



BansilalRamnath Agarwal Charitable Trust's

Vishwakarma Institute of Technology

((An Autonomous Institute affiliated to SavitribaiPhule Pune University formerly University of Pune))

Structure & Syllabus of

B.Tech. (Mechanical Engineering)

Pattern 'A-14'

Effective from Academic Year 2016-17

(T.Y. B.Tech.)

Prepared by: - Board of Studies in Mechanical Engineering

Approved by: - Academic Board, Vishwakarma Institute of Technology, Pune

Signed by

Chairman – BOS

Chairman – Academic Board

Vision, Mission and PEOs of B. Tech. Mechanical Engineering

Vision of the Department

To be recognized as one of the preeminent Mechanical Engineering Programs

Mission of the Department

- To prepare students competent to make their careers in Mechanical Engineering
- To provide value education to students to make them responsible citizen
- To strengthen collaborations with Industries, Academia and Research Organizations to enrich learning environment and to enhance Research Culture
- To be recognized as a leading Mechanical Engineering Department in the field of Knowledge, Skill and Research

Program Educational Objectives

To achieve the mission of the program, Mechanical Engineering graduates will be able:

- To work independently as well as in team to formulate, design, execute solutions for engineering problems and also analyze, synthesize technical data for application to product, process, system design & development
- To understand & contribute towards social, environmental issues, following professional ethics and codes of conduct and embrace lifelong learning for continuous improvement
- To develop expertise towards use of modern engineering tools, instruments, programming languages and software's
- To acquire and develop careers in industries, Research organizations, academia and demonstrate entrepreneurial skill

Program Outcomes

Mechanical Engineering

Engineering Graduates will be able to:

1. **Engineering knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
2. **Problem analysis:** Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
3. **Design/development of solutions:** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
4. **Conduct investigations of complex problems:** Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
5. **Modern tool usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
6. **The engineer and society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
7. **Environment and sustainability:** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
8. **Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
9. **Individual and team work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
10. **Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

11. **Project management and finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
12. **Life-long learning:** Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change

Program Specific Outcomes (PSO)

Mechanical Engineering

Mechanical Engineering Graduates will be able to:

1. Read & generate 2D & 3D computer based drawings of Mechanical Engineering components & systems and select appropriate materials and manufacturing processes for their production.
2. Conceptually understand Mechanical Engineering components & systems and thereby design & analyze them for enhancement of thermal & mechanical performance.
3. Conduct experiments on mechanical systems to measure different parameters required to evaluate the performance of materials, components & systems and deduce relevant conclusions

T.Y. B.Tech -Mechanical Engineering Structure with effect from Academic Year 2016-17 MODULE 5

Code	Subject	Type	Teaching Scheme			Assessment Scheme						Credits
			L	P	Tut.	ISA					ESA	
						Test 1	Test 2	HA	Tut.	CA	ESE	
ME30113	Fluid Machinery and Fluid Power Engineering	Theory - Core	3	-	1	10	20	5	5	-	60	4
ME30115	Mechatronics	Theory – Core / MD	3	-	1	10	20	5	5	-	60	4
ME30109	Internal Combustion Engine	Theory – Core	3	-	-	15	20	5	-	-	60	3
ME31117	Production Metallurgy	Theory – MD	2	-	-	15	20	5	-	-	60	2
ME30309	Internal Combustion Engine	Lab – Core	-	2	-	-	-	-	-	70	30	1
ME30313	Fluid Machinery and Fluid Power Engineering	Lab – Core/MD	-	2	-	-	-	-	-	70	30	1
ME33325	Measurement & Quality Control	Lab – PD	-	2	-	-	-	-	-	70	30	1
ME 30407	Comprehensive Viva Voce	Oral	-	-	-	-	-	-	-	-	100	2
TOTAL			11	6	2							18

T.Y. B.Tech -Mechanical Engineering Structure with effect from Academic Year 2016-17 MODULE 6

