of Exams.	: 03 hours

List of Experiments

1. Study of a strain gage based cantilever beam and measurement of strain on the beam
2. Study of a LVDT and measurement of linear displacement
3. Study of an inductive pick up and measurement of linear displacement
4. Study of a LDR and measurement of linear displacement
5. Study of capacitive pick up and measurement of angular displacement
6. Study of temperature transducers and measurement of temperature of fluid
7. Study of a LVDT(strain gage based) and measurement of linear displacement
8. Study of a torque pick up and measurement of torque
9. Study of a pressure pick up and measurement of pressure of fluid
10. Study of load cell and measurement of load with load cell
11. Study of non-contact type speed pick up and measurement of rotational speed
12. Comparison of sensitivity of thermocouple, thermister and RTD

Note: The students must perform at least eight experiments.

Scheme of examination for B. Tech Degree Course

7th Sem (Mechanical Engineering)

S.No	Code	Subjects Name	Teaching Schedule (Hrs)				Examination Schedule (Marks)			Total Marks	Duration of Exam
			L	T	P / D	Total	Theory	Sessional	Practical/ viva-voce		
1	MET-401	Automobile Engineering	4	1	--	5	75	50	---	125	3
2	MET-403	Measurement and control	4	1	--	5	75	50	---	125	3
3	MET - 437	Elective* -1 (Maintenance Engg.)	4	1	--	5	100	50	---	150	3
4	CET - 423	Open elective*-1 (Environmental Engg.)	3	1	--	4	75	50	---	125	3
5	MET-405	Statistical quality control & Reliability	4	1	--	5	75	50	---	125	3
6	MET-407	Measurement (PR)	-	-	2	2	---	50	25	75	3
7	MET-409	Project**-1	-	-	7	7	---	100	75	175	3
8	MET - 411	Seminar	-	-	2	2	---	-	---	---	---
9	MET - 413	In plant Training Report	-	-	-	-	---	75	---	75	3
	Total		19	05	11	35	425	475	100	975	---

* Refer List of Elective and Open Elective

MET - 401 Automobile Engineering

L	T P/D	Total	Theory	: 75 marks
4	1	-	Sessional	: 50 marks
		5	Duration of Exams.	: 03 hours

1. Introduction to Automobile Engineering:

Brief history of automobiles, Main components of an automobile, Brief description of each component.

2. Power requirements in an automobile:

Brief description of constructional details and working of a four stroke I.C. Engine (S.I. Engines and C.I. Engines) including lately developed overhead cam shaft, Multi-cylinder engines, Introduction to recent developments in I.C. Engines- Direct injection systems, Multi-Point fuel injection systems, Microprocessor based fuel supply systems, Multi valve engines, Mechanical balancing, Firing Order, Power balancing, Power overlap, Power flow charts.

3. Transmission System of Automobile:

Introduction, Brief description of different components of Transmission System.

- (a) Clutch: Introduction to Clutch and its different types, Principle of Friction Clutch, Clutch Lining and friction materials used in Friction Clutches, Torque transmitted, Brief description of Cone Clutch, Single Plate and Multiplate Clutches, Dry and wet clutches, Automatic clutch action, Centrifugal clutches, Electromagnetic clutches, Fluid Flywheel.
- (b) Gear Box: Air resistance, gradient resistance and rolling resistance coming across a moving automobile, Tractive effort, Variation of tractive effort with speed, Performance curves (object and need of a gear box), Sliding mesh gear box, Control mechanism, Sliding type selector mechanism, Ball type selector mechanism, Steering column gear shift control, Constant mesh gear box, Synchromesh device, Automatic transmission in general, AP automatic gear box, Torque converter, Torque converter with direct drive, Lubrication of Gear Box.
- (c) Propeller Shaft: Functions and requirements of a propeller shaft, Universal joints, Constructional forms of universal joints, Flexible-ring joints, Rubber-bushed flexible joints. Constant-velocity joints.
- (d) Differential: Principle of operation, Constructional details of a typical –differential Unit, Traction control differentials, Multi-plate clutch' type traction control device Traction control by viscous coupling.
- (e) The back axle: Live back axles, The final drive, single reduction live axle, Torque reaction, Driving thrust, torque & thrust member arrangements, spring serving as torque and thrust members, Hotchkiss drive with torque reaction member, single combined torque - thrust reaction member, with springs taking only vertical and lateral loads. Transverse radius rods, Three radius rods, Axle construction, Effects of wheel bearing layout on axle loading, Some actual bearing arrangements, Axle casing construction, The double reduction axles.

