B.Tech. (Fourth semester) Mechanical engineering

ME-202 Production Technology-II

L	T	P		
3	1	0	Theory:	60
			Continuous Evaluation:	40
			Time:	3 Hours
			Credit:	3.5

Unit-1 Kinematics of Machine Tools.

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

Unit-2 Manufacturing Methods

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

Unit-3 Unconventional Machining Processes & Press Working Tools

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

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

Unit-4 Machine Tools Vibration and Dynamometry

Introduction, effects of vibration on-machine tools, cutting conditions, work piece and tools life, source of vibration, machine tool chatter, Need for measuring forces, basic requirements of measuring techniques, design requirements of dynamometers, 3-divisional turning dynamometer and its calibration, drill dynamometers.

Recommended Books:

1. Manufacturing science: Ghosh and Malik, E.W. Press
2. Principles of metal cutting:Sen and Bhattacharya, New Central Book.
3. Metal cutting principles:Shaw, MIT Press Cambridge
4. Manufacturing analysis: Cook, Adisson-Wesley

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

M.M.UNIVERSITY,MULLANA 2008

B.Tech. (Fourth semester) Mechanical engineering

ME-202 Production Technology-II

L T P Theory: 60 3 1 0 Continuous Evaluation: 40

Time: 3 Hours Credit: 3.5 Unit-1 Kinematics of Machine Tools. Drives in machine tools for rotation movement, stepped and step less drives, mechanical and hydraulic drives, Individual and group drives, selection of extreme values of spindle speed on a lathe, principle of stepped regulation, Layout of spindle speeds. A.P., G.P. and Logarithmic progressions, Kinematics advantage of G. P. for gear box design, selection of common ratio, Number of steps in a given speed range, design of all geared head stock. Unit-2 Manufacturing Methods Characteristics of turret Lathes, turret-indexing mechanism, tooling equipment for turrets, tool Layout for turrets. Classification of gear production methods, gear generation, gear hobbing gear shaping, gear finishing methods; shaving, burnishing grinding, Lapping, gear shaping. Unit-3 Unconventional Machining Processes & Press Working Tools Need for unconventional processes, Ultrasonic machining, electrochemical machining, electrochemical grinding, Laser beam machining their process parameters, principle of metal removal, applications advantages and limitations. Introduction, classifications of presses and dies, shear, action in die cutting operations, center of pressure, clearances, cutting forces, punch dimensioning. Unit-4 Machine Tools Vibration and Dynamometry Introduction, effects of vibration on-machine tools, cutting conditions, work piece and tools life, source of vibration, machine tool chatter, Need for measuring forces, basic requirements of measuring techniques, design requirements of dynamometers, 3-divisional turning dynamometer and its calibration, drill dynamometers. Recommended Books:

1. Manufacturing science: Ghosh and Malik, E.W. Press 2. Principles of metal cutting:Sen and Bhattacharya, New Central Book. 3. Metal cutting principles:Shaw, MIT Press Cambridge 4. Manufacturing analysis: Cook, Adisson-Wesley NOTE: In the semester examination, the examiner will set 8 questions in all, at least two question from each unit, and students will be required to attempt only 5 questions, at least one from each unit.

B.Tech. (Fourth semester) Mechanical engineering

ME- 204 Material Science

L	T	P		
4	0	0	Theory:	60
			Continuous Evaluation:	40
			Time:	3 Hours
			Credit:	4.0

Unit -1 Crystallography & Imperfections in Metal Crystals

Review of crystal structure, space lattice, Miller indices of crystal planes and crystal directions, co-ordination number, number of atoms per unit cell, atomic packing factor, Numericals related to density, planar density and inter planar distance in cubic crystals.

Crystal imperfections and their classifications, point defects, line defects, edge & screw dislocations—theory & their properties, surface defects, volume defects. Frank read source; effects of imperfections on metal properties.