Code	Subject	Type	Teaching Scheme			Assessment Scheme						Credits
			L	P	Tut.	ISA					ESA	
						Test 1	Test 2	HA	Tut.	CA	ESE	
ME30116	Computational Methods in Mechanical Engineering	Theory - Core	3	-	1	10	20	5	5	-	60	4
ME30118	Heat Transfer	Theory – Core / MD	3	-	1	10	20	5	5	-	60	4
ME30114	Theory of Machines	Theory – Core	3	-	-	15	20	5	-	-	60	3
ME31120	Production Technology	Theory – MD	2	-	-	15	20	5	-	-	60	2
ME30314	Theory of Machines	Lab – Core	-	2	-	-	-	-	-	70	30	1
ME30318	Heat Transfer	Lab – Core / MD	-	2	-	-	-	-	-	70	30	1
ME33326	Computational Methods in Mechanical Engineering	Lab – PD	-	2	-	-	-	-	-	70	30	1
ME 30408	Comprehensive Viva Voce	Oral	-	-	-	-	-	-	-	-	100	2
TOTAL			11	6	2							18

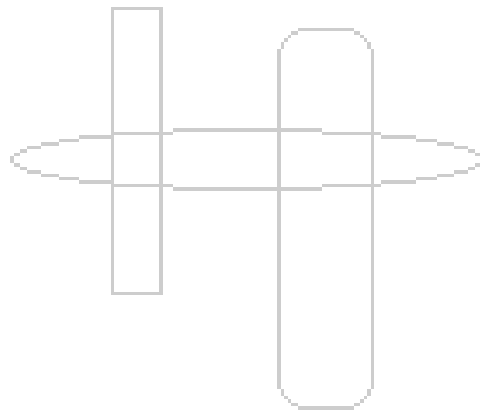
T.Y. B.Tech -Mechanical Engineering Structure with effect from Academic Year 2016-17**Semester I – Irrespective of Module**

Code	Subject	Type	Teaching Scheme			Assessment Scheme						Credits
			L	P	Tut.	ISA					ESA	
						Test 1	Test 2	HA	Tut.	CA	ESE	
ME 30111	Mechanical Design	Theory – Core	3	-	-	15	20	5	-	-	60	3
ME30311	Mechanical Design	Lab – Core	-	2	-	-	-	-	-	70	30	1
ME 37301	Seminar	Seminar	-	4	-	-	-	-	-	70	30	2
ME 37405	Mini Project	Project	-	4	-	-	-	-	-	70	30	2
TOTAL			3	10	-							8

T.Y. B.Tech -Mechanical Engineering Structure with effect from Academic Year 2016-17**Semester II – Irrespective of Module**

Code	Subject	Type	Teaching Scheme			Assessment Scheme						Credits
			L	P	Tut.	ISA					ESA	
						Test 1	Test 2	HA	Tut.	CA	ESE	
ME 30112	Design of Machine Elements	Theory – Core	3	-	-	15	20	5	-	-	60	3
ME30312	Design of Machine Elements Lab	Lab – Core	-	2	-	-	-	-	-	70	30	1
ME 37302	Major Project-Stage I	Project	-	4	-	-	-	-	-	70	30	2
TOTAL			3	6	-							6

MODULE - V



ME30113: FLUID MACHINERY AND FLUID POWER ENGINEERING

Credits: 03

Teaching Scheme: 3 Hours / Week

Unit 1

(8Hrs)

Impulse Turbines

A Pelton turbine, Work done and Efficiencies of Pelton Turbines, Velocity Triangles and their analysis, Governing, Main and Operating Characteristics

B Governing Mechanisms, Unit Quantities

Unit 2

(8Hrs)

Reaction Turbines

A Francis turbine, Work done and Efficiencies of Reaction Turbines, Velocity Triangles and their analysis, Kaplan Turbine, Governing, Main and Operating Characteristics

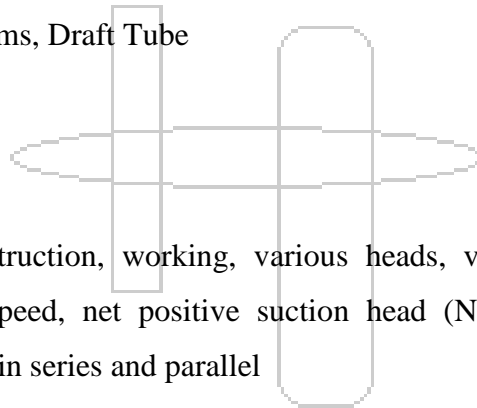
B Governing Mechanisms, Draft Tube

Unit 3 (8Hrs)