4. Running system:

- (a) Wheel and rim, Tyre and its function and constructional details.
- (b) Brakes. Function and its method of operation, Brake efficiency, Elementary theory of shoe brake, brake shoe adjustment, A modern rear wheel brake, Disk brakes, Brake linkages, Leverages and adjustment of brake linkage, Servo and power-operated brakes, Vacuum brake operation, Hydraulic Brakes-constructional details and working, Bendix Hydrovac, Direct action vacuum

servos, Power operated brakes, A dual power air brakes system, Compressed air systems, Actuating cylinders for air brakes.

5. Suspension System:

Suspension principles, Road irregularities and human susceptibility, Suspension system, Damping, Double tube damper, Single tube damper, Lever arm type damper, Springs-Leaf springs, Coil and torsion springs, variable rate springs, Composite leaf springs, Rubber springs, Air springs, Adjustable and self-adjusting suspensions, Interconnected suspension system, Interconnected air and liquid suspensions, Independent suspension system, Different independent suspension layouts, McPherson strut type. Rear suspension-live axle, Torque reaction and axle guidance, Watt's linkage. Rear suspension-dead axles, Rear suspension-independent, McPherson strut rear suspension.

6. Steering Mechanism:

Steering geometry, Castor, Camber, Kingpin inclination, Combined angle, Toe in, Steering system-basic aims, Ackerman linkage, Steering linkages for independent suspension, Center point steering, Costarring or trailing action Cornering power, Self-righting torque, Steering characteristics-over steer and under steer, Axle beam, Stub-axle construction, Steering column, Reversible and irreversible steering, Rack-and-pinion steering mechanism, Effect of toe-in on steering, Power steering, Vicker's System.

7. Recent trends in Automobile Engineering:

Multi-fuel automobiles, Automobiles running on alternate sources of energy, Emission control through catalytic converter, Double catalytic converter, Aspects of pollution control in Automobiles.

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MET- 403 Measurements and Control

L	T	P/D	Total	Theory	: 75 marks
4	1		5	Sessional	: 50 marks
				Duration of Exams.	: 03 hours

1. Introduction:

Definition, application of measurement instrumentation, functional elements of a generalized measuring system, measuring standards, types of measurement, types of input to measuring instruments and instrument system, classification of measuring instruments, merits and demerits of mechanical measuring systems, comparison of mechanical measuring system with electrical measuring systems, calibration.

2. Generalized performance characteristics of instruments:

Introduction, types of error, types of uncertainties, propagation of uncertainties in compound quantity, Static performance parameters: accuracy, precision, resolution, static sensitivity, linearity, hysteresis, dead band, backlash, and drift., sources of error, selection of a measuring instruments, mechanical and electrical loading, fundamentals dynamic characteristics, generalized mathematical model of measuring systems, types of input, dynamic performance parameters: dynamic error speed of response, etc, dynamic response of a first order mechanical system with different inputs e.g. step, ramp, sinusoidal and impulse input.

3. Statistical analysis of experimental data:

Introduction, types of measuring data, statistical attributes, various method of presentation, estimation of presentation and uncertainties, confidence level, precision and statistical treatments of single and multi sample type experimental data, Chauvenet's criteria of rejecting a dubious data, curve fitting, best linear calibration and its precision, significant figures and rounding off. Overall uncertainty estimation of measuring systems, common sense approach, and engineering applications.

4. Transducers:

Introduction, primary function, classification, electrostatic transducers: principle theory, types, advantages, and limitations, Fixed contact mechano-resistive transducers: classification, and uses, Metallic resistance strain gauge: types, construction theory of operation, Adhesive: property, selection criteria, mounting of strain gauges, Mathematical analysis of ballast – and DC Wheatstone bridge circuits, characteristic and comparison of ballast and DC Wheatstone bridge circuits, temperature effects and their compensation.

5. Measuring of Non-electrical Physical quantities.

Measurement of load, force, and thrust using resistant strain gauges, Elastic load

cells, proving rings, fluid pressure measurement in pipe and containers, using strain gauges, measuring of torque in transmission shaft under axial and bending loads in varying ambient conditions.

6. Control Systems:

Introduction, classification of control systems, control system terminology, servomechanism, process control and regulators, Manual and automatic control systems, physical systems and mathematical models, linear control systems, Laplace transform, transfer function, block diagram, signal flow graphs, system stability, Time and frequency domain.