Unit -2 Solid solutions, phase diagram & Heat Treatment

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

Unit-3 Deformation & Failure of Metals

Elastic and plastic deformation, mechanism of plastic deformation, twinning, conventional and true stress strain curves for polycrystalline materials, yield point phenomena, strain ageing, work hardening, Bauschinger effect, season cracking. Elastic after effect, Recovery, re-crystallization and grain growth.

Failure analysis, fracture, process of fracture, types of fracture, fatigue, characteristics of fatigue, fatigue limit, mechanism of fatigue, factors affecting fatigue.

Unit -4 Creep, Corrosion, Plastics, Composites & Ceramics

Definition and concept of creep, creep curve, mechanism of creep, impact of time and temperature on creep, creep fracture, creep testing and prevention against creep. Corrosion: mechanism and effect of corrosion, prevention of corrosion.

Introduction to polymers, formation of polymers, polymer structure & crystallinity, Introduction to particle-reinforced, fiber-reinforced and structural composites and their applications. Types of ceramics, properties, advantages and application of ceramics, Introduction to glass ceramics, dielectric ceramics, electronic ceramics and cermets.

Recommended Books:

1. A Text Book of Material Science & Metallurgy – O.P. Khanna, Dhanpat Rai & Sons
2. Material Science - Narula, Narula and Gupta. New Age Publishers, 1988
3. Material Science & Engineering –V. Raghavan, Prentice Hall of India Pvt. Ltd, New Delhi
4. Elements of Material Science and Engineering: VanVlack, Wesley Pub. Comp.
5. Material Science and Engineering-An Introduction - Callister; W.D., John Wiley & Sons., Delhi.
6. Material Science & Engineering—R.K. Rajput, S.K. Kataria & Sons, Delhi, 2006

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

M.M.UNIVERSITY,MULLANA 2008

B.Tech. (Fourth semester) Mechanical engineering

ME- 204 Material Science

L T P Theory: 60 4 0 0 Continuous Evaluation: 40

Time: 3 Hours Credit: 4.0 Unit -1 Crystallography & Imperfections in Metal Crystals Review of crystal structure, space lattice, Miller indices of crystal planes and crystal directions, co-ordination number, number of atoms per unit cell, atomic packing factor, Numericals related to density, planar density and inter planar distance in cubic crystals. Crystal imperfections and their classifications, point defects, line defects, edge & screw dislocations—theory & their properties, surface defects, volume defects. Frank read source; effects of imperfections on metal properties.

Unit -2 Solid solutions, phase diagram & Heat Treatment Introduction to single and multiphase solid solutions and types of solid solutions, importance and objectives of phase diagram, systems, phase and structural constituents, cooling curves, unary & binary phase diagrams, Gibbs's phase rule, Lever rule, eutectic and eutectoid systems, peritectic and peritectoid systems, iron carbon equilibrium diagram and TTT diagram. Principles, purpose, classification of heat treatment processes, annealing, normalizing, stress relieving, hardening, tempering, carburizing, nitriding, cyaniding, flame and induction hardening. Allotropic transformation of iron and steel, Properties of austenite, ferrite, pearlite, martensite.

Unit-3 Deformation & Failure of Metals Elastic and plastic deformation, mechanism of plastic deformation, twinning, conventional and true stress strain curves for polycrystalline materials, yield point phenomena, strain ageing, work hardening, Bauschinger effect, season cracking. Elastic after effect, Recovery, re- crystallization and grain growth. Failure analysis, fracture, process of fracture, types of fracture, fatigue, characteristics of fatigue, fatigue limit, mechanism of fatigue, factors affecting fatigue.

