



### List of Revised Courses

**Department : Mechanical Engineering**

**Programme Name : B.Tech.**

**Academic Year : 2019-20**

### List of Revised Courses

Sr. No.	Course Code	Name of the Course
01.	ME03TPC01	Mechanics of Solid-I
02.	ME03TPC02	Kinematics of Machine
03.	ME03PPC01	Kinematics of Machine Lab
04.	ME03PPC02	Mechanics of Solid-I Lab
05.	ME04TPC03	Fluid Mechanics
06.	ME03TPC04	Dynamics of Machine
07.	ME04TPC05	Machine Drawing
08.	ME04TPC04	Manufacturing Science-I
09.	ME04PPC03	Fluid Mechanics Lab
10.	ME04PPC04	Dynamics of Machine Lab

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गुरु घासीदास वि.वि. / Guru Ghasidas V.V.  
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## Minutes of Meetings (MoM) of Board of Studies (BoS)

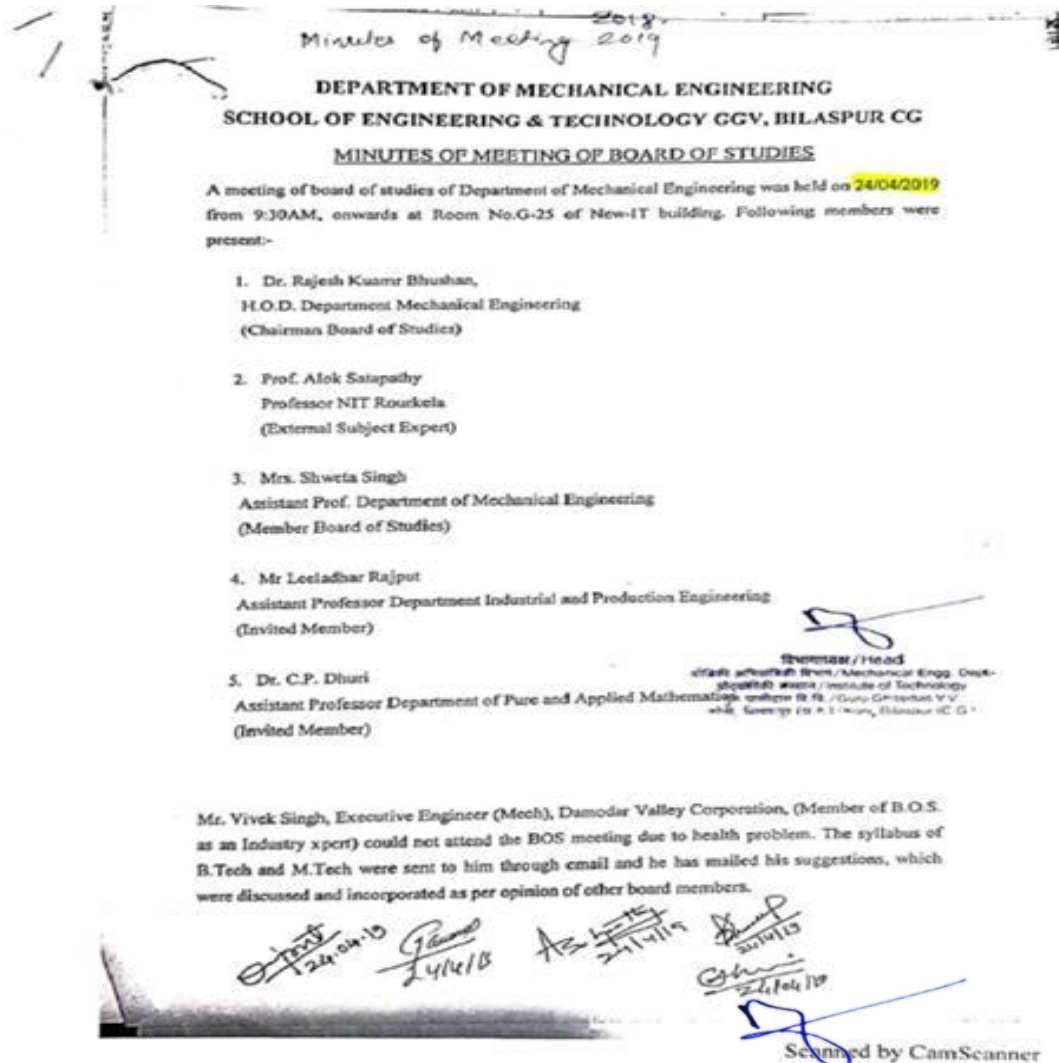
Academic Year : 2019-20

School : **School of Studies of Engineering and Technology**

Department : **Mechanical Engineering**

Date and Time : **April 24, 2019 - 09:30 AM**

Venue : **G-25**



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Department of Mechanical Engineering, School of Engineering & Technology, GGV, Bilaspur (C.G.)

