

**UNIVERSITY OF JAMMU, JAMMU**  
**FOR EXAMINATIONS TO BE HELD FOR BATCH 2013**  
**COURSE OF STUDY FOR BE 1ST SEMESTER ENGINEERING**

**BRANCH: COMMON TO ALL BRANCHES**

Course No.	Course Name	Lecture	Tutorial	Pract.	Marks			
					Theory	Sessional	Practical	Total
MTH -101	Engg. Math-1	3	2	-	100	25	-	125
PHY -102	Engg. Phy-I	3	1		100	25	-	125
CHM -103	Engg. Chem-I	3	1		100	25	-	125
M -104	Engg. Mech	3	1		100	25	-	125
HUM -105	Comm. Skills	3	1	-	100	25	-	125
M-106	Engg. Graphics	1	-	3	100	-	50	150
PHY -107	Engg. Physics Lab.	-	-	2	-	-	50	50
CHM -108	Engg. Chemistry Lab	-	-	2	-	-	50	50
M -109	Engg. Mech. Lab.	-	-	2	-	-	50	50
M -110	WS Technology	1	-	3	-	-	75	75
Total		17	6	12	600	125	275	1000

**CLASS : B.E. IST SEMESTER  
BRANCH: COMMON TO ALL**

**COURSE TITLE: ENGINEERING MATHEMATICS-I**

**COURSE NO.MTH-101**

**DURATION OF EXAM: 3 HOURS**

L	T	MARKS	
3	2	Theory	Sessional
		100	25

### **SECTION-A**

1. **Differential Calculus:**Successive differentiation, Leibnitz theorem (without proof), Partial differentiation with errors and approximations, Euler's theorem on homogeneous functions, Taylor's and Maclaurin's series of two variables, Maxima and Minima of functions of two variables, Asymptotes, Double points, curvature, Curve tracing in Cartesian, polar and parametric forms.
2. **Integral Calculus:-**Definite integrals with important properties, differentiation under the integral sign, Gamma, Beta and error functions with simple problems, applications of definite integrals to find length, area, volume and surface area of revolutions, transformation of coordinates, double and triple integrals with simple problems.

### **SECTION-B**

1. **Complex Trigonometry:**Hyperbolic functions of a complex variable, Inverse Hyperbolic functions, Logarithmic function of a complex variable, Summation of series by  $C+iS$  method.
2. **Ordinary Differential Equations:** Differential equations of first order and first degree: Exact and non-exact differential equations, Linear and Bernoulli's differential equations. Higher order linear differential equations: Complementary solution, particular integral and general solution of these equations, variation of parameters technique to find particular integral of second order differential equations, Cauchy's and Lagrange's differential equations. Applications of Ordinary Differential Equations to simple Electrical and Mechanical Engg. problems.
3. **Solid Geometry:** Sphere, Intersection of sphere and plane, tangent plane property, cone and cylinder, related problems to right circular cone and cylinder.

### **BOOKS RECOMMENDED :**

1. Engineering Mathematics B.S. Grewal, Khanna Publications, New Delhi
2. Calculus and Analytic Geometry Thomas and Finney, AddisonWesley, Narosa.
3. Differential Calculus S. Narayan, New Delhi

4. Integral Calculus

S. Narayan, New Delhi.

**NOTE:** There shall be total eight questions, four from each section. Each question carry 20 marks. Five questions will have to be attempted, selecting atleast two from each section. Use of calculator is allowed.

Subject: Engg. Mathematics – I

Course No.: MTH 101

**Course Outcomes:**

**CO101.1** Learn the rules of nth derivative, to find maximum and minimum value of any function, to trace the curves.

**CO101.2** Understand the concept of definite integrals and find arc length, area, surface area and volume of various curves

**CO101.3** Solve the differential equations of first order and higher order.

**CO101.4** Differentiate the concept of finding the equations of sphere, cone and cylinder and evaluate the complex no. in polar form and understand the idea of hyperbolic functions.

**B.E IST SEMESTER****MAXIMUM MARKS:125****BRANCH: COMMON TO ALL****SUBJECT: ENGINEERING PHYSICS-I****L****T****P****THEORY****SESSIONAL****COURSE NO.PHY-102****3****1****2****100****25****DURATION OF EXAM: 03 HOURS****SECTION-A****UNIT-I : MATHEMATICAL PHYSICS**

Review of Vector Algebra, Scalar and Vector fields, Gradient of a Scalar field, Divergence and curl of a vector field and their physical significance, solenoidal fields, Gauss Divergence theorem, Stokes theorem and their applications, Vector Identities

*No of Lectures – 10, Weightage = 25%***UNIT-II : ELECTROMAGNETIC FIELDS AND WAVES**

Gauss's law in vector notation (differential and integral forms), Applications of Gauss's law to find electric fields due to a long straight charged wire, Cylindrical and Spherical charge distributions.

Derivation of Ampere's Circuital law, Application of Ampere's circuital law to find magnetic intensity due to long cylindrical wire, due to a long solenoid. Differential & Integral form of Faraday's law of electromagnetic induction, Equation of continuity, Displacement current and its significance, Maxwell's field equations (differential and integral forms), Betaron,

Electromagnetic wave propagation in free space (e.m wave equations for  $\vec{E}$  &  $\vec{B}$  fields for free space and their solutions (plane wave solution), velocity of e.m. waves, Relation between  $E_0$  &  $B_0$  . Definition of Poynting Vector, Poynting theorem.

*No of Lectures – 16, Weightage = 25%***SECTION-B****UNIT-III : APPLIED OPTICS**

Interference in thin films (by reflection and transmission of light), Theory of Newton's rings by reflected light, Determination of wave length and refractive index of monochromatic light by Newton's theory.

Fraunhofer & Fresnel's diffractions Fresnel's half period zones and rectilinear propagation of light, Fraunhofer diffraction due to a single slit, plane diffraction grating & its theory for secondary maxima and minima.

Unpolarized and polarized light, Nicol Prism, Mathematical representation of polarization of different types, Quarter & half wave plates.

*No of Lectures – 12, Weightage = 20%***UNIT-IV : OSCILLATIONS**

Free damped and forced oscillations and their differential equations, Logarithmic decrement, power dissipation & Quality factor, ultrasonic waves and their production by Piezoelectric method and applications (General)

*No of Lectures – 05, Weightage = 15%*

**UNIT-V : FIBRE OPTICS**

Propagation of light in fibres, numerical aperture, Single mode and multimode fibres, General applications  
*No of Lectures – 05, Weightage = 15*

TUTORIALS

S.NO.	TOPICS	UNIT NO.
T-1	Numerical problems based on vector analysis	I
T-2	Numerical problems on Gradient of Scalar fields	I
T-3	Numerical problems on Divergence of Vector fields	I

T-4	Numerical problems on Curl of vector fields	I
T-5	Numerical problems based on Guass divergence theorem and Stokes Theorem	I
T-6	Numerical problems based on the applications of Guass's Law	II
T-7	Numerical problems based on the applications of Ampere's law	II
T-8	Numerical problems pertaining to the applications of Faraday's law	II
T-9	Numerical problems pertaining to the applications of Interference phenomenon, Formation of Newton's rings	III
T-10	Numerical problems pertaining to the applications of diffraction and polarization phenomenon	III
T-11	Numerical problems based on the applications of SHM, damped and forced motion of bodies and applications of ultrasonic	IV
T-12	Numerical problems based on the applications of Fibre optics	V

**NOTE: SETTING OF QUESTION PAPER (Instructions for examiners)**

- i) The question paper will consist of two sections\
  - a) Section-1
  - &
  - b) Section-II
- ii) Section-I Comprises of Unit-I and Unit-II  
Section-II Comprises of Unit-III, Unit-IV and Unit-V
- iii) Number of questions to be set in the paper =8 (eight)  
(Four from each section) as per weightage
- iv) Number of questions to be attempted =5 (five)  
(Selecting at least two from each section)

**BOOKS RECOMMENDED :**

S.NO.	TITLE	AUTHOR
1.	Vector Analysis	Spiegel
2.	Mathematical Physics	Rajput & Gupta
3.	Physics	Reisnick&Hatliday
4.	Optics	Brijlal&Subramaniam
5.	Sound	Subramaniam
6.	Sound	Khanna&Bedi
7.	Fibre Optics	Ghatak, Tyagrajan

## COURSE OUTCOMES

**CO102.1:** Students should be able to understand the mathematical concepts required to understand physics.

**CO102.2:** Students should be able to derive the Maxwell's equations and understand the basis electromagnetic theory.

**CO102.3:** Students should be able to assimilate the basic concepts of interference in thin films, diffraction, polarisation and the characteristics of different types of waves.

**CO102.4:** Students should be able to gain the knowledge about lasers, their characteristic's & properties and the basics of optical fibres

**CLASS : B.E. IST SEMESTER**

**BRANCH: COMMON TO ALL**

**COURSE TITLE: ENGG. CHEMISTRY**

**COURSE NO.:CHM-103**

**DURATION OF EXAM: 3 HOURS**

L	T	P	MARKS		
3	1	2	Theory	Sessional	Practical
			100	25	50

#### **SECTION - A**

1. **SPECTROSCOPY :** UV Spectroscopy –Electronic transitions, spectrum, shift of bonds with solvents for double bonds, carbonyl compounds and aromatic compounds.

IR-Spectroscopy –Introduction, brief idea about instrumentation, applications and interpretation of IR Spectra, characterization of functional groups and frequency shift associated with structural changes.

<sup>1</sup>H-NMR Spectroscopy –Theory of <sup>1</sup>H-NMR Spectroscopy, equivalent and non-equivalent protons, chemical shift, spin-spin coupling, spin-spin splitting, <sup>1</sup>H'-NMR spectrum of a few organic compounds.

2. **EXPLOSIVES:** Introduction, classification and types of explosives, requirement for good explosives, preparation and uses of following explosives – Nitrocellulose, TNT, Dinitrobenzene, Picric Acid, Nitroglycerine and Dynamite, Gun Power, RDX, Tetracene.

#### **SECTION - B**

1. **STEREOCHEMISTRY:**Optical isomerism, racemization, asymmetric synthesis, methods for resolution of racemic mixture, enantiomerism and diastereoisomerism.
2. **ALLOYS :**Introduction, purpose of making alloys, preparation of alloys, classification of alloys. (Ferrous and non-ferrous alloys), alloy steels & copper alloys.
3. **LUBRICANTS :**Definitions, functions of lubricants, mechanism of lubrication, classification of lubricants (Lubricating oils, semi solid lubricants and solid lubricants) synthetic lubricants, flash and fire points, oiliness, cloud and pour points.
4. **DYES AND DRUGS :**Classification of dyes and its applications. Define drug and give the applications of following drugs.



- a) Narcotics                      b) Tranquilizers                      c) Antipyretics                      d) Antibiotics

### FORMAT OF QUESTION PAPER

**Total No. of Questions** = 08

**Questions to be attempted** = 05

**(Minimum Two from Each Section A & B)**

### BOOKS RECOMMENDED :

- |    |                                   |                   |
|----|-----------------------------------|-------------------|
| 1. | Engineering Chemistry             | Jain & Jain       |
| 2. | Engineering Chemistry             | Sharma, B.K.      |
| 3. | Engineering Chemistry             | Dara, S.S.        |
| 4. | Organic Chemistry                 | Bahl, B.S.        |
| 5. | Organic Chemistry                 | Soni, P.L.        |
| 6. | Organic Chemistry                 | Jain, M.K.        |
| 7. | Spectroscopy of Organic Compounds | Silverstain       |
| 8. | Spectroscopy of Organic Compounds | Kalsi, P.S.       |
| 9. | Engineering Chemistry             | Dr.Rajinder Kumar |

### Course Outcomes:

**CO103.1** One could acquire Knowledge about the identification of newly synthesized products.

**CO103.2** Know the New drug development process.

**CO103.3** Ability to design and perform in - vitro dissolution studies for various drugs as per the standards of official monographs Combine dyeing Process and Colorants design - quality systems, develop manufacturing procedures.

**CO103.4** Know how to approach the problem of choosing an alloy for a particular application,

**CO103.5** Know the importance of stereochemistry in organic compound and apply the knowledge gain in this course to the variety of chemical compounds.

**CLASS : B.E. IST SEMESTER**

**BRANCH: COMMON TO ALL**

**COURSE TITLE: ENGINEERING MECHANICS**

**COURSE NO.M-104**

**DURATION OF EXAM: 3 HOURS**

L	T	P	MARKS		
3	1	2	Theory	Sessional	Practical
			100	25	50

### **SECTION-A (STATICS)**

Scope and basic concepts (Rigid body, force, units, etc), concept of free body diagram, Resultant of Co-planar concurrent forces in a plane and space, moment of force, Principle of Moments, Coplanar and spatial applications. Virtual work method and its applications.

Equilibrium and its equations for a planar and spatial systems, Analysis of trusses, Method of joints and sections.

Theory of friction, its laws and applications (inclined plane). Square threaded screws, Bolt friction, Centroids and center of gravity, centroids of lines and composite areas, centroids determined by integration.

Moment of inertia, Area M.O.I, Transfer theorems, Polar M.O.I, Product of inertia, Principal M.O.I, Mohr's circle for area M.O.I, Transfer theorems and axes M.O.I of composite bodies.

### **SECTION-B (DYNAMICS)**

Kinematics of a particle rectilinear motion, motion curves, Rectangular components of curvilinear motion, Flight of Projectile, Normal and tangential components of acceleration, Radial and transverse components, Newton's Laws. D'Alembert's Principle.

Kinematics of rigid bodies: Types of rigid body motion, Angular motion, fixed axis rotation, Analysis of plane motion and its applications, Instantaneous center and Instantaneous axis of rotation.

Kinetics of Particle: Translation, Analysis of a particle as a rigid body.

Kinetics of rigid bodies: Equations of plane motion, fixed axis rotation, Rolling bodies, General plane motion, Impulse and momentum in plane motion, Angular momentum.

### **RECOMMENDED BOOKS :**

- |    |  |                      |
|----|--|----------------------|
| 1. | Engineering Mechanics (Statics & Dynamics)   | Beer and Johnson     |
| 2. | Engineering Mechanics (Statics & Dynamics)   | Mariam and Kraige    |
| 3. | Engineering Mechanics (Statics and Dynamics) | Timoshenko and Young |

4. Engineering Mechanics (Statics and Dynamics) Ferdinand L Singer.

**NOTE :**There shall be total eight questions, four from each section. Five questions will have to be attempted selecting atleast two from each section. Use of calculator is allowed.

### Course Outcomes (COs)

<b>CO104.1:</b> Analyze the system of units and the conversion of units from one to another.
<b>CO104.2:</b> Demonstrate knowledge on basic calculation of forces and their resultant and resolution.
<b>CO104.3:</b> Approach to a conclusion of forces causing equilibrium.
<b>CO104.4:</b> Be proficient in the use of integral and moment methods for calculating centre of gravity.
<b>CO104.5:</b> Develop a stable, environment friendly structure for various engineering purpose using various modern tools.

**B.E 1ST SEMESTER**  
**BRANCH: COMMON TO ALL**  
**TITLE: COMMUNICATION SKILLS**  
**COURSE NO: HUM-105**  
**DURATION: 3 HOURS**

L	T	P	MARKS	
3	1	-	Theory	Sessionals
			100	25

Exercises in comprehension, grammar vocabulary, usage, pronunciation, spelling and composition based on the following texts:

- i. Contemporary English Prose  
 Edited by Menon  
 Oxford University Press
  - ii. Developing English Skills  
 Edited by Thanker, Desai and Purani  
 Oxford University Press
- Or
- English through Reading-II  
 Edited by Bhasker and Prabhu

**Note:** Test-I carries 50% weightage in the question paper and Text-II carries 50% weightage

Question Paper:

1. Six short answer questions on comprehension to be set from Text-I. Students expected to answer any three in about 150 words each (30 marks)
2. Phrases and idioms from text I to be used in sentences. (20 marks)  
 Hundred percent choices to be given
3. Completing a paragraph of which the first two or three short marks) (10 marks)  
 Sentences are given
4. Exercise on tenses from Text II (5 marks)
5. Exercises on active/passive transformation from Text-II (5 marks)
6. Forming verbs or adjectives or nouns from the given words-text-II (5 marks)
7. Propositions from text-II (5 marks)

8. Matching words and their meanings Text-II  
(5 marks)
  9. Forming words ending in-ify,-ize,-tion, ec. From Text-II  
(5 marks)
  10. Filling in the blanks with a given set of words in brackets-Text-II (5 marks)
  11. Questions on miscellaneous exercises from Text-II such as Question tags - articles etc. (5 marks)
- or
- Marking Stress or Syllable in given words.

**1. COMMUNICATION SKILLS (1<sup>ST</sup> SEMESTER) HUM-105 (COMMON TO ALL BRANCHES)**

**CO105.1:** Prepare, organize, and deliver engaging oral presentations and thus increase confidence in speaking publicly.

**CO105.2:** Write effectively for a variety of professional and social settings.

**CO105.3:** Become active readers who can articulate their thoughts, views etc. and built curiosity for other perspectives and shall be able to understand the importance of communication with others.

**CO105.4:** Interpret texts with an awareness of and curiosity for other viewpoints.

**CO105.5:** Enhance his/her vocabulary.

**CLASS: B.E. IST SEMESTER**

**BRANCH: COMMON TO ALL**

**COURSE TITLE: ENGINEERING GRAPHICS**

**COURSE NO.Eng-106**

**DURATION OF EXAM: 3 HOURS**

L	T	P	MARKS		
1	0	3	Theory	Sessional	Practical
			100	0	50

### **UNIT-1**

**Introduction:** Conventional lines and signs used in Engineering Drawing, Printing and Lettering, Curves used in Engineering Practice: Cycloidals, Involutes, Spirals and Hellices, Locus of a point on simple mechanisms.

#### **Theory and practice of Orthographic projections.**

**Projection of points and Lines:** Projections of points and lines in different quadrants w.r.t principle reference planes, Finding of true length, True inclinations and traces of lines.

**Projection of Planes:** Projections of a plane w.r.t. the principle planes in simple and inclined positions. Rotation method and the Auxiliary plane method. Space relation of a plane and a line. To locate a point on a plane given its projections. Parallel relation of lines and planes. Shortest distance between a line and a plane.

### **UNIT-2**

**Projection of Solids:** Classification and main features-Prisms and Pyramids. Projection of solids inclined to both the reference planes by (1) Rotation Method, and (II) Auxiliary plane method. Projection of solids in combination (Co-axial) in simple and inclined positions.

**Sectioning of Solids:** Object of sectioning, Types of cutting planes, True shape of section, Auxiliary views of sections of multiple co-axial solids in simple and titled conditions.

### **UNIT-3**

**Interpenetration of Solids and Intersection of Surface:** Intersection of geometrical solids/hollow sections, Tracing of lines of intersection by line method and by section method.

**Development of Surfaces:** Classification of surfaces, Methods of development-Straight line method and Radial line method, Development of solids and hollow sections in full or part development of transition pieces. To draw projections from given development.

### **UNIT-4**



**Isometric Projection:** Isometric scale, Isometric axes and Isometric planes, Isometric projection of solids and simple machine blocks.

**Orthographic Projections:** Orthographic projection of simple blocks (First & Third angles), to draw the third view from given two views. Missing lines in projection.

**RECOMMENDED BOOKS :**

- |                                       |                            |
|---------------------------------------|----------------------------|
| 1. Engineering Drawing                | N.D Bhatt                  |
| 2. Practical Geometry                 | V. Laxminarayan& GEV       |
| 3. Engineering Graphics               | K.L. Narayanan& P. Kamaish |
| 4. Principles of Engineering Graphics | P.E Giesecks               |
| 5. Engineering Graphics               | Frederic & Michelle.       |

**NOTE :** At least two questions to be attempted from Unit-I and at least one question from each of the Units-II, III and IV in the theory examination paper.

**Course Outcomes (COs)**

<b>CO106.1:</b> Draw orthographic projections of sections.
<b>CO106.2:</b> Use architectural and engineering scales with accuracy.
<b>CO106.3:</b> Work with zeal of office practices and standards.
<b>CO106.4:</b> Convert sketches to engineered drawing.
<b>CO106.5:</b> Perform auto cad two dimensional drawing.

**B.E IST SEMESTER**

**P**

**MAXIMUM MARKS**

**SUBJECT: ENGINEERING PHYSICS LAB-I**

**2**

**SESSIONAL**

**COURSE NO.: PHY-107**

**50**

<b>S.No.</b>	<b>Experiment No.</b>	<b>Title of Experiment</b>
1.	Exp-I	To plot a graph between the distance of the knife edges from the center of gravity and the time period of a compound pendulum. From the graph, find a) Acceleration due to gravity b) Radius of gyration and the moment of inertia of the bar about an axis through the center of gravity.
2.	Exp-II	To find the dispersive power of a given prism using a spectrometer.
3.	Exp-III	To find the refractive index of a given liquid using a hollow prism
4.	Exp-IV	To find the focal lengths of a convex mirror and a concave lens using a convex lens and a concave mirror respectively.
5.	Exp-V	To find the frequency of A.C mains using an electrical vibrator.
6.	Exp-VI	To draw the V-I characteristics of a forward and reverse bias P-N junction diode.
7.	Exp-VII	To study the common base characteristics of PNP junction transistor.
8.	Exp-VIII	To study the common emitter characteristics of PNP junction transistor.
9.	Exp-IX	To study the common base characteristics of NPN junction transistor.
10.	Exp-X	To study the common Emitter characteristics of NPN junction transistor.
11.	Exp-XI	To evaluate the value of Planck's constant.
12.	Exp-XII	To study the characteristics of a Solar Cell.

**NOTE:** A minimum of six experiments is to be performed in a semester.

**BOOKS RECOMMENDED :**

	<b>TITLE</b>	<b>AUTHOR</b>
1.	Practical Physics	Warnop & Flint
2.	Practical Physics	Chauhan & Singh (Vol. I & Vol. II)
3.	B.Sc. Practical Physics	C.L Arora

## **COURSE OUTCOMES**

### **C0107.1: Photoelectric Effect**

The students will be able to calculate the value of Plank's constant by using Photoelectric effect and thereby verify the Einstein's photoelectric equation.

### **C0107.2: Pn Diode**

The students will be able to understand the concepts of semiconductor diodes by studying their characteristics in forward and reverse bias modes.

### **C0107.3: Sonometer Apparatus**

The students will be able to understand the concepts of stationary waves and hence find the value for frequency of A.C Mains by using Sonometer.

### **C0107.4: Compound pendulum**

The experiment will equip the students with concepts of acceleration due to gravity, moment of inertia & radius of gyration and verify the same by using compound pendulum.

### **C0107.5: Spectrometer (Angle of prism and Refractive index of a prism)**

The students will be able to calculate the angle of prism by using spectrometer and thereby verify the laws of reflection & refraction. To verify the laws of dispersion of light and calculate the minimum deviation and hence find the Refractive Index of a Prism by using Spectrometer

<b>B.E IST SEMESTER</b>	<b>P</b>	<b>MAXIMUM MARKS</b>
<b>SUBJECT: ENGINEERING CHEMISTRY LAB</b>	<b>2</b>	<b>SESSIONAL</b>
<b>COURSE NO.: CHM – 108</b>		<b>50</b>

**CHEMISTRY PRACTICAL :**

1. Determine the percentage of  $\text{CaCO}_3$  in precipitated chalk. You are provided with 1N HCl and 0.1N NaOH.
2. To analyse the given antacid tablets.
3. Determine Volumetrically the %age purity of given sample of Ferrous sulphate, x gms of which have been dissolved per litre provided N/10  $\text{KMnO}_4$
4. Determine Volumetrically the number of molecules of water of crystallization present in the given sample of Mohr's salt, x gms. of which have been dissolved per litre provided N/10  $\text{K}_2\text{Cr}_2\text{O}_7$  (using an external indicator).
5. Determine Volumetrically the percentage of Cu in a sample of  $\text{CuSO}_4$  crystals, Z gms of which have been dissolved per litre, provided 0.1N  $\text{Na}_2\text{S}_2\text{O}_3$ .
6. To determine the coefficient of viscosity of an unknown liquid using Ostwald Viscometer.
7. Determine the surface tension of a unknown liquid using Stalagmometer.
8. To prepare a pure and dry sample of Aspirin
9. To prepare a pure and dry sample of Glucosazone
10. Determine the method of purification of organic compounds by coloumn chromatography.
11. Determine the aniline point of a given lubricating oil.