Unit -4 Creep, Corrosion, Plastics, Composites & Ceramics Definition and concept of creep, creep curve, mechanism of creep, impact of time and temperature on creep, creep fracture, creep testing and prevention against creep. Corrosion: mechanism and effect of corrosion, prevention of corrosion. Introduction to polymers, formation of polymers, polymer structure & crystallinity, Introduction to particle-reinforced, fiber-reinforced and structural composites and their applications. Types of ceramics, properties, advantages and application of ceramics, Introduction to glass ceramics, dielectric ceramics, electronic ceramics and cermets. Recommended Books: 1. A Text Book of Material Science & Metallurgy – O.P. Khanna, Dhanpat Rai & Sons 2. Material Science - Narula, Narula and Gupta. New Age Publishers, 1988 3. Material Science & Engineering –V. Raghavan, Prentice Hall of India Pvt. Ltd, New Delhi 4. Elements of Material Science and Engineering: VanVlack, Wesley Pub. Comp. 5. Material Science and Engineering-An Introduction - Callister; W.D., John Wiley & Sons., Delhi. 6. Material Science & Engineering—R.K. Rajput, S.K. Kataria & Sons, Delhi, 2006 NOTE: In the semester examination, the examiner will set 8 questions in all, at least two question from each

unit, and students will be required to attempt only 5 questions, at least one from each unit.

B.Tech. (Fourth semester) Mechanical engineering
ME- 206 Strength of Materials-II

L	T	P		
3	1	0	Theory:	60
			Continuous Evaluation:	40
			Time:	3 Hours
			Credit:	3.5

Unit-1 Strain Energy & Impact Loading
Definitions, expressions for strain energy stored in a body when load is applied (i) gradually, (ii) suddenly and (iii) with impact, strain energy of beams in bending, beam deflections, strain energy of shafts in twisting, energy methods in determining spring deflection, Castigliano's & Maxwell's theorems, Numerical. Theories of Elastic Failure: Various theories of elastic failures with derivations and graphical representations, applications to problems of 2-dimensional stress system with (i) Combined direct loading and bending, and (ii) combined torsional and direct loading, Numericals.

Unit-2 Unsymmetrical Bending
Properties of beam cross section, product of inertia, ellipse of inertia, slope of the neutral axis, stresses & deflections, shear center and the flexural axis Numericals. Thin Walled Vessels: Hoop & Longitudinal stresses & strains in cylindrical & spherical vessels & their derivations under internal pressure, wire would cylinders, Numericals.

Unit-3 Thick Cylinders & Spheres
Derivation of Lame's equations, radial & hoop stresses and strains in thick, and compound cylinders and spherical shells subjected to internal fluid pressure only, wire wound cylinders, hub shrunk on solid shaft, Numericals. Rotating Rims & Discs: Stresses in uniform rotating rings & discs, rotating discs of uniform strength, stresses in (I) rotating rims, neglecting the effect of spokes, (ii) rotating cylinders, hollow cylinders & solids cylinders. Numericals.

Unit-4 Bending of Curved Bars
Stresses in bars of initial large radius of curvature, bars of initial small radius of curvature, stresses in crane hooks, rings of circular & trapezoidal sections, deflection of curved bars & rings, deflection of rings by Castigliano's theorem stresses in simple chain link, deflection of simple chain links, Problems. Springs: Stresses in closed and open coiled helical spring subjected to axial loads and twisting couples, leaf springs, flat spiral springs,, Numericals.

Recommended Books:

1. Strength of Materials – G.H.Ryder, Third Edition in SI Units 1969 Macmillan, India.
2. Mechanics of Materials – (Metric Edition) : Ferdinand P. Beer and E. Russel Johnston, Jr. Second Edition, McGraw Hill.
3. Strength of Material R. Subramanian Oxford University Press
4. Book of Solid Mechanics – Kazmi, Tata Mc Graw Hill
5. Strength of Materials – D.S. Bedi - S. Chand & Co. Ltd.
6. Advanced Mechanics of Solids and Structures – N. Krishan Raju and D.R.Gururaje-Narosa Publishing House.
7. Strength of Materials – Andrew Pytel and Fredinand L. Singer Fourth Edition, Int. Student Ed. Addison – Wesley Longman.