**Changes in syllabus of B. Tech. 2<sup>nd</sup> year (III & IV Sem) Mechanical Engineering BoS 24-04-2019**

The following changes have been incorporated in the course syllabus of B. Tech. 2<sup>nd</sup> Year Mechanical Engineering as per the discussion in BoS meeting held in the department. The complete III and IV semester syllabus along with the evaluation scheme is appended for your reference. Salient aspects of the revisions made are listed below.

- Material Science & Metallurgy**- subjects remove from compulsory subject and added as professional elective in 3<sup>rd</sup> semester.
- Engineering Thermodynamics**- Applied Thermodynamics and Engineering Thermodynamics has been merged and added as a compulsory subject in 3<sup>rd</sup> semester as Engineering Thermodynamics.  
**Reasons and Benefits:** To compensate the latest syllabus and scheme as described by AICET.
- Electrical Machine**- This subject has removed from 4<sup>th</sup> semester.  
**Reasons:-** To compensate the latest syllabus and scheme as described by AICET.
- Dynamics of Machine**- This subject has been added as a compulsory subject in 4<sup>th</sup> semester from the list of 6<sup>th</sup> semester compulsory subjects.  
**Reasons and Benefits:** To keep Kinematics of Machine and Dynamics of Machine in continuation.

**Objectives of the Program**

- To produce competent, creative and imaginative engineers.
- To create an intellectual reservoir to meet the growing engineer demands of the nation.
- To inculcate in the student concepts and intellectual skills, courage and integrity.
- To help the graduates to make their way in the society with proper scientific and technical knowledge in mechanical engineering.
- To help the graduates in design and analysis of mechanical systems with strong fundamentals and methods of synthesis.

**Learning Outcomes**

- Ability to apply knowledge of mechanical engineering fundamentals for solving problems.
- Ability to design and develop mechanical components and processes to meet desired needs considering various aspects.
- Ability to understand and investigate complex mechanical engineering problems experimentally.
- Ability to develop sustainable solutions and understand their impact on society and environment.
- Ability to function effectively as an individual and as a member or leader in diverse teams and in multidisciplinary settings.
- Ability to comprehend, design documentation, write effective reports, make effective presentations to the engineering community and society at large.
- Ability to apply knowledge of engineering to lead teams and manage projects in multidisciplinary environments.
- Ability to engage in independent and life-long learning in the broad context of technological changes and advancements.

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(केन्द्रीय विश्वविद्यालय अधिनियम 2009 का 25 के अंतर्गत स्थापित केन्द्रीय विश्वविद्यालय)  
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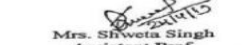
At the meeting syllabus and scheme of B.Tech (Mechanical Engineering) from III Semester to IV Semester as per Choice Based Credit System (CBCS), The syllabus and scheme of M.Tech I and II semester (Machine Design) and PhD course work have been discussed in detail. The syllabus and scheme of B.Tech (Mechanical Engineering) III Semester and IV Semester, M.Tech I and II semester (Machine Design), PhD course work are approved by the B.O.S. members, revised syllabus is attached with the minutes.

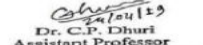
The B.O.S. meeting was concluded with vote of thanks.

  
Prof. Alok Satapathy  
Professor NIT  
Rourkela (External  
Subject Expert)

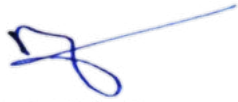
  
Dr. Rajesh Kumar Bhushan  
H.O.D. Department of  
Mechanical Engineering  
(Chairman Board of Studies)

  
Mr. Leeladhar Rajput  
Assistant Professor  
Department of Industrial and  
Production Engineering  
(Invited Member)

  
Mrs. Shweta Singh  
Assistant Prof.  
Department of Mechanical  
Engineering (Member BOS)

  
Dr. C.P. Dhuri  
Assistant Professor  
Department of Pure and  
Applied Mathematics  
(Invited Member)

  
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INSTITUTE OF TECHNOLOGY, (SCHOOL OF ENGINEERING  
& TECHNOLOGY) GURU GHASIDAS VISHWAVIDHALAYA, (A CENTRAL  
UNIVERSITY) DEPARTMENT OF MECHANICAL ENGINEERING  
CBCS-NEW, STUDY & EVALUATION SCHEME  
W.E.F. SESSION 2019-2020