**BOOKS RECOMMENDED :**

1. Experimental Engineering Chemistry ShashiChawla
2. Lab. Manual on Engg. Chemistry Basin, S K &Sudha Rani
3. A Manual of Practical Engineering Chemistry Dr.Rajinder Kumar

**COURSE OUTCOMES OF ENGINEERING CHEMISTRY (PRACTICAL) SEMESTER I<sup>ST</sup>**

**CO108.1** Capability to visualize and understand chemical engineering unit, operations related to fluid and practical mechanics and mass transfer.

**CO108.2** To provide an overview of preparation and identification of organic compound.

**CO108.3** This course relies on quantitative analysis and makes use of simple equation to illustrate the concept involved.

**CO108.4** Handling different types of instruments for analysis of materials, using small quantity of material involved for quick and accurate results.

**B.E IST SEMESTER**

**P**

**MAXIMUM MARKS**

**SUBJECT: ENGG. MECHANICS LAB**

**2**

**SESSIONAL**

**COURSE NO.: M – 109**

**50**

**Lab work shall be based on theory course of Engineering Mechanics Paper**

**Course Outcomes (COs)**

Students will be able to:

<b>COM109.1</b> Apply the fundamentals of statics and motion principles of various engineering problems related to statics and motion.
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<b>COM109.2</b> Have the knowledge of finding the stable structures of various engineering purposes and bending of beams by using bending moment apparatus.
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<b>COM109.3</b> Solve engineering problems related to motion.
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<b>COM109.4</b> Demonstrate the knowledge on basic calculation of forces and their resultant and resolution.
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<b>COM109.5</b> Solve the engineering problems related to friction and analyse it in real life situation.
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**CLASS : B.E. IST SEMESTER**

**BRANCH: COMPUTER ENGG., CIVIL ENGG., MECH. ENGG., ELECTRICAL ENGG.,  
ELECTRONICS & COMM. ENGG.**

**COURSE TITLE: WORKSHOP TECHNOLOGY**

**COURSE NO.WS-110**

L	T	P	MARKS		
1	0	3	Theory	Sessional	Practical
			0	0	75

**COURSE CONTENT:**

Introduction to workshop as a fabrication unit. Information regarding various material of construction i.e Ferrous and Non-Ferrous, wood, plastics, etc. Basic fabrication process i.e castings, Mechanical working, welding and machining.

Wood working and pattern making practice, Information about working hand and wood working machines, various methods of joining of wooden parts for the fabrication of patterns, Pattern materials and allowances, pattern construction procedures, preservation of patterns.

Moulding and casting practice. Sand Moulding, Natural foundry sands and synthetic sands, preparation of moulding sands, mould making procedure, cast iron and aluminum and pouring, melting crucible process, Extraction of Castings.

Cold and hot working processes, basic tools and equipment used in mechanical working. Forging furnace operation, Smith forging operations.

**BOOKS:**

1. Manufacturing process and materials by Campbell.
2. Manufacturing Process by P.N. Rao
3. Workshop Technology by Hajra and Chowdhary Vol.I

**SHOP PRACTICE:**

**Unit-1                    Pattern Making:**

- i) Baring block pattern
- ii) Split pattern of "bench Vice" (Sliding Jaw).

**Unit-II                  Moulding and Casting**

Moulding and Castings of Patterns at Unit I.

**Unit-III Hand forging of:**

- i) Hexagonal headed bolt from a cylindrical rod.
- ii) Cubical Block from a Cylindrical section.

**Course Outcomes (COs)**

<b>CO110.1:</b> Able to prepare pattern making of open bearing block
<b>CO110.2:</b> Able to prepare pattern making of bench vice (Sliding Jaw).
<b>CO110.3:</b> Able to perform moulding and casting of open bearing block and bench vice .
<b>CO110.4:</b> Perform forging of hexagonal headed bolt from a cylindrical rod.
<b>CO110.5:</b> Perform forging of cubical block from a cylindrical section.



**UNIVERSITY OF JAMMU, JAMMU  
FOR EXAMINATIONS TO BE HELD FOR BATCH 2014 & ONWARDS**

**COURSE OF STUDY FOR BE 2ND SEMESTER ENGINEERING**

**BRANCH: COMMON TO ALL BRANCHES**

Course No.	Course Name	Lecture	Tutorial	Pract	Marks			
					Theory	Sess.	Pract	Total
MTH –201	Engineering Math-1I	4	2	-	100	25	-	125
PHY -202	Engineering Phy-II	3	1	-	100	25	-	125
CHM -203	Engineering Chem-II	3	1	-	100	25	-	125
COM -204	Computer Programming	3	1	-	100	25	-	125
HUM-205	Engineering Economics	3	1	-	100	25	-	125
M -206	Machine Drawing-I	1	-	3	100	25	-	125
M -207	Workshop Technology-II	1	-	3	-	-	75	75
PHY –208	Engineering Physics II Lab	-	-	2	-	-	50	50
CHM –209	Engineering Chemistry II Lab	-	-	2	-	-	50	50
COM –210	Computer Programming Lab	-	-	2	-	-	75	75
<b>Total</b>		18	6	12	600	150	250	1000

**B.E 2<sup>ND</sup> SEMESTER**

**MAXIMUM MARKS:125**

**COURSE NO: MTH-201**

**L T**

**THEORY**

**SESSIONAL**

**COURSE TITLE: ENGG. MATH-II**

**4 2**

**100**

**25**

**BRANCH : COMMON TO ALL**

**DURATION OF EXAM: 3 HOURS**

### **SECTION-A**

- 1. Introduction to infinite series & sequences:-** Convergence and divergence of a series, Leibnitz test, p-test, comparison test, Cauchy's root test, D' Alembert Ratio Test, Raabe's Test, Logarithmic test, alternating series..
- 2. Fourier Series:** Introduction, Euler's formulae, sufficient conditions for a Fourier expansion, functions having points of discontinuity, change of intervals. Odd and even functions, Fourier expansion of Odd and even periodic functions, half range series, typical wave forms, Parseval's formula, complex form of Fourier -series.
- 3. Power Series Solutions of Second order O.d.e:** Analytic function, ordinary point, singular point, regular and irregular singular points of o.d.e.  $Y'' + P(x)Y' + Q(x)Y=0$ , Series solution of such differential equations about an ordinary point, Frobenius series solution about a regular singular point.

### **SECTION-B**

- 2. First Order partial differential equations:-**  
Formation of p.d.e, First order linear p.d.e, Non-Linear p.d.e. of 1st order, solution by Charpit's method, Four Standard forms of non-linear p.d.e with reference to Charpit's technique.
- 3. Higher Order Linear p.d.e:** Homogenous and Non-homogenous higher order linear partial differential with constant coefficient inverse operator  $1/f (D,D')$ , Rules for finding P.I and C.F, Non-Linear equations of 2<sup>nd</sup> order. Application of p.d.e, method of separation of variables to solve equations of vibrations of strings (or one dim wave equation), one dim and two dim heat flow equations, Laplace equations, transmission line).
- 4. Matrices & determinants:** Introduction, Rank of matrix, Elementary transformations, Elementary matrices, Inverse using elementary transformation, Normal form of a matrix, Vector spaces, Linear dependence and independence of vectors, consistency of linear system of equations, linear and orthogonal transformations, Eigen values and Eigen vector, Properties of Eigen value, Cayley Hamilton Theorem, Reduction to diagonal form, Reduction of quadratic form to canonical form, complex matrices.

### **BOOKS RECOMMENDED :**

1. Advanced Engineering Mathematics by R.K. Jain, S.R.K Iyenger, 2<sup>nd</sup> edition, Narosa, New Delhi.
2. Higher Engineering Mathematics Dr. B.S. Grewal
3. Engineering Mathematics Dr. Bhopinder Singh
4. Engineering Mathematics B.S. Grewal  
Publication, New Delhi. Khanna

5. Partial differential equations

Singhania

**NOTE :** There shall be total eight questions, four from each section. Each question carry 20 marks. Five questions will have to be attempted, selecting atleast two from each section. Use of calculator is allowed.

**Course Outcomes:**

<b>CO201.1</b> Learn the concept of linear and non- linear partial differential equations.
<b>CO201.2</b> Understand the concept of Fourier series of any function
<b>CO201.3</b> Apply the concept of analyticity of functions for the expansions of second order differential equations.
<b>CO201.4</b> Find the rank, Eigen values/ vectors of matrices, solve simultaneous linear equations, <b>CO201.5</b> Find inverse of matrices using normal forms and evaluate the convergence and divergence of a given sequence of series

**B.E IIND SEMESTER (COMMON COURSE)****MAXIMUM MARKS:125****COURSE NO. PHY-202****L T****THEORY****SESSIONAL****COURSE TITLE : ENGINEERING PHYSICS-II****3 1****100****25****BRANCH : COMMON TO ALL****DURATION OF EXAM: 3 HOURS**

<b>UNIT-1</b>	<b>RELATIVISTIC DYNAMICS</b>	<b>NO. OF LECTURES</b>	<b>WEIGHTAGE</b>
	Concept of Relativity, Frames of reference, Galilean Transformations, Michelson and Morley's experiment, Postulates of Special Theory of relativity, Lorentz transformations, Length Contraction, Time dilation, variation of mass with velocity (Velocity addition), mass energy equivalence ( $E^2=P^2c^2+m_0^2c^4$ ).	10	25%
<b>UNIT-II</b>	<b>WAVE-PARTICLE DUALITY</b> Black Body radiation spectrum (Characteristics & Energy distribution), Wien's laws, Rayleigh Jeans Law excluding mathematical derivations, ultraviolet Catastrophe, Planck's hypothesis and Planck's radiation law, Explanation of black body radiation characteristics on the basis of Planck's law, photon concept. Compton effect, derivation of the direction of emission and the change in wavelength of scattered photons, direction of recoil electron and discussion of observed results. DeBroglie's hypothesis, concept of matter waves, Davisson & Germer's experiment, wavepacket, Phase and Group velocity, Heisenberg's uncertainty principle. Experimental illustration of uncertainty principle using single slit.	12	25%
<b>UNIT -III</b>	<b>QUANTUM MECHANICS</b> Wave function definition, interpretation and significance of wave function, Schrodinger's wave equations (Steady-State and time dependent) for 1-dim case, concept of operators and expectation values, Applications of Schrodinger's equation (Time independent) to a) Particle in a 1-dimensional box of infinite height, b) single step potential barrier, c) Tunnel effect, d) Quantum Mechanical harmonic oscillator with concept of Zero point energy.	14	25%
<b>UNIT-IV</b>	<b>SOLID STATE PHYSICS</b> Intrinsic & extrinsic semi-conductors, Fermi & impurity levels, Impurity compensation, charge neutrality equation and semi-conductor conductivity. Einstein's relation, drift and diffusion current. Introductory	7	15%

concepts of advanced materials viz; conducting polymers dielectric materials, Nanomaterials, Smart materials and High  $T_c$  materials.

**UNIT-V**

**LASERS**

Principle of Laser action, population Inversion, Einstein's Coefficients, He-Ne & Ruby Lasers, Holography

5

10%

**TUTORIALS**

**B.E IIND SEMESTER**

**SUBJECT: ENGG: PHYSICS-II  
COURSE NO.PHY-202**

<b>S.NO.</b>	<b>TOPICS</b>	<b>UNIT NO.</b>
T-1	Numerical problems based on Length contraction & time dilation	I
T-2	Numerical problems based on variation of mass, energy mass equivalence etc.	I
T-3	Numerical problems pertaining to energy spectrum of Black body radiations, Wien's displacement/R-J laws, Planck's law	II
T-4	Numerical problems based on photo-electric effect, work functions	II
T-5	Numerical problems based on Compton effect, recoil energy of electron etc.	II
T-6	Numerical problems based on the characteristics of De-broglie waves, Davisson-Germer's Expt.	II
T-7	Numerical problems related to Heisenberg's uncertainty principle	II
T-8	Numerical problems based on Schrodinger's wave equation, expectation values of certain physical quantities and operators	III
T-9	Numerical problems to find the Eigen function and eigen values for particle in a box	III
T-10	Numerical problems to find the reflection and transmission co-efficients for a particle penetrating a potential barrier	III
T-11	Simple numerical problems based on finding the bandgaps in semi-conductor materials etc.	IV
T-12	Simple numerical problems based on finding the energy level difference in Lasers etc.	V

**NOTE:** SETTING OF QUESTION PAPER (Instructions for Examiners)

- i) The question paper will consist of two sections
  - a) Section-I  
&
  - b) Section-II
- ii) Section-I Comprises of Unit-I and Unit-II  
Section-II Comprises of Unit-III, Unit-IV and Unit-V
- iii) Number of questions to be set in the paper =8 (eight)

(Four from each section as per weightage)

- iv) Number of questions to be attempted =5 (five)  
(Selecting at least two from each section)

**BOOKS RECOMMENDED :**

<b>TITLE</b>	<b>AUTHOR</b>	
1) Modern Physics	Beiser	
2) Modern Physics		Blatt
3) Modern Physics	Gupta & Gupta	
4) Basic Electronics	Millman&Halkias	
5) Material Science	Kakani, AmitKakani	S.L.

**COURSE OUTCOMES**

**PHYSICS-II**  
**COURSE NO.PHY-202**

<b>CO202.1:</b> Students should be able to understand the mathematical concepts required to understand physics.
<b>CO202.2:</b> Students should be able to derive the Maxwell's equations and understand the basis electromagnetic theory.
<b>CO202.3:</b> Students should be able to assimilate the basic concepts of interference in thin films, diffraction, polarization and the characteristics of different types of waves.
<b>CO202.4:</b> Students should be able to gain the knowledge about lasers, their characteristic's & properties and the basics of optical fibers.

**B.E 2<sup>ND</sup> SEMESTER**

**MAXIMUM MARKS:125**

**COURSE NO: CHM-203**

**L**

**T**

**THEORY**

**SESSIONAL**

**COURSE TITLE: ENGG. CHEM-II**

**3**

**1**

**100**

**25**

**BRANCH : COMMON TO ALL**

**DURATION OF EXAM: 3 HOURS**

### **SECTION-A**

1. **ENVIRONMENTAL CHEMISTRY :**

Concept of Environmental chemistry, segments of environment (a brief idea about atmosphere, hydrosphere and lithosphere)

**AIR POLLUTION** –Introduction, Types of air pollution and control of air pollution.

**WATER POLLUTION** : Introduction, Sources of water pollution and methods of controlling water pollution.

**CHEMICALS AND METAL TOXICOLOGY** (Biochemical effects of Pb, Hg, As, Zn, Cd, Ni, Se, CN, O<sub>3</sub> and pesticides in brief on man).

2. **INORGANIC CEMENTING MATERIALS :**

Cement and Lime – Introduction, classification of lime, manufacture and properties of lime, setting and hardening of lime.

Cement, types of cement, manufacture of Portland cement, setting and hardening of cement.

3. **WATER TREATMENT**

Introduction, types of water, softening of water by different processes, chemical methods and sterilization, priming and foaming, sludge and scale formation, determination of hardness of water by soap titration method and EDTA method. Radioactivity of water, numericals on hardness and softening of water.

### **SECTION-B**

1. **PLASTICS:**

Introduction, importance of plastics and uses, classification of plastics, moulding constituents of a plastic, moulding of plastics into articles ( compression moulding, injection moulding, transfer moulding and extrusion moulding) Preparation , properties and uses of following plastic materials:

a) Polymethyl methacrylate      b) Epoxy resins    c) Alkyd resins.

2. **RUBBER**

Introduction , types of rubber, treatment of latex, vulcanization of rubber, preparation, properties and uses of following synthetic rubber: Buna-S, Buna-N & Butyl rubber.

3. **PAINTS**

Introduction, requisites of a good paint, constituents of a paint, manufacture of a paint, properties and uses of important white pigments such as white lead, Zinc oxide and Lithophone.

**BOOKS RECOMMENDED :**

- |    |                                     |                   |
|----|-------------------------------------|-------------------|
| 1. | Engineering Chemistry               | Jain & Jain       |
| 2. | Engineering Chemistry               | Sharma, B.K.      |
| 3. | Engineering Chemistry               | Dara, S.S.        |
| 4. | Engineering Chemistry               | Shashi, Chawla    |
| 5. | Organic Chemistry                   | Bahl, B.S.        |
| 6. | Environmental Chemistry             | De, A.K.          |
| 7. | Textbook of Environmental Chemistry | Tyagi&Mehra       |
| 8. | Polymer Science<br>etal.            | Gowrikar, V.R.    |
| 9. | Engineering Chemistry               | Dr.Rajinder Kumar |

**NOTE :** There shall be total eight questions, four from each section. Each question carry 20 marks. Five questions will have to be attempted, selecting atleast two from each section. Use of calculator is allowed.

**COURSE NO: CHM-203**

**COURSE TITLE: ENGG. CHEM-II**

**COURSE OUTCOMES:**

<b>CO203.1.</b> Explain the air quality, emission, pollution control and Environmental. Health.
<b>CO203.2.</b> The different polymerization processes used to make thermoplastic and thermosetting plastics.
<b>CO203.3.</b> Recognise the common physical, chemical process encountered in treatment process of water.
<b>CO203.4</b> Define basic knowledge on cement, its production, characteristics, properties etc.
<b>CO203.5</b> Summarize the chemical structure, molecular properties, vulcanization process and application of major type of rubber.



**CLASS: B.E 2<sup>nd</sup> SEMESTER**

**BRANCH: COMMON FOR ALL**

**COURSE TITLE: COMPUTER PROGRAMMING USING C**

**COURSE NO: COM –204**

**DURATION OF EXAM: 3 HOURS**

<b>L</b>	<b>T</b>	<b>P</b>	<b>MARKS</b>	
<b>3</b>	<b>1</b>	<b>-</b>	<b>Theory</b>	<b>Sessionals</b>
			<b>100</b>	<b>25</b>

### **SECTION-A**

1. Basic structure of Computer, Stored Program Concept, Binary Arithmetic – Addition, Subtraction, Multiplication, Data Representation – Fixed and Floating Point, Semiconductor Memories.
2. Introduction to C, Data Types, Constants, Variables, Expressions, Statements, Operators, Data Input and Output.
3. Control Statements, Arrays, Recursion, Storage Classes, Library Functions.

### **SECTION-B**

4. Functions, User Defined Data Types, Structures, Unions, Passing Structure to Functions.
5. Pointers, Operation on Pointers, Passing Pointers to Functions, Data Files – Opening, Closing, Creating Data Files

### **BOOKS RECOMMENDED:**

1. Programming With C - Byron Gottfried.
2. Programming With C - E. Balaguruswamy.
3. C The CompleteReferance - Herbert Schildt.
4. Let us C - YashwantKanitkar.
5. Digital Computer Fundamentals - Thomas C. Bartee.
6. Digital Computer Design - V. Rajaraman.

**NOTE:** There will be eight questions of 20 marks each, four from each section. Students are required to attempt five questions selecting atleast two questions from each section. Use of Calculator is allowed.

**COURSE TITLE: COMPUTER PROGRAMMING USING C**

**COURSE NO: COM –204**

**Course Outcomes:**

<b>CO204.1</b> Remember the fundamentals of C programming.
<b>CO204.2</b> Understand the use of loops and decision making statements to solve the problems.
<b>CO204.3</b> Apply different operations on arrays and user-defined functions to solve real-time problems.
<b>CO204.4</b> Analyze the operation of pointers, structures and unions.
<b>CO204.5</b> Implement file operations in C programming for a given application.

**B.E. 2<sup>ND</sup> SEMESTER**

**MAXIMUM MARKS: 125**

**COURSE NO. HUM-205**

**THEORY      SESSIONAL**

**COURSE TITLE: ENGINEERING ECONOMICS      L    T**

**100                  25**

**BRANCH: COMMON TO ALL                  3    1**

**DURATION OF EXAM : 3 HOURS**

**SECTION-A**

**UNIT-1**

Definitions of Economics

- a) Science of Wealth
- b) Science of Material Welfare
- c) Science of Scarcity

Economic System

- a) Features of Capitalism
- b) Features of Socialism
- c) Features of Mixed Economy

**UNIT-II**

Consumer Behaviour

- a) Cardinal Utility Analysis: The Concept and Utility Maximisation: Laws of Diminishing Marginal Utility and Equi-Marginal Utility.
- b) Ordinal Utility Analysis: Meaning and Properties of Indifference Curves and Utility Maximization.

Demand Theory:

- a) Meaning of Demand and law of Demand
- b) Factors Affecting Demand
- c) Elasticity of Demand (Price Elasticity, Income Elasticity and Cross Elasticity)
- d) Demand Forecasting

**SECTION-B**

**UNIT-III**

Theory of Production:

- a) Factors of Production and Production Function.
  - b) Isoquants : Meaning & Properties
  - c) Law of Variable Proportions & Returns to scale
- Costs and Cost Analysis

- a) The Concept of Marginal, Average, Fixed and Variable Costs.
- b) The Shape of Fixed, Average and Marginal Cost Curves (short run)

Market and Market Structures

- a) Meaning and Feature of Perfect Competition, Monopolistic Competition, Oligopoly and Monopoly.
- b) Price Determination Under Perfect competition and monopoly.

**UNIT-IV**

Some commonly used Economic Concepts

- a) Meaning, Types and Methods to Control Inflation.
- b) Concept of Stock Market
- c) Meaning & Concept of National Income
- d) Functions of Commercial Bank & Central Bank
- e) Features of Development and Under Development
- f) Meaning & Phases of Trade/Business Cycle
- g) Index Number : Construction and difficulties in measurement of Index Number.

**BOOKS RECOMMENDED :**

- |    |              |   |
|----|--------------|---|
| 1. | K.K.Dewett   | : Modern Economic Theory                  |
| 2. | H.L Ahuja    | : Advanced Economic Theory                |
| 3. | M.L. Jhingan | : Macro Economics                         |
| 4. | P.N Chopra   | : Business Economics/Advanced Eco. Theory |

**NOTE:** There shall be total eight questions, four from each section. Each question carry 20 marks. Five questions will have to be attempted, selecting atleast two from each section. Use of calculator is allowed.

**1. ECONOMICS (2<sup>nd</sup> SEMESTER) HUM-205 (COMMON TO ALL BRANCHES)**

<b>CO205.1:</b> Understand difference between classical and modern economic views.
<b>CO205.2:</b> Understand business environment of a country of which every business manager has to be aware in order to execute successfully.
<b>CO205.3:</b> Apply the laws in daily routine and be able to become a rational consumer and purchaser.
<b>CO205.4:</b> Suggest producing the products at minimum cost by studying in detail about the cost curves and market structures.
<b>CO205.5:</b> Apply the knowledge of macroeconomics such as national income, index numbers, business cycle etc.

**B.E. 2<sup>ND</sup> SEMESTER**

**MAXIMUM MARKS: 125**

**COURSE NO. M-206**

**THEORY      SESSIONAL**

**COURSE TITLE: MACHINE DRAWING-I**

**L    P            100            25**

**BRANCH: COMMON TO ALL**

**1    3**

**DURATION OF EXAM : 3 HOURS**

**SECTION-A**

1. I.S. Code for Machine Drawing.
2. Types of Sections and Recommended Scale, Dimensioning and Sectioning of Machine elements.
3. Drawing and sketching of machine elements in Orthographic Projections.
4. Different types of Joints: Riveted joints, Threaded fasteners, Knuckle joint, Cotter Joints: Gib and Cotter, Sleeve and Spigot.
5. Stud assembly, Pipe joints including expansion joint.
6. Shaft pulley, cone pulley, Fast and loose pulley, etc.

**SECTION-B**

1. Simple assemblies: Shaft couplings and Clutches, Muff Coupling, Split muff, Flange Couplings: Solid and Flexible, Protected and Unprotected, Universal Coupling.
2. Bearings: Pedestal bearing including Hanger bearings, Pivot bearing and Swivel bearing.

**RECOMMENDED BOOKS:**

1. Machine Drawing P.S. Gill
2. Machine Drawing Sidheshwar and Kannaih
3. Machine Drawing N.D. Bhatt

**NOTE:-**

1. There will be Six questions in all, five from **Section- A** (each of 15 marks) and one Compulsory question of 55 marks from **Section - B**.
2. Students are required to attempt Four questions in all, three form Section-A and one compulsory question involving assembly from **Sections–B**.

<b>Course Outcomes (COs)</b>
<b>CO206.1:</b> Helping the student in drafting their technical ideas.
<b>CO206.2:</b> Creating knowledge about the various practices with regard to the dimensioning, sectioning and development of views.
<b>CO206.3:</b> Understanding the importance of the linking functional and visualization aspects in the preparation of the part drawing.
<b>CO206.4:</b> Preparation of the part or assembly drawings as per the conventions.
<b>CO206.5:</b> Interpretation of machine drawings that in turn helps the students in the preparation of the production drawings Machine Drawing Conventions.