7. Hydraulic and Pneumatic control systems:

Introduction, functional operation, desirable characteristics of hydraulic fluids, hydraulic control systems: hydraulic pump, hydraulic control valve, Pneumatic control systems: pneumatic nozzle, relay, advantages and limitation of such control systems.

Reference and Text Books:

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2. Instrumentation and Mechanical measurements - By AX. Tayal, Galgotia Pub!.
3. Measurements systems application and design -By Ernest Doebelin, McGraw-Hili

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MET- 405 Statistical Quality Control and Reliability

L	T	P/D	Total
4	1		5

Theory: 75 marks

Sessional: 50 marks

Duration of Exams. : 03 hours

1. Introduction:

Quality-Basic Concepts: Issues in Quality, factors affecting quality, creating quality by design, product development cycle, economics of quality, Various definitions, ISO definition of quality and its meanings, and various phases till TQM and its meaning to industries, customers. and employees, contribution of quality gurus etc. towards quality concepts. Total Quality Management: its scope, application and implementation. Quality Circle: its objectives, structure and techniques. Variability concept in manufacturing cycle, fish bone diagrams, charts in time philosophy.

2. Quality Control:

Basic statistical concepts, various types of distributions, General theory X and R chart. Decision preparatory to the control charts. Trial control limits. Selection of subgroups. Charts with variable subgroups, Reject and Revoke, limits for average on X charts, modified control limits, specification limits, practical limitations. Control charts for fraction defectives, calculation and plotting of control limits, sensitivity of p chart, applications. Control charts for Defects, difference between defect and defective, calculation and plotting of control limits, applications. pi charts and u charts, plotting of charts. Tests for various control charts. Process capability- inherent and potential capability.

3. Acceptance Sampling:

Purpose of Acceptance by Attributes, Single sampling plans. G.C. curve, selection of sampling plans, Acceptance number, Type A and Type B O.C. curves, Double sampling plan and its analysis, Multiple and sequential sampling, A.O.Q.L., Acceptance sampling plans under risk. Design of various sampling plans, Dodge-Roming type system for acceptance sampling by attributes (use of various tables). Determination of process, average, Acceptance sampling by variables.

4. Reliability:

Control of reliability, factors affecting reliability, patten of failure, mean time to failure. Fundamental of statistical concepts. Consideration of reliability in series and parallel system, effect of redundancy and reliability, method of reliability evaluation, reliability optimization, Availability and Maintainability, Means to improve reliability, Reliability control during manufacture.

MET- 407 Measurements and Control (Practical)

L	T	P/D	Total	Theory	: 25 marks
	2	2		Sessional	: 50 marks
				Duration of Exams.	: 03 hours

List of Experiments

1. Study of a strain gage based cantilever beam and measurement of strain on the beam
2. Study of a LVDT and measurement of linear displacement
3. Study of an inductive pick up and measurement of linear displacement
4. Study of a LDR and measurement of linear displacement
5. Study of capacitive pick up and measurement of angular displacement
6. Study of temperature transducers and measurement of temperature of fluid
7. Study of a LVDT(strain gage based) and measurement of linear displacement
8. Study of a torque pick up and measurement of torque
9. Study of a pressure pick up and measurement of pressure of fluid
10. Study of load cell and measurement of load with load cell
11. Study of non-contact type speed pick up and measurement of rotational speed
12. Comparison of sensitivity of thermocouple, thermister and RTD

Note: The students must perform at least eight experiments.

MET - 409 Project - I

L	T	P/D	Total
-	-	7	7

Theory : 75 marks
Sessional : 100 marks
Duration of Exams. : 03 hours

The student is expected to take up a project under the guidance of teacher from the college. The project must be based on the mechanical engineering problems, which will extend full academic session in two parts. The student may be asked to work individually or in-group with not more than four students. Viva-voce must be based on the preliminary report submitted by student(s) related to project.

MET – 411 Seminar

L	T	P/D	Total
-	-	2	2

Sessional: 50

Students will give a talk on some new technical topics.
Note: The seminar will continue in the eight semester and will be evaluated in the eight semester.