Year: B.Tech. 2<sup>ND</sup> year

SEMESTER- III

SN	Course No.	SUBJECT	PERIODS			EVALUATION SCHEME			CREDIT
			L	T	P	INTERNAL ASSESSMENT	ESE	SUB-TOTAL	
1.	ME03THS02	Elective from Humanity Science HS-02	3	0	-	30	70	100	3
2.	ME03TBS05	Statistical Methods	3	1	-	30	70	100	4
3.	ME03TPC01	Mechanics of Solid-I	3	1	-	30	70	100	4
4.	ME03TPC02	Kinematics of Machine	3	1	-	30	70	100	4
5.	ME03TES04	Engineering Thermodynamics	3	1	-	30	70	100	4
6.	ME03TPE01	Professional Electives-01	3	0	-	30	70	100	3
<b>Total</b>			<b>18</b>	<b>4</b>	<b>-</b>	<b>180</b>	<b>420</b>	<b>600</b>	<b>22</b>
<b>PRACTICALS</b>									
1.	ME03PPC01	Kinematics of Machine Lab	-	-	2	30	20	50	1
2.	ME03PPC02	Mechanics of Solid-I Lab	-	-	2	30	20	50	1
<b>Total</b>			<b>0</b>	<b>0</b>	<b>4</b>	<b>60</b>	<b>40</b>	<b>100</b>	<b>2</b>

Total Credits: 24

Total Contact

Hour: 26 Total

Marks: 700

\*INTERNAL ASSESSMENT- Two Class Test of 15 Marks each will be conducted.

L-LECTURE, T-TUTORIAL, P-PRACTICAL, ESE -END SEMESTER EXAMINATION

ME03THS02 Electives from Humanity Science-02	ME03TPE01 Professional Electives-01
ME03THS21 Engineering Economics	ME03TPE11 Material Science & Metallurgy
ME03THS22 Work study and ergonomics	ME03TPE12 Powder Metallurgy
ME03THS23 Employee Relations	ME03TPE13 Material Management

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GURU GHASIDAS VISHWAVIDHALAYA, (A CENTRAL UNIVERSITY)  
DEPARTMENT OF MECHANICAL ENGINEERING  
CBCS-NEW, STUDY & EVALUATION SCHEME  
W.E.F. SESSION 2019-2020

Year: B.Tech. 2<sup>ND</sup> year

SEMESTER- IV

SN	Course No.	SUBJECT	PERIODS			EVALUATION SCHEME			CREDITS
			L	T	P	INTERNAL ASSESSMENT	ESE	SUB-TOTAL	
1.	ME04THS03	Elective from Humanity Science HS-03	3	0	-	30	70	100	3
2.	ME04TBS06	Numerical Analysis & Computer Programming	3	1	-	30	70	100	4
3.	ME04TPC03	Fluid Mechanics	3	1	-	30	70	100	4
4.	ME03TPC04	Dynamics of Machine	3	1	-	30	70	100	4
5.	ME04TPC05	Machine Drawing	3	0	-	30	70	100	3
6.	ME04TPC04	Manufacturing Science-I	3	0	-	30	70	100	3
<b>Total</b>			<b>18</b>	<b>3</b>	<b>-</b>	<b>180</b>	<b>420</b>	<b>600</b>	<b>21</b>
<b>PRACTICALS</b>									
1.	ME04PPC03	Fluid Mechanics Lab	-	-	2	30	20	50	1
2.	ME04PPC04	Dynamics of Machine Lab	-	-	2	30	20	50	1
<b>Total</b>			<b>0</b>	<b>0</b>	<b>4</b>	<b>60</b>	<b>40</b>	<b>100</b>	<b>2</b>

Total Credits: 23

Total Contact Hour: 25

Total Marks: 700

\*INTERNAL ASSESSMENT- Two Class Test of 15 Marks each will be conducted.

L-LECTURE,T-TUTORIAL,P-PRACTICAL, ESE –END SEMESTER EXAMINATION

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### (ME03TPC01) MECHANICS OF SOLID-I

#### Course Objectives:

- L To gain a fundamental understanding of the concepts of stress and strain by analysis of solids and structures.
- L To study engineering properties of materials, force-deformation and stress-strain relationship
- L To learn fundamental principles of equilibrium, compatibility, and force-deformation relationship, and principle of superposition in linear solids and structures
- L To analyze; determinate and indeterminate axial members, torsional members and beams to determine axial forces, torque, shear forces, bending moments, slopes and deflection.
- L To determine stress, strain, and deformation of bars, beams and springs.
- L To be able to perform structural analysis by hand computations and design axial and torsion members.