Centrifugal Pump

A Classification, construction, working, various heads, velocity triangle, losses and efficiencies, specific speed, net positive suction head (NPSH), Main and Operating Characteristics, Pumps in series and parallel

B Priming and troubleshooting, Unit quantities



Unit 4 (8Hrs)

Source of Power and Fluid Power Control

A Fluid Power Systems, advantages, Applications, Principle of working, Construction of Gear Pumps, Vane Pumps, Necessity of Fluid control, Pressure Control Valves, Flow Control Valves, and Direction Control Valves

B Symbols for hydraulic systems and pneumatic systems

Unit 5 (8Hrs)

Industrial Circuits and Systems

A) Actuators types, Types of Cylinders, Simple Circuits (Regeneration, Speed Control, Sequencing, Synchronizing, fail safe, unloading, actuator locking circuit)

B) Reservoir assembly, Filters, Accumulators

Text Books:

1. R.K.Rajput, “Hydraulic Machines”, S.Chand Publications, New Delhi
2. Esposito A., “Fluid Power with application”, Prentice Hall

Reference Books :

1. Modi and Seth, “Hydraulics, Fluid Mechanics and Machinery”, Standard Book House, NewDelhi
2. Vasandani V. P., “Theory of Hydraulic Machinery”, Khanna Publishers,Delhi
3. Vickers Manual on Industrial Hydraulics
4. Lal J., “Hydraulic Machines”, Metropolitan Book Co., Delhi.
5. Karassic, “Hand Book of Pumps”, Tata McGraw Hill Ltd. Delhi
6. Majumdar, “Oil Hydraulics-Principle and Maintenance”, Tata McGraw Hill
7. Pipenger J. J., “Industrial Hydraulics”, McGraw Hill

Course Outcomes:

The students will be able to –

1. Apply principles of fluid mechanics to the operation, design, and selection of fluid machinery such as pumps and turbines.
2. Use the characteristics of turbines and pumps for various applications.
3. Understand the working of hydro power plant.
4. Understand and analyze the fluid power components and circuits.
5. Apply the knowledge of fluid power for industrial systems.

ME30213 : FLUID MACHINERY AND FLUID POWER ENGINEERING

Credits: 01

Teaching Scheme: - Tutorial 1 Hrs/Week

List of Tutorials:

1. Solving numerical on impulse turbines.
2. Solving numerical on design of Pelton turbine.
3. Solving numerical on Reaction turbines.
4. Solving numerical on design of Francis turbine.
5. Solving numerical on centrifugal pumps.
6. Solving numerical on design of centrifugal pump.
7. Solving numerical on design of accumulator.
8. Solving numerical on gear pump.
9. Solving numerical on vane pump.
10. Solving numerical on design of hydraulic circuit.

Text Books

1. Modi and Seth, "Hydraulics, Fluid Mechanics and Machinery", Standard Book House, New Delhi
2. Esposito A., "Fluid Power with application", Prentice Hall

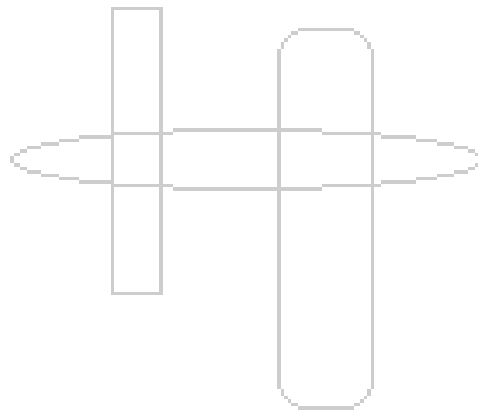
Reference Books

1. Vasandani V. P., "Theory of Hydraulic Machinery", Khanna Publishers, New Delhi
2. Pease D. A., "Basic Fluid Power", Prentice Hall
3. Vickers Manual on Industrial Hydraulics

Course Outcomes:

The student will be able to –

1. Solve numericals based on the applications of impulse momentum principle.
2. Solve numerical based on the fluid power system and its components.
3. Make meaningful conclusions based on the results obtained.