23	MET – 439	Machine Tool Design	
24	MET – 441	Computational Fluid Dynamics	
24-A	MET – 443	Mechatronics Engineering	
25	HUE-461	Modern Trends in management	
26	HUE-463	Industrial Social Responsibility	
27	HUE-467	Development and planning in Indian economy	
28	HUE-465	Advance communication skill in english	
29	MaE-467	Advanced Mathematics-I	
30	PhT-465	Lasers	
31	PhT-467	Ultrasonics	

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Scheme of examination for B. Tech Degree Course

8th Sem (Mechanical Engineering)

S.No	Code	Subjects Name	Teaching Schedule (Hrs)				Examination Schedule (Marks)			Total Marks	Duration of Exam
			L	T	P/D	Total	Theory	Sessional	Practical/viva-voce		
1	MET-402	Entrepreneurship	3	1	---	4	75	25	---	100	3
2	MET-420	Elective* - II (NCM)	4	1	---	5	75	50	---	125	3
3	MET-444	Open Elective* - II (Air Pollution)	4	1	---	5	75	50	---	125	3
4	MET-404	Power Plant Engineering	4	1	---	5	75	25	---	100	3
5	MET-406	Operation research	3	1	---	4	75	25	---	100	3
6	MET-408	Entrepreneurship (PR)	---	---	2	2	---	50	25	75	3
7	MET-410	Project** -II	---	---	9	9	---	100	75	175	3
8	MET-411	Seminar	---	---	2	2	---	50	---	50	---
9	ME-412	Comprehensive Viva - Voce	---	---	---	---	---	75	---	75	3
10	ME-414	General Fitness & Professional Aptitude	---	---	---	---	---	---	75	75	3
Total			17	05	13	35	375	450	175	1000	---

* Refer List of Elective and Open Elective

** Project II is independent of Project I and will be completed in 8th sem. itself.

MET-437 MAINTENANCE ENGINEERING

L	T	P/D	Total	Sessional Marks	: 50 marks
				Theory	: 100 Marks
4	1	-	5	Duration Of Exam:	3 Hrs.

PART A

Unit-I Introduction

Evolution of maintenance, objective of maintenance, maintenance policies and philosophies, maintenance concept, maintenance management and Terro Technology, relationship with other functional areas, importance of maintenance, elements of good maintenance economics of maintenance, training and safety aspect in maintenance

Unit-II Maintenance strategies

Classification of maintenance programs, Corrective, preventive & Predictive maintenance, comparison of maintenance program, preventive maintenance concept, function, benefit, limitations

Unit-III Condition Based Maintenance (CBM)

Objective, What to monitor, when to monitor, principal of CBM, Condition based maintenance techniques, Manual inspection, performance monitoring, Vibration monitoring, Current monitoring, coil debris/spectroscopy, thermography and corrosion monitoring, step in implementation of CBM, benefit of CBM

UNIT-IV Reliability Centered Maintenance (RCM)

RCM logic maintenance and RCM, benefit of RCM, Total productive maintenance(TPM), introduction, key supporting element of TPM, methodology, evaluation and benefit

PART-B

Unit-V Non-Destructive Testing (NDT)

Purposes and challenges, techniques, Visual Aids- boroscopes, endoscopes, fiber optics scanner, magnetic particle inspection, liquid penetrants , eddy current, ultrasonic radiography, selection of NDT technique, merits and demerit and application of various Techniques.

Unit-VI Maintenance Planning and Control

Basic ingredients basic steps in maintenance management, maintenance planning and control system, documentation, maintenance productivity areas for improvement.

UNIT-VII Reliability Maintenance & Availability

Techniques For improvements of operational reliability, safety and availability of machines and production system, maintainability criteria, checklist to assess the

maintainability of a system. Maintainability program, objectives, key issues in availability improvements program, fault diagnosis, pareto principal ishikawa diagram

UNIT-VIII Application of Computers to Maintenance Management

Data processing System for Integrated Maintenance, Maintenance Information And reporting systems

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CET - 423

Environmental Engineering

L	T	P/D	Total
3	1	-	4

Theory: 75 marks

Sessional: 50 marks

Duration of Exams: 03 hours

Max. Marks: 125

Introduction: Environment & its segment, Biosphere, impact of humans upon environment, impact of humans upon environment, Biodiversity and sustainable development.

Ecology: Meaning, scope and sub division of ecology ecosystems and its types, Energy flow (Radiation & Heat Budget) food chains, trophic level, ecological pyramid biogeochemical cycles- nitrogen, sulphur and phosphorous cycles. Ecological balance in nature, consortism and ranks of consortium, Sources and effects of radio actives fall-outs , disposal of radioactive waste, chemical and biological agents and effects of chemical and biological warfare, population Explosion - its affects & India's scenario.