**B.E 2<sup>ND</sup> SEMESTER****MAXIMUM MARKS : 75****COURSE NO: M-207****L P****PRAC/LAB****COURSE TITLE: WORKSHOP TECHNOLOGY-II****1 3****75****BRANCH : COMMON TO ALL****DURATION OF EXAM : 3 HOURS****WELDING SHOP**

1. Introduction to Welding as a fabrication process, Welding application and general safety precautions.
2. Introduction to Gas and Arc welding processes.
3. Preparation of single V-butt joint by Gas and Arc welding processes.
4. Preparation of double V-butt joint, Lap joint, Tee joint and Corner joint by Gas and Arc welding processes.

**FITTING SHOP**

1. Assembly of Snap fitting of flat pieces (Male, Female).
2. Assembly and fitting of two L-shaped rectangular flat pieces.

**SHEET METAL SHOP**

1. Introduction to sheet metal tools.
2. Practice of making regular geometrical and traditional shapes in sheet metal, which includes:
  - a) Square elbow
  - b) Tee joint
  - c) Funnel making
  - d) Tray and riveted handle.



### Course Outcomes (COs)

<b>CO207.1:</b> Perform welding process like Arc and Gas welding .
<b>CO207.2:</b> Able to prepare single V butt joint, double V butt joint, Lap joint, Tee joint and corner joint.
<b>CO207.3:</b> Perform Assembly of Snap fitting of flat pieces.
<b>CO207.4:</b> Perform Assembly and fitting of two L shaped flat piece.
<b>CO207.5:</b> Perform various sheet metal process like square elbow, funnel making and tray and riveted handle.

**B.E 2<sup>ND</sup> SEMESTER**

**MAXIMUM MARKS : 50**

**COURSE NO: PHY-208**

**P**

**PRAC/LAB**

**COURSE TITLE: ENGINEERING PHYSICS LAB-II**

**2**

**50**

**BRANCH : COMMON TO ALL**

**DURATION OF EXAM : 3 HOURS**

<b>S.NO.</b>	<b>EXPERIMENT NO.</b>	<b>TITLE OF EXPERIMENT</b>
1.	Exp-1	To determine the wavelength of sodium light using a plane diffraction grating.
2.	Exp-II	To find the wavelength of a monochromatic source of light using Fresnel's Biprism.
3.	Exp-III	To determine the specific rotation of sugar using Laurent's half shade polarimeter.
4.	Exp-IV	Verification of Faraday's laws.
5.	Exp-V	To find the wavelength of monochromatic light using Newton's rings Apparatus.
6.	Exp-VI	To find the coefficient of self-induction of a coil by Anderson's bridge using head phone.
7.	Exp-VII	To determine the value of e/m for electron by a long solenoid (Helical method).
8.	Exp-VIII	To find the impedance of LCR series and parallel circuits.
9.	Exp-IX	To study the Zener diode characteristics.
10.	Exp-X	To find the specific resistance of given wire by using Carey Foster's Bridge.
11.	Exp-XI	To find the wavelength of He-Ne gas laser.
12.	Exp-XII	To find the diameter of a thin wire using He-Ne gas laser.

**NOTE:** AT LEAST A MINIMUM OF SIX EXPERIMENTS IS TO BE PERFORMED IN A SEMESTER.

**BOOKS RECOMMENDED :**

	<b>TITLE</b>	<b>AUTHOR</b>
1.	B.Sc Practical physics	C.L. Arora
2.	Practical Physics	Worsnop & Flint
3.	Practical Physics	Chauhan & Singh (Vol. I & Vol. II)

**Course Outcomes:**

**C0208.1 : LCR CIRCUIT**The experiment will give the students an insight about the working principle of LCR circuit and measurement of its impedance parameter.

**C0208.2: Newton rings**

The experiment will give the students an insight about the interference by using thin films and enable them to calculate the Wavelength of monochromatic light.

**C0208.3: Diffraction grating and Polarimeter**

The students will get an idea related to the diffraction of light using a transmission grating and thus find out the wavelength of monochromatic light. The students will also be able to understand the concepts of polarisation of light and its rotation through optically active solutions by using Laurent's half shade polarimeter.

**C0208.4: Self induction of a coil and Tangent galvanometer**

This experiment will enable the students to work on the principles of wheat stone bridge and thereby calculate the self-induction of a given coil by Anderson's method using a headphone. The students will be able to verify Biot's Savart's Law by calculating the variation of magnetic field with distance along the axis of a circular coil.

**C0208.5: PNP Transistor**

The students will be able to understand the functioning of PNP transistors for various combinations in forward and reverse bias.

**B.E 2<sup>ND</sup> SEMESTER**

**MAXIMUM MARKS : 50**

**COURSE NO: CHM-209**

**P**

**PRAC/LAB**

**COURSE TITLE: ENGINEERING CHEMISTRY LAB-II**

**2**

**50**

**BRANCH : COMMON TO ALL**

**DURATION OF EXAM : 3 HOURS**

### **EXPERIMENTS**

1. Determine the total hardness of a sample of water by complexometric method (using EDTA).
2. Determine the chloride content in supplied water sample using Mohr's method (Argentometric method).
3. Determine dissolved oxygen in the given sample of water (winkler's method).
4. Determine the free chlorine in the given sample of water.
5. Determine the acidity of a given water sample.
6. Determine the alkalinity of a given water sample.
7. Determine the percentage of calcium oxide in cement.
8. Organic Analysis: Identify the following organic compounds (preparation of at least one derivative).
  - a) Carboxylic acids
  - b) Compounds containing alcoholic and phenolic OH groups
  - c) Aldehydes & Ketones
  - d) Carbohydrates
  - e) Amides, amines, anilides and nitro compounds
  - f) Hydrocarbons
  - g) Compounds containing sulphur or halogen

### **LIST OF BOOKS RECOMMENDED**

1. Experimental Engineering Chemistry ShashiChawla
2. Lab. Manual on Engineering Chemistry Basin, S K & Sudha Rani
3. A Manual of Practical Engineering Chemistry Dr. Rajinder Kumar

**COURSE NO: CHM-209**

**COURSE TITLE: ENGINEERING CHEMISTRYLAB-II**

**COURSE OUTCOMES:**

<b>CO209.1</b> Capable to visualize and understand chemical engineering unit, operations related to fluid and practical mechanics and mass transfer.
<b>CO209.2</b> Provide an overview of preparation and identification of organic compound.
<b>CO209.3</b> Relies on quantitative analysis and make use of simple equation to illustrate the concept involved.
<b>CO209.4</b> Handle different types of instruments for analysis of materials, using small quantity of material involved for quick and accurate results.

**B.E 2<sup>ND</sup> SEMESTER**

**MAXIMUM MARKS : 75**

**COURSE NO: COM-210**

**P**

**PRAC/LAB**

**COURSE TITLE: COMPUTER PROGRAMMING**

**2**

**75**

**USING C LAB.**

**BRANCH : COMMON TO ALL**

**DURATION OF EXAM : 3 HOURS**

The practicals will be based on the topics covered under Theory Syllabus. The Students are required to perform at least 15 Programs.

**COURSE TITLE: COMPUTER PROGRAMMING USING C LAB.**

**COURSE NO: COM-210**

**Course Outcomes:**

<b>CO210.1</b> Read, understand and trace the execution of programs written in C language.
<b>CO210.2</b> Exercise conditional and iterative statements to write C programs.
<b>CO210.3</b> Implement Programs using operators, arrays and pointers to access functions.
<b>CO210.4</b> Write programs that perform operations using derived data types and files.

**UNIVERSITY OF JAMMU, JAMMU**

**COURSE SCHEME**

**FOR B.E. 3RD SEMESTER MECHANICAL ENGINEERING BRANCH**

**FOR EXAMINATIONS TO BE HELD FOR BATCH 2014 & ONWARDS**

Course No.	COURSE NAME	Hours/ Weeks			Marks			
		L	T	P	Thry.	Sess.	Pract.	Total
M-301	Engineering Thermodynamics	3	2	0	100	25	0	125
M-302	Fluid Mechanics	3	2	0	100	25	0	125
M-303	Machine Drawing-I	1	0	4	100	0	50	150
M-304	Mechanics Of Solids-I	3	2	0	100	25	0	125
M-305	Production Technology-I	3	2	0	100	25	0	125
M-306	Theory Of Machine-I	3	1	0	100	25	0	125
M-307	Engineering Thermodynamics Lab.	0	0	2/2	0	0	50	50
M-308	Fluid Mechanics Lab.	0	0	2/2	0	0	50	50
M-309	Mechanics Of Solids Lab.	0	0	2/2	0	0	50	50
M-310	Theory Of Machine Lab.	0	0	2/2	0	0	25	25
M-311	Workshop Practice-I	0	0	3	0	0	50	50
	<b>TOTAL</b>	<b>16</b>	<b>9</b>	<b>11</b>	<b>600</b>	<b>125</b>	<b>275</b>	<b>1000</b>

**CLASS: B.E. 3<sup>RD</sup> SEMESTER**

**Hours/ Week**

**MARKS**

**BRANCH: MECHANICAL ENGINEERING**

**L T P Theory Sessional Paractical**

**COURSE TITLE: ENGG. THERMODYNAMICS**

**3 2 0 100 25 0**

**DURATION OF EXAMINATION: 3 HOURS.**

**COURSE NO.: M-301**

## **COURSE OUTCOMES (CO's)**

<b>CO301.1:</b> Apply fundamental concepts of thermodynamics to engineering applications.
<b>CO301.2:</b> Estimate thermodynamic properties of substances in gas and liquid states.
<b>CO301.3:</b> Determine thermodynamic efficiency of various energy related processes.
<b>CO301.4:</b> Observe and distinguish the different thermodynamic processes around them and think creatively.
<b>CO301.5:</b> Read data from various defined steam tables and psychometrics tables.

### **UNIT-1**

Basic concepts and definitions, equilibrium, concept of thermal equilibrium, Zerothlaw and concept of temperature.

Concept of work-first law of thermodynamics, concept of energy, definition of heat open system, concept of enthalpy, specific heats, steady flow energy equation and related applications.

### **UNIT-2**

Second law of thermodynamics and applications, various statements and their equivalence, reversible process and reversible cycle, Carnot theorem, concept of thermodynamic temperature scale, Clausius theorem.

### **UNIT-3**

Entropy , Concept of entropy, calculations of change in entropy, reversibility and irreversibility, Clausius inequality, Law of increase in entropy of universe. Applications of entropy principle, First and second laws combined.Availability in Steady flow & non-flow systems, Helmholtz & Gibbs function.

### **UNIT-4**

State postulate and thermodynamic relations--Maxwell's relations, specific heat relations--Properties of ideal gas and process calculations--Use of steam tables & chart and process calculations. Mixtures of ideal gases and vapours and process calculations. Psychrometry&elementry property calculations.

### **RECOMMENDED BOOKS :**

1. Engineering Thermodynamics P.K. Nag --Tata McGraw Hill
2. A Course in Thermodynamics Joseph Kestin --H.P.C. Washington
3. Heat and Thermodynamics M.W. Zemansky --McGraw Hill, New York.



**NOTE :**

1. Five questions out of eight to be attempted by the student selecting at least one from each unit in the theory examination paper.
2. Use of Steam tables, Mollier chart and scientific calculator will be allowed in the examination hall.

**CLASS: B.E. 3<sup>RD</sup> SEMESTER**

**Hours/ Week**

**MARKS**

**BRANCH: MECHANICAL ENGINEERING**

**L**

**T**

**Theory**

**Sessional**

**COURSE TITLE: FLUID MECHANICS**

**3**

**2**

**100**

**25**

**DURATION OF EXAMINATION: 3 HOURS.**

**COURSE NO.: M-302**

**Course Outcomes (COs)**

<b>CO302.1:</b> Determine the fluid flow as it is the main component which decide power associated with the fluid.
<b>CO302.2:</b> Determined energy associated with fluid flow in a channel or a steam.
<b>CO302.3:</b> Know the nature fluid in order to choose appropriate fluid as per need
<b>CO302.4:</b> determine losses occurred when dealing with a fluid flowing in a channel
<b>CO302.5:</b> determine friction factor from Darcy-Weisbach equation.

**UNIT-1**

Fluids and their properties, Fluids-shear stress in a moving fluid-difference between solids and fluids-viscosity - Newtonian and Non-Newtonian fluids - viscosity in liquids and gases - continuum concepts of a fluid - density-surface tension - capillarity.

Fluid Statics : Pressure-variation of pressure in a static fluid - absolute and gauge pressure-measurement of gauge pressure-hydrostatic forces on plane and curved surfaces-centre of pressure - buoyancy and stability of submerged and floating bodies - metacentric heights.

## UNIT-2

Kinematics of Fluid Flow: Eulerian and Lagrangian approaches, classification of fluid flow as steady and unsteady flow, uniform and non-uniform flow, laminar and turbulent flow - pathline, stream line, streak line and stream tube - one, two and three dimensional flow - velocity and acceleration in steady and unsteady flow. Basic hydrodynamics: ideal fluids - equation of continuity in the differential form - rotational and irrotational flow - circulation and vorticity - stream function. Euler's equation for unsteady flow in three dimensions - one dimensional flow along a stream of velocity, Bernoulli's equation and its applications - pitot and pitot-static tubes - venturimeter, flow nozzles, notches and weirs.

## UNIT-3

Basic equations of Fluid Mechanics : System and control volume approaches - equation of continuity, momentum equation and energy equation for a control volume - adaptation of these equations to one dimensional flow - velocity and momentum correlation - application of momentum equation to straight and bent, uniform and reducing conduits.

## UNIT-4

Steady flow of incompressible fluids in Pipes, Laminar and Turbulent flows, critical Reynold's number - hydraulic radius - general equation for friction, friction in non-circular pipes - Darcy Weisbach equation - eddy viscosity - development of boundary layer in pipe's flow, smooth and round pipes, friction factor and mean wall shear stress - Moody's Chart, Minor losses in pipes.

### RECOMMENDED BOOKS :

- |    |   |   |
|----|---|---|
| 1. | Fluid Mechanics   | VL Streeter                                     |
| 2. | Fluid Mechanics with International Student Engineering Applications Hill ). | Dougherty & Franzini -- Edition ( McGraw Hill ) |
| 3. | Engineering Fluid Mechanics   | Roberson & Crowe                                |
| 4. | Fluid Mechanics ELBS.   | Massey --                                       |
| 5. | Fluid Mechanics   | KL Kumar  |

### NOTE :

1. Two questions to be set from each unit.
2. Five questions out of eight to be attempted by the student selecting at least one from each unit in the theory examination paper.

Use of scientific calculator will be allowed in the examination.

Hours/ Week		MARKS	
L	P	Theory	Sessional
1	4	100	50

**CLASS: B.E. 3<sup>RD</sup> SEMESTER**

**BRANCH: MECHANICAL ENGINEERING**

**COURSE TITLE: MACHINE DRAWING-II**

**DURATION OF EXAMINATION: 4 HOURS.**

**COURSE NO.: M-303**

**Course Outcomes (COs)**

<b>CO303.1:</b> Understand about design aspect
<b>CO303.2:</b> Understand 2D and 3D views of assembly.
<b>CO303.3:</b> Draw different views of assembly.
<b>CO303.4:</b> Draw disassembly from assembled view.
<b>CO303.5:</b> Differentiate between different types of coupling, bearing and pulleys.

**UNIT-1**

1.1 Fits, Tolerances and Machining symbols.

1.2. Assembly Drawings of the following machines :

- a) Steam and I.C. Engines : Piston, Connecting Rod, Cylinder, Head and Slide Valve.
- b) Machine tools : Tool post of a shaper, Tailstock, Machine vices.
- c) Boiler Mountings : Safety valve, Feed check valve, Steam stop valve, and Blow off Cock.

**UNIT-2**

2.1 Disassembly Drawing from Assembled views: Disassembly of a machine part and preparing its free –hand drawing from manufacturing considerations. Fits, tolerance, surface finish, material etc.) for simple machines and assemblies.

2.2 Construction of Profiles for :

Spur Gear Teeth ( Involute and Cycloid).,Cams

**RECOMMENDED BOOKS :**

- 1. Machine Drawing P. S. Gill.
- 2. Machine Drawing N. D. Bhat.

3. Machine Drawing

R. B. Gupta.

**NOTE :**

1. Question paper will be of 4 Hours' duration.
2. One compulsory question of 60 marks from UNIT-1,
3. Two questions of 25 marks each from 2.1 and one question of 10 marks from 2.2 to be set.
4. One question each to be attempted from 2.1 and 2.2 in addition to the compulsory question from UNIT-1.

**CLASS: B.E. 3<sup>RD</sup> SEMESTER**

**Hours/ Week**

**MARKS**

**BRANCH: MECHANICAL ENGINEERING**

**L**

**T**

**Theory**

**Sessional**

**COURSE TITLE: MECHANICS OF SOLIDS-I**

**3**

**2**

**100**

**25**

**DURATION OF EXAMINATION : 3 HOURS.**

**COURSE NO.: M-304**

**Course Outcomes (COs)**

<b>CO304.1:</b> Analyse problems related to mechanics of solid engineering bodies.
<b>CO304.2:</b> Differentiate between principal stresses.
<b>CO304.3:</b> Describe and use theories of failure.
<b>CO304.4:</b> Analyse and solve problems related to beams.
<b>CO304.5:</b> Understand the mechanics of springs.

**UNIT-1**

**Introduction :**Introductory concepts, Scope and assumptions.

**Stresses and Strains :**Definition of Stress and Strain, Physical meaning of strain, Mathematical definition of strain, Stress – Strain Diagram , Material properties.

**Constitutive relations :** Hooke's Law, Poisson's ratio, Transformation of stresses and strains (Two dimensional case only ), Relation between elastic constants.

Stresses in axially loaded members, Statically indeterminate problems, Thermal stresses.

Principle stresses, Mohr's circle of stress, Strain Rosette.

**UNIT-2**

**Torsion :**Torsion of circular sections, Coulomb's theory, Basic assumptions, Torsion formula, Angle of twist, Shearing stresses.

Closed – coiled Helical Springs. Springs in series and parallels.

### UNIT-3

Shear force and Bending moment diagrams.

**Bending of Beams** :Normal and shear stresses in bending of beams. Limitations.

Combined Bending and Torsion.

### UNIT-4

**Deflection of beams** :Direct Integration method and moment area method, Method of Superposition for simple Statically indeterminate problems.

**Columns & Struts** :Theory, Buckling, Euler's formulae for different end conditions.

#### RECOMMENDED BOOKS :

1. Introduction to Mechanics of Solids E.P. Popov--PHI Pvt. Ltd.
2. Elements of Strength of Materials Timoshenko & Young --  
McGraw Hill
3. An Introduction to the Stephan  
H.Grandall,-- McGraw Hill Mechanics of Solids  
NoumanC.Dahl  
& Thomas J.  
Hardner

#### NOTE :

1. Two questions to be set from each unit.
2. Five questions out of eight to be attempted by the student selecting at least one from each unit in the theory examination paper.

Use of scientific calculator will be allowed in the examination hall.

**CLASS: B.E. 3<sup>RD</sup> SEMESTER**

**Hours/ Week**

**MARKS**

**BRANCH: MECHANICAL ENGINEERING**

**L**

**T**

**Theory**

**Sessional**

**COURSE TITLE: PRODUCTION TECHNOLOGY-I**

**3**

**2**

**100**

**25**

**DURATION OF EXAMINATION: 3 HOURS.**

**COURSE NO.: M-305**

### Course Outcomes (COs)

<b>CO305.1:</b> Recognize the different types of casting process.
<b>CO305.2:</b> Select suitable manufacturing process for typical components.
<b>CO305.3:</b> Describe the various welding process.
<b>CO305.4:</b> Explain the concept of forging ,rolling process and drawing.
<b>CO305.5:</b> Explain various production technique used in various engineering communities.

#### UNIT-1

**Introduction:** Definition, primary and secondary processes, criteria for selection.

**Casting:** As a production process, patterns, pattern material allowance, design and layout.

**Moulds:** Types, materials, foundry sands, and testing cores, core making process, melting furnace,Cupola.

#### UNIT-2

**Gating and Riser:** Types of gating systems, pouring time and temperature. Design criteria for pouring basin, sprue, runner gate and riser, problems on gating design, Concept of casting modification, directional principle; Special casting processes: shell, investment, centrifugal, permanent mould castings and die castings, defects and inspection of castings.

#### UNIT-3

**Mechanical, working processes:** Plastic deformation, yield criterion, hot and cold working, forming processes. Rolling, deep drawing, extrusion, etc.

Analysis of forces and pressure based on equilibrium equation in strip rolling, drawing and extrusion (simple cases)

**Forging operation :** Drop forging, press forging, die forging, basic considerations in die design, sheet metal operations.

#### UNIT-4

**Welding processes:** Definition, classification, and selection.

Gas welding equipment, safety precautions, types of flames, gas cutting.

Arc welding, principle of arc welding, arc initiation, arc welding equipment, power sources and their selection, manual metal arc welding, submerged arc welding, shielded arc welding (TIG & MIG), resistance welding, soldering and brazing, welding inspection and defects.

#### RECOMMENDED BOOKS :

- |    |                         |              |
|----|-------------------------|--------------|
| 1. | Manufacturing Processes | PN Rao       |
| 2. | Manufacturing Science   | Ghosh&Mallik |
| 3. | Foundry Technology      | Sinha&Goyal  |

4. Welding Technology Little

**NOTE :**

3. Two questions to be set from each unit.
4. Five questions out of eight to be attempted by the student selecting at least one from each unit in the theory examination paper.
5. Use of scientific calculator will be allowed in the examination hall

**CLASS: B.E. 3<sup>RD</sup> SEMESTER**

**Hours/ Week**

**MARKS**

**BRANCH: MECHANICAL ENGINEERING**

**L**

**T**

**Theory**

**Sessional**

**COURSE TITLE: THEORY OF MACHINES-I**

**3**

**1**

**100**

**25**

**DURATION OF EXAMINATION: 3 HOURS.**

**COURSE NO.: M-306**

**Course Outcomes (COs)**

<b>CO306.1:</b> Be familiar with common machine elements and mechanisms used in various types of machines.
<b>CO306.2:</b> Analyse any given mechanism.
<b>CO306.3:</b> Be familiar with concepts of gears , cams , governors etc.
<b>CO306.4:</b> Be aware of common machine elements.
<b>CO306.5:</b> Solve problems related to motion transmission.

**UNIT-1**

**Introduction:** Mechanisms and machines, plane mechanisms, kinematic pairs, kinematic chains and their classification, kinematic inversion.

**Kinematic analysis of plane mechanisms:** Introduction, general case of plane motion, velocity, acceleration, Coriolis's component, velocity and acceleration images, velocity analysis using instantaneous centres (graphical methods only).

**UNIT-2**

**Cams:** Classification of cams and followers, geometry of radial cam, displacement diagram, uniform, simple harmonic, parabolic and cycloidal motions, graphical layout of cam profiles with different followers, follower velocity, acceleration and jerk relations, comparison of follower motions, pressure angle.

**Governors:** Purpose, comparison with flywheel, Porter, Proell and Hartnell type of Governors, Governor effort and power.

**UNIT-3**

**Friction:** Friction devices, Pivots and Collars, Clutches, Brakes and their applications.

**Belts** : Flat belts, V-belts, Open and cross belts, Condition for maximum power, Power transmission and Mechanical Efficiency.

#### UNIT-4

**Spur gears:** Gear terminology, types of gears, conjugate motion, generation of gear tooth profiles; Involute and Cycloid, comparison of characteristics of involute and cycloidal profiles, interference, Involute arc of action, contact ratio, arc and path of contact, minimum number of teeth.

**Gear trains:** Introduction, example of gear trains, simple gear trains, calculation of gear ratios, planetary gear trains, solution of planetary gear train problems.

#### RECOMMENDED BOOKS :

- |    |  |                 |              |
|----|--|-----------------|--------------|
| 1. | Kinematic Analysis of Mechanisms<br>McGraw Hill  | JE Shigley      | --           |
| 2. | Kinematics & Dynamics of Machines<br>McGraw Hill | George H martin | --           |
| 3. | Mechanics of Machinery<br>McGraw Hill            | CW Ham, EJ Craw | --           |
|    |  |                 | &            |
|    | WL Rogers  |                 |              |
| 4. | Theory of Machines<br>--Longmans, Green &        | Thomas          | Bevan        |
|    |  | Co.             |              |
| 5. | Elementary Kinematics of Mechanisms              | Zimmerman       | --John Wiley |

#### NOTE :

- 1 Two questions to be set from each unit.
- 2 Five questions out of eight to be attempted by the student selecting at least one from each unit in the theory examination paper.