ME 30115 : MECHATRONICS**Credits: 03****Teaching Scheme: 3 Hours / Week****Unit 1: Introduction to Mechatronics****(8 Hours)****Part A:**

Mechatronic system, measurement systems, control systems and response of systems.

Measurement systems: static characteristics, classification of sensors

Flow measurement: Rotameter, anemometer and comparison of characteristics of different flow meters.

Pressure measurement: Mcleod gauges. Actuators: Stepper motor, Servo motors, solenoids

Part B: Comparison of characteristics of different pressure measuring devices.

Unit 2: System Models**(8 Hours)****Part A:**

Mathematical models, introduction to mechanical, electrical, fluid and thermal systems.

Rotational and transnational systems, electro – mechanical, hydraulic – mechanical systems.

Control Systems: Open loop, closed loop systems, transfer functions, feedback and feed forward control systems and their applications.

Control Actions: On–Off, proportional, proportional + integral, proportional + derivative, proportional + integral + derivative control actions.

Part B:

Hydraulic mechanical Systems

Unit 3: System Response**(8 Hours)****Part A:**

System Response, modeling of dynamic systems, dynamic response of first order, second order systems to step, ramp and impulse inputs,

Transfer functions, rise time, peak time, subsidence ratio,

Frequency domain analysis of systems, Bode plots.

Part B: Stability of systems

Unit 4: Signal Processing**(8 Hours)****Part A:**

Analog signal processing: Introduction, principle, passive circuits, operational amplifiers - characteristics and specifications

Digital Signal Processing: Timing diagrams, applications of flip flops, decade counters, Schmitt trigger, 555 timers.

Data Acquisition System: Interfacing of Sensors / Actuators to DAQ system, Bit width, sampling theorem, Aliasing, Sample and hold circuit, sampling frequency.

Part B: ADC (Successive Approximation), DAC (R-2R)

Unit 5: Programmable Logic Controllers**(8 Hours)****Part A:**

Relay logic, basic structure, input/output processing, timers, internal relays and counters, shift registers, ladder diagram and programming, introduction to SCADA systems

Mechatronic systems case studies – any three

Part B:

Selection of PLCs, introduction to microcontroller.

Text Books:

1. Bolton W; “Mechatronics–Electronics Control–Systems in Mechanical and Electrical Engineering” Pearson – Education (Singapore) Pvt. Ltd2
2. Histan B. H., Alciatore D. G. “Introduction to Mechatronics and Measurement Systems”,
3. Thomas G. Beckwith, Roy D. Marangoni, John H. Lienhard V “Mechanical Measurements”

Reference Books: (As per IEEE format)

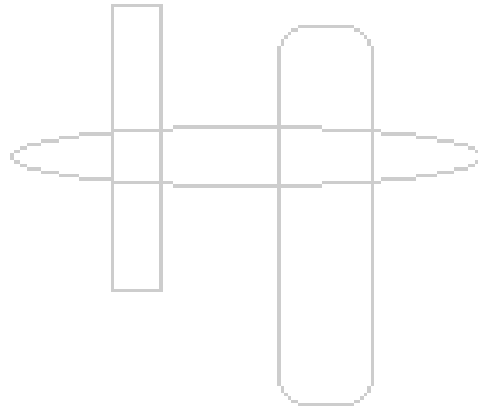
1. Rangan C. S., Sarma G. R. and Mani V. S., “Instrumentation – Devices and Systems”, Tata McGraw Hill, New Delhi.
2. Johnson C. D. “Process Control Instrumentation Technology”, Prentice Hall of India Pvt Ltd., New Delhi.

3. Doebelin E. O., Manik D. N., “Measurement System–Application and Design”, Tata McGraw Hill, New Delhi.
4. Rajput R. K, “A Textbook of Mechatronics”, S. Chand and Co. Ltd.

Course Outcomes:

The student will be able to –

1. Apply knowledge of mathematics, science and engineering to model and solve various mechatronic systems.
2. Use basic electro-mechanical components in control systems.
3. Select the instruments to measure and control mechanical parameters based on the characteristics and system response.
4. Use appropriate signal conditioning method to satisfy needs of the mechatronic system
5. Understand the applications of PLCs in engineering industry.