ENERGY & ENVIRONMENT:

Energy, uses of energy, historical background, economic of energy, conventional and non conventional sources of energy, renewable energy sources (such as solar, wind, tidal, wave, geothermal, hydro and bio mass energy), and their environmental impacts with special references on Indian scenario.

Air pollution : Composition and structure of atmosphere , classification and sources of air pollutants, Meteorological parameters influencing air pollution, plume behavior, effects of air pollution on meteorological conditions like green house effects ozone depletion, & acid rains, effects of air pollution on plants, animals and human health & economic effects of air pollution. El-Nin and its affects. Automobile pollution – effects and control measures and techniques of air pollution control. Air pollution control devices like settling chamber, cyclones, ESP, Bag, filters, catalytic convertors etc.

Noise Pollution: General introduction to noise pollution, human acoustic. Unit of measurement, loudness, measurements of noise & weighting networks, sources and effects of noise pollution, noise abatement / control and noise standards.

Solid wastes: Definition, types and composition, sources of solid wastes, method of disposal, land filling, incineration, pulverization,

Compositioning. Selection of method of disposal. Solid waste management and reuse of material.

Recommended Books:

1. Environmental Engineering by H.S.Peavy and D.R.Rowe , McGraw Hill Book co. ltd.
2. Ecology By E.P.Odum Oxford & IBN publication. New Delhi.
3. Air Pollution By: M.N. Rao
4. Environmental Noise pollution by P.F. Cuniff, John Wiley & sons.

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MET- 402 Entrepreneurship

L	TP/D	Total
3	1	4

Theory	: 75 marks
Sessional	: 25 marks
Duration of Exams.	: 03 hours

1. Engineering Economics:

Definition and concept, Importance of economics for engineers, present value and future value, Wealth, Goods, Wants, Value and price, capital, money, utility of consumer and producer goods.

2. Costing:

Introduction, Elements of cost, Prime cost, Overhead, Factory cost, Total cost, Selling price, Nature of cost, Types of cost.

3. Depreciation:

Definition and concept, Causes of depreciation, Methods of calculating depreciation.

4. Economic analysis of investment and selection of alternatives:

Introduction, Nature of selection problem, Nature of replacement problem, Replacement of items which deteriorate, Replacement of machines whose operating cost increase with time and the value of money also changes with time, methods used in selection of investment and replacement alternatives.

5. Entrepreneurship:

Entrepreneurship, Role of entrepreneurship in Indian economy, Characteristics of an entrepreneur, Types of entrepreneurs, some myths and realities about entrepreneurship

6. Small scale Industries:

Introduction, Role and scope of small scale industries, concept of small scale and ancillary industrial undertakings, How to start a small scale industry, Steps in launching own venture, procedure for registration of small scale industries, various development agencies-their functions and role in industrial and entrepreneurship development, Infrastructure facilities available for entrepreneurship development in India.

7. Product planning and Development:

Introduction, Requirement of a good product design, product development approaches, Product development process, Element of Concurrent engg., Quality function development, rapid prototyping, various controlling agencies, involved - their role and formalities for getting clearance before starting individual venture

8. Financial management:

Financial concept for small-scale industries, financial requirements Financial support programmer of banks, government financial agencies, Hire-purchase facilities alternate sources of finance.

9. Marketing:

The modern concept of marketing, Definitions, functions and principle of marketing, Marketing research, Advertising, Market survey, Pre-feasibility and feasibility of project. Identification and evaluation of business opportunity, risk involved and preparation of business plan.

10. Preparation of feasibility Project Report:

Tools for evaluation of techno economic feasibility project report, SWOT analysis

Reference and Text Books:

The practice of Entrepreneurship

- By G. G. Meredith, R.E. Nelson and P.A. Neck

Handbook of Entrepreneurship

- By Rao and Pareek

Automobile Engineering

-By K.M. Gupta, Umesh Publications

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MET – 404 Power Plant Engineering

L	TP/D	Total
4	1	5

Theory	: 75 marks
Sessional	: 25 marks
Duration of Exams.	: 03 hours

1. Sources of Energy:

Conventional and non-conventional sources of energy; Importance of electrical energy; Geothermal power plants; Tidal power plants; Windmills; Solar power plants; Direct energy conversion systems; Energy sources in India; Recent developments in power plants.