Use of scientific calculator will be allowed in the examination hall.



**CLASS: B.E. 3<sup>RD</sup> SEMESTER**

**BRANCH: MECHANICAL ENGINEERING**

**COURSE TITLE: Thermodynamics lab M-307**

**Course Outcomes (COs)**

<b>CO307.1:</b> Explain the working of throttling calorimeter and how it can be used to calculate the dryness fraction of the steam.
<b>CO307.2:</b> Explain the COP of refrigerator and heat pump practically, and also they can explain the actual work of refrigerator and heat pump.
<b>CO307.3:</b> Explain about P-V-T behaviour of real and ideal gas.
<b>CO307.4:</b> Explain the working of steam boilers efficiency
<b>CO307.5:</b> Apply practical knowledge in their research work.

**LIST OF EXPERIMENTS**

1. To study the p-v-T behavior of real gases in comparison with Ideal gases.
2. To study steam boiler and its accessories and determination of:
  - i) Equivalent Evaporation
  - ii) The dryness fraction of steam using Throttling Calorimeter
3. To find out the COP of the Refrigerator and Heat Pump.

**CLASS: B.E. 3<sup>RD</sup> SEMESTER**

**Hours/ Week**

**MARKS**

**BRANCH: MECHANICAL ENGINEERING**

**P**

**Paractical**

**COURSE TITLE: FLUID MECHANICS LAB.**

**2/2**

**50**

**COURSE NO.: M-308**

**Course Outcomes (COs)**

<b>CO308.1:</b> Have knowledge of basic principles of fluid mechanics.
<b>CO308.2:</b> Analyse fluid flow problems with the applications of the momentum and energy equations.
<b>CO308.3:</b> Analyse pipe flow as well as fluid machinery.
<b>CO308.4:</b> Perform Reynolds Experiment.
<b>CO308.5:</b> Analyse problems related to friction factor.

**LIST OF EXPERIMENTS**

1. To find out the Metacentric Height of the floating pontoon.
2. To verify the Bernoulli's Equation.
3. To find out the co-efficient of discharge using Venturimeter, Orificemeter and Pitot tube.
4. To study the regimes of flow using Reynold's Experiment.
5. To find out the viscosity of a fluid using Redwood Viscometer.
6. To find out the Friction factor of a pipe and compare the resistances to flow in various pipes.

**CLASS: B.E. 3<sup>RD</sup> SEMESTER**

**Hours/ Week**

**MARKS**

**BRANCH: MECHANICAL ENGINEERING**

**P**

**Paractical**

**COURSE TITLE: MECHANICS OF SOLID LAB.**

**2/2**

**50**

**COURSE NO.: M-309**

**Course Outcomes (COs)**

<b>CO309.1:</b> Perform hardness tests and tensile tests on different specimens.
<b>CO309.2:</b> Differentiate between tensile and compressive tests.
<b>CO309.3:</b> Perform bending at different loadings conditions.
<b>CO309.4:</b> Perform tests on Vicker hardness, Brinell hardness and Rockwell hardness testing machines.
<b>CO309.5:</b> Perform as part of team in challenging environments developing communication and managerial skills.

**LIST OF EXPERIMENTS**

1. To conduct the tensile test on a M.S. specimen and draw the load extension diagram using a UTM.
2. To conduct the compression test on a concrete specimen and draw the load compression diagram using a UTM.
3. To find the hardness of a specimen using :
  - a) Rockwell Hardness Tester
  - b) Brinell Hardness Tester
  - c) Vickers Hardness Tester
4. To conduct the Izod and Charpy Tests on a notched M.S. specimen
5. To conduct simple bending experiments for different types of loadings.

**CLASS: B.E. 3<sup>RD</sup> SEMESTER**

**Hours/ Week**

**MARKS**

**BRANCH: MECHANICAL ENGINEERING**

**P**

**Paractical**

**COURSE TITLE: THEORY OF MACHINES-I LAB.**

**2/2**

**25**

**COURSE NO.: M-310**

**Course Outcomes (COs)**

<b>CO310.1:</b> Practically familiar with working of various types of cams and followers.
<b>CO310.2:</b> Able to understand various types of gear, gear train and working of gear box.
<b>CO310.3:</b> Familiar with various quick return mechanisms.
<b>CO310.4:</b> Familiar with actual working of governor.
<b>CO310.5:</b> Up –to-date about various brake systems of a vehicles.

**LIST OF EXPERIMENTS**

1. Study various types of cams and followers.
2. Study of various types of gear trains.
3. Study of various types of Governors with the help of stroboscope and to determine sleeve displacement, speed of Governor and corresponding radius of Governor in case of :
  - i) Watt Governor
  - ii) Porter Governor
  - iii) Proell Governor
4. To determine the load on spring and stiffness of spring in case of Hartnell Governor.
5. Study of Epicyclic gear train apparatus:
  - i) Internally and
  - ii) Externally
6. Study of Gearbox
7. Study of Quick return motion mechanism.
8. Study of Whitworth quick return motion mechanism.
9. Study of various types of brake systems.

**CLASS: B.E. 3<sup>RD</sup> SEMESTER**

**Hours/ Week**

**MARKS**

**BRANCH: MECHANICAL ENGINEERING**

**P**

**Paractical**

**COURSE TITLE: WORKSHOP PRACTICE – I**

**3**

**50**

**COURSE NO.: M-311**

**COURSE TITLE: WORKSHOP PRACTICE-I**

**Course Outcomes (COs)**

<b>CO311.1:</b> Discuss the working mechanism of machine tools namely- center lathe, shaper, planer, drilling machine.
<b>CO311.2:</b> Employed cutting tool with their tool holder
<b>CO311.3:</b> Practical exercises on straight turning, taper turning, facing, grooving, parting, threading, etc.
<b>CO311.4:</b> Practical exercises on surfacing on a shaper and planer, cutting of inclined surfaces, V-grooves (External & Internal).
<b>CO311.5:</b> Practical exercises on drilling of holes (Through & Blind), use of different types of drills for different operations.

**EXPERIMENTS**

1. To discuss the working mechanism of machine tools namely- center lathe, shaper, planer, drilling machine and the operations performed on the machine tools.
2. Cutting tools employed with their tool holders- both for solid and inserted tool bits.
3. Practical exercises on:
  - a) Straight turning, taper turning, facing, grooving, parting, threading, etc. Selection of feed, depth of cut and cutting speeds.
  - b) Surfacing on a shaper and planer, cutting of inclined surfaces, V-grooves (External & Internal)
  - c) Drilling of holes (Through & Blind), use of different types of drills for different operations.
  - d) Use of gauges and instruments for inspection in the above operations.
3. To find out the COP of the Refrigerator and Heat Pump.

**UNIVERSITY OF JAMMU, JAMMU**

**COURSE SCHEME**

**FOR B.E. 4<sup>TH</sup> SEM MECHANICAL ENGINEERING.**

**FOR EXAMINATION TO BE HELD FOR BATCH 2014 & ONWARDS**

Course No.	Course Name	CLASSES			MARKS			Total
		L	T	P	Th.	Sess	Prac	
EE-410	Electrical Engg	3	2	0	100	25	0	125
MTH-412	Engg Maths-III	3	2	0	100	25	0	125
M-401	Heat Transfer	3	2	0	100	25	0	125
M-402	Metallurgy & Material Science	3	2	0	100	25	0	125
M-403	Mech of Solids-II	3	2	0	100	25	0	125
M-404	Theory of M/c –II	3	2	0	100	25	0	125
EE-411	Electrical Engg Lab.	0	0	2/2	0	0	50	50
M-405	Heat Transfer Lab.	0	0	2/2	0	0	50	50
M-406	Metallurgy & Material Science	0	0	2/2	0	0	50	50
M-407	Theory of M/c-II Lab	0	0	2/2	0	0	50	50
M-408	Auto Motive Lab.	0	0	2	0	0	50	50
<b>TOTAL</b>		<b>18</b>	<b>12</b>	<b>6</b>	<b>600</b>	<b>150</b>	<b>250</b>	<b>1000</b>

<b>CLASS: B.E. 4<sup>TH</sup> SEMESTER</b>	<b>Hours/ Week</b>			<b>MARKS</b>		
<b>BRANCH: MECHANICAL ENGINEERING</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>Theory</b>	<b>Sessional</b>	<b>Paractical</b>
<b>COURSE NO. : EE-410</b>	<b>3</b>	<b>2</b>	<b>0</b>	<b>100</b>	<b>25</b>	<b>0</b>
<b>COURSE TITLE: ELECTRICAL ENGINEERING</b>						
<b>DURATION OF EXAMINATION: 3 HOURS</b>						

**Course Outcomes:**

<b>CO401.1:</b> Apply the basic laws of electricity to D.C. & A.C. circuits.
<b>CO401.2:</b> Analysis of R, L & C circuits and solutions of their circuits with independent sources.
<b>CO401.3:</b> Acquire the knowledge about characteristics and working principles of machines with constant, rotating and oscillating fields.
<b>CO401.4:</b> Identify the types of electrical machines for a given application.
<b>CO402.5:</b> Recognize the rating of different electrical apparatus.

**SECTION –I**

**D.C. SERIES PARALLEL CIRCUITS:** Superposition Principle, Thevenin’s Theorem.

**A.C. CIRCUITS:** Pure resistance, capacitance and inductive circuits, RL, LC, RLC circuits, Series resonance.

**D.C. GENERATORS:** Constructional features, EMF Equation, Operating characteristics, Parallel operation.

**D.C. Motors:** Operating principle, Torque Equation, Starters, Speed control applications.

**SECTION –II**

**TRANSFORMERS :**Principle of operation, Vector Diagram, Regulation, Efficiency, Parallel operation.

**SYNCHRONOUS GENERATORS :**Principle of operation, EMF Equation, Parallel operation.

**SYNCHRONOUS MOTORS :**Principle of operation, V-curves, Starting methods, Application.

**INDUCTION MACHINES:** Principle of operation, Equivalent circuits, No loads and loaded motor tests, Applications.

**BOOKS RECOMMENDED:**

1. “Principle of Electrical Engineering” by V.DEL TORO
2. “Electrical Technology” by H. COTTON
3. “Theory of A.C. Machines” by A.S. Langsdorf

4. "Electrical Machines" by I.G. Nagrath and D.P. Kothari

**NOTE :** There shall be total Eight questions, four from each section. Five questions have to be attempted selecting at least two questions from each section. Use of calculator is allowed.

**CLASS: B.E. 4TH SEMESTER**  
**BRANCH: MECHANICAL ENGINEERING**  
**COURSE TITLE: MATHEMATICS – III**

**Hours/ Week**

**MARKS**

**COURSE No. MTH-412**

L	T	Theory	Sessional
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**DURATION OF EXAM: 3 HOURS**

3	2	100	25
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**Course Outcomes:**

<b>CO412.1</b> Learn the concept of Laplace Transform, inverse Laplace transform of various function and its applications.
<b>CO412.2</b> Understand the idea of Fourier transform, Fourier sine and cosine transform and their properties.
<b>CO412.3</b> Understand the concept of special functions such as Bessel's functions and Legendre's polynomial and their relations.
<b>CO412.4</b> Draw the circuits using properties of Boolean algebra.

**SECTION-I**

**LAPLACE TRANSFORMS:**

Laplace Transforms, Inverse Laplace Transforms, Properties of Laplace Transforms, LT of unit step function, Impulse function, Periodic function, Initial value theorem, Final value theorem, Convolution theorem, Application of LT to solve linear differential equations and convolution type integral equations.

**INTEGRAL TRANSFORMS AND FOURIER INTEGRALS:**

Integral transforms and Fourier Integrals Fourier integral theorem, Fourier sine and cosine Integrals, and their inverses.

**SECTION-II**

**SPECIAL FUNCTIONS :**

Special Functions Legendre polynomials, Rodrigue's formula, Recurrence formulae, generating function, Orthogonality of Legendre polynomials, Bessel function of 1st kind. Recurrence formulae, generating function, Orthogonality of Bessel function.

**BOOLEAN ALGEBRAS:**



Boolean Algebras, Lattices, Finite Boolean algebra, C.N.F and D.N.F, Application of Boolean algebra to switching theory.

**BOOKS RECOMMENDED :**

- |     |                                |                 |
|-----|--------------------------------|-----------------|
| 01. | Higher Engineering Mathematics | B.S. Grewal     |
| 02. | Boolean Lattices               | V.K. Khanna     |
| 03. | Engineering Mathematics-III    | Bhopinder Singh |

**NOTE :** There shall be total Eight questions, four from each section. Five questions have to be attempted selecting at least two questions from each section. Use of calculator is allowed.

**CLASS: B.E. 4<sup>TH</sup> SEMESTER**

**Hours/ Week**

**MARKS**

**BRANCH: MECHANICAL ENGINEERING**

**L**

**T**

**Theory**

**Sessional**

**COURSE TITLE: HEAT TRANSFER**

**3**

**2**

**100**

**25**

**COURSE NO.M-401**

**DURATION OF EXAMINATION : 3 HOURS.**

**Course Outcomes (COs)**

<b>CO401.1:</b> Apply principles of heat and mass transfer to basic engineering systems.
<b>CO401.2:</b> Analyse heat transfer by conduction, convection.
<b>CO401.3:</b> Analyse and design heat exchangers
<b>CO401.4:</b> Analyse diffusional process and calculate the flux in diffusion process.
<b>CO401.5:</b> Analyse black body and its application.

**UNIT-1**

**Introduction :** Basic modes of heat transfer.

**Conduction :** General heat conduction equation in Cartesian, Spherical and Cylindrical coordinates, One dimensional steady state conduction with and without heat generation, Critical insulation thickness, Extended surface heat transfer, Variable thermal conductivity.

Unsteady state heat conduction in one dimension, Lumped heat capacity system, Semi-infinite solid with sudden change in surface temperature, Use of charts for transient conduction.

**UNIT-2**

**Convection :** Newton's Law, Concept of boundary layer, Significance of Prandtl number , Boundary layer equations, Flat plate heat transfer solutions by integral method, Laminar and

Turbulent flow of heat transfer in tubes, Forced convection in turbulent flow, Reynolds's Analogy, Empirical relations in forced convection.

**Natural convection** : Heat transfer from vertical plate by integral method, Empirical relations in free convection, Condensation and Boiling, Film and Dropwise condensation, Film boiling and pool boiling, Empirical relations for heat transfer with change of phase.

### UNIT-3

**Radiation** : Radiation spectrum, Thermal radiation, Concept of black body, Monochromatic emissive power, Absorptivity , Reflectivity, Transmissivity , Emissivity, Plank's Law, Stephan Boltzman's Law, Lambert's Law, Kirchoff's Law. Radiation between two real surfaces, Geometrical factors for simple configuration, Heat transfer in presence of re-radiating surfaces, Radiation shields, Electrical network method of solving radiation problems.

### UNIT-4

**Heat exchangers** : Types of heat exchangers, Log mean temperature difference, Overall heat transfer coefficient, Fouling and scaling of heat exchangers, N.T.U. method of evaluation of heat exchangers.

Heat exchanger effectiveness, Introduction to mass transfer, Fick's law of diffusion in thermal evaporation of water into air, Mass transfer coefficient.

### RECOMMENDED BOOKS :

- |    |  |                    |                                   |
|----|--|--------------------|-----------------------------------|
| 1. | Heat Transfer<br>--McGraw Hill.                          |                    | J.P. Holman                       |
| 2. | Heat Transfer<br>--International Student                 |                    | Frank Krieth<br><br>Edition       |
| 3. | Engineering Heat Transfer                                | Gupta and Prakash  | --Intnl Book Co.                  |
| 4. | Fundamentals of Heat Transfer<br>Sons. and Mass Transfer | Frank P. Incorp. & | - John Wiley &<br>David P. Dewitt |
| 5. | Heat Transfer<br>--Tata McGraw Hill.                     |                    | B. Gebhart                        |

### NOTE :

1. Two question to be set from each unit.
2. Five questions out of eight to be attempted by the student selecting at least one from each unit in the theory examination paper.  
Use of Heat Transfer data book and a scientific calculator will be allowed in the examination hall

**CLASS: B.E. 4<sup>TH</sup> SEMESTER**

**Hours/ Week**

**MARKS**

**BRANCH: MECHANICAL ENGINEERING**

**L T Theory Sessional**

**COURSE TITLE: METALLURGY AND MATERIAL  
SCIENCE**

**3 2 100 25**

**COURSE NO.M-402**

**DURATION OF EXAMINATION: 3 HOURS.**

### **Course Outcomes (COs)**

<b>CO401.1:</b> Analyse the structure of material at different levels, basic concepts of crystalline materials like unit cell, FCC, BCC, HCP, APF, Co-ordination number etc.
<b>CO402.2:</b> Understand the concept of mechanical behaviour of material and calculation of same appropriate equations.
<b>CO402.3:</b> Explain the concept phase diagram and understand the basic technologies associated with the metallurgy. Construction and identification of phase diagram and reactions.
<b>CO402.4:</b> Understand and suggest the heat treatment process and types .Significance of properties Vs microstructure. Surface hardening and its type. Introduce the concept of hardenability and demonstrate the test used to find hardenability of steels
<b>CO402.5:</b> Explain features, classification, application of newer class material like smart materials, piezoelectric materials, biomaterials, composite materials etc.

### **UNIT-1**

Macro structure, Micro structure and sub structure, Metallographic specimen preparation.

**Crystal structure :** Space Lattice, Crystal Systems, crystal directions and planes, Miller indices, Planar density of crystallographic planes, Interplaner spacing, Atomic packing factor, Co-ordination number, Stacking sequence. Solidification of metals : Homogeneous and Heterogeneous nucleation, Crystal growth, Dendritic pattern , Equalized and columnar grains, Polymorphism.

**Crystal Imperfections :** Point defect , Line defect, Edge dislocation, Screw dislocation, Interactions between dislocations, Planar defects, Stacking fault, Twinning, Grain boundary, Diffusion, Mechanism of diffusion in crystals, Fick's laws of diffusion.

### **UNIT-2**

**Phase :** Equilibrium between phases, Gibb's phase rule, Solid solutions, Interstitial, Substitutional, Ordered and disordered types, Hume-Rothery rules. Equilibrium phase Diagrams of Binary Alloys : Construction from cooling curves, Phase diagram of Cu-Ni system, Lever rule, Coring, Eutectic

alloy, Bi-Cd phase diagram, Eutectic reaction, Partial solid solubility, Lead - Tin phase diagram , Iron-Iron carbide diagram, Peritectic and Eutectoid reactions.

### UNIT-3

**T-T-T-Diagram and its uses** : Heat Treatment of Carbon steel, Annealing, Normalising, Hardening, Tempering, Austempering, Martempering, Hardenability, Jominy test, Case hardening, Surface treatment of steel, metallic coating, Hot dipping, Electroplating, Impregnation, Metal spraying, Metal facing and cladding. Failure of metals : Creep, Mechanism of creep, Creep curves, Creep resistance materials, Fracture, Brittle fracture, Griffith's theory, Ductile fracture, Ductile-brittle transition, Protection against fracture, Fatigue, Mechanism of fatigue, S.N. curves.

### UNIT-4

**Deformation of metals** : Elastic, Inelastic and visco elastic behaviour, Plastic deformation, Mechanism of slip, Slip planes and slip directions, Strengthening mechanisms, Work hardening, Grain boundary hardening, Precipitation hardening, Cold working, Hot working, Recovery, Recrystallisation and grain growth

#### RECOMMENDED BOOKS :

1. Science of Engineering Materials ( Vol. I, II & III) ManasChanda --  
McMillan Co., India.
2. Elements of Material Science LH Van Vlack  
--Addison Wesley.
3. Physical Metallurgy Principles Reed Hill --Affiliated East-  
West Press.

#### NOTE :

10. Two questions to be set from each unit.
11. Five questions out of eight to be attempted by the student selecting at least one from each unit in the theory examination paper.  
Use of scientific calculator will be allowed in the examination hall

**CLASS: B.E. 4<sup>TH</sup> SEMESTER**

**Hours/ Week**

**MARKS**

**BRANCH: MECHANICAL ENGINEERING**

**L**

**T**

**Theory**

**Sessional**

**COURSE TITLE: MECHANICS OF SOLIDS – II**

**3**

**2**

**100**

**25**

**COURSE NO.M-403**

**DURATION OF EXAMINATION: 3 HOURS.**

### **Course Outcomes (COs)**

<b>CO403.1:</b> Understand the fundamental concept of stress and strain and the relationship between both through the strain stress equation in order to solve problems for tridimensional elastic solid.
<b>CO403.2:</b> Calculate and represent the stress diagram in bars and simple structure
<b>CO403.3:</b> Solve problems relating to pure and non uniform bending of beams other simpler structure
<b>CO403.4:</b> Solve problem related to torsional deformation of bars and other tridimensional structure.
<b>CO403.5:</b> Understand the concept of buckling and be able to solve problem related to isolated bars

### **UNIT-I**

Strain energy and its components under different types of loading.

**Energy Methods** :Castigliano's Theorem and its Applications, Determinate and Indeterminate problems, Maxwell's reciprocity Theorem.

### **UNIT-2**

Thin Cylinders and related problems.

**Thick Cylinders** : Lamé's Theorem for determining the Principle Stress in a thick cylinder (Open ended and Ends Closed) under Internal and External Pressures, Strains and radial reflection. Effect of compounding of thick cylinders, Most economic proportions of a compound cylinder. Shear centre of section and bending axis of a beam in Unsymmetrical bending, Determination of bending stress.

### **UNIT-3**

**Curved Beams** : Bending of curved bars, Determination of bending stress as through Winkler–Bach Solution, Radial Stresses, Location of Neutral axis, Thick Rings and Chain links.

### **UNIT-4**

**Statically Indeterminate Beams** : Theorem of Three moments and applications. Theories of failure: Theories of failure as applicable to ductile and brittle materials, their significance and comparison. Applications of theories of failure.

**NOTE :**

1. Three questions each to be set from UNIT-1 AND UNIT-2 and two questions from UNIT-3.
2. Five questions out of eight to be attempted by the student selecting at least one from each Unit in the theory examination paper.
3. Use of a Scientific Calculator will be allowed in the Examination Hall.

**RECOMMENDED BOOKS:**

- |    |                                   |                    |
|----|-----------------------------------|--------------------|
| 1. | Advanced Mechanics of Solids      | L.S.Srinath        |
| 2. | Elements of Strength of Materials | Timoshenko & Young |
| 3. | Mechanics of Material             | Beer & Johnson     |
| 4. | Mechanics of Solids               | Popov              |
| 5. | Strength of Materials             | P.N.Singh          |

**CLASS: B.E. 4<sup>TH</sup> SEMESTER**

**Hours/ Week**

**MARKS**

**BRANCH: MECHANICAL ENGINEERING**

**L**

**T**

**Theory**

**Sessional**

**COURSE TITLE: THEORY OF MACHINES – II**

**3**

**2**

**100**

**25**

**COURSE NO.M-404**

**DURATION OF EXAMINATION: 3 HOURS.**

**Course Outcomes:**

<b>CO404.1:</b> Dynamically analyze common mechanisms.
<b>CO404.2:</b> Conceptualize gyroscopic effect.
<b>CO404.3:</b> Mathematically solve problems of flywheel.
<b>CO404.4:</b> Conceptualize static and dynamic balancing of rotating and reciprocating.
<b>CO404.5:</b> Identify various types of mechanical vibrations, their causes and solutions.

**UNIT-1**

Static force Analysis of plane Motion Mechanisms, Analysis of four bar chain

**Dynamic Force Analysis :** D' Alembert's Principle, Dynamically equivalent system, Dynamic force analysis of four bar chains.

**Dynamics of Reciprocating Engines** : Inertia forces and Equivalent masses for different members.

Turning moment diagram, Flywheel.

### UNIT-2

**Dynamometers** :Types,Analysis of Prony-brake, Rope-brake and Belt-transmission dynamometers.

**Gyroscopic Action in Mechanics** : Gyroscope and gyroscopic couples, Gyroscopic stabilisation of ships and airplanes, Stability of moving automobile.

### UNIT-3

**Balancing** : Static and Dynamic balancing, Balancing of several masses in a plane, Balancing of masses rotating in different planes, Conditions for complete balancing of an engine, Reciprocating and rotating parts, Locomotive balancing-Hammer blow, Variation of tractive effort, Swaying couple, Coupled locomotives, Multicylinder in-line engines, Radial engines and V-engines balancing.