ME 30215 :MECHATRONICS TUTORIAL

Credits: 01

Teaching Scheme: 1 Hours / Week

List of Tutorials:

1. Assignment on Flow measurement
2. Assignment on Temperature measurement
3. Assignment on modeling of mechanical and electrical systems
4. Assignment on modeling of fluid and thermal systems
5. Assignment on solution of first and second order systems
6. Assignment on transfer function
7. Assignment on sampling frequency
8. Assignment on ladder programming

Text Books: (As per IEEE format)

1. Bolton W; “Mechatronics–Electronics Control Systems in Mechanical and Electrical Engineering” Pearson – Education (Singapore) Pvt. Ltd²
2. Histan B. H., Alciatore D. G. “Introduction to Mechatronics and Measurement Systems”,
3. Thomas G. Beckwith, Roy D. Marangoni, John H. Lienhard V “Mechanical Measurements”

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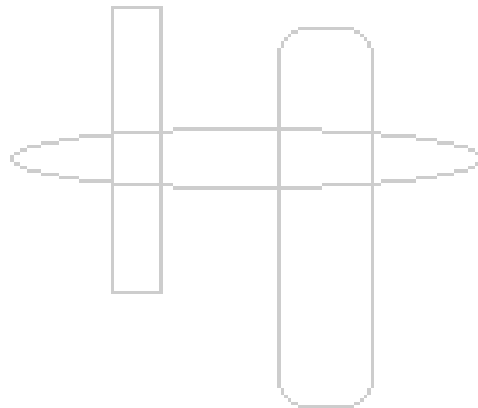
1. Rangan C. S., Sarma G. R. and Mani V. S., “Instrumentation – Devices and Systems”, Tata McGraw Hill, New Delhi.
2. Johnson C. D. “Process Control Instrumentation Technology”, Prentice Hall of India Pvt Ltd., New Delhi.
3. Doebelin E. O., Manik D. N., “Measurement System–Application and Design”, Tata McGraw Hill, New Delhi.
4. Rajput R. K, “A Textbook of Mechatronics”, S. Chand and Co. Ltd.

Course Outcomes:

The student will be able to –

1. Apply knowledge of mathematics, science and engineering to model and solve various mechatronic systems.
2. Use basic electro-mechanical components in control systems.

3. Select the instruments to measure and control mechanical parameters based on the characteristics and system response.
4. Use appropriate signal conditioning method to satisfy needs of the mechatronic system
5. Understand the applications of PLCs in engineering industry.



ME 30109: INTERNAL COMBUSTION ENGINES**Credits: 03****Teaching Scheme: 3 Hrs/Week****Unit I :****(8 Hrs)****Introduction:**

(A) Engine components, Basic engine nomenclature, Engine classification, Working of four stroke and two stroke engines, Valve timing diagrams, Port timing diagrams.

I.C.Engine Cycles: Air standard cycles.- Assumptions, Otto, Diesel and Dual cycles, Comparison of Otto, Diesel and Dual cycles, Fuel-air cycles - Importance, Effect of variable specific heat and dissociation ,Effect of operating variables on performance .

(B) Actual cycles.

Unit II:(8 Hrs)**Fuel Supply Systems for S. I. and C. I. Engines:**

(A) Fuel Supply Systems for S. I. Engines: Carburetion, Mixture requirements, Simple carburetor, Theory of simple carburetor, Types of carburetors, Automobile carburetors - Solex, Carter and S. U. Carburetor.

Fuel Supply Systems for C. I. Engines: Requirements, Types, Construction and working of Bosch fuel injection pump and fuel injector, Types of nozzles, Common rail injection system, Distributor type injection system.

(B) Petrol injection, MPFI system.

Unit III:**(8 Hrs)****Engine Systems:**

(A) Ignition System: Battery ignition system, Magneto ignition system, Electronic ignition system, Advantages over mechanical contact breaker point system.

Engine Cooling System: Necessity of engine cooling, overcooling and under cooling, Types- Air cooling, Water cooling .

Lubrication System: Functions of lubrication system, Types - Mist lubrication system, Wet sump Lubrication, Dry sump lubrication, Oil filters.

Governing System: Quality governing, Quantity governing.

(B) Exhaust system: Components of Exhaust system and its functions.