2. Hydro Power Plants:

Hydrology: rainfall, runoff, hydrographs, flow duration curves; Site selection for hydro power plants; Classification of hydro power plants; Storage type hydro power plant and its operation; Estimation of power availability; Selection of water turbines; Combination of hydro power plants with steam plants; advantages and disadvantages of hydro power points.

3. Steam (Thermal) Power Plants:

Analysis of steam power cycles for power plant application; High pressure boilers- La-Mont boiler, Benson boiler; Loeffler boiler; Velox boiler; Super pressure steam power plants; Economizers; Air-preheaters; Super heaters and reheaters; Feed water heaters. General layout of thermal power plant; Site selection for thermal power plant; Coal as fuel, classification of coals, analysis of coal; Coal handling; Dead and live storage; Combustion of coal: coal burning methods, overfeed stokers, underfeed stokers, pulverized fuels and burners. Ash handling and disposal; Dust collectors. Heat balance sheet for thermal power plants.

4. Diesel Power Plants:

Introduction; Field of use; Outline of diesel electric power plant; Different systems of diesel power plant; Supercharging of diesel engines; Performance of diesel power plant; Advantages and disadvantages of diesel plants over thermal power plants.

5. Gas Turbine Plants:

Elements of plant; Thermal refinements; Performance of plants; Gas turbine characteristics; Comparison with other plants; Combined steam and gas turbine power plants.

6. Nuclear Power Plants:

Basic theory and terminology; Nuclear fission and fusion processes; Fission chain reaction; Moderation; Fertile materials; Nuclear fuels; General components of nuclear reactor; Different types of reactors; Breeder reactors; Nuclear power plants in India; Disposal of nuclear waste.

7. Fluctuating-Loads on Power Plants:

Introduction; Load curves; Different terms. and definitions; Effects of variable loads on power plant design and operations.

8. Economic Analysis of Power plants and Tariffs:

Cost of electrical energy; Selection of type of generation; selection of generating

equipment; performance and operating characteristics of power plants; Load division among generators; Tariffs methods for electrical energy.

Reference and Text Books:

1. Power Plant Engineering - By Morse

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MET- 408 Operation Research

L	TP/D	Total
3	1	4

Theory	: 75 marks
Sessional	: 50 marks
Duration of Exams.	: 03 hours

1. Introduction:

Development of operations Research, characteristics and scope of operations Research, operations Research in Management, Models in operations Research, Model Formulation, Types of mathematical models, Limitations of operations Research.

2. Linear Programming:

L.P. models, simplex method, the algebra of simplex method. (Minimization and Maximization problems), The big M method, post optimality analysis, essence of duality theory, Application of sensitivity analysis.

3. Transportation & Assignment:

Introduction to model, matrix terminology, Formulation and solution of Transportation model (least cost method, Vogel's Approximation method) , Least time transportation problem, Assignment problems.

4. Net Work Analysis:

Introduction to net work logic, Numbering of events (Fulkersen Rule), PERT calculations - Forward path, backward path. Slack, probability, comparison with PERT, Critical path, Floats. Project cost, crashing the network, updating (PERT and CPM).

5. Simulation:

Introduction, applications of simulation, advantages and limitations of simulation technique, generation of random numbers, Time-flow mechanism, simulation languages.

6. Decision Analysis:

Steps in decision theory approach, Decision machinery environment, Decision machining under certainty and uncertainty, Decision machining under conditions of risk, Decision Trees, minimum enchaind criteria, Advantages and limitations of decision tree solutions, post-optimality.

Definitbn of arguments models, comparison with transport models. Mathematical representation of assignment models, Formulation and solution of Arguments models, Variations of the Argument models, Alternate optimal solutions.

7. Queuing Theory:

Introduction, Applications of queuing Theory, Waiting time and idle time costs, single channel queuing theory and multi channel queuing theory with Poisson arrivals and exponential services, Numericals on single Channl and multi channel queuing theory.

8. Game Theory:

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MET- 408 Entrepreneurship (Practical)

L	TP/D	Total
2		2

Viva-voce : 25 marks
Sessional : 50 marks
Duration of Exams. : 03 hours

1. Exercises on assessing the industrial potentiality of any particular area.
2. Exercise on market survey for product identification and demand estimation of the product.
3. Exercise on preparation of techno economic feasibility product project report.
4. Presentation and group discussion on techno economic feasibility project report.