### UNIT-4

**Fundamentals of Vibration** : Periodic motion and Fourier representation, Vibrations of single degree of freedom systems, Natural vibration-Equation of motion, Equilibrium method, Energy method. Damped vibrations :Viscous damping, Logarithmic decrement. Equivalent damping coefficients.

Forced vibration - Harmonic excitation with and without damping, Non-dimensional expression for amplitude and phase, Critical speed for shafts, Importance of vibration analysis.

### RECOMMENDED BOOKS :

- |    |  |                      |                |
|----|--|----------------------|----------------|
| 1. | Dynamic Analysis of Machine<br>--McGraw Hill.    |                      | Shigley        |
| 2. | Theory of Vibrations With Applications           | William T. Thomson   | --McGraw Hill. |
| 3. | Dynamics of Machinery<br>McGraw Hill.            | Hollowenko           | --             |
| 4. | Theory of Machines<br>--Longmans,<br>Green & Co. |                      | Thomas Bevan   |
| 5. | Theory of Machines & Mechanisms<br>PHI           | A. Ghosh & A. Mallik | --             |
| 6. | Mechanical vibrations                            |                      | GK Grover      |

### NOTE :

1. Two questions to be set from each unit.
2. Five questions out of eight to be attempted by the student selecting at least one from each unit in the theory examination paper.

Use of a scientific calculator will be allowed in the examination hall.

**CLASS: B.E. 4<sup>TH</sup> SEMESTER**

**Hours/ Week**

**MARKS**

**BRANCH: MECHANICAL ENGINEERING**

**P**

**Paractical**

**COURSE NO: EE-411**

**2/2**

**50**

**COURSE TITLE: ELECTRICAL ENGINEERING LAB.**

**DURATION OF EXAMINATION: 3 HOURS.**

**Course Outcomes:**

<b>CO411.1</b>	Experimentally verify the basic circuit theorems
<b>CO411.2</b>	Measure current in series-parallel RLC circuits.
<b>CO411.3</b>	Measure power dissipation in single phase circuit by using wattmeter.
<b>CO411.4</b>	Determine the turn's ratio and polarity test of single phase transformer.

**LIST OF EXPERIMENTS**

- 1) Verification of Kirchoff's Laws.
- 2) Verification of Superposition Theorem.
- 3) Verification of Thevinin's Theorem.
- 4) Verification of Reciprocity Theorem.
- 5) Verification of Maximum Power Transfer Theorem.
- 6) Measurement of current in various branches of RLC series-parallel circuit.
- 7) Single phase power measuring by using a Wattmeter.
- 8) Study of three-phase A.C Circuits with Star and Delta connected Load.
- 9) Study of single phase transformers. Determination of voltage Ratio, Turns Ratio and Polarity Test. Open circuit and short circuit test of given single phase transformer. Determination of regulation and efficiency.



**CLASS: B.E. 4<sup>TH</sup> SEMESTER**

**Hours/ Week**

**MARKS**

**BRANCH: MECHANICAL ENGINEERING**

**P**

**Paractical**

**COURSE TITLE: HEAT TRANSFER LAB.**

**2/2**

**50**

**COURSE NO.M-405**

**DURATION OF EXAMINATION: 3 HOURS.**

#### **Course Outcomes (COs)**

**CO405.1:** Develop concept of boundary layer formation over heated surfaces during forced and free convection, formulation of momentum and energy equations of the laminar boundary layers and their solution by approximate method.

**CO405.2:** Calculate fluid temperatures, mass flow rates, pressure drops, heat exchange and effectiveness during parallel, counter and cross flow in simple and baffled-shell and tube type heat exchangers, condensers, evaporators, etc.

**CO405.3:** Describe film wise and drop wise condensation in condensers, pool, forced, sub-cooled and saturated boiling in boilers and evaporators, bubble formation and critical heat flux. Model laminar film condensation and its application in the design of condensers. Evaluation of Reynolds and Nusselt numbers for boiling and condensation.

**CO405.4:** Develop concept of monochromatic and total radiations, intensity of radiation, shape factor, radiation shields, solar radiation and estimation of radiative heat exchange between two or more surfaces of different geometries.

**CO405.5:** Formulate and predict heat conduction problems with and without heat generation in composite walls and extended surfaces subjected to convective boundaries. Analyse 1-D unsteady and 2-D steady conduction problems.

#### **LIST OF EXPERIMENTS**

1. To find the thermal conductivity of a given insulating material.
2. To study heat transfer characteristics of horizontal cylindrical fins.
3. To study natural heat transfer from a vertical pipe.
4. To study the working of a natural convection solar water heater.
5. To study experimentally cooling rates of a metallic plate and compare the result with those given by theoretical predictions.

**CLASS: B.E. 4<sup>TH</sup> SEMESTER**

**BRANCH: MECHANICAL ENGINEERING**

**Hours/ Week    MARKS**

**COURSE TITLE: METALLURGY AND MATERIAL SCIENCE LAB.**

**P**

**Paractical**

**COURSE NO.M-406**

**2/2**

**50**

**DURATION OF EXAMINATION: 3 HOURS.**

**Course Outcomes (COs)**

<b>CO406.1:</b> Qualitatively describe the bonding schemes and its general physical properties as well as possible applications.
<b>CO406.2:</b> Describe physical origin as well as strength of a bond.
<b>CO406.3:</b> Qualitatively derive a material's Young's modulus from a potential energy curve.
<b>CO406.4:</b> Index peaks and infer the structure from a simple set of diffraction data.
<b>CO406.5:</b> Solve simple diffusion problems.

**LIST OF EXPERIMENTS**

1. To determine the tensile strength of a given sample.
2. Hardness Testing of :
  - a) Ferrous
  - b) Non-Ferrous AlloysWith the available methods such as:
  - i) Brinell Hardness Testing
  - ii) Rockwell Hardness Testing
  - iii) Vickers Hardness Testing
3. To test and find the impact strength of a given steel sample (both Izod and Charpy Tests)
4. To prepare specimens for micro-structural studies.
5. Study of Microstructure of Steel and Cast Iron under :
  - i) Optical Microscope
  - ii) Scanning Electron Microscope

**CLASS: B.E. 4<sup>TH</sup> SEMESTER**

**Hours/ Week**

**MARKS**

**BRANCH: MECHANICAL ENGINEERING**

**P**

**Paractical**

**COURSE TITLE: THEORY OF MACHINES – II**

**2/2**

**50**

**COURSE NO.M-407**

**DURATION OF EXAMINATION: 3 HOURS.**

**Course Outcomes (COs)**

<b>CO407.1:</b> Understand the kinematics of Quick Return Motion.
<b>CO407.2:</b> Know about gyroscopic effect.
<b>CO407.3:</b> Familiar with various cases of vibrating motion.
<b>CO407.4:</b> Dynamically engines for balancing.
<b>CO407.5:</b> Be aware with various mechanism used in various outside communities.

**LIST OF EXPERIMENTS**

1. Find displacement, velocity and acceleration of slider of the Quick-return motion mechanism.
2. To study motorized gyroscope
3. To study the undamped free vibrations of equivalent spring mass system.
4. To study the forced vibrations of equivalent spring mass system.
5. Force analysis of seven cylinder radial engine.
6. To study static and dynamic balancing apparatus.
7. To study the torsional vibration (undamped) of single rotor shaft system.

**CLASS: B.E. 4<sup>TH</sup> SEMESTER**

**Hours/ Week**

**MARKS**

**BRANCH: MECHANICAL ENGINEERING**

**P**

**Paractical**

**2**

**50**

**COURSE TITLE: AUTO MOTIVE LAB.**

**COURSE NO.M-408**

**DURATION OF EXAMINATION: 3 HOURS.**

**Course Outcomes (COs)**

<b>CO408.1:</b> Familiar with various types of gears and their uses.
<b>CO408.2:</b> Familiar with various types of clutches and their uses.
<b>CO408.3:</b> Familiar with various steering geometry parameters.
<b>CO408.4:</b> Familiar with fuel supply systems of IC Engines.
<b>CO408.5:</b> Familiar with braking system of automotive.

**LIST OF EXPERIMENTS :**

1. Study of different types of gears:
  - a) Spur gear
  - b) Helical gear
  - c) Bevel gear
  - d) Worm and Worm wheel
2. Study of different types of clutches:
  - a) Cone clutch
  - b) Single plate clutch
  - c) Multi plate clutch
  - d) Toggle clutch
3. Study of different types of Steering mechanisms:
  - a) Study of different parts of a steering
  - b) Check steering geometry
  - c) Camber angle
  - d) Caster angle
  - e) King pin inclination
  - f) Toe-in & Toe-out
4. Study of Fuel supply system in both CI and SI engines:
  - a) Find the consumption of:
    - i) Fuel in petrol engine
    - ii) Air consumption, etc.

5.  
remove  
  
and
- b) Maintenance of fuel system in both diesel and Petrol engines.
  - c) Tuning of carburetor of Petrol engine and fuel pump of Diesel engine.
  - a) Speedy Hydraulic Brake System and bleeding of Hydraulic system to air block.
  - b) Speedy Checking Hand Brake applied as an emergency brake in cars vehicles.

**UNIVERSITY OF JAMMU, JAMMU**

**COURSE SCHEME**

**FOR B.E. 5<sup>TH</sup> SEMESTER MECHANICAL ENGINEERING**

**FOR EXAMINATION TO BE HELD FOR BATCH 2014 & ONWARDS**

CourseNo.	Course Name	CLASSES			MARKS			Total
		L	T	P	Theory	Sessional	Practical	
MTH-501	Engineering. Math-IV	4	1	0	100	50	0	150
M- 501	Applied Thermodynamics-I	4	1	0	100	25	0	125
M- 502	Fluid Machinery-I	3	2	0	100	25	0	125
M-503	Machine Design-I	3	2	0	100	50	0	150
M- 504	Production Technology -II	3	1	0	100	25	0	125
ECE-510	Electronics devices	3	2	0	100	25	0	125
M-505	Applied Thermodynamics	0	0	2	0	0	50	50
M- 506	Fluid Machinery Lab.	0	0	2/2	0	0	50	50
M-507	Workshop Practice-II	0	0	3	0	0	50	50
ECE-518	Electronics devices &Circuits Lab.	0	0	2/2	0	0	50	50
<b>Total</b>		<b>20</b>	<b>9</b>	<b>7</b>	<b>600</b>	<b>200</b>	<b>200</b>	<b>1000</b>

**CLASS: B.E. 5<sup>TH</sup> SEMESTER**

**MARKS**

**BRANCH: MECHANICAL ENGINEERING.**

**L T P Theory Sessional**

**COURSE NO: MTH- 501**

**4 1 0 100 50**

**COURSE TITLE: ENGINEERING MATHEMATICS - IV**

**DURATION OF EXAM: 3 HOURS**

**Course Outcomes:**

<b>CO501.1:</b> Find limit, continuity, differentiability of a function in a plane.
<b>CO501.2:</b> Calculate the integrals using residue evaluation instead of actual complicated calculation.
<b>CO501.3:</b> The basics of Operators and their types.
<b>CO501.4:</b> To obtain the values of function at a given point within the given data by using certain method of Interpolation
<b>CO501.5:</b> Find out the exact real root of algebraic and transcendental equations.

**SECTION-I**

**THEORY OF COMPLEX VARIABLES :** Functions of a complex variable, Limits, Continuity, Derivative, Analytic function, Cauchy-Riemann equations, Conformal mappings, Standard Transformation, Bilinear transformation, Line integral, Cauchy's theorem, Cauchy's integral formula, Cauchy's inequality, Liouville's theorem, Taylor and Laurent series expansions, Poles and singularities, Contour integration, Residue theorem, Evaluation of Real Integrals using residue theorem, and Contour integration.

**SECTION-II**

**NUMERICAL METHODS :** Definition of operators, Finite and divided difference, Newton's and Lagrange's Interpolation formulas, Numerical differentiation and Numerical integration, Trapezoidal and Simpson's one-third Rule.

Numerical Solutions of Algebraic and Transcendental Equations by RegulaFalsi, Newton-Raphson and direct iterative methods, Solution of difference equations, solution of differential equations by Picard's method, Euler's method, Modified Euler's method, Taylor's method, Runge-Kutta method.

**BOOKS RECOMMENDED :**

01. Advance Engineering Mathematics by Jain & Iyengar
02. Numerical Methods in Engg. & Science by B.S. Grewal
03. Difference Calculus (New Edition) by S.C. Sexena
04. Engineering Mathematics by S.S. Sastry

**NOTE:** There shall be total Eight questions, four from each section. Five questions have to be attempted selecting at least two questions from each section. Use of calculator is allowed.

**CLASS: B.E. 5<sup>TH</sup> SEMESTER**

**MARKS**

**BRANCH: MECHANICAL ENGINEERING**

L	T	P	Theory	Sessional
4	1	0	100	25

**COURSE NO: M-501**

**COURSE TITLE: APPLIED THERMODYNAMICS-I**

**DURATION OF EXAM: 3 HOURS**

**Course Outcomes (COs)**

<b>CO501.1:</b> Define various concepts of thermodynamics.
<b>CO501.2:</b> Apply concepts of thermodynamics for evaluating the properties of fluids used in various industrial systems such as Mechanical Power Production by using engines, air conditioning and refrigeration.
<b>CO501.3:</b> Demonstrate and conduct experiments, interpret and analyse data and report results.
<b>CO501.4:</b> Design a thermal system or a process that meets desired specifications and requirements.
<b>CO501.5:</b> Identify, formulate and solve thermal engineering problems.

**UNIT-I**

Thermodynamics of combustion, combustion reaction of common fuels, Air-fuel ratio, enthalpy and Internal energy of combustion, Application of First law of Thermodynamics to chemical reaction (combustion), analysis of products of combustion, Orsat apparatus.

**UNIT-2**

Analysis of vapour processes, Thermodynamics analysis of steam power cycle, Rankine, Reheat and Regenerative cycles, Binary vapour cycles.

**UNIT-3**

**Steam generators:** Classification, Modern steam generators, boiler mounting and accessories, Boiler performance, boiler draught and chimney calculations.

Condensers: Function, Classification, Mass of circulating water required and other calculations.

**UNIT-4**

Steam nozzles, mass flow rate, Throat pressure for maximum discharge, Relation between area, velocity and pressure, supersaturated flow, Effect of backpressure. Steam turbine: Type and applications, Impulse and Reaction turbines, Velocity diagram, Blade height, Design procedure for steam turbines, Turbine performance, Governing.

**NOTE :** There shall be eight question of 20 marks each, two from each unit. five question have to be attempted selecting atleast one question from each unit.



**RECOMMENDED BOOKS :**

- |                               |                        |
|-------------------------------|------------------------|
| 1. Thermodynamics             | Rogers & Mayhew        |
| 2. Thermal Engineering        | PL Ballaney            |
| 3. Applied Thermodynamics     | Mathur & Mehta         |
| 4. A Course in Thermodynamics | CP Kothandraman et al. |
| 5. Thermodynamics             | Gupta & Prakash        |
| 6.                            |                        |

**CLASS: B.E. 5<sup>TH</sup> SEMESTER****MARKS****BRANCH: MECHANICAL ENGINEERING**

L	T	P	Theory	Sessional
3	2	0	100	25

**COURSE NO: M-502****COURSE TITLE: FLUID MACHINERY-I****DURATION OF EXAM: 3 HOURS****Course Outcomes (COs)**

<b>CO502.1:</b> have a solid foundation in fluid flow principles.
<b>CO502.2:</b> analyse practical problem in all power plants and chemical industries.
<b>CO502.3:</b> analyse a variety of practical fluid flow device and utilize fluid mechanics principles in design
<b>CO502.4:</b> provide exposure to modern computational techniques in fluid dynamics
<b>CO502.5:</b> calculate performance in turbine and pump and can be used in power plant.

**UNIT-I**

Dynamic action of fluid, momentum equation applied to a control volume, Impact of jets, Flow of an incompressible fluid over fixed and moving vanes, work done and efficiency, Reaction principle, Propulsion of ships, whirling of fluid, dimensional analysis- Rayleigh's method, Buckingham Pi theorem, non dimensional parameters in fluid machinery, Principle of similitude- geometrical, Kinematic and dynamic similarity, Model studies.

**UNIT-2**

Euler's turbine equation, Velocity triangles, Impulse and reaction turbines, Pelton turbine, Francis turbine and Kaplan turbine- their constructional features and performance characteristics, Non-dimensional parameters for comparative study of turbine performance, Model laws, theory of draft tubes, Speed of turbines, Governing of turbines.

### UNIT-3

**Pumping machinery** : General features of positive displacement and rotodynamic pumps, classification, principle of working and principle of operation, Euler's head equation, Velocity diagrams, Losses in pumps, circulatory flow, pre-rotational efficiencies, Non-dimensional parameters, specific speed, Effect of change of diameter and speed of pumps.

Cavitations in fluid machines, installations susceptible to cavitations, collapse of Bubble theory, Thomas's parameter, factors affecting cavitations in pumps and turbines, prevention of cavitations damage (Qualitative approach only).

### UNIT-4

**Reciprocating pumps** : acceleration head, effect of friction, use of air vessels, efficiencies, pump characteristics, classification, indicator diagram.

Rotary pumps, Gear pumps and rotary piston pumps, Theory and application of Hydraulic Ram, efficiencies, Theory of operation of surge tanks, different types of surge tanks, Hydraulic crane.

**NOTE:** There shall be eight question of 20 marks each, two from each unit .Five question have to be attempted selecting atleast one question from each unit.

#### .RECOMMENDED BOOKS:

- |  |                |                         |
|--|----------------|-------------------------|
| 1. Hydraulic Machines<br>Book co., Delhi | Jag dish Lal   | --Metropolitan          |
| 2. Fluid Flow Machines<br>Hil            | N S GovindaRao | --Tata McGraw           |
| 3. Fluid Machinery                       | D.S. Kumar     | -- S.K.Kataria and Sons |
| 4. Fluid Machinery                       | R.K.Bansal     | -- Laxmi Publications   |

**MARKS**

**CLASS: B.E. 5<sup>TH</sup> SEMESTER**

**L T P Theory Sessional**

**BRANCH: MECHANICAL ENGINEERING**

**3 2 0 100 50**

**COURSE NO: M-503**

**COURSE TITLE: MACHINE DESIGN-I**

**DURATION OF EXAM: 3 HOURS**

**Course Outcomes:**

<b>CO503.1:</b> Understand the appropriate and traditional use of the engineering and machine design fundamentals.
<b>CO503.2:</b> Define and calculate the factor of safety according to static failure criteria.
<b>CO503.3:</b> Define and compare the factor of safety for fatigue or endurance loading and endurance limit strength.
<b>CO503.4:</b> Understand the design procedure of various machine elements and selection of various materials for design.
<b>CO503.5:</b> Select appropriate mechanical components from manufacture's catalogues.

**UNIT-I**

Introduction to the design procedures, design requirement, selection of material and manufacturing considerations in design such as casting, forging, mechanical working of metals, limits & fits.

Stress-strain diagram, stresses in composite bars, Principal stresses, theories of failure, creep, stress concentration, effect of tensile, bending and torsional loads, cyclic loading and endurance limit, design of pipe and pipe joints.

**UNIT-2**

Design of machine elements like screw joints, cotter and Knuckle joints, riveted, pin and welded joints, Keys and couplings.

**UNIT-3**

Design of flat belts, pulleys, clutches like single and multiple disc and brakes like single and pivoted block.

**UNIT-4**

Design and selection of sliding and roller bearings.

**NOTE :**

1. PSG Design Data book is compulsory and will be allowed in the examination hall.
2. There shall be eight question of 20 marks each, two from each unit .Five question have to be attempted selecting atleast one question from each unit

**RECOMMENDED BOOKS :**

- |                                       |                               |          |
|---------------------------------------|-------------------------------|----------|
| 1. Machine Design<br>Tata McGraw Hill | Black & Adam                  | --       |
| 2. Machine Design                     | Shigley                       |          |
| 3. Machine Design<br>Publishers       | Sunderajamurthy&<br>Shanmugam | --Khanna |
|                                       | Mahadeven                     |          |

**MARKS**

**CLASS: B.E. 5<sup>TH</sup> SEMESTER**

**L T P Theory Sessional**

**BRANCH: MECHANICAL ENGINEERING**

**3 1 0 100 25**

**COURSE NO: M-504**

**COURSE TITLE: PRODUCTION TECHNOLOGY-II**

**DURATION OF EXAM: 3 HOURS**

#### **Course Outcomes (COs)**

<b>CO504.1:</b> explain the features and applications of lathe, milling, drilling and broaching machine.
<b>CO504.2:</b> discuss features and applications of reciprocating machine tool like shaper, planer and slotting machine.
<b>CO504.3:</b> write a program to control and operate NC and CNC machine
<b>CO504.4:</b> learn about concept of boring and drilling, their difference and grinding of materials.
<b>CO504.5:</b> learned about construction and working of semiautomatic and fully automatic lathe machine.

#### **UNIT-I**

Introduction to the machining processes, concept of generatrix and directrix, methods of producing generatrix and directrix.

**Machine tools :** classifications, elements of machine tools, structures, slideways and guideways, spindle, work and tool holding devices, stepped drive of machine tools, speed and feeds, Ray diagram, Machining parameters.

#### **UNIT-2**

**Turning operations :** turning tools, Tool geometry of a single point tool, importance of tool angles, Tool designation, types of turning operation, screw, cutting, machining time and metal removal rate (MRR), chip formation, Types of chips, shear zone, tool life, tool life equation, determination of cutting forces using merchant analysis, economics. Shaper & slotter.

**Milling operation :** different type of milling operations, milling cutters, cutter geometry, & indexing head.

#### **UNIT-3**

Drilling, Boring and Reaming operations, types of drills, geometry of twist drill, difference between drilling, boring and reaming, boring machines, MRR and drilling time.

Grinding: abrasive machining, grinding wheel structure and designation, abrasive and binding materials, effect of grinding conditions on the wheel characteristics, wheel life and grinding ratio, grinding operations-surface, cylindrical and centre less.

## UNIT-4

**Semi-automatic lathes** : capstan and turret lathe, constructional features, tool layout, indexing of turret, work and tool holding devices, machining operations, problems on tool layout for specific components.

**Automatic lathes** : Features of construction and operation of single spindle automatic screw cutting machine, Swiss type screw cutting machine, Cam layout for single spindle automatic lathes, Automatic loading and feeding of work pieces, transfer devices, role of group technology in manufacturing system.

**NOTE** : There shall be eight question of 20 marks each, two from each unit .Five question have to be attempted selecting atleast one question from each unit

### RECOMMENDED BOOKS :

- |  |                |     |
|--|----------------|-----|
| 1. Principles of machine tools<br>Bhattacharya   | Sen&           |     |
| 2. Fundamentals of metal cutting & Machine tools | Juneja&Shekhon |     |
| 3. Metal cutting<br>Rao                          |                | P N |
| 4. Mechanized Assembly                           | Bothroyd       |     |
| 5. Workshop Technology (Vol. I, II, III)         | Chapman        |     |
| 6. Production technology                         | R K Jain       |     |

**CLASS: B.E. 5<sup>TH</sup> SEMESTER**

**MARKS**

**BRANCH: MECHANICAL ENGG.**

**L T P Theory Sessional**

**COURSE NO: ECE-510**

**3 2 0 100 25**

**COURSE TITLE: ELECTRONICS DEVICES  
& CIRCUITS**

**DURATION OF EXAM: 3 HOURS**

**Course Outcomes:**

<b>CO510.1:</b> Acquire knowledge of solid state devices including BJTs, FETs in terms of their operational characteristics.
<b>CO510.2:</b> Understand the working principles of rectifiers and special purpose diodes along with their practical applications.
<b>CO510.3:</b> Relate different types of triggering devices used in power electronics field on the application basis.
<b>CO510.4:</b> Differentiate between combinational and sequential circuits.

**SECTION-A**

**Linear Electronic Circuits :** Junction diodes and its characteristics, Bipolar junction transistors– configuration (CC, CE, CB), Characteristics, BJT as an amplifier, FET – characteristics, as an amplifier, RC coupled amplifier & its operation.

**Use of Diode as a Rectifier :** Half & Full wave rectifiers, Filter circuits, Special purpose diodes– LED, Tunnel diode, Schottky diode, Photo diode, Varactor diode, Zener diodes, Zener diodes as a regulator.

**SECTION-B**

**Power Electronic Devices:**

SCR, DIAC, TRIAC-their construction & operation. Gate triggering Circuits & Communication Circuits for SCR. UJT & its application.

**Digital Electronic Circuits :**Number system – Conversion, Boolean Algebra, K-map up to four variables, Combinational logic circuits–adder, subtractor, Flip – flop, Counters, Seven segment display, Synchronous & Asynchronous counters shift Registers.