Unit IV:(8 Hrs)

Testing and Performance of I. C. Engine:

(A) Determination of fuel consumption, air consumption, air-fuel ratio, Determination of brake power, indicated power, friction power. Determination of brake thermal efficiency, mechanical efficiency, volumetric efficiency. Determination of mean effective pressure, Energy Balance, Performance characteristics.

Supercharging: Objectives of supercharging, Supercharging of S.I. Engines and C.I. Engines and its limitations, Effects of supercharging on performance of engine.

(B) Turbocharging- Methods, Limitations.

Unit V:

(8 Hrs)

Combustion in S. I. and C. I. Engines:

(A) Combustion in S. I. Engines: Ignition limits, Stages of combustion, Effect of engine variables on Ignition lag and flame propagation, Abnormal combustion, Detonation- Theories, Effects of engine variables on detonation, Controlling measures, Surface ignition, Combustion chambers for S.I. engines.

Combustion in C. I. Engines: Stages of combustion. Effect of engine variables on delay period, Diesel knock and its control, Combustion chambers for C.I. engines.

(B) Pollutants from S.I. engines and its measurement, Pollutants from C.I. engines and its measurement, Pollution control methods, Hybrid Vehicles.

Text Books:

1. V. Ganesan, "Internal Combustion Engines", Tata McGraw-Hill Publishing Company Ltd.
2. M. L. Mathur and R. P. Sharma, "A Course in Internal Combustion Engines", Dhanpat Rai and Co. Pvt. Ltd.

3. Rajput R. K. “International combustion Engines”, Laxmi publications Pvt. Ltd.

Reference Books:

1. R. Yadav, “Internal Combustion Engines” Central Book Depot, Allahabad
2. Heywood , “Internal Combustion Engine Fundamentals”, , Tata McGraw-Hill Publishing Company Ltd.
3. Srinivasan, “Automotive Engines”, Tata McGraw-Hill Publishing Company Ltd.
4. Domkundwar and Domkundwar, “Internal Combustion Engines”, Dhanpat Rai and Co. Pvt. Ltd.

Course Outcomes:

The student will be able to –

1. Do analysis of Engine cycles for Air standard, fuel-air and real conditions.
2. Demonstrate and Compare Engine systems
3. To analysis of engine Performance parameters
4. Apply Internal Combustion Engine combustion fundamentals to interpret engine performance
5. Demonstrate knowledge about the engine pollutants , its measurements and modern trends in the engines.

ME30117 Production Metallurgy

Credits:02

Teaching Scheme: 02 Hours / Week

Unit 1: The Iron-Iron carbide Phase equilibrium Diagram (06 Hours)

Part A: Introduction, Iron carbon diagram, Significant Temperatures, Definitions of structures, Carbon solubility in Iron, Slow cooling of steel, Classification of steels

Part B: Basics of Phase Diagram, Lever Rule, Cooling curve for pure iron.

Unit 2: Heat Treatment of Steels (06 Hours)

Part A: Introduction, Full Annealing, Normalizing, Hardening, Tempering, Isothermal transformation Diagram for eutectic steel, Products of Austenite, Quenching, Hardenability, Austempering

Part B: Jominy End quench Test

Unit 3: Surface Heat Treatments (04 Hours)

Part A: Carburising, heat treatment after carburising, Nitriding, Carbonitriding, Flame hardening and Induction hardening. Commercial heat treatment practice of gears of different sizes, tools, springs..

Part B: Hardenable Carbon Steels, Isothermal heat treatments

Unit 4: Alloy Steels and Cast iron (06 Hours)

Part A: Alloy Steels - Effects of alloying elements, classification of alloying elements. Stainless Steels, Tool steels and tool materials, Special purpose steels with applications. Cast irons- Classification, Gray cast iron, White cast iron, Malleable cast iron" Ductile Iron Effects of various parameters on structures and properties of cast irons,

Part B: Applications of cast irons for different components of machine tool, automobiles, pumps etc.

Unit 5: Non ferrous metals and Alloys (06 Hours)

Part A: Copper alloys - Brasses, Bronzes-: Tin, Aluminium, Beryllium, Silicon Copper nickel alloys, Nickel - Silver, Aluminium and aluminium alloys. High Temperature materials such as Nimonics, Super alloys, Ti-alloys etc.