MET- 410 Projects - II

L	TP/D	Total
9		9

Theory : 75 marks
Sessional : 100 marks
Duration of Exams. : 03 hours

The student is expected to finish the remaining portion of the project.

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MET- 420 Non-Conventional Manufacturing

L	TP/D	Total
4	1	5

Theory	: 75 marks
Sessional	: 50 marks
Duration of Exams.	: 03 hours

1. Introduction: Unconventional machining processes, Rapid prototyping processes, their classification, considerations in process selection.

2. Ultrasonic Machining:

Elements of process, design of cutting tool, metal removal mechanism, effect of parameters, economic considerations, limitations and applications, surface finish.

3. Electrochemical Machining:

Elements of process, process chemistry, metal removal mechanism, tool design, accuracy, surface finish and work material characteristics, economics advantages, limitations and applications, Electrochemical grinding, debarring and honing, Chemical machining.

4. Electric Discharge Machining:

Principle and mechanism of metal removal, generators, electrode feed control, electrode material, tool electrode design, EDM wire cutting, surface finish, accuracy and applications,

5. Jet Machining:

Principal and metal removal mechanism of abrasive and water jet machining, process variables, design of nozzle, advantages, limitations and applications.

6. Other Machining Processes:

Plasma arc machining, Electron beam machining, Laser beam machining, their principles and metal removal mechanism, process parameters, advantages and limitations, applications.

7. Rapid Prototyping Processes:

Fundamentals, process chain, physics of processes, principles and process mechanism of SLA, SGC, LOM, FDM and SLS processes, their advantages and limitations, applications of RP processes, RP data formats, STL file format, STL file problems, STL file repair, other translators and formats.

8. Rapid Tooling Processes:

Introduction, fundamentals, classification, indirect RT processes, Principles of Silicone Rubber Molding, Epoxy Tooling, Spray Metal Tooling, Pattern for Investment Casting, Vacuum Casting, and Vacuum forming processes, direct RT processes, Shape Deposition manufacturing, their advantages, limitations and applications.

Reference and Text Books:

Modern machining processes

-By P.C. Pandey and H.S. Shan, TMH.

**DEPARTMENT OF MECHANICAL ENGG.
ELECTIVE & OPEN ELECTIVES (EIGHT SEMESTER)**

S. No	CODE	SUBJECT	REMARKS
ELECTIVE-II			
1	MET-420	Non-Conventional Manufacturing	
2	MET-422	Industrial Robotics	
3	MET-424	Reliability Engineering	
4	MET-426	Energy Management	
5	MET-430	Piping Engineering	
6	MET-432	Total Quality Management	
7	MET-434	Fluidics	
8	MET-436	Non-Conventional Energy System	
9	MET-438	Management Information System	
OPEN ELECTIVE-II			
1	CET-414	River Mechanics Food Control	
2	CET-416	Geosynthetics Engineering	
3	CET-418	Introduction to Finite Element Method	
4	CET-420	Transport Planning	
5	COT-472	Fundamental of Operating Systems	
6	COT-474	Fundamental of Computer Networks	
7	COT-476	Object oriented Software Engineering	
8	COT-478	Expert Systems	
9	COT-480	Security and Cryptography	
10	ET-462	Energy Management and Conservation	
11	ET-464	Robotics Dynamics and Control	
12	ET-466	Reliability Centered Maintenance	
13	ET-468	Process Instrumentation Control	
14	ET-470	ANNs and Fuzy Logic	
15	ET-472	Control and Guidance	
16	ET-474	Artificial Intelligence and Expert Systems	
17	ECT-436	IC Fabrication Processes	
18	ECT-438	OP-amp Applications	
19	ECT-440	Theory and Application of DSP	
20	ECT-442	Mobile Communication	
21	MET-436	Non Conventional Energy Systems	
22	MET-440	Value Engineering	
23	MET-442	Pneumatics Hydraulics Control	
24	MET-444	Air Pollution and its Control	
25	HUE-462	Entrepreneurship	
26	HUE-464	Human Resources Management	

27	HUE-466	Intellectual Property Rights	
28	MaE-468	Advanced Mathematics - II	
29	PhT - 468	Non-Destructive Testing	
30	PHT – 478	Transducers their Organization	
31	MET -420	Non Conventional Manufacturing	
32	MET-426	Energy Management	
33	MET-428	Industrial Engg. Organization	
34	MET-442	Process Equipment Design	

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