**Operational Amplifier :** Introduction, Ideal & practical OPAMP, Inverting & Non-Inverting amplifier, Applications of OPAMP, Summer, difference amplifier, Voltage follower , Integrator, Differentiator, Summing, Scaling, Introduction to D/A & A/D converter – R-2R ladder D/A, Successive approx A/D, Square wave generator, Triangular wave generator.

**NOTE :**There shall be total 8 questions, four from each section. Five questions have to be attempted by the students selecting atleast two questions from each section.

**BOOKS RECOMMENDED :**

01.	Digital Electronics	Moris Mano
02.	Integrated Electronics	MillmanHalkias
03	Linear Integrated Circuits	R.A. Gaikwad
04.	Power Electronics	P.S. Bhimbra

<b>CLASS: B.E. 5<sup>TH</sup>SEMESTER</b>	<b>Hours/ Week</b>	<b>MARKS</b>
	<b>P</b>	<b>Paractical</b>
<b>BRANCH: MECHANICAL ENGG.</b>	<b>2</b>	<b>50</b>
<b>COURSE NO: M-505</b>		
<b>COURSE TITLE: APPLIED THERMODYNAMICS-I LAB.</b>		

**Course Outcomes (COs)**

<b>CO505.1:</b> Explain different boilers and can draw heat balance sheet of the boiler and also were in the position to explain the combustion product of the boiler and also tell about the methods to control harmful product.
<b>CO505.2:</b> Explain about steam turbine and steam nozzle actual work and the type of losses occur in them with different plots.
<b>CO505.3:</b> Understand practical work of power plant.
<b>CO505.4:</b> Communicate with each other more frequently regarding various thermodynamics equipment in industry.
<b>CO505.5:</b> Work in a team and develop a leadership qualities.

**LIST OF EXPERIMENTS**

1. Study and Analysis of various types of boilers.
2. Heat balance in boilers.
3. Combustion analysis by Orsat.
4. Experiments on Steam Nozzles.
5. Study and performance of Steam turbine.

<b>Hours/ Week</b>	<b>MARKS</b>
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**CLASS: B.E. 5<sup>TH</sup> SEMESTER**

**BRANCH: MECHANICAL ENGG.**

**COURSE NO: M-506**

**COURSE TITLE: FLUID MACHINERY I LAB.**

**P**

**Paractical**

**2/2**

**50**

**Course Outcomes:**

<b>CO506.1:</b> Calculate performance analysis of turbines and pumps and can be used in power plants.
<b>CO506.2:</b> Understand and analyze practical problems in all power plants and chemical industries.
<b>CO506.3:</b> Conduct experiments of pipe flows and open-channel flows and interpreting data from model studies to prototype cases, as well as documenting them in engineering reports.
<b>CO506.4:</b> Analyze a variety of practical fluid flow devices and utilize fluid mechanics principles in design.
<b>CO506.5:</b> Perform modern computational techniques in fluid dynamics.

**LIST OF EXPERIMENTS**

Study and analysis of :

1. Pelton Wheel.
2. Francis turbine.
3. Kaplan Turbine.
4. Performance and Analysis of:-
5. Positive Displacement pumps.
6. Rot dynamic pumps.

**Hours/ Week**

**MARKS**

**CLASS: B.E. 5<sup>TH</sup> SEMESTER**

**P**

**Paractical**

**BRANCH: MECHANICAL ENGG.**

**3**

**50**

**COURSE NO: M-507**

**COURSE TITLE: WORKSHOP PRACTISE-II**

**Course Outcomes (COs)**

<b>CO507.1:</b> study working mechanism of machine tools .
<b>CO507.2:</b> study working mechanism Capstan and Turret lathes, milling machine and grinding machine
<b>CO507.3:</b> Perform various grinding operation.
<b>CO507.4:</b> Perform Face milling and peripheral milling.
<b>CO507.5:</b> Perform gear cutting operation.

**LIST OF EXPERIMENTS**

**UNIT-I**

1. To study the working mechanism of the machine tools namely:
2. Capstan and Turret lathes. Milling machine and Grinding machine,
3. Operation performed on these machines. Cutting tools employed i.e, SP Tools, Cutters of different forms. Grinding wheels of different shapes including their holders.
4. Practical operations and working exercise on: Capstan Lathe, Selection of tooling, Process planning chart examination, Machine of a spindle with multiple operations on Capstan/Turret Lathe.
5. Exercise on face milling and peripheral milling, Use of dividing head for gear cutting operations, Both surface and cylindrical grinding.

**CLASS: B.E. 5<sup>TH</sup> SEMESTER**

**Hours/ Week**

**MARKS**

**BRANCH: MECHANICAL ENGG.**

**P**

**Paractical**

**COURSE NO: ECE-518**

**2/2**

**50**

**COURSE TITLE: ELETRICAL DEVICES CIRCUIT LAB**

**Course Outcomes (CO's)**

**COURSE OUTCOMES:**

<b>CO518.1:</b> Plot forward and reverse characteristics of zener diodes.
<b>CO518.2:</b> Fabricate half and full wave rectifiers using CRO and evaluate their performance parameters.
<b>CO518.3:</b> Design various combinational and sequential circuits.
<b>CO518.4:</b> Plot V-I characteristics of transistor for CE amplifier using trainer kit.
<b>CO518.5:</b> Verify truth tables of different logic gates using different digital IC's.
<b>CO518.6:</b> Understand different applications of Op-amp.

### **LIST OF EXPERIMENTS**

1. Study of Rectifier circuits:
2. Half Wave & Full Wave Centre tap.
3. Bridge rectifier & to observe the rectified waveform on CRO with or without using capacitor foter circuit.
4. Study of Zener Diode as constant voltage source.
5. Study of Common Emitter Amplifier.
6. Verification of truth table of different digital ICs.
7. Study of Flip Flops (JK & SR).
8. Study of Counters.
9. Study of Op-amps using 741 chip as
10. Adder
11. Subtract or
12. Inverter
13. Comparator.
14. Study of SCR characteristics.

**UNIVERSITY OF JAMMU, JAMMU**

**COURSE SCHEME**

**FOR B.E. 6<sup>TH</sup> SEMESTER MECHANICAL ENGINEERING**

**FOR EXAMINATION TO BE HELD FOR BATCH 2014 & ONWARDS**

CourseNo.	Course Name	CLASSES			MARKS			Total
		L	T	P	Theory	Sessional	Practical	
M- 601	Applied Thermodynamics-II	3	2	0	100	25	0	125
M- 602	Fluid Machinery-II	3	2	0	100	25	0	125
M-603	Machine Design-II	3	2	0	100	50	0	150
M- 604	Engg. Metrology	3	2	0	100	25	0	125
M-605	Industrial Engineering -I	3	2	0	100	25	0	125
EE-610	Instrumrntation& Control	3	2	0	100	25	0	125
M- 606	Applied Thermodynamics-II Lab.	0	0	2/2	0	0	50	50
M- 607	Fluid Machinery-II Lab.	0	0	2/2	0	0	50	50
M- 608	Industrial Engg.-I Lab.	0	0	2/2	0	0	50	50
M- 609	Engg. Metrology Lab.	0	0	2	0	0	50	50
EE-611	Inst. & Control Lab.	0	0	2/2	0	0	25	25
<b>Total</b>		<b>18</b>	<b>12</b>	<b>6</b>	<b>600</b>	<b>175</b>	<b>225</b>	<b>1000</b>

**CLASS: B.E. 6<sup>TH</sup> SEMESTER**

**MARKS**

**BRANCH: MECHANICAL**

**L T P Theory Sessional**

**3 2 0 100 25**

**COURSE NO: M-601**

**COURSE TITLE: APPLIED THERMODYNAMICS-II**

**DURATION OF EXAM: 3 HOURS**

**Course Outcomes (COs)**

<b>CO601.1:</b> Demonstrate sound domain knowledge on wider and solve thermal engineering problems.
<b>CO601.2:</b> Demonstrate an ability to conceptualise designs of thermal system or components and evaluate them to select optimal feasible solution considering safety, environment and other realistic constraints.
<b>CO601.3:</b> Exhibit the traits of professional integrity and ethics and demonstrate the responsibility to implement the research outcomes for sustainable development of the society.
<b>CO601.4:</b> Demonstrate traits of manager in handling engineering projects and related finance, and coordinate work force towards their goals.
<b>CO601.5:</b> Demonstrate an ability to work in laboratory and multidisciplinary tasks.

**UNIT-1**

Reciprocating compressors, Effect of clearance and volumetric efficiency, staging of compressors, elementary details of construction of compressors, Rotary compressors, their types and applications.

**UNIT-2**

**Air Standard Cycles :** Otto, Diesel and Dual cycles, Comparison, Introduction to the IC engine, Four stroke and two stroke engines, component details and valve diagrams, SI engines, Fuel injection system, Cooling and lubrication system in both SI and CI engines, Performance curves and charts.

### UNIT-3

Combustion in SI engines, Flame propagation, Normal and abnormal combustion, Detonation, resignation, After burring, Highest Useful compression Ratio (HUCR), Fuel rating, Additives in petrol, CI engines, Phase of normal combustion, Diesel knock, Effect of engine variables on diesel knock, Cetane number, Additive in diesel, combustion chambers of CI engines, catalytic converters.

### UNIT-4

**Refrigeration** : Single stage vapour compression cycle, calculation using charts, Air cycle refrigeration, Psychometric and use of psychometric charts.

**NOTE** : There shall be eight question of 20 marks each, two from each unit .Five question have to be attempted selecting atleast one question from each unit.

#### RECOMMENDED BOOKS:

- |   |                |        |        |
|---|----------------|--------|--------|
| 1. Thermodynamics & Heat<br>JainBrothers,New Delhi<br>Power Engineering | Mathur& Mehta  | --     |        |
| 2. Elements of IC engines<br>hill                                       | Rogowksi       | --Tata | McGraw |
| 3. IC Engines<br>DhanpatRai& Sons                                       | Mathur& Sharma |        | --     |
| 4. Refrigeration & Air<br>Hill<br>Conditioning                          | CP Arora       | --Tata | McGraw |
| 5. Thermodynamics<br>Laxmi publication                                  | R.K Rajput     |        | --     |

**CLASS: B.E. 6<sup>TH</sup> SEMESTER**

**MARKS**

**BRANCH: MECHANICAL**

**L T P Theory Sessional**

**COURSE NO: M-602**

**3 2 0 100 25**

**COURSE TITLE: FLUID MACHINERY-II**

**DURATION OF EXAM: 3 HOURS**

**Course Outcomes (COs)**

<b>CO602.1:</b> Illustrate the thermodynamic analysis on various air-breathing engines.
<b>CO602.2:</b> Explain design of supersonic and subsonic intakes and nozzles.
<b>CO602.3:</b> Design internal and external supersonic diffusers using modern technique.
<b>CO602.4:</b> Explain design of converging-Diverging nozzles.
<b>CO602.5:</b> Design an environmental friendly rocket in collaboration with outside world.

**UNIT-1**

Review of concepts in Thermodynamics, System and Control; volume, Conservation of mass, momentum and energy in a control volume, Aerostatics: Troposphere, International Standard Atmosphere, Relative pressure, General features of one dimensional flow of a compressible fluid, Continuity equation, Dynamics of generalized Steady One dimensional flow. Isentropic flow, Speed of propagation of pressure disturbances, acoustic speed, Mach number, Incompressible subsonic and supersonic flows, Karman's rules for supersonic flow, Mach cone, Compressibility factor, Stagnation conditions: enthalpy, temperature, pressure and density, Stagnation acoustic speed, Critical flow area, Steam thrust and Impulse function, Steady one dimensional isentropic flow with area change, Effect of area change on flow parameters, Choking in converging nozzles, performance of nozzle under decreasing back pressure, De Level nozzle, Optimum area ratio, Effect of back pressure, Nozzle discharge co-efficient, Nozzle efficiencies.

**UNIT-2**

Simple friction flow, Adiabatic flow with friction in constant area duct, Governing equation, Fanon line, Limiting condition, Effect of wall friction on flow properties in a constant area duct. Isothermal flow with friction in a constant area duct, Governing equations, Rayleigh line, entropy change caused by heat transfer, conditions for maximum enthalpy and entropy, Thermal choking, Intersection of Rayleigh and Fanon lines, Effect of heat transfer on flow parameters.

**UNIT-3**

**Wave phenomena :** Normal shock waves in perfect gases, properties of flow across a normal shock, Governing equations, Rankine-Huggniot equations, Prandtl-Meyers relationship, continuity equation, One dimensional flow, Relations for normal shocks, performance curves for inlet subsonic normal waves and converging-diverging supersonic inlets.

## UNIT-4

**Gas turbine plants** : Open and closed cycles, Thermodynamic cycles, Regeneration, reheating, Intercooling, Efficiency and performance of gas turbines.

**Jet propulsion** : Turbo-jet cycle, Net thrust, specific thrust, Thermal efficiency of turbo-jet engine, rocket propulsion, turbo engines, Propulsive efficiency, Effect of forward speed.

**NOTE:** There shall be eight question of 20 marks each, two from each unit. Five question have to be attempted selecting atleast one question from each unit. Use of scientific calculator as well as Gas Tables is allowed in the examination hall.

### RECOMMENDED BOOKS:

1. Fundamentals of Compressible flow : S.M.Yahya
2. Turbo Machines : S.M.Yahya
3. Gas Turbines, Theory & Practice : Cohen & Rogers-Orient  
Longman



**CLASS: B.E. 6<sup>TH</sup> SEMESTER**

**MARKS**

**BRANCH: MECHANICAL**

**L T P Theory Sessional**

**COURSE NO: M-603**

**3 2 0 100 50**

**COURSE TITLE: MACHINE DESIGN-II**

**DURATION OF EXAM: 3 HOURS**

**Course Outcomes (COs)**

<b>CO603.1:</b> Develop an ability to apply knowledge of mathematics, science and engineering
<b>CO603.2:</b> Demonstrate knowledge on basic machine elements used in machine design and design machine element to withstand load and deformation for given application using engineering and management principle within engineering norms
<b>CO603.3:</b> Approach a design problem successfully, taking decision when there is not a unique answer and show your approach to various engineering communities.
<b>CO603.4:</b> Be proficient in the use of software for analysis and design
<b>CO603.5:</b> To developed healthy team work environment for designing a machine part using modern tool and software.

**UNIT-1**

Design of coil i.e. helical and leaf springs, Use of compound or concentric springs, Design of chairs and ropes i.e. fiber ropes.

**UNIT-2**

Analysis of forces and bearing reactions for gears, Design of spur, Helical, Worm and Bevel gearing.

**UNIT-3**

Design of main engine components like cylinder, Pistons, Connecting rods, Crank shafts (centre), Flywheels.

**UNIT-4**

Design of shafts and levers.

**NOTE :** i) There shall be eight question of 20 marks each, two from each unit. Five question have to be attempted selecting atleast one question from each unit.

ii) PSG Design Data Book as well as Scientific Calculator is allowed in the examination.

**RECOMMENDED BOOKS:**

1. Machine Design Hill Black & Adam --Tata McGraw
2. Machine Design Shigley
3. Machine Design Sunderajamurthy& Shanmugam --Khanna Publishers
4. Machine Design (Data Handbook) Shrief Abdullah and Mahadevan

**CLASS: B.E. 6<sup>TH</sup> SEMESTER**

**MARKS**

**BRANCH: MECHANICAL**

**L T P Theory Sessional**

**COURSE NO: M-604**

**3 2 0 100 25**

**COURSE TITLE: ENGINEERING METROLOGY**

**DURATION OF EXAM: 3 HOURS**

**Course Outcomes (COs)**

<b>CO604.1:</b> Understand basic tools and equipment used in metrology
<b>CO604.2:</b> Conceptualize working and different mechanism related to dial indicators and comparators.
<b>CO604.3:</b> Identify types of threads and related terminology.
<b>CO604.4:</b> Perform experiments on hardness testing machines and correlate it with real world problem.
<b>CO604.5:</b> work in team, upholding the spirit of team work and leadership.

**UNIT-1**

Metrology-Definition and concept, Need of inspection, Principles of measurement, Process of measurement, Precision and accuracy, Errors in measurement, Linear measurement-Measuring instruments, Principle of verniers, Least count, type of vernier, Micrometers, classification, Principle and least count, Precautions, Error in Micrometer, Slip Gauges, Selection of Slip gauges. Angular measurements, Optical Bevel Protractor, Sine Bar, and Use of Sine bar, Limitations of Sine bar, Sources of error in sine bar.

## UNIT-2

Dial indicators-Introduction, requirements, Advantages, Classification, Working Mechanism, Drawbacks, General care of dial indicators.

Comparators-Introduction, Need of Comparator, Basic principles of operation, uses, essential characteristics, Classification of comparators.

Surface texture, Evaluation of surface finish, peak to Valley height, Conventional method for designing surface finish, Tomlinson surface meter.

## UNIT-3

Limits fit and tolerances- Introduction, system of writing tolerance, Relation between tolerance and cost, Maximum and minimum metal limits, conventional diagram for limits and fits, terminology, types of fits, allowance, system of obtaining different types of fits, Hole basis and shaft basis system.

Screw Thread Measurement- Introduction, screw thread terminology, errors in threads, pitch threads, Measurements of various elements of threads, major diameter, minor diameter, pitch measurement.

## UNIT-4

Non destructive testing- Introduction, Most commonly used non destructive testing method, Visual inspection, Pressure and Leak Test, Ultrasonic test, Radiography, Magnetic particle test, Eddy current, Optical Holographic Recording, Hardness testing.

**NOTE:** There shall be eight question of 20 marks each, two from each unit .Five question have to be attempted selecting atleast one question from each unit. Use of Calculator is allowed.

### RECOMMENDED BOOKS:

- |  |           |              |                     |
|--|-----------|--------------|---------------------|
| 1. Instrumentation Measurement<br>hillAnd Analysis | BC Nakra& | --Tata<br>KK | McGraw<br>Choudhary |
| 2. Mechanical Measurements<br>Addison Wesley       |           | TG Beckwith  | --                  |
| 3. A text Book of Metrology<br>DhanpatRai& Co.     |           | M.Mahajan    | --                  |

**CLASS: B.E. 6<sup>TH</sup> SEMESTER**

**MARKS**

**BRANCH: MECHANICAL**

**L T P Theory Sessional**

**COURSE NO: M-605**

**3 2 0 100 25**

**COURSE TITLE: INDUSTRIAL ENGINEERING-I**

**DURATION OF EXAM: 3 HOURS**

**Course Outcomes (COs)**

<b>CO605.1:</b> Design a system, component or process to meet desired need within realistic constraints such as economics, environmental, social, political, ethical, health and safety, manufacturability and sustainability.
<b>CO605.2:</b> Use the techniques, skills and modern engineering tools necessary for engineering practice.
<b>CO605.3:</b> Function on multi-disciplinary teams.
<b>CO605.4:</b> Identify, formulate and solve engineering problems.
<b>CO605.5:</b> Develop understanding of professional and ethical responsibility.

**UNIT-1**

Introduction to industrial engineering, Project Management, Network models: An Introduction modeling with networks, specialized network algorithms viz. Minimal spanning tree, shortest route, shortest route, and maximal flow.

Facilities are planning and plant engineering. Location factors, location of plant with multiple operations, various location decision models including transportation models and “Brown-Gibson” model, location model for critical service industries.

Types of layouts, charts, required for facilities planning. Quantitative methods in process layout, computerized layout planning: CRAFT, COROLLA and AIDED.

Productivity, scales and models for analysis.

**UNIT-2**

Materials management, Nature and scope, inventory management, classical EOQ vendor model and its various extension, other deterministic models, ABC, VED analysis, MRP and just-in-Time methods, Make-buy decisions, value engineering techniques, use of PC package for MRP.

Technique for method study, motion economy principles

**UNIT-3**

Managerial forecasting, nature and scope, various techniques, DELPHI method, Growth curves trend extrapolation- Cross-impact analysis, Casual method and scenario building.

Techniques for work measurement.

## UNIT-4

Managerial control, Quality control, Quality corporate strategy, cost of quality, Use of statistical methods in process control; R, P, C and D charts.

Acceptance sampling, simple sampling plans, OC curves, average outgoing quality levels, Total quality Management, Production Planning and Control, Gantt sequencing charts, Aggregate planning, Elementary ideas of linear Programming, Transportation and HMMS models for production planning, line balancing techniques.

Job evolution and merit rating, ergonomics and job design.

**NOTE:** There shall be eight question of 20 marks each, two from each unit .Five question have to be attempted selecting atleast one question from each unit. Use of Calculator is allowed.

### RECOMMENDED BOOKS:

- |  |                        |
|--|------------------------|
| 1. Modern Production Management                            | Buffa                  |
| 2. Production/Operations Management                        | Chary                  |
| 3. Economic Decisions Models<br>For Engineers and Managers | Riggs James L          |
| 4. Industrial Quality Control<br>&Grautt                   | Leavenworth            |
| 5. Production Planning and Control                         | Eilon Samuel--UBC Ltd. |
| 6. Industrial Engineering Handbook                         | Maynards               |

**CLASS: B.E. 6<sup>TH</sup> SEMESTER**

**MARKS**

**BRANCH: MECHANICAL**

**L T P Theory Sessional**

**COURSE NO: EE-610**

**3 2 0 100 25**

**COURSE TITLE: INSTRUMENTATION AND CONTROL-II**

**DURATION OF EXAM: 3 HOURS**

**Course Outcomes (COs)**

<b>CO610.1:</b> Formulate and then analyze the working of any electrical instrument using mathematical model under loaded and unloaded conditions.
<b>CO610.2:</b> Troubleshoot the operation of an electrical instrument.
<b>CO610.3:</b> Select a suitable measuring instrument for a given application at specific condition.
<b>CO610.4:</b> Understand the control system more effectively & make its application accordingly for new improvised systems.
<b>CO610.5:</b> Select appropriate device for the measurement of parameters like temperature, pressure, speed, stress, humidity, flow velocity etc. and justify its use through characteristics and performance.

**UNIT-1**

Functional elements and characteristics of instruments, transducers, Intermediate, Indicating and recording elements, classification of instruments, static performance and dynamics characteristics of instruments, Measurement methods and application, absolute and relative motion. Measurement of pressure. Measurement of flow with primary and secondary meters.

**UNIT-2**

Measuring devices and their calibration, force, power and torque measurement, load cells, and their calibration, use of dynamometers. Calibration and testing of instruments, electrical, non-electrical and radiation method for temperature measurement.

Acoustic measurement, typical measuring system.

**UNIT-3**

Introduction of control systems: Concept of automatic action, types of control –action, Proportional derivative and integral control. Transfer function & Block diagram, Modeling by transfer function approach. Signal flow graph, Manson's gain formula. Transient and steady state response, Dynamic error constants; effects of PID and rate controllers on time response.

**UNIT-4**

Frequency response method of analysis, Polar plot and Bode plot, Minimum and non-minimum phase transfer functions, Gain and phase margin, Constant N circles, Nicole's chart. Stability analysis, concept of conformal mapping, Routh, Hurwitz stability criterion, Nyquist stability extension, Introduction to Root locus, Root locus for simple transfer functions, Root locus method, electrical, hydraulic and pneumatic controllers.

**NOTE:** There shall be eight questions of 20 marks each, two from each unit. Five questions have to be attempted selecting at least one question from each unit. Use of Calculator is allowed.

**RECOMMENDED BOOKS:**

1. Instrumentation Measurement BC Nakra & KK Choudhary --Tata McGraw hill  
And Analysis
2. Mechanical Measurements TG Beckwith --Addison Wesley
3. Industrial Instrumentation Eckman DP --  
John Wiley & Sons.
4. Control Systems Engineering Nagrath & Gopal --Wiley Eastern
5. Automatic Control Systems Kuo BC --PHI

**MARKS**

**CLASS: B.E. 6<sup>TH</sup> SEMESTER**

**P**

**Paractical**

**BRANCH: MECHANICAL**

**2/2**

**50**

**COURSE NO: M-606**

**COURSE TITLE: APPLIED THERMODYNAMICS LAB-II**

**DURATION OF EXAM: 3 HOURS**

**Course Outcomes (COs)**

<b>CO606.1:</b> After completing this lab they are in position to explain about the actual work of two stroke engine, four stroke engine with there valves timing diagrams and there operating curves.
<b>CO606.2:</b> Also they are in position to explain about the calorific value of the fuel and also they are in position easily explain about the actual working of the reciprocating compressor, volumetric efficiency of compressor and why actual clearance volume is kept in the compressor
<b>CO606.3:</b> They are in position to explain about the manufacture of ice in an ice plant.
<b>CO606.4:</b> Be able to communicate with each other regarding various thermodynamics equipment in industry.
<b>CO606.5:</b> Be able to work in a team and develop a leadership qualities.