Part B: Selection of Materials and Failure Prevention: Selection factors, some case studies of common engineering components. Failure prevention through design, proper material selection.

Text Books: (As per IEEE format)

1. Sydney Avner; *Introduction to Physical Metallurgy; Edition No2., McGraw Hill Education (India)Private Limited*
2. W F Smith etal; *Material Science and Engineering; Edition No5., McGraw Hill Education (India)Private Limited*

Reference Books: (As per IEEE format)

- 1.W.D.Callister;*Material science and Engineering An Introduction; Edition No5., John Willey and Sons*
2. Van Vlack L.H.: *Elements of Material Science. Addison- Wesley Publishing Co.*
3. Murthy -*Structure and properties engineering materials, Tata McGraw Hill 2003.*

Course Outcomes:

1. Students will be able to select and recommend Steels for different applications
2. Students will be able to suggest Heat Treatment for steels
3. Students will be able to suggest different applications based surface coating solutions

ME30309 :Internal Combustion Engines

Credits:01

Teaching Scheme: 2. Hours / Week

List of Practicals:

1. Study and demonstration of conventional diesel fuel injection system.
2. Study and Demonstration of common rail diesel injection system
3. Study and demonstration of carburetors.
4. Study of electronic ignition system.
5. Study of alternative fuels for I.C. Engines
6. Trial on exhaust gas analyzer for emission analysis at variable load
7. Trial on smoke meter for smoke analysis at variable load
8. Trial on diesel engine to determine variable load performance and energy balance
9. Variable speed trial on petrol/diesel engine.
10. Trial on multi-cylinder petrol engine – Morse Test.
11. Trial on IC engine to plot Pressure - Crank angle diagram.
12. Trial on variable compression ratio engine
13. Visit to service station

Text Books:

1. V. Ganesan, “Internal Combustion Engines”, Tata McGraw-Hill Publishing Company Ltd.
2. M. L. Mathur and R. P. Sharma, “A Course in Internal Combustion Engines”, Dhanpat Rai and Co. Pvt. Ltd.
3. Rajput R. K. “International combustion Engines”, Laxmi publications Pvt. Ltd.

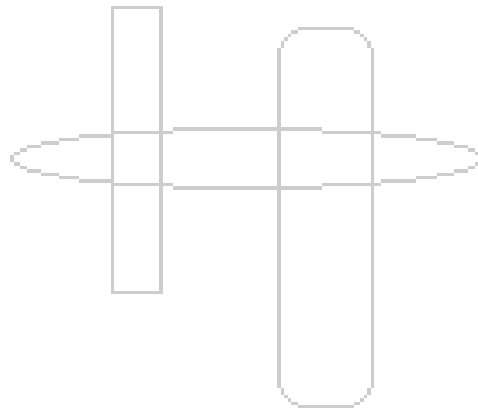
Reference Books:

1. R. Yadav, “Internal Combustion Engines” Central Book Depot, Allahabad
2. Heywood , “Internal Combustion Engine Fundamentals”, , Tata McGraw-Hill Publishing Company Ltd.
3. Srinivasan, “Automotive Engines”, Tata McGraw-Hill Publishing Company Ltd.

Course Outcomes

Students will be able to

1. Understand construction and working of various engine systems.
2. Perform Testing of Engine and data analysis to draw conclusions
3. Do engine pollution measurement and its analysis.



ME30313 :: FLUID MACHINERY AND FLUID POWER ENGINEERING

Credits: 01

Teaching Scheme: 2Hours / Week

List of Practical:

1. Trial on Pelton Turbine
2. Trial on Francis Turbine
3. Trial on Centrifugal Pump
4. Study of Kaplan Turbine
5. Trial on Gear Pump
6. Trial on Vane Pump
7. Study of Compressed air generation and distribution systems
8. Study of Filters, Regulator and Lubricator
9. Study of Shuttle valve/Quick Exhaust valve/Twin pressure valve /Pneumatic Clamp
10. Demonstration of working of Pressure/Direction/ Flow control valves
11. Visit to Hydro power plant
12. Visit to Pumping Station

Text Books

1. Modi & Seth, "Hydraulics, Fluid Mechanics & Machinery", Standard Book House, New Delhi
2. Esposito A., "Fluid Power with application", Prentice Hall