#### Course outcomes:

- Apply knowledge of mechanics of deformable body for understanding, formulating and solving engineering problems.
- Acquire knowledge and hands-on competence in applying the concepts mechanics of solid in the design and development of mechanical systems.
- Demonstrate creativeness in designing new systems components and processes in the field of engineering in general and mechanical engineering in particular.
- Identify, analysis, and solve mechanical engineering problems useful to the society.
- Work effectively with engineering and science teams as well as with multidisciplinary designs.

#### Unit-I

**Introduction:** State of stress and strain at a point: Engineering stress and strain, Two dimensional and one dimensional state of stress as a particular case of three dimensional stress system, Members under axial compression and tension, temperature stresses and strains in composite members, Principal stresses and Principal planes for Two dimensional stress system, Mohr's stress circle, Hooke's law and stress strain relation, Ductile and Brittle materials, Relationship between elastic constants.

#### Unit-II

**Bending of beams:** Shear force and bending moment diagram in beams and calculation of maximum BM and SF and the point of contra flexure,

**Bending and shear stresses:** Bending and shear stresses in different sections, composite beams, application of moments.

#### Unit-III

**Slope and deflection of beams:** Relationship between moment, slope and deflection, double integration method, area moment method, Macaulay's methods, Conjugate beam method, method of superposition and other methods.

#### Unit-IV

**Torsion:** Torsion of circular shaft: Derivation of torsion equation and its assumptions, solid and hollow circular shafts, torsional rigidity, combined torsion and bending of circular shafts, principal stress and maximum shear stresses under combined loading of bending and torsion, torsion of thin hollow sections, analysis of closed coil helical spring.

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## (ME03TPC02) KINEMATICS OF MACHINES

### Course Objectives:

- To impart knowledge on various types of Mechanisms
- To impart skills to analyse the position, velocity and acceleration of mechanisms
- To familiarize higher pairs like cams and gears
- To understand the concept of clutch & brakes

### Course Outcomes:

- To present a problem oriented in depth knowledge of kinematics of machines
- To understand the basic concepts and methods behind kinematics of machines.
- Student can find the applications of all the areas in day-to-day life.

### Unit-I

#### Mechanism and Machines

Links, kinematics pair, classification of kinematics pair, kinematics chain, degree of freedom & constrained motion, mechanism, inversion problem of slider crank mechanism & its inversion, four bar chain etc. equivalent linkage, mechanism with lower pairs, pantograph.

### Unit-II

#### Velocity and Acceleration in Mechanism

Plane motion, absolute and relative motion, velocity and acceleration of a point, velocity and acceleration of a mechanism by relative velocity diagram, coriolis components.

### Unit-III

#### Gear and Gear Train

Classification of gears, spur, helical, bevel, worm gears, spur gear, conjugate action, law of gearing, involutes and cycloidal tooth's profiles, interference and under cutting, contact ratio, gear train, simple, compound and epicyclical gear trains.

### Unit-IV

#### Cams and Followers

Classification of cam and follower, types of follower motion, uniform, simple harmonic, parabolic, cycloid, Cam's profile by graphical method.

### Unit – V

**Clutch:** single plate and multi plate clutch, cone clutch

**Brakes:** Analysis & simple brakes assuming uniform pressure and uniform wear, band brake, block brake, internal shoe brake.

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**Text books:**

1. Mechanism of machines By Ghosh and Mallick East West Press
2. Theory of machine By S. Ratan TMGH
3. Theory of Machine By Thomas Beven, C.B.S. Publications

**ME03PPC01-Kinematics of machine Lab**

**Course Objectives:**

- Kinematics of machine lab provides the practical knowledge about various mechanisms & their applications.
- Student will go through the various experiments of different mechanism like cam-follower mechanism, gears, gear train etc. There are fourteen experiments in this lab.

**Course Outcomes:**

- To present a problem oriented in depth knowledge of kinematics of machines.
- To understand the basic concepts and methods behind kinematics of machines.
- Student can find the applications of all the areas in day to day life.

**List of Experiments:**

1. To study Four-bar mechanism and its inversions.
2. To study Single slider crank mechanism and its inversions.
3. To study double slider crank mechanism and its inversions.
4. To Study and analysis of Pantograph
5. To Study different types of kinematics pair & its classification..
6. To draw displacement, velocity and acceleration curve of cam motion.
7. To determine the jump phenomena of cam follower apparatus.
8. To verify the Coriolis's component of acceleration with theoretical and practical results.
9. To find the speed and torque of different gear in an epicyclic gear train.
10. To find the speed and torque of different gear in a simple, compound and reverted gear train.