**LIST OF EXPERIMENTS :**

1. Study of multi-cylinder Petrol engine.
2. Heat balance of the engine.
3. A/F ratio variation with load.
4. Morse test .
5. Valve timing diagram.
6. Study and performance of two-stroke engine.
7. Determination of Calorific Value of gaseous fuel.
8. Study and performance of ice plant.
9. To find the COP of a refrigerator unit on a refrigeration tutor.
10. To find volumetric efficiency & Isothermal efficiency of an air compressor and to draw various performance.
11. Characteristics curves.

**MARKS**



**CLASS: B.E. 6<sup>TH</sup>SEMESTER**

**P**

**Paractical**

**2/2**

**50**

**BRANCH: MECHANICAL**

**COURSE NO: M-607**

**COURSE TITLE: FLUID MACHINARY-II LAB**

**DURATION OF EXAM: 3 HOURS**

**Course Outcomes (COs)**

<b>CO607.1:</b> Calculate performance analysis in different types of nozzles and their variants.
<b>CO607.2:</b> Provide the technical knowledge about functioning of diffusers for extending in future work.
<b>CO607.3:</b> Analyse the variant of experiments and make their comparison to perform additional design or to modify the existing one.
<b>CO607.4:</b> Explain design process of supersonic air foils using shock wave theory.
<b>CO607.5:</b> Be able to work in a team and develop a leadership qualities.

**LIST OF EXPERIMENTS**

1. Study of Gas Turbine Plant.
2. Study of performance.
3. Study of effect of wall friction on flow parameters in constant area duct.
4. Study of shock waves in converging & diverging nozzles.

**MARKS**

**CLASS: B.E. 6<sup>TH</sup> SEMESTER**

**P**

**Paractical**

**BRANCH: MECHANICAL**

**2/2**

**50**

**COURSE NO: M-608**

**COURSE TITLE: INDUSTRIAL ENGINEERING –I LAB**

**DURATION OF EXAM: 3 HOURS**

**Course Outcomes (COs)**

<b>CO608.1:</b> Apply knowledge of mathematics, science and engineering
<b>CO608.2:</b> Function on multi-disciplinary teams.
<b>CO608.3:</b> Identify, formulate and solve engineering problems.
<b>CO608.4:</b> Have an understanding of professional and ethical responsibility.
<b>CO608.5:</b> Have an ability to design a system, component or process to meet desired need within realistic constraints such as economics, environmental, social, political .ethical, health and safety, manufacturability and sustainability.

**LIST OF EXPERIMENTS**

1. Micrometer study using Gantt. Chart.
2. Study of different types of process charts,
3. Calculation of observed Normal and Standard time for an operation using stop watch by:-  
a) Continuous      b) SNAP-back timing.
4. To study the process capability of a machine.
5. Study and use of Therblings in describing an operation and for motion economy.

**CLASS: B.E. 6<sup>TH</sup> SEMESTER**

**BRANCH: MECHANICAL**

**COURSE NO: M-609**

**MARKS**

**P**

**Paractical**

**2**

**50**

**COURSE TITLE: METROLOGY LAB.**

**DURATION OF EXAM: 3 HOURS**

**Course Outcomes (COs)**

<b>CO609.1:</b> Familiarise with the sine bars and other angular measurement techniques.
<b>CO609.2:</b> Familiarise with the hardness testing machines.
<b>CO609.3:</b> Familiarise with the Tomilson surface meter.
<b>CO609.4:</b> Familiarise with concept of limits, fits and tolerances.
<b>CO609.5:</b> Develop teamwork habits by their involvement in group practicals.

**LIST OF EXPERIMENTS**

1. To study the measuring tools and inspection tools i.e. comparators, gauges of different forms and their use, surface finish and its measurement.
2. To find out the accuracy of a machine product.
3. Limits, fits and tolerances and shaft and hole base system
4. Screw thread measurement.

**CLASS: B.E. 6<sup>TH</sup> SEMESTER**

**MARKS**

**BRANCH: MECHANICAL**

**P**

**Paractical**

**COURSE NO: EE-611**

**2/2**

**25**

**COURSE TITLE: INSTRUMENTATION & CONTROL LAB.**

**DURATION OF EXAM: 3 HOURS**

**Course Outcomes (COs)**

<b>CO611.1:</b> Design and conduct experiments, as well as to analyze and interpret data.
<b>CO611.2:</b> Design a system, component or process to meet desired needs.
<b>CO611.3:</b> Identify, formulate and solve engineering problems.
<b>CO611.4:</b> Use the techniques skills and modern engineering tools necessary for engineering practice.
<b>CO611.5:</b> Analyse problems in the specification, design and verification of digital systems.

**LIST OF EXPERIMENTS**

1. Experiment to be conducted in a production Engineering Lab and Metallurgy Lab.
2. To measure the harmonic distortion in output of function generator.
3. To study the working of Analog Millimeter as Voltmeter, Ammeter and Ohmmeter.
4. To study the working of Digital Millimeter as Voltmeter, Ammeter and Ohmmeter.
5. To Study the working of digital frequency counter.
6. To measure strain using Strain Simulators.
7. Measurement of temperature with various types of temperature sensors.
8. To study the constructional details of LVDT
9. Measure of Linear displacement using LVDT.
10. Measurement of frequency and phase of input signal in CRO using:  
(i) Lissajous pattern (ii) Dual trace facility on Oscilloscope
11. Study of vertical Amplifier, Horizontal amplifier and time base characteristics of CRO.

**UNIVERSITY OF JAMMU, JAMMU**

**COURSE SCHEME**

**FOR B.E. 7<sup>TH</sup> SEMESTER MECHANICAL ENGINEERING**

**FOR EXAMINATION TO BE HELD FOR BATCH 2014 & ONWARDS**

COURSE No.	NAME OF THE COURSE	Hours Per Week			MARKS			
		L	T	P	Th.	Sess.	Prac.	Total
HUM-713	Organization & Management	3	2	0	100	50	0	150
M-701	CAD, CNC & Robotics	3	2	0	100	50	0	150
M-702	Plant layout & Material Handling	3	2	0	100	50	0	150
M-703	Energy Resources & Utilization	3	2	0	100	50	0	150
M-704	CAD, CNC and Robotics Lab.	0	0	4	0	0	50	50
M-705	Minor Project	0	0	6	0	0	150	150
M-706	Seminar	0	0	6	0	0	100	100
M-707	Industrial Training	0	0	0	0	0	100	100
<b>TOTAL</b>		<b>12</b>	<b>8</b>	<b>16</b>	<b>400</b>	<b>200</b>	<b>400</b>	<b>1000</b>

**CLASS: B.E. 7<sup>TH</sup> SEMESTER**

**MARKS**

**BRANCH: MECHANICAL ENGINEERING**

L	T	P	Theory	Sessional
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**COURSE NO: HUM-713**

3	2	0	100	50
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**COURSE TITLE: ORGANISATION AND MANAGEMENT**

**DURATION OF EXAM: 3 HOURS**

### **COURSE OUTCOMES**

<b>CO713.1:</b> Understand the meaning and functions such as planning, organizing, actuating and controlling etc. of industrial management.
<b>CO713.2:</b> Apprehend the methods of selection, interviews.
<b>CO713.3:</b> Differentiate between line, staff, functional and committee organizations.
<b>CO713.4:</b> Realize the importance and conduct of various psychological tests in industry.
<b>CO713.5:</b> Understand the role of entrepreneur and thus would be able to get the basis of starting his/her own venture in future.

### **UNIT-I**

**Industrial Management :** Meaning for Industrial Management and definitions of Management, Functions of management like planning, organizing, actuating and controlling. Defining management objectives, managerial activity and objectives. Primary, secondary, personal and social objectives of management and tests of management objectives.

### **UNIT-II**

**Management Organization :** Various forms of organization and Departmentalization

Line, staff, functional and committee organization.

Formal and informal organization.

**Delegation :** Meaning and importance, Delegation of authority, Barriers to effective delegation.

**Decision making :** Meaning, Importance and steps in decision making.

### **UNIT-III**

**Entrepreneurship :** Scope of entrepreneurship as profession for engineers., Leadership: Definition and Traits like born and acquired.

Forms of Industrial Organizations.

a) Single proprietorship

- b) Partnership
- c) Joint stock companies
- d) State Enterprises.

#### **UNIT-IV**

**Personal Management** : Methods of Selection, Interview, Psychological Testing in Industry

**Vocational guidance** : Its need and technique, Importance of counseling, system of merit rating and Job evaluation, job satisfaction and morale- their effects on productivity.

**RECOMMENDED BOOKS:**

A. Principles of Management	:	George R. Terry
B. Industrial Orgn. & Management	:	Tara Chand
C. Business Orgn. & Management	:	MC.Shukla
D. Management	:	George Junior

**NOTE** : There shall be eight questions of 20 marks each, two from each unit. Students are required to attempt five questions selecting atleast one question from each unit. Use of Calculator is allowed.

**CLASS: B.E. 7<sup>TH</sup> SEMESTER**

**MARKS**

**BRANCH: MECHANICAL ENGINEERING**

**L T P Theory Sessional**

**COURSE NO: M-701**

**3 2 0 100 50**

**COURSE TITLE: CAD, CNC & ROBOTICS**

**DURATION OF EXAM: 3 HOURS**

**Course Outcomes (COs)**

<b>CO701.1:</b> Apply/develop solutions or to do research in the area of design and simulation in mechanical engineering.
<b>CO701.2:</b> Have abilities and capabilities in developing and applying computer software and hardware to mechanical design and manufacturing fields.
<b>CO701.3:</b> Review and document the knowledge developed by scholarly predecessors and critically assess the relevant technological issues.
<b>CO701.4:</b> Formulate relevant research problems; conduct experimental and/or analytical study and analyzing results with modern mathematical/scientific methods and use of software tools.
<b>CO701.5:</b> Design and validate technological solutions to defined problems and communicate clearly and effectively for the practical applications of their work.

**Unit-I**

CAD: Introduction, Organization of computer CAD work station. System configuration computer memory input output device and display device, mouse, digitizers, OMR, plotter and printer VDU-DVST, DBRT, Raster and Digital display.

**Unit-II**

Windowing clipping & zooming 2D&3D transformation, Translation, Scaling, Rotating Mirroring and Inversing. Modeling wire frame, Surface and solid Shading model; Diffused and specular reflection coloring models RGB, CMV, HIS.

**Unit-III**

Automaton in manufacturing basic concepts of numerical control system and machine CNC and DNC, advantages of NC system. Fundamental of numerical control CO-ordinate system and motion control system ATC. Classification and structure of robots, robotic system configuration fundamental motion. End effectors application of robotics

**Unit-IV**

NC part programming manual part programming G&M codes F,S,T. symbol in programming datum in NC machine tools offsets radius compensation examples of manual part programming introduction to CAPP

**RECOMMENDED BOOKS :**

A. Numerical control and CAM

:T.K. kundra P.N Rao&N.K. Tiwari



B. CAD/CAM  
Zimmerman(PHI)

:M.Grover&

J.P.A.

C. Introduction to Robotics

:JamesRehg

**NOTE** : There shall be eight questions of 20 marks each, two from each unit. Students are required to attempt five questions selecting atleast one question from each unit. Use of Calculator is allowed.

**CLASS: B.E. 7<sup>TH</sup> SEMESTER**

**MARKS**

**BRANCH : MECHANICAL ENGINEERING**

**L T P Theory Sessional**

**COURSE NO: M-702**

**3 2 0 100 50**

**COURSE TITLE: PLANT LAYOUT &**

**MATERIAL HANDLING**

**DURATION OF EXAM: 3 HOURS**

**Course Outcomes (COs)**

<b>CO702.1:</b> Identify the rule that each department plays in achieving the goal of an organization.
<b>CO702.2:</b> Explain the problems in organizing ,planning and controlling the use of man ,money , material and machines for industrial production
<b>CO702.3:</b> Apply industrial engineering principles to solve the problems in organizing ,planning and controlling the use of man ,money ,material and machines for industrial production .
<b>CO702.4:</b> Design material handling system for a variety of scenarios pertaining to manufacture and service industry.
<b>CO702.5:</b> Develop and analyse plant layouts using manuals and computers aided software methodologies.

**Unit-I**

**Plant Layout:** objective and criteria for facilities planning and industrial plant design.

**Site Selection :** Factors affecting site selection, Application of transportation problem. Decision matrix. Locational theory.

**Types of production activities :** job ,Shop, Batch. Mass and continuous flow production.

**Unit-II**

**Types of Layout :** similar products Special Product Fixed Process and product type layout and their combinations.

**Layout planning :** Factor influencing plant layout. Design considerations. Steps in planning,safety requirements.

Cross-chart technique to plant layout problems.

Analytical evaluation of plant layout.

**Unit-III**

**Material Handling :** Role application study of problem. Calculation of handling costs interplant transporting facilities and handling equipment , Factor in Equipment selection, Types of material

handling equipment Hoisting appliance cranes and elevators integration of material handling equipment

#### Unit-IV

**Conveyors:** General theory of conveyed machines components part. Belt conveyors, Apron conveyors flight conveyors, Bucket and swing conveyors. Overhead conveyors car and platform conveyors, Screw conveyors, Roller conveyors, Oscillating conveyors and Vibratory conveyors, Hydraulic and Pneumatic conveyors.

#### RECOMMENDED BOOKS :

- A. Plant layout and Material Handling : Apple -Ronald
- B. Plant layout and Design: : Moore G.F -  
McGraw Hill
- C. Material Handling Equipments: :Rudenko - Peace  
Publications Moscow.
- D. Practical Plant Layout: :Muther - McGraw Hill
- E. Material Handling Handbook : Bolz and Hugeman –Ronaldo

**NOTE :** There shall be eight questions of 20 marks each, two from each unit. Students are required to attempt five questions selecting atleast one question from each unit. Use of Calculator is allowed.

**CLASS: B.E. 7<sup>TH</sup> SEMESTER**

**MARKS**

**BRANCH: MECHANICAL ENGINEERING**

**L T P Theory Sessional**

**COURSE NO: M-703**

**3 2 0 100 50**

**COURSE TITLE: ENERGY RESOURCES AND UTILIZATION**

**DURATION OF EXAM: 3 HOURS**

**Course Outcomes (COs)**

<b>CO703.1:</b> Select the suitability of site for a power plant.
<b>CO703.2:</b> Calculate performance of thermal power plant.
<b>CO703.3:</b> Explain the major type of hydro power and wind power turbines and estimate power generation potential.
<b>CO703.4:</b> Explain working principle of different type of nuclear power plant.
<b>CO703.5:</b> Calculate load factor, capacity Factor, average load and peak load on a power plant.

**UNIT-I**

Conventional energy resources, Types of power plants, Selection of site for steam, Hydro, Nuclear and standby power plants, Selection of base load and peak load power plants, Variable load problems.

**UNIT-II**

Special features of modern steam boilers, circulation principle, Steam separation and purification, Economizer and air pre-heaters and super heat control, Fuel preparation and burning, Furnaces and combustion equipment, Water treatment plant, Condensers and air pumps, Performance estimation, Spray ponds and cooling tower Components of nuclear power plants, moderators, coolants, reflectors and other components, control of nuclear plants, Different kinds of nuclear reactors, Disposal of radioactive waste.

**UNIT-III**

Economic of power generation, operational and maintenance various power plants.

**UNIT-IV**

Non conventional energy sources Biomass, Solar, Wind, Tidal, Geothermal and MHD.

**RECOMMENDED BOOKS :**

- A. Power Plant Engineering :  
Morse
- B. Power Plant Technology :  
E.lwakil
- C. Power station engineering economy :  
VopatSkotzki
- D. Power station engineering economy :  
John F lee
- E. Nuclear power plant :  
Robert loftness
- F. Modern power plant engineering : Weisman  
eskarf

**NOTE :** There shall be eight questions of 20 marks each, two from each unit. Students are required to attempt five questions selecting atleast one question from each unit. Use of Calculator is allowed.

<b>CLASS: B.E. 7<sup>TH</sup> SEMESTER</b>		<b>MARKS</b>
<b>BRANCH : MECHANICAL ENGINEERING</b>	<b>P</b>	<b>Practical</b>
<b>COURSE NO: M-704</b>	<b>4</b>	<b>50</b>
<b>COURSE TITLE: CAD, CNC AND ROBOTICS LAB</b>		
<b>DURATION OF EXAM: 3 HOURS</b>		

**Course Outcomes (COs)**

<b>CO704.1:</b> Analyse the input and output devices of workstation.
<b>CO704.2:</b> Demonstrate the knowledge on basic drafting software tools and ability to use them accordingly.
<b>CO704.3:</b> Approach a design problem successfully, taking decisions when to use a specific tool.
<b>CO704.4:</b> Be proficient in the use of part programming in NC/CNC lathe, drilling and milling.
<b>CO704.5:</b> Understand the working mechanism of AUTOMAT.

**LIST OF PRACTICAL'S :**

1. Study of the CAD workstation on various components including the various types of input and output devices.
2. Study of the drafting using latest drafting softwares.
3. Simple exercises of drawing through the same packages-two dimensional drafting and three dimensional modeling.
4. Working mechanism of NC machine tools, Part programming for a job on NC/CNC lathe, drilling and milling machine.
5. Working mechanism of an Automat.
6. Exercise on manual part-programming for CNC machines like turning center and the end mill Cutter, Use of various codes.
7. Simulation of the cutting process and determination of the Tool-path graphics using simulation packages for the above cutting processes.

**CLASS: B.E. 7<sup>TH</sup> SEMESTER**

**BRANCH: MECHANICAL ENGINEERING**

**COURSE NO: M-705**

**COURSE TITLE: MINOR PROJECT**  
**Course Outcome**

**MARKS**

**P Paractical**

**6 150**

### **COURSE OUTCOMES**

<b>CO705.1</b> Identify a topic in advanced areas of Mechanical Engineering.
<b>CO705.2</b> Review literature to identify gaps and define objectives & scope of the work.
<b>CO705.3</b> Generate and implement innovative ideas for social benefit.
<b>CO705.4</b> Easily develop or modify the design for various manufacturing processes/equipment.
<b>CO705.5</b> Design and conduct experiments, as well as to analyze and interpret data.

The project will be assigned to the students towards the end of 6th semester and will start working on those projects at the commencement of their 7th semester. The topic of the project will be decided as per the developments taking place in the field of Mechanical Engineering .

This may require complete literature survey, design, fabrication, simulation of some models and/or some preliminary laboratory experiments etc. The same project shall be extended to 8th semester.

#### **Distribution of Marks as per University statutes:**

Total Marks for End semester Evaluation	= 150 marks
1) Presentation/Demonstration	= 45 marks 30%
2) Viva-voce	= 45 marks 30%
3) Actual work done	= 60marks 40%

#### **Award of Marks**

- Marks under (1) and (2) will be awarded by the Departmental committee constituted comprises of convener and atleast two members.
- Marks under (3) will be awarded by the Project Guide/supervisor concern.

**CLASS: BE 7<sup>TH</sup> SEMESTER**

**MARKS**

**BRANCH : MECHANICAL ENGINEERING**

**P**

**Paractical**

**COURSE NO: M-706**

**6**

**150**

**COURSE TITLE: SEMINAR**

**Course Outcome**

### **COURSE OUTCOMES**

<b>CO706.1</b> Identify and compare technical and practical issues related to the area of program specialization.
<b>CO706.2</b> Outline annotated bibliography of research demonstrating scholarly skills.
<b>CO706.3</b> Prepare a well-organized report employing elements of technical writing and critical thinking.
<b>CO706.4</b> Demonstrate the ability to describe, interpret and analyze technical issues and develop competence in presenting.
<b>CO706.5</b> Understand the need to be knowledgeable of contemporary issues.

This will involve a detailed study of a topic of interest reproduced in the candidate's own style. For this, a student has to prepare a seminar by doing proper survey of literature, compilation of information so gathered and then presentation of the same followed by question-answer session.

The report of which has to be submitted by the student well before the conduct of seminar. The handout submitted by the student will be in accordance with the standards of technical papers.

#### **Guidelines and evaluation of Seminar in 7th semester :**

The topic of the Seminar is to be finalized and approved by the departmental committee by the end of 6th Semester. The committee shall have a convener and atleast two members.

#### **Distribution of Marks :**

Total Marks for Seminar Evaluation = 100 marks

- 1) Project Report = 30 marks
- 2) Presentation = 50 marks
- 3) Attendance = 20 marks.

#### **Award of Marks :**

- Marks Under (1) will be awarded by the Seminar Incharge.
- Marks Under (2) and (3) will be awarded by the Departmental committee constituted for the purpose.



**CLASS: B.E. 7<sup>TH</sup> SEMESTER**

**MARKS**

**BRANCH: MECHANICAL ENGINEERING**

**P**

**Practical**

**COURSE NO: M-707**

**0**

**100**

**COURSE TITLE: INDUSTRIAL TRAINING**

### **COURSE OUTCOMES**

<b>CO707.1</b> Students should be able to work in industry with any hesitation.
<b>CO707.2</b> Apply ethical principles and commit to responsibilities and norms of engineering practice.
<b>CO707.3</b> Recognition of the need for, and an ability to engage in life-long learning.
<b>CO707.4</b> To use the techniques, skills, and modern engineering tools necessary for engineering practice.
<b>CO707.5</b> To identify, formulate, and solve engineering problems.

Students are required to undertake 4 to 6 weeks Practical Training during the summer vacations in the field of Mechanical Engineering in Govt./Semi-Govt./Private sector. Thereafter, each student shall be required to submit a report on the practical training to the concern HOD for evaluation.

#### **Guidelines for evaluation of Practical Training:**

The evaluation shall be done by the departmental committee by the end of 7<sup>th</sup> semester. The committee shall have a convener and atleast two member.

#### **Distribution of Marks as per the University statutes:**

Total Marks for Evaluation

= 100 marks

i)	Report = 40	40%	
ii)	Viva-Voce 30%		= 40
iii)	Miscellaneous Marks 30%		= 30

Due weightage will be given to those who have opted Industrial Training outside the State as well as keeping in view the profile of that Industry.

#### **Award of the Marks:**

Marks under (i), (ii) & (iii) will be awarded by the departmental committee constituted for the purpose.

**UNIVERSITY OF JAMMU, JAMMU**

**COURSE SCHEME**

**FOR B.E. 8<sup>TH</sup> SEMESTER MECHANICAL ENGINEERING**

**FOR EXAMINATION TO BE HELD FOR BATCH 2014 & ONWARDS**

Course No.	Name of the Course	Hours Per Week			Marks			
		L	T	P	Theory	Sessional	Practical	Total
M-801	Optimization Technique	3	2	--	100	50	--	150
Elective-I M-802	A) Automobile Engineering B) Refrigeration and Air conditioning C) Advance Manufacturing Technology	3	2	--	100	50	--	150
Elective-II M-803	A) Welding Technology B) Mechatronics C) Entrepreneurship	3	2	--	100	50	--	150
Elective-III M-804	A) Production Planning & Control B) Metal Cutting & Tool Design C) Method Engineering & Ergonomics	3	2	--	100	50	--	150
M-805	Major Project	--	--	16	--	250	150	400
<b>Total</b>		<b>12</b>	<b>8</b>	<b>16</b>	<b>400</b>	<b>450</b>	<b>150</b>	<b>1000</b>

**Note :** Students have to select one course each from Elective I, II, and III.

**CLASS: B.E. 8<sup>TH</sup> SEMESTER**

**MARKS**

**BRANCH: MECHANICAL ENGINEERING**

**L T P Theory Sessional**

**COURSE NO: M-801**

**3 2 0 100 50**

**COURSE**

**TITLE: OPTIMIZATION TECHNIQUES**

**DURATION OF EXAM: 3 HOURS.**

**Course Outcomes (COs)**

<b>CO801.1:</b> Identify necessity and development of mathematical models for various industries.
<b>CO801.2:</b> Describe basic optimization and simulation techniques applied to various industries.
<b>CO801.3:</b> Recall investment analysis and game theory.
<b>CO801.4:</b> Predict the industrial systems under the conditions of certainty, uncertainty and risk.
<b>CO801.5:</b> Propose a queuing model based upon given data.

**UNIT-1**

**Introduction to optimization** : Nature and Historical Development of Optimization sciences. Phases of Operation Research model Building and type of Optimization problems. Project Scheduling: Planning and Scheduling with the basic network models incorporation probabilities and costs PERT and CPM , Network crashing.