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M.M.UNIVERSITY,MULLANA 2008

B.Tech. (Fourth semester) Mechanical engineering

ME- 206 Strength of Materials-II

L T P Theory: 60 3 1 0 Continuous Evaluation: 40

Time: 3 Hours Credit: 3.5

Unit-1 Strain Energy & Impact Loading

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

Unit-2 Unsymmetrical Bending

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

Unit-3 Thick Cylinders & Spheres

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

Unit-4 Bending of Curved Bars Stresses in bars of initial large radius of curvature, bars of initial small radius of curvature, stresses in crane hooks, rings of circular & trapezoidal sections, deflection of curved bars & rings, deflection of rings by Castigliano's theorem stresses in simple chain link, deflection of simple chain links, Problems. Springs: Stresses in closed and open coiled helical spring subjected to axial loads and twisting couples, leaf springs, flat spiral springs,, Numericals. Recommended Books:

1. Strength of Materials – G.H.Ryder, Third Edition in SI Units 1969 Macmillan, India. 2. Mechanics of Materials – (Metric Edition) : Ferdinand P. Beer and E. Russel

Johnston, Jr. Second Edition, McGraw Hill. 3. Strength of Material R. Subramanian Oxford University Press 4. Book of Solid Mechanics – Kazmi, Tata Mc Graw Hill 5. Strength of Materials – D.S. Bedi - S. Chand & Co. Ltd. 6. Advanced Mechanics of Solids and Structures – N. Krishan Raju and D.R.Gururaje-

Narosa Publishing House. 7. Strength of Materials – Andrew Pytel and Fredinand L. Singer

Fourth Edition, Int.

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

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B.Tech. (Fourth semester) Mechanical engineering
ME- 208 Fluid Mechanics

L	T	P		
3	1	0	**Theory:**	**60**
			Continuous Evaluation:	**40**
			Time:	**3 Hours**
			Credit:	**3.5**

Unit-1 Fluid Properties, Fluid Static and Fluid Kinematics:
Concept of fluid and flow, ideal and real fluids, continuum concept, properties of fluids, Newtonian and non-Newtonian fluids. Pascal's law, hydrostatic equation, hydrostatic forces on plane and curved surfaces, buoyancy and flotation, stability of floating and submerged bodies,metacentric height and its determination, relative equilibrium. Problems.
Eulerian and Lagrangian description of fluid flow; stream, streak and path lines; types of flows, flow rate and continuity equation, differential equation of continuity in cylindrical and polar coordinates, rotation, vorticity and circulation, stream and potential functions, flow net. Problems.

Unit-2 Fluid Dynamics and Flow Measurement:
Concept of system and control volume, Euler's equation, Bernoulli's equation, kinetic and momentum correction factors, Impulse momentum relationship and its applications. Free and forced vortex motion. Problems.
Manometers, pitot tubes, venturi meter and orifice meters, orifice, mouthpieces, notches and weirs, rotameter.

Unit-3 Viscous Flow and Flow Through Pipes:
Flow regimes and Reynold's number, Relationship between shear stress and pressure gradient, uni-directional flow between stationary and moving parallel plates, movement of piston in a dashpot, power absorbed in bearings, Problems.
Major and minor losses in pipes, Hagen-Poiseuilli law, hydraulic gradient and total energy lines, series and parallel connection of pipes, branched pipes; equivalent pipe, power transmission through pipes. Problems.

Unit-4 Boundary Layer Flow and Dimensional Analysis:
Boundary layer concept, displacement, momentum and energy thickness, von-karman momentum integral equation, laminar and turbulent boundary layer flows, drag on a flat plate, boundary layer separation and control. Streamlined and bluff bodies lift and drag on a cylinder and an airfoil, Problems.
Fundamental and derived units and dimensions, dimensional homogeneity. Rayleigh's and buckingham's Pi method for dimensional analysis. Dimensionless numbers and their significance, geometric, kinematic and dynamic similarity, model studies.