**List of Equipment/Instruments/Machines/Software Required:**

- Cam analysis apparatus
- Coriolis's component of acceleration apparatus
- Slip & Creep Measurement Apparatus in Belt Drive
- Epicyclic gear train apparatus.
- Four bar mechanism and its inversions
- Rope brake dynamometer apparatus (with all accessories)
- Single slider crank chain & its inversion

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### ME03PPC02-Mechanics of Solid-I Lab

#### Course Objectives:

- Develop the formal theory of solid mechanics the equilibrium, kinematic, and constitutive equations.
- Introduce the atomistic mechanisms underlying the mechanical behavior of materials.

#### Course Outcomes:

- To apply the formal theory of solid mechanics to calculate forces, deflections, moments, stresses, and strains in a wide variety of structural members subjected to tension, compression, torsion, bending, both individually and in combination, including axially loaded bars/components in pure shear/circular shafts in torsion/beams in bending
- To understand the concepts of stress at a point, strain at a point, and the stress-strain relationships for thin-walled pressure vessel/strusses linear, elastic, homogeneous, isotropic materials.
- To determine principal stresses and angles, maximum shearing stresses and angles, and the stresses acting on any arbitrary plane within a structural element.
- To draw Free Body Diagrams (FBD) for rigid bodies, beams, 2-D and 3-D structures, frames and machines, and set up equilibrium equations (i.e. forces and couples) for them.
- To utilize basic properties of materials such as elastic moduli and Poisson's ratio to appropriately to solve problems related to isotropic elasticity.
- To solve problems and identify the fundamental elements involved in the mechanical design of engineering structures; e.g. which failure / safety criterion to apply for different applications, failure prediction and analysis.

#### List of Experiments:

1. To study the Universal Testing Machine.
2. To perform the Tensile Test of Mild Steel on U.T.M and To Draw Stress–Strain Curve.
3. To study the Impact Testing Machine and test specimen of Izod and Charpy.
4. To determine Izod and Charpy Value of the given mild steel specimen.
5. To study the Torsion Testing Machine
6. To determine ultimate shear stress and modulus of rigidity under Torsion.
7. To study the Rockwell Hardness Testing Machine and to determine the Rockwell Hardness of the given material.
8. To study the Brinell Hardness Machine and to determine the Brinell hardness of the given material.
9. To study the Vickers Hardness Machine and to conduct a hardness test on the machine.

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**List of Equipment/Instruments/Machines/Software Required:**

- Universal Testing Machine
- Impact Testing Machine
- Fatigue Testing Machine
- Torsion Testing Machine
- Rockwell Hardness Testing Machine
- Brinell Hardness Machine

Vickers Hardness Machine

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**(ME04TPC03) FLUID MECHANICS**

**Course Objectives:**

- L Obtaining a solid understanding of the fundamentals of Fluid Mechanics
- L The ability to formulate basic equations for Fluid Engineering problems
- L geometries and Fluid
- L engineering applications
- L The ability to perform dimensional analysis and identify important parameters

**Course Outcomes:**

- L Apply knowledge of Fluid Mechanics formulating and solving engineering problems.
- L Acquire knowledge of fluid mechanics for the design and development of mechanical systems.
- L Demonstrate creativeness in designing new systems components and processes in the field of engineering in general and mechanical engineering in particular.
- L Identify, analysis, and solve mechanical engineering problems useful to the society.
- L Skilfully use modern engineering tools and techniques for mechanical engineering design, analysis and application.
- L Develop fundamentals to continue the study of the advance subject fluid machinery, Heat and mass transfer etc.

**UNIT-I**

**Properties of Fluid:** Fluid ideal and real fluid, properties of fluid, mass density, weight density, specific volume, specific gravity, viscosity, surface tension, capillarity, vapour pressure, compressibility and bulk modules, Newtonian and non-Newtonian fluids.

**Fluid Statics:** Pressure, Pascal's law, Hydrostatic law, Pressure measurement, Hydrostatic force on submerged surface and curved surface, law of buoyancy and flotation.

**UNIT-II**

**Fluid Kinematics**

Description of fluid motion, Lagrangian and Eulerian approach, types of fluid flow, types of flow lines, stream line, stream tube acceleration of a fluid particle, rotational flow, rotation and vorticity, circulation, velocity function, stream and potential function, flow net, its characteristics and utilities. Control volume and surface concept.