**UNIT-2**

**Linear Distribution** : Linear Programming Optimization models. Problem formulation, Geometric solution in two and three dimensional space, Simplex algorithm. Solution. Complication in Simplex algorithm Duality and post – Optimality analysis. Introduction to Integer programming.

**UNIT-3**

**Optimization models** : Transportation models. Variations and selected application. Assignment models. Waiting Line models: Queuing System. Features of queuing process Classification of models and their solution M/M/I and M/M/C Models.

**UNIT-4**

T-test,  $\beta$ -test, ANOVA analysis, Six-sigma and application.

**RECOMMENDED BOOKS :**

1. Operation Research :  
Hamdy H Taha- McMillan pub. Co.
2. Industrial Engineering & Management : O.P. Khanna.
3. Fundamental of Operation Research : R.L.Ackoff&M.W.Sasieni-  
Wiley Eastern
4. Theory and Problem of Operation Reseach : R.Bronson –Schaums Outline  
Series

**NOTE :** There shall be eight questions of 20 marks each, two from each unit. Students are required to attempt five questions selecting atleast one question from each unit. Use of Calculator is allowed.

**CLASS: B.E. 8<sup>TH</sup> SEMESTER**

**MARKS**

**BRANCH: MECHANICAL ENGINEERING**      **L**    **T**    **P**    **Theory**    **Sessional**

**COURSE NO: M-802(A) ELECTIVE-I**                      **3**    **2**    **0**    **100**            **50**

**COURSE TITLE: AUTOMOBILE ENGINEERING**

**DURATION OF EXAM: 3 HOURS.**

**Course Outcomes (COs)**

<b>CO802.1:</b> Understand the construction and working of an automobile.
<b>CO802.2:</b> Be familiar with fuel injection systems.
<b>CO802.3:</b> Be familiar with cooling, lubrication and ignition systems.
<b>CO802.4:</b> Be familiar with power transmission in automobiles.
<b>CO802.5:</b> Be familiar with braking, suspension and steering systems.

**UNIT-1**

General classification of vehicles, layout of passenger car-Major parts. Working of petrol and diesel Engines-Engine block (crank-shaft, crane, shaft, piston, conceding rod valves-material and construction).

Fuel system – Air filter, fuel pump (S.I engine), Carburetor and its types, Fuel Injection pump (C.I engine). Nozzles, inlet and exhaust manifolds.

**UNIT-2**

Cooling-Type of cooling systems, liquid and air radiators.

Lubrication- Types of lubricating systems, wet sump (splash and pressure), Dry sump, Properties of lubricating oils.

Electrical system-ignition system, Coil, Magneto and Electronic ignition. Battery generator, Starter motor lighting.

**UNIT-3**

Transmission system- Clutch- type, Mechanical details, Gear-box (constant mesh, sliding mesh synchromesh), Overdrive- Propeller shaft, Differential rear-axle, front axle. Trans-axles.

Torque convertors and automatic transmission, concepts of Transfer Gear- box, Limited slip Differential and Differential lock.

## UNIT-4

Brakes -Hydraulic and Pneumatic brakes. Drum type. Power assisted brakes.

Suspension system- purpose, leaf and helical spring systems. Torsion bars. Shock absorbers.

Steering- Ackerman's steering, Wheel alignment, toe-in and Toe-out, Camber and Castor.

Tyres and their types, selection of types, magnetic Levitation.

### RECOMMENDED BOOKS :

1. Automobile Engineering : Joseph Heitner-East  
West Press Pvt. Ltd.
2. Automobile Engineering (Vol. I & II) : Kirpalsingh-Standard  
Publishers, Delhi.
3. Automobile Engineering :G.B.SNarang-Khanna  
Publishers.
4. Automobile Engineering : Crouse.
5. The Motor Vehicle : Newton and steed.
- 6.

**NOTE :** There shall be eight questions of 20 marks each, two from each unit. Students are required to attempt five questions selecting atleast one question from each unit. Use of Calculator is allowed.

**CLASS: B.E. 8<sup>TH</sup> SEMESTER**

**MARKS**

**BRANCH: MECHANICAL ENGINEERING**

**L T P Theory Sessional**

**COURSE NO: M-802(B) ELECTIVE-I**

**3 2 0 100 50**

**COURSE TITLE: REFRIGERATION & AIR-  
CONDITIONING**

**DURATION OF EXAM: 3 HOURS.**

**Course Outcomes (COs)**

<b>CO802B.1:</b> Differentiate between vapour compression and vapour absorption cycles.
<b>CO802B.2:</b> Analyse thermodynamically, vapour compression systems
<b>CO802B.3:</b> Understand the purpose of condensers, compressors, expansion devices etc.
<b>CO802B.4:</b> Recall and differentiate various refrigerants.
<b>CO802B.5:</b> Do psychometric analysis.

**UNIT-1**

**Refrigeration:** Principle, Heat pump and refrigeration machine, Vapour compression system, Vapour Absorption system, Air cycle refrigeration, Steam jet refrigeration, solar refrigeration, thermo-electric refrigeration. COP and power requirement calculations for different systems. Reversed Braxton cycle.

**UNIT-II**

Thermodynamic analysis of vapour compression system. Actual cycle. Effects of Operating variables on the performance of vapour compression system, Compound systems with inter-cooling for single and multiple evaporators, Cascading.

**UNIT-III**

**Refrigeration equipment:** a) Expansion devices- types and their operating characteristics. b) Evaporators-types and heat transfer in them. c) Condenser-Types and heat transfer in them, stack effect, chimney effect. d)Compressors- Types and capacity control, system balancing. e) Cooling towers- types.

**System Evaluation :**Tests for leakage, charging methods, HP and LP controls, Temperature controls, solenoid valves.

**Refrigerants :**Designation and selection of a refrigerant, thermodynamic chemical and physical requirements, secondary refrigerants and alternative refrigerants.

**UNIT-IV**

Air-conditioning-Psychometric of Air-conditioning process, Mixing process, Basic processes in conditioning of air, air-conditioning load calculation and applied psychometrics. Summer

and winter air-conditioning, Design conditions-Choice of inside conditions, comfort, outside design conditions, Choice supply design conditions, and Critical loading conditions. Applications of Refrigeration-ice and ice cream manufacture, dairy refrigeration, poultry products, fishery products, Modern techniques of food preservation. Linde system for liquidification of air.

**RECOMMENDED BOOKS :**

1. Refrigeration and Air-conditioning Hill : C.P Arora-Tata McGraw
2. Refrigeration and Air-conditioning Eastern :Manohar Prasad-Wiley
3. Refrigeration and Air-conditioning : Jennings and Rogers
4. Refrigeration and Air-conditioning : Stoccker- McGraw Hill
5. Refrigeration and Air-conditioning Data Book : Manohar Prasad-Wiley Eastern

**NOTE :**There shall be eight questions of 20 marks each, two from each unit. Students are required to attempt five questions selecting atleast one question from each unit. Use of Calculator is allowed.





**RECOMMENDED BOOKS :**

1. Non-traditional machining methods: ASME.
2. New Technology by Bhattayacharya; I.E. (India)
3. Ultrasonic cutting by Rozenberg; Consultants Bureau; N.Y.

**NOTE :** There shall be eight questions of 20 marks each, two from each unit. Students are required to attempt five questions selecting atleast one question from each unit. Use of Calculator is allowed.

**CLASS: B.E. 8<sup>TH</sup> SEMESTER**

**MARKS**

**BRANCH: MECHANICAL ENGINEERING**

**L T P Theory Sessional**

**COURSE NO: M-803(A) ELECTIVE-II**

**3 2 0 100 50**

**COURSE TITLE: WELDING TECHNOLOGY**

**DURATION OF EXAM: 3 HOURS.**

#### **Course Outcomes (COs)**

<b>CO803A.1:</b> Understand the fundamentals of various welding processes.
<b>CO803A.2:</b> Do classification of various welding processes.
<b>CO803A.3:</b> Understand the purpose and effect of welding arcs.
<b>CO803A.4:</b> Differentiate between TIG, MIG etc welding processes.
<b>CO803A.5:</b> Develop a fundamental understanding of welding technique using radiation energy.

#### **Unit-I**

Basic classification of welding processes, weld ability, weld thermal cycle, metallurgy of fusion welds, solidification mechanism and micro structural products in weld metal, epitaxial, cellular and dendritic solidification, metallurgical changes in weld metal, phase transformation during cooling of weld metal in carbon and low alloy steel, prediction of microstructures and properties of weld metal, phase transformation during cooling of weld metal in carbon and low alloy steel, prediction of microstructures and properties of weld metal. Heat affected zone, re-crystallization and grain growth of HAZ, gas metal reaction, effects of alloying elements on welding of ferrous metals.

#### **Unit-II**

**Welding Arc :** Arc efficiency, temperature distribution in the arc; arc forces, arc blow, electrical characteristics of an arc, mechanism of arc mechanism of arc initiation and maintenance, role of electrode polarity on arc behavior and arc stability, analysis of the arc.

**Coated Electrodes :** Electrode coatings, classification of coatings of electrodes for SMAW, SAW fluxes, role of flux ingredients and shielding gases, classification of solid and flux code wires.

#### **Unit III**

**Fusion Welding reviews :** Critical reviews of manual metal arc welding ,TIG,MIG and CO welding processes, duty cycles, AC, DC welding power source, DC rectifiers, thyristor controlled rectifiers, transistorized units, inverter systems. Arc length regulation in mechanized welding processes,

**Metal Transfer and Melting Rate** : Mechanism and types of metal transfer, forces affecting metal transfer, modes of metal transfer, metal transfer in various welding processes, effective of polarity on metal transfer and melting rate.

#### **Unit-IV**

**Solid State welding** : Theory and mechanism of solid state welding. Techniques and scope of friction welding, diffusion welding, cold pressure welding and ultrasonic welding. High energy rate welding. Analysis of the process.

**Welding techniques using Radiation energy** : Technique scope and application of the electron beam and laser welding processes.

#### **RECOMMENDED BOOKS :**

1. Welding processes & technology by Dr. R.S. ParmarKhanna Publishers.
2. Principles of Welding Technology by L.M Gourd ELBS/Edward Arnold.
3. Welding & Welding Technology Richard L. Little, McGraw Hill

**NOTE** : There shall be eight questions of 20 marks each, two from each unit. Students are required to attempt five questions selecting atleast one question from each unit. Use of Calculator is allowed.

**CLASS: B.E. 8<sup>TH</sup> SEMESTER**

**MARKS**

**BRANCH: MECHANICAL ENGINEERING**

L	T	P	Theory	Sessional
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**COURSE NO: M-803(B) ELECTIVE-II**

3	2	0	100	50
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**COURSE TITLE: MECHATRONICS**

**DURATION OF EXAM: 3 HOURS.**

**Course Outcomes (COs)**

<b>CO803B.1:</b> Understand the fundamentals of mechatronics.
<b>CO803B.2:</b> Use control charts for various engineering purposes.
<b>CO803B.3:</b> Differentiate between various sensors and transducers.
<b>CO803B.4:</b> Work with pneumatic and hydraulic systems.
<b>CO803B.5:</b> Differentiate between various electrical actuation systems.

**UNIT-1**

**Introduction to mechatronics:**

Definition and approach of mechatronics, Measurement and control system, microprocessor and controller and mechatronic approach.

**UNIT-II**

**Sensors and Transducers:**

Performance terminology, displacement, velocity, position, proximity, force, fluid pressure, liquid small, temp, light sensors, procedure for selection.

**UNIT-III**

**Pneumatic and hydraulic systems:**

Actuation system, Directions, pressure presses control value, pneumatic & Hydraulic system.

**UNIT-IV**

**Electrical Actuation systems:**

Mechanical switches, solid state swatches, solenoid DC/AC motor, stopper motors.

**RECOMMENDED BOOKS :**

1. Mechatronics : W. Bolton
2. Microprocessors : Rafiqu-zaman
3. Automatic control system : Benjamin.

**NOTE :** There shall be eight questions of 20 marks each, two from each unit. Students are required to attempt five questions selecting atleast one question from each unit. Use of Calculator is allowed.

**CLASS: B.E. 8<sup>TH</sup> SEMESTER**

**MARKS**

**BRANCH: MECHANICAL ENGINEERING**

L	T	P	Theory	Sessional
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**COURSE NO: M-803(C) ELECTIVE-II**

3	2	0	100	50
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**COURSE TITLE: ENTREPRENEURSHIP**

**DURATION OF EXAM: 3 HOURS.**

### Course Outcomes (COs)

<b>CO803C.1:</b> Collect and analyse data to assess the attractiveness of new business opportunities in regards to the market, the industry and the team.
<b>CO803C.2:</b> Detect his weaknesses and strengths within a business opportunity and give suggestions on how to improve these weaknesses and utilise these strengths.
<b>CO803C.3:</b> Design, organise and lead a team with the goal of bringing new products and services to market.
<b>CO803C.4:</b> Design, organise and lead a team with the goal of bringing new products and services to market.
<b>CO803C.5:</b> Adapt to changing circumstances that occur during the entrepreneurial process. They are able to transform an initial idea into a fully-fledged business opportunity and effectively communicate this opportunity through a business plan and pitch.

### Unit I

**Introduction:** Factors leading to Industrial development Entrepreneur definition and various concepts, self awareness. Motivational aspects, attitude development, creativity, copying with uncertainties, resilience.

### Unit II

**Information:** Industrial potential, environmental scanning, identification of opportunities, dynamics of an opportunities, business opportunities recognition. Government policy for industrial development. Choice of Technology research for patents, product development.

### Unit III

**Planning :** Planning of an industrial unit, project planning, identification of market and demand for products, role of significant variables, execution of projects legal aspects, financial aspects and labour laws, feasibility studies, sectoral, industrial and unit level feasibility, exposure to past, present and future.

### Unit IV

**Entrepreneurial Management:** Business finance Management through elementary concept-break even, working capital knowledge of various institutions and their mode of assistance.

Elements of production processes, quality control, inspection methods. Production planning group dynamics.

**RECOMMENDED BOOKS :**

1. Entrepreneurship development programme in India and its relevance to developing countries by VG Patel; EDI- India; Ahmedabad (1987)
2. Developing of New Entrepreneurship by EDI India; Ahmedabad(1987)
3. Self- made Impact making Entrepreneurship by G.R. Jain and M.A. Ansari; by EDI India; Ahmedabad(1988)

**NOTE :** There shall be eight questions of 20 marks each, two from each unit. Students are required to attempt five questions selecting atleast one question from each unit. Use of Calculator is allowed.

**CLASS: B.E. 8<sup>TH</sup> SEMESTER**

**MARKS**

**BRANCH: MECHANICAL ENGINEERING**

**L T P Theory Sessional**

**COURSE NO: M-804(A) ELECTIVE-III**

**3 2 0 100 50**

**COURSE TITLE: PRODUCTION PLANNING AND  
CONTROL**

**DURATION OF EXAM: 3 HOURS.**

**Course Outcomes (COs)**

<b>CO804A.1:</b> Apply the system concept of design of production and service systems.
<b>CO804A.2:</b> Make forecast in the manufacturing and service sector using selective quantitative and qualitative techniques.
<b>CO804A.3:</b> Apply the principles and techniques for planning and control of the production and service system to optimise /make best use of resources.
<b>CO804A.4:</b> Understand the importance and the function of inventory and to be able to apply selected techniques for its control and management under dependent and independent circumstances.
<b>CO804A.5:</b> Apply the principles and techniques for planning and control of the production and service system to optimise /make best use of resources.

**UNIT-1**

**Introduction:** Objectives and function and aims of PPC, Qualities of production planning advantages of PPC, Pre-planning and production Planning: Introduction to product development and design, Different methods of forecasting feature demands- Qualitative and Quantities, Determination of factors of production requirements, Facilities layout and Machine handling Departmental arrangement, Selection of materials, Methods, Routing and Scheduling.

**UNIT-II**

**Materials planning and Control:** Field and scope, Materials planning, Inventories, Types and Classification. ABC analysis Economic lot size, lead time, RE-order point, Production control in intermittent and continuous manufacturing, dispatchment dispatching of work cards, inspection cards, control Board and charts (for variable and attribute ) progress reporting.

**UNIT-III**

**Evaluation and Analysis:** Requirement problems, Quantitative Evaluation introduction to PERT and critical path scheduling,



## UNIT-IV

Linear programming, early start and finish time, Benefits of critical path analysis and its applications. Feed back and system review of PPC.

### RECOMMENDED BOOKS :

- |   |                                   |
|---|-----------------------------------|
| 1. Elements of Production Planning:                         | Eilon-McMillan & Control          |
| 2. Production and Operations Management:                    | Raymond R. Meyer- McGraw Hill     |
| 3. Material Management:<br>India.                           | A.K Dutta Prentice Hall           |
| 4. Operations Management:                                   | Buffn-John Wiley.                 |
| 5. Production Management:                                   | Hedge- John Wiley.                |
| 6. Scientific Inventory:<br>India.                          | Bachan&Kesnigsberg- Prentice Hall |
| 7. Principles & Design of Production<br>Planning & Control: | Westerman&Wimnest- Prentice Hall  |

**NOTE :**There shall be eight questions of 20 marks each, two from each unit. Students are required to attempt five questions selecting atleast one question from each unit. Use of Calculator is allowed.

**CLASS: B.E. 8<sup>TH</sup> SEMESTER**

**MARKS**

**BRANCH: MECHANICAL ENGINEERING**      **L**    **T**    **P**    **Theory**    **Sessional**

**3**    **2**    **0**    **100**    **50**

**COURSE NO: M-804(B) ELECTIVE-III**

**COURSE TITLE: METAL CUTTING & TOOL DESIGN**

**DURATION OF EXAM: 3 HOURS.**

**Course Outcomes (COs)**

<b>CO804B.1:</b> Design Machining tools for various purposes.
<b>CO804B.2:</b> Understand the purpose of various cutting tool parameters.
<b>CO804B.3:</b> Do force analysis in metal machining.
<b>CO804B.4:</b> Do tool machining economics.
<b>CO804B.5:</b> Understand the function of jigs and fixtures.

**UNIT-1**

Cutting Tool Material- Requirements of tool materials, Classification, High Carbon Steel, cast alloys, Carbides, Ceramics. Machine ability, Factors effecting machine ability, geometry of Cutting tools- Tool Angles, Cutting Tool nomenclature, Different systems- British, American, German and Normal Rake system, Reference planes, co-ordinate and Orthogonal system and inter-relationship.

**UNIT-II**

Geometry of Chip Formation in orthogonal and oblique cuttings. Force analysis in metal machining, Orthogonal and oblique cutting, chip formation, Classification, Shear angle, Chip velocity relationship, force analysis in Orthogonal cutting (merchant's analysis).Effect of cutting variables- Speed, Feed, Tool geometry and Depth of cut on the cutting forces, theories on mechanics of metal cutting. Thermal Aspects of chip Formation, Sources of heat generation. Friction at tool-chip interface, measurement of tool chip temperature at the shear plane and tool-chip interface.

**UNIT-III**

Cutting Fluids-Functions, Types, Selection and application.

Tool Wear and Tool Life- Types of tool wear, Mechanics of tool wear, Crater and flank wear of cutting tools, criteria for life, Formulation of tool life equation. Factors that affect tool life.

Economics of Machining- Criteria for optimization, Minimum cost of production, Maximum production rate and maximum profit rate, Restriction on cutting conditions.

## UNIT-IV

Tool design- Classification of Tooling, Cutting tools, Jigs and fixtures, Gauges, Sheet metal forging dies. Design of a single point turning tool. Design of a form turning tool, Design of pull broach, Principle of jig and fixture design, Drilling Jig Design, Locating and clamping.

### RECOMMENDED BOOKS:

- |   |                                     |
|---|-------------------------------------|
| 1. Fundamentals of machining:<br>and Machine Tools. | Bothroyd& Knight-Dekker.            |
| 2. Machine Tool Design:                             | N.K Mehta- McGraw Hill.             |
| 3. Principles of machine Tools:<br>Agency.          | Sen& Bhattacharya- New Central Book |
| 4. Principles of metal Cutting;                     | Shaw- Oxford & I.B.H.               |
| 5. Fundamentals of Tool Design:                     | W. Franklin- Tata McGraw Hill.      |
| 6. Machining Theory and Practice:                   | American Society for Metals         |

**NOTE :** There shall be eight questions of 20 marks each, two from each unit. Students are required to attempt five questions selecting atleast one question from each unit. Use of Calculator is allowed.

**CLASS: B.E. 8<sup>TH</sup> SEMESTER**

**MARKS**

**BRANCH: MECHANICAL ENGINEERING**

**L T P Theory Sessional**

**COURSE NO: M-804(C) ELECTIVE-II**

**3 2 0 100 50**

**COURSE TITLE: METHODS ENGINEERING &  
ERGONOMICS**

**DURATION OF EXAM: 3 HOURS.**

**Course Outcomes (COs)**

<b>CO804C.1:</b> Understand the use of ergonomics in engineering.
<b>CO804C.2:</b> Solve various industrial engineering problems.
<b>CO804C.3:</b> Understand the process of design approval.
<b>CO804C.4:</b> Understand the purpose of control and distribution of work loads.
<b>CO804C.5:</b> Understand the effect of various environmental parameters on a workers body.

**Unit I**

Introduction to Industrial Engineering and productivity measurement of productivity, Introduction to work study, methods-study principles and motion economy, filming techniques and micro-motion analysis, introduction to work measurement. Time study, performance allowances, work sampling predetermined motion system, standard data system, job evaluation of merit rating. Wage incentive plans MTM (Methods time Measurement)

**Unit II**

**Design Approval:** a new design, modification, of existing design, assessment of design. Limitation of man and machine with respect to each other, posture-standing at work, seated at work, work station heights and seat geometry. Human anthropometry and its use in work place layout.

**Unit III**

**Controls:** Hand controls and foot controls, location of controls and work place envelope Recommendation about hand and foot push buttons, rotary selector switches, hand wheels, crank levers etc. Instruments and displays.

**Work Load:** Static and dynamic muscular work. Human motor activity, metabolism, physical work load, measurement of physical work load, mental work load, measurement of mental work load, repetitive and inspection work, work duration and rest pauses, principles of motion economy.

**Unit IV**

**Climates:** a. Heat Humidity: Body heat balance, effective temperature scales, zones of discomfort, effect of heat on body and work performance.

**b.) Vibration** : Terminology, response of body to low frequency vibration, vibrations and discomfort, effect on health of worker, high frequency vibration, effect of High frequency vibrations, methods of reducing vibrations, analysis.

**c.) Noise** : Terminology, physiological effects of noise, annoyance of noise, speed interference, hearing loss, temporary and permanent thresh hold shift, effect of noise on performance, reduction of noise, personal noise protection.

**RECOMMENDED BOOKS :**

1. Methods Engineering Study- Krick, EV.
2. Work study and Ergonomics- Shah, H.S. DhanpatRai& Sons-1992.
3. Introduction of Ergonomics-Bridger-Tata McGraw Hill-1995.
4. Sound, Noise and Vibration Control- Lyle, F. Yerges- Van Nostrand- 1978.

**NOTE :** There shall be eight questions of 20 marks each, two from each unit. Students are required to attempt five questions selecting atleast one question from each unit. Use of Calculator is allowed.

**CLASS: B.E. 8<sup>TH</sup> SEMESTER**

**MARKS**

**BRANCH: MECHANICAL ENGINEERING**

**P**

**Paractical**

**COURSE NO: M-805**

**16**

**400**

**COURSE TITLE: MAJOR PROJECT**

**Course Outcomes (CO's)**

<b>CO805.1</b> Identify methods and materials to carry out experiments/develop code.
<b>CO805.2</b> Reorganize the procedures with a concern for society, environment and ethics.
<b>CO805.3</b> Analyze and discuss the results to draw valid conclusions.
<b>CO805.4</b> Prepare a report as per recommended format and defend the work.
<b>CO805.5</b> Explore the possibility of publishing papers in peer reviewed journals/conference proceedings.

The Project involves innovation, fabrication, design, case study in any relevant field of Mechanical Engineering. It must comprise up of name of Project, Introduction, methodology, literature survey, problem formulation, experimentation work (if any), conclusion ,future scope of work, reference.

After successful completion of the Project, the students will have to submit a detailed project report and a viva-voca (Internal and External) will be conducted.

**Guidelines for evaluation of Project Work in 8<sup>th</sup> semester :**

**Sub-distribution of marks:**

For External Examiner	=	150
For Internal Examiner	=	250

### **Awards of Marks:**

Mark distribution of Internal Project work as per the University statutes shall be based on:

a. Viva-Voca	=	75
b. Presentation	=	75
c. Report	=	100
		—
Total		<u>250</u>