Recommended Books:

1. Fluid Mechanics – Streeter V L and Wylie E B, Mc Graw Hill
2. Mechanics of Fluids – I H Shames, Mc Graw Hill
3. Introduction to Fluid Mechanics and Fluid Machines – S.K. Som and G. Biswas, TMH
4. Fluid Mechanics and Fluid Power Engineering – D.S. Kumar, S.K. Kataria and Sons
5. Fluid Mechanics and Machinery – S.K. Agarwal, TMH, New Delhi

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

M.M.UNIVERSITY,MULLANA 2008

B.Tech. (Fourth semester) Mechanical engineering ME- 208 Fluid Mechanics

L T P Theory: 60 3 1 0 Continuous Evaluation: 40

Time: 3 Hours Credit: 3.5 Unit-1 Fluid Properties, Fluid Static and Fluid Kinematics: Concept of fluid and flow, ideal and real fluids, continuum concept, properties of fluids, Newtonian and non-Newtonian fluids. Pascal's law, hydrostatic equation, hydrostatic forces on plane and curved surfaces, buoyancy and flotation, stability of floating and submerged bodies,metacentric height and its determination, relative equilibrium. Problems.

Eulerian and Lagrangian description of fluid flow; stream, streak and path lines; types of flows, flow rate and continuity equation, differential equation of continuity in cylindrical and polar coordinates, rotation, vorticity and circulation, stream and potential functions, flow net. Problems. Unit-2 Fluid Dynamics and Flow Measurement: Concept of system and control volume, Euler's equation, Bernoulli's equation, kinetic and momentum correction factors, Impulse momentum relationship and its applications. Free and forced vortex motion. Problems. Manometers, pitot tubes, venturi meter and orifice meters, orifice, mouthpieces, notches and weirs, rotameter. Unit-3 Viscous Flow and Flow Through Pipes:

Flow regimes and Reynold's number, Relationship between shear stress and pressure gradient, uni-directional flow between stationary and moving parallel plates, movement of piston in a dashpot, power absorbed in bearings, Problems.

Major and minor losses in pipes, Hagen-Poiseuilli law, hydraulic gradient and total energy lines, series and parallel connection of pipes, branched pipes; equivalent pipe, power transmission through pipes. Problems. Unit-4 Boundary Layer Flow and Dimensional Analysis:

Boundary layer concept, displacement, momentum and energy thickness, von-karman momentum integral equation, laminar and turbulent boundary layer flows, drag on a flat plate, boundary layer separation and control. Streamlined and bluff bodies lift and drag on a cylinder and an airfoil, Problems. Fundamental and derived units and dimensions, dimensional homogeneity. Rayleigh's and buckingham's Pi method for dimensional analysis. Dimensionless numbers and their significance, geometric, kinematic and dynamic similarity, model studies.

Recommended Books:

1. Fluid Mechanics – Streeter V L and Wylie E B, Mc Graw Hill 2. Mechanics of Fluids – I H Shames, Mc Graw Hill 3. Introduction to Fluid Mechanics and Fluid Machines – S.K. Som and G. Biswas, TMH 4. Fluid Mechanics and Fluid Power Engineering – D.S. Kumar, S.K. Kataria and Sons 5. Fluid Mechanics and Machinery – S.K. Agarwal, TMH, New Delhi

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

B.Tech. (Fourth semester) Mechanical engineering
ME- 210 Dynamics of Machines

L	T	P		
3	1	0	Theory:	60
			Continuous Evaluation:	40
			Time:	3 Hours
			Credit:	3.5

Unit-1 Static Force Analysis & Inertia Forces in Mechanism
Equations of equilibrium, Couple, equilibrium of force and four force systems, Free body diagrams, Forces on slider crank mechanism, quick return mechanism & four-bar mechanism, slider crank mechanism with friction at turning pairs and numerical problems.
Determination of forces and couples for a link, inertia of reciprocating parts. Dynamically equivalent system. Analytical and graphical methods, inertia force analysis of basic engine mechanism (crank connecting rod and piston etc.). Torque required to overcome inertia and gravitational force of a four bar linkage.

Unit-2 Gyroscope, Flywheel & Turning Moment Diagrams:
Definition, axis of spin, axis of precision, gyroscope, gyroscopic couple, Gyroscopic effect on the movement of ships and vehicles, ship and plane stabilization, stability of automobile and locomotive taking a turn
Turning moment and crank effort diagrams for steam and I.C. Engine, dynamics of simple horizontal and vertical engine. Fluctuation of speed, co-efficient of fluctuation of speed and energy, Punching press. Simple problems on turning moment diagrams and the determination of a flywheel taking centrifugal stresses into consideration.