**UNIT-III**

**Fluid Dynamics**

Conservation of Mass: Continuity equation, conservation of momentum, momentum equation, Navier-Stokes Equation, Euler's equation, Bernoulli's equation and its practical application, Venturimeter, Orifice meter, Nozzle, Pitot tube, Rotameter, notches and weirs.

**UNIT-IV**



## Turbulence

Basics of Turbulence, Reynolds stresses, Prandtl's mixing length hypothesis, friction velocity, laws of walls. Dimensional Analysis and Similitude: methods of dimensional analysis, Rayleigh's method, Buckingham's theorem, dimensional number and their significance, concept and types of physical similarity, dynamic similarity, applications of dynamic similarity.

## UNIT-V

### Viscous Flow

Flow through circular pipes, flow between two parallel plates, loss of head due to friction in viscous flow. Kinetic energy corrections & momentum correction factors. Flow Through pipe: major & minor loss in pipe, Hydraulic gradient and total energy line, pipe in series and parallel, equivalent pipe, power transmission through pipe, water hammer in pipes.

### Text Books:

1. Modi & Seth; Fluid Mechanics; Standard Book House, Delhi
2. Som and Biswas; Fluid Mechanics and machinery; TMH
3. JNICK DAKE; Essential of EnggHyd; Afrikan Network & ScInstt. (ANSTI)
4. Franiss JRD; A Text Book of fluid Mech. for Engg. Student
5. R Mohanty; Fluid Mechanics; PHI
6. Gupta; Fluid Mechanics; Pearson.

### Reference Books:

1. Streeter & Wylie, Fluid Mechanics
2. Cengel; Fluid Mechanics; TMH
3. V.L. Shames, Fluid Mechanics

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### (ME03TPC04) DYNAMICS OF MACHINES

#### Course Objective:

- To understand the principles of gyroscope and governors.
- To determine the balancing of masses of rotating and reciprocating machine elements
  - To analyze the static and dynamic forces for mechanical systems.
  - To understand the basics of vibrations.

#### Course Outcomes:

- Ability to apply the concept of gyroscopic effects and stabilization on various transport vehicles, aero plane & ships etc
  - Understand the concept and applications of various governors.
  - Ability to apply the principles of balancing of masses to various links, mechanisms and engines.
- 4. Ability to study the various principles of vibrations systems.

#### UNIT – I

**Gyroscope:** Gyroscopic forces and couple (Torque), Angular velocity and acceleration of gyroscope, gyroscopic effect on naval ships, gyroscopic effect on airplane and vehicle moving on curved path.

#### UNIT – II

**Inertia force analysis:** Effective force and inertia force of a link, D'Alembert's principle and dynamic equilibrium, equivalent offset inertia force, Dynamically equivalent system, velocity and acceleration of piston, inertia forces in reciprocating engine, engine force analysis, inertia of connecting rod, Flywheels, turning moment diagram for single and multi-cylinder I.C. Engine, Co-efficient of fluctuation of speed, Co-efficient of fluctuation of energy.

#### UNIT – III

**Balancing:** Static and dynamic balancing, balancing of rotating masses and balancing of reciprocating masses, balancing of locomotives, effect of partial balancing in locomotive balancing of I.C. Engine, balancing of IN-line engine, balancing of V-engine, balancing of radial engine, forward and reverse crank method, balancing of rotors.

#### UNIT – IV

**Governors:** Types of governor, centrifugal governor, spring controlled governor, Watt, Porter and Proell, Hartnell, Hartung governor, governor effect, Power stability, Inertia effects. Governor Performance parameters.

#### UNIT – V

**Introduction to Vibration:** One dimensional longitudinal, transverse, and torsional vibrations, natural frequency, effect of damping on vibrations, types of damping, different types of damping. Forced vibration, forces and displacement, transmissibility, vibration isolation, vibration sensors: seismometer and accelerometers Whirling of shafts with single rotor.


#### Text Books:



**Text Books:**

1. S.S.Ratan, Theory of machine, TMH.
2. J.E.Shingley, Theory of machines, McGraw Hill
3. A.Ghosh& A.K. Mallik, Theory of mechanisms and machines, EWP Press
4. Thomas Bevan, The Theory of machines, CBS Publisher
5. J.S.Rao& R.V. Dukupati, Mechanisms and machines Theory, Wiley Eastern Limited

**(ME04TPC05) MACHINE DRAWING**

  
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**Course Objectives:**

- Understand the different steps in producing drawings according to bureau of Indian standards (B.I.S.) as per SP:46 (1988)

Drawing

- Comprehend general projection theory, with an emphasis on the use of orthographic projection to represent three-dimensional objects in two-dimensional views
- Apply auxiliary or sectional views to most practically represent engineered parts
- Assemble important parts used in major mechanical engineering applications.