Unit-3 Governors & Balancing
Functions, types and characteristics of governors, Watt, porter and proell governors. Hartnell and Wilson-Hartnell spring loaded governors. Simple numerical problems on these governors. Sensitivity, stability, isochronism and hunting of governors, governor effort and power.
Classification, need for balancing, balancing for simple and multiple masses, static and dynamic balancing – Primary and secondary balancing for reciprocating masses, inside and outside cylinder locomotive balancing, swaying couple and variation of tractive effort, partial balancing of locomotive

Unit-4 Gears & Gear Trains
Toothed gears and their uses, types of toothed gears, gears terminology, law of gearing, forms of teeth, cycloidal and involute gears, interference in involute gears and its removal, comparison of involute and cycloidal gear systems. Types of gear trains, single and compound, epicyclic gear trains. Problems involving their applications.

Recommended Books:
1. Theory of Machines : P.L. Ballaney – Khanna publishers, Delhi, 1994.
2. Theory of Machines : Shigley, Tata McGraw Hill, New Yark, 1981.
3. Mechanism & Machine Theory : J.S. Rao & R.V. Dukhipati, Wiley Eastren Ltd., New Delhi, 1992.
4. Theory of Mechanisms & Machines : Amitabh Gosh & A.K. Mallik, East West Press Private Ltd.
5. Theory of Machines : S S. Rattan, T.M.H.

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

M.M.UNIVERSITY,MULLANA 2008

B.Tech. (Fourth semester) Mechanical engineering ME- 210 Dynamics of Machines

L T P Theory: 60 3 1 0 Continuous Evaluation: 40

Time: 3 Hours Credit: 3.5

Unit-1 Static Force Analysis & Inertia Forces in Mechanism Equations of equilibrium, Couple, equilibrium of force and four force systems, Free body diagrams, Forces on slider crank mechanism, quick return mechanism & four-bar mechanism, slider crank mechanism with friction at turning pairs and numerical problems. Determination of forces and couples for a link, inertia of reciprocating parts. Dynamically equivalent system. Analytical and graphical methods, inertia force analysis of basic engine mechanism (crank connecting rod and piston etc.). Torque required to overcome inertia and gravitational force of a four bar linkage.

Unit-2 Gyroscope, Flywheel & Turning Moment Diagrams:

Definition, axis of spin, axis of precision, gyroscope, gyroscopic couple, Gyroscopic effect on the movement of ships and vehicles, ship and plane stabilization, stability of automobile and locomotive taking a turn Turning moment and crank effort diagrams for steam and I.C. Engine, dynamics of simple horizontal and vertical engine. Fluctuation of speed, co-efficient of fluctuation of speed and energy, Punching press. Simple problems on turning moment diagrams and the determination of a flywheel taking centrifugal stresses into consideration.

Unit-3 Governors & Balancing Functions, types and characteristics of governors, Watt, porter and proell governors. Hartnell and Wilson-Hartnell spring loaded governors. Simple numerical problems on these governors. Sensitivity, stability, isochronism and hunting of governors, governor effort and power. Classification, need for balancing, balancing for simple and multiple masses, static and dynamic balancing – Primary and secondary balancing for reciprocating masses, inside and outside cylinder locomotive balancing, swaying couple and variation of tractive effort, partial balancing of locomotive

Unit-4 Gears & Gear Trains Toothed gears and their uses, types of toothed gears, gears terminology, law of gearing, forms of teeth, cycloidal and involute gears, interference in involute gears and its removal, comparison of involute and cycloidal gear systems. Types of gear trains, single and compound, epicyclic gear trains. Problems involving their applications.

Recommended Books: 1. Theory of Machines : P.L. Ballaney – Khanna publishers, Delhi, 1994. 2. Theory of Machines : Shigley, Tata McGraw Hill, New Yark, 1981. 3. Mechanism & Machine Theory : J.S. Rao & R.V. Dukhipati, Wiley Eastren Ltd., New Delhi,

1992. 4. Theory of Mechanisms & : Amitabh Gosh & A.K. Mallik, East West Press Machines

Private Ltd. 5. Theory of Machines : S S. Rattan, T.M.H. NOTE: In the semester examination, the examiner will set 8 questions in all, at least two question from each unit, and students will be required to attempt only 5 questions, at least one from each unit.