**Course outcomes:**

- After going through this course, the student shall be able to understand the drawings of mechanical components and their assemblies along with their utility for design and development of mechanical system.

designs.

- Skilfully use modern engineering tools and techniques such as CAD- CAM software's for mechanical engineering design, analysis and Application

**Unit- I**

**Drawing conventions**, sectional views and sectioning, representation of machine parts such as external and internal threads, slotted heads, square ends, and flat radial ribs, slotted shaft, splined shafts, bearings, springs, Convention of gears in mesh, representation of geometrical tolerances on drawings.

**Unit-II**

**Rivet heads and riveted joints:** Lap and butt joint with single and double straps.

**Welding joints** and their representation, symbols of different joint.

**Machining symbols**, Surface roughness, grades, material symbols.

**Unit- III**

**Screw thread and screw fastening**, different types of thread profile and nuts, bolts.



**Screw thread and screw fastening**, different types of thread profile and nuts, bolts.

**Sectional views:** keys, cotter joints, knuckle joints

**Shaft coupling**, flanged coupling, different types of shaft coupling. **Shaft bearing**, bushed bearing, plumber block, foot step bearing. **Pulleys:** fast & loose pulleys, stepped pulley's belt pulley, rope pulley.



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#### Unit-IV

**Assembly drawing** of Engine parts like piston, stuffing box, cross-heads, eccentrics, connecting rod; Assembly drawing of stop valve, feed check valve, safety valve, blow off cock. Assembly drawing of lathetail stock post.

#### Unit- V

Concept of computer aided drafting(CAD), implementation of CAD, atleast five projects from the abovespecified topics using CAD software.

#### Recommended Books:

1. Shigley J.E; Machine Design; TMH
2. Sharma and Purohit; Design of Machine elements; PHI
3. Wentzell Timothy H; Machine Design; Cengage learning
4. Mubeen; Machine Design; Khanna Publisher
5. Ganesh Babu K and Srithar k; Design of Machine Elements; TMH
6. Sharma & Agrawal; Machine Design; Kataria & sons
7. Maleev; Machine Design.





(ME04TPC04)MANUFACTURING SCIENCE - I

**Course Objectives:**

- To understand various manufacturing processes & its classifications
- To understand various Casting processes
  - To understand various welding processes
  - To understand various metal removal process
- To appreciate the capabilities, advantages and the limitations of the processes

**Course Outcomes:**

- Acquire knowledge and hands-on competence in applying the concepts of manufacturing science in the design and development of mechanical systems.  
processes in the field of engineering in general and mechanical engineering in particular.
- Work effectively with engineering and science teams as well as with multidisciplinary
- Skilfully use modern engineering tools and techniques for mechanical engineering design, analysis and application.

**Unit-I**

**Welding:** Classification of welding process, basic principle & scope of application, Principle of Gas and electric arc welding, characteristics of power sources, types of forces acting during welding, mode of metal transfer, soldering, brazing. TIG & MIG processes and their parameter selection, electrodes, types & coatings, welding defects and remedies.

**Resistance welding:** principle, equipments & types.

**Unit-II**

**Foundry:** Moulding method and materials, sand-clay-water system, additives, pattern making and types, pattern allowances and design considerations, types of moulding sand and their properties, testing, cores boxes, core making, moulding machine.

**Melting furnaces and practices:** Melting cast iron, steel and non ferrous material, cupola, open furnaces, converter and crucible furnaces, electric, direct arc furnace, inductive furnace.

**Unit-III**

**Casting:** Centrifugal and investment casting, shell, plastic and mould methods, melting of cast iron, elements of gating system- top gating, bottom gating, types and design of riser, solidification of casting, aspiration effect, casting defects, clearing of casting, principle of die casting, gravity and pressure die casting, Die casting consideration.  
Plastic processing, injection, compression & blow moulding.

**Unit-IV**

**Forming:** mechanism of forming process, elastic and plastic deformation



**Rolling:** classification, theories of Hot & Cold rolling, rolling mills & its types, calculation of rolling parameter & rolling defect, roll pass sequence.

forging operations and their classification forging design and defects.

**Extrusion:** Classification of extrusion process, Extrusion Principle, analysis of processes, drawing of rods, wire tube-analyses of wire drawing, tube drawing, defects in extrusion & drawing.

### Unit-V

**Sheet-metal working:** Role of sheet Metal Components, cutting mechanism, description of cutting processes blanking, piercing, stripper and stock guide, stock strip layout, description of forming processes like bending, cup drawing, coining, embossing, basic elements of press, classification, punch and die clearances, elements of die and punches, clearance, compound, combination, progressive and inverted dies and their operations

### Text Books:

1. Manufacturing Technology vol.1 , P.N. Rao, T.M.G.H. Publications
2. Manufacturing Science , Ghose and Mallick, , East West press
3. Material and process of Manufacturing, A.Lindberg Roy, PHI Publication.

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### ME04PPC03-Fluid Mechanics Lab

#### Course Objectives:

- To provide practical knowledge in verification of principles of fluid flow
- To impart knowledge in measuring pressure, discharge and velocity of fluid flow
  - To understand Major and Minor Losses
  - To gain knowledge in performance testing of Hydraulic Turbines and Hydraulic Pumps at constant speed and Head

#### Course Outcomes:

- To provide the students with a solid foundation in fluid flow principles
  - To provide the students knowledge in calculating performance analysis in turbines and pumps and can be used in power plant
    - Students can able to understand to analyze practical problems in all power plants and chemical industries
  - Conduct experiments (in teams) in pipe flows and open-channel flows and interpreting data from model studies to prototype cases, as well as documenting them in engineering reports
- design
- Given the required flow rate and pressure rise, select the proper pump to optimize the pumping efficiency
  - To provide exposure to modern computational techniques in fluid dynamics




### List of Experiments:

2. To determine the meta-centric height of a ship model.
3. To verify Bernoulli's Theorem.
4. To verify Impulse Momentum Principle.
5. To calibrate a Venturimeter and study the variation of coefficient of discharge.
6. To calibrate an orifice-meter.
7. Experimental determination of critical velocity in pipe.
8. To determine of head loss in various pipe fittings.
9. Flow measurement using Pitot tube.
10. To study the transition from laminar to turbulent flow and to determine the lower critical Reynolds's number.
11. To determine the hydraulic coefficients ( $C_c$ ,  $C_d$  and  $C_v$ ) of an orifice.
12. To determine the coefficient of discharge of a mouth piece.
13. To obtain the surface profile and the total head distribution of a forced vortex.
14. To study the velocity distribution in pipe and to compute the discharge by integrating velocity profile.
15. To study the variation of friction factor for pipe flow.
16. To determine the roughness coefficient of an open channel.

### List of Equipment/Instruments/Machines/Software Required:

- Apparatus for determination of metacentric height
- Bernoulli's apparatus
- Impact of jet apparatus
- Venturimeter
- Orificemeter
- Pipe friction apparatus
- Orifice apparatus
- Mouth Piece apparatus with the provision for determination of hydraulic coefficient  $C_c$  &  $C_v$
- Vortex flow apparatus
- Apparatus of head loss in various pipe fittings.
- Reynold's apparatus
- Complete setup for flow measurement using Pitot tube
- Complete set for open channel apparatus

  
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## Dynamics of Machine Lab

### Course Objectives:

- Dynamics of machine lab provides the practical knowledge about various machines & their applications.
- Student will go through the various experiments of different machines like Governor, Gyroscope, Balancing, and Universal vibration Apparatus, Whirling of shaft etc.

### Course Outcomes:

- To present a problem oriented in depth knowledge of Dynamics of machines.
- Student can find the applications of all the areas in day to day life.
- To understand the basic concepts and methods behind Dynamics of machines.

### List of Experiments:

1. To find out gyroscopic couple with Gyroscope.
2. To Perform & find out condition of Static & Dynamic balancing on Balancing Apparatus.
3. To perform experiments of Watt Governor & find out Relation between sleeve height & speed.
4. To perform experiments of Porter Governor & find out Relation between sleeve height & speed.
5. To perform experiments of Proell Governor & find out Relation between sleeve height & speed.
6. To perform experiments of Hartnell Governor & find out Relation between sleeve height & speed.
7. To perform experiment of Single pendulum.
8. To perform experiment of Compound pendulum.
9. To perform experiment on Whirling of shaft.

### List of Equipment/Instruments/Machines/Software Required:

- Gyroscope. apparatus
- Static & Dynamic balancing on Balancing Apparatus
- Governor Apparatus
- Universal Vibration Apparatus
- Whirling of shaft

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