B.Tech. (Fourth semester) Mechanical engineering
ME- 214 Fluid Mechanics Lab

L	T	P		
0	0	3	Practical:	20
			Continuous Evaluation:	30
			Credit:	1.5

List of Experiments:

1. To determine the coefficient of impact for vanes.
2. To determine coefficient of discharge of an orificemeter.
3. To determine the coefficient of discharge of Notch (V and Rectangular types).
4. To determine the friction factor for the pipes.
5. To determine the coefficient of discharge of venturimeter.
6. To determine the coefficient of discharge, contraction & velocity of an orifice.
7. To verify the Bernoullis Theorem.
8. To find critical Reynolds number for a pipe flow.
9. To determine the meta-centric height of a floating body.
10. To determine the minor losses due to sudden enlargement, sudden contraction and bends.
11. To show the velocity and pressure variation with radius in a forced vertex flow.

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

M.M.UNIVERSITY,MULLANA 2008

B.Tech. (Fourth semester) Mechanical engineering

ME- 214 Fluid Mechanics Lab

L T P Practical: 20 0 0 3 Continuous Evaluation: 30

Credit: 1.5

List of Experiments:

1. To determine the coefficient of impact for vanes. 2. To determine coefficient of discharge of an orificemeter. 3. To determine the coefficient of discharge of Notch (V and Rectangular types). 4. To determine the friction factor for the pipes. 5. To determine the coefficient of discharge of venturimeter. 6. To determine the coefficient of discharge, contraction & velocity of an orifice. 7. To verify the Bernoullis Theorem. 8. To find critical Reynolds number for a pipe flow. 9. To determine the meta-centric height of a floating body. 10. To determine the minor losses due to sudden enlargement, sudden contraction and

bends. 11. To show the velocity and pressure variation with radius in a forced vertex flow.

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

B.Tech. (Fourth semester) Mechanical engineering
ME- 212 Production Technology Lab

L	T	P		
0	0	3	Practical:	20
			Continuous Evaluation:	30
			Credit:	1.5

List of Experiments:

Introduction to milling machines its types functions applications etc.

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

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

M.M.UNIVERSITY,MULLANA 2008

B.Tech. (Fourth semester) Mechanical engineering

ME- 212 Production Technology Lab

L T P Practical: 20 0 0 3 Continuous Evaluation: 30

Credit: 1.5

List of Experiments:

Introduction to milling machines its types functions applications etc.

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

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

B.Tech. (Fourth semester) Mechanical engineering
ME 216 Dynamics of Machine (Lab.)

L	T	P		
0	0	2	Practical:	20
			Continuous Evaluation:	30
			Credit:	1.0

List of Experiment

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

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

M.M.UNIVERSITY,MULLANA 2008

B.Tech. (Fourth semester) Mechanical engineering

ME 216 Dynamics of Machine (Lab.)

L T P Practical: 20 0 0 2 Continuous Evaluation: 30

Credit: 1.0 List of Experiment

1. To determine experimentally, the moment of inertia of a flywheel and axle compare

with theoretical values. 2. To find out critical speed experimentally and to compare the whirling speed of a

shaft with theoretical values. 3. To find experimentally the Gyroscopic couple on motorized gyroscope and

compare with applied couple. 4. To perform the experiment of balancing of rotating parts and finds the unbalanced

couple and forces. 5. To determine experimentally the unbalance forces and couples of reciprocating

parts. 6. To calculate the torque on a planet carrier and torque on internal gear using

epicyclic gear train and holding torque apparatus. 7. To study the different types of centrifugal and inertia governors and demonstrate

any one. 8. To study the automatic transmission unit. 9. To study the differential types of brakes. 10. To find out experimentally the corli and component of acceleration and compare

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