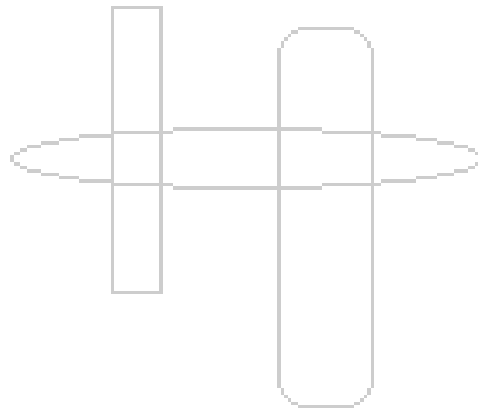
Reference Books

1. Vasandani V. P., "Theory of Hydraulic Machinery", Khanna Publishers, Delhi
2. Pease D. A., "Basic Fluid Power", Prentice Hall
3. Vickers Manual on Industrial Hydraulics

Course Outcomes:

The student will be able to –

1. Understand the applications of impulse momentum principle.
2. Understand the principles of fluid power and its components.
3. Apply the knowledge of hydraulics and pneumatics for industrial systems.



ME33327 Measurement and Quality Control**Credits:01****Teaching Scheme: 02 Hours / Week****List of Practical**

Any TWELVE of the following assignment/experiments are to be conducted,
(Any 6 experiments out of 1-10, and any 6 experiments out of 11-18)

1. Measurement of angle by sine bar / Sine center.
2. Measurement of Optical surface using Interferometer.
3. Study and Experiment on Profile Projector.
4. Measurement of straightness, flatness, roundness.
5. Measurement of the Surface roughness.
6. Measurement of Screw thread parameters using Floating Carriage Micrometer.
7. Measurement of Gear tooth thickness using Gear tooth Vernier caliper and Span Micrometer.
8. Calibration of a dial gauge
9. Design of snap and plug gauge.
10. Alignment Test on Lathe/ Drilling/ Milling Machine
11. Experiment to measure Process Capability using Statistical Process Control.
12. Measurement of direct and shear strain
13. Measurement of acceleration with data acquisition system
14. Calibration of a bourdon pressure gauge
15. Displacement measurement with LVDT
16. Industrial Visit: - A Report on Industrial visit to Metrology Department.

Assignments:

1. Assignment on Line Standard, End Standard and sources of error.
2. Assignment on two and three wire method for screw thread measurement.
3. Assignment on construction and working of surface roughness measuring devices and interpretation of roughness indices Ra, Rv, Rpk, Rpm, bearing area ratio, etc.
4. Assignment on gear profile error, lead error and total cumulative error measurement.

5. Assignment on construction and working of NPL flatness tester and calculation of flatness error from the fringe patterns.
6. Assignment on construction and application of Tool Maker's Microscope.
7. Assignment on construction and working of Auto Collimator.

Text Books: (As per IEEE format)

1. "Engineering Metrology", R. K. Jain, Khanna Publication.
2. "Practical Engineering Metrology", K. W. B. Sharp, Pitman Publication
3. "Mechanical Measurements", Beckwith, Buck and Marangon, Narosa Publication.

Reference Books: (Reference Books)

1. "A Text book of Engineering Metrology", I. C. Gupta, Dhanpat Rai and Sons
2. "Statistical Quality Control", E. L. Grant and R. S. Kearenworth
3. "Measurement Systems", E. O. Doebelin, McGraw Hill Publication

Course Outcomes:

The student will be able to –

1. Students will be able to carry out measurements with different measuring instruments
2. Students will be able to calibrate measuring instruments like Pressure gauge, Dial gauge and thermocouples.
3. Students will be able to carry out measurements of existing components and parts.
4. Students will be able to design measurement processes for quality control.

ME 30407 :: Comprehensive Viva Voce	
Credits: 02	Teaching Scheme: Nil

The CVV will be conducted on the basis of following Lab Courses –

- Fluid Machinery and Fluid Power Engineering
- Internal Combustion Engine
- Measurement and Quality Control
- Mechanical Design (during Sem I)

OR

- Design of Machine Elements (during Sem II)

Course Outcomes:

- 1. Students will be able to exhibit the theoretical concept.
- 2. Students will be able to demonstrate verbal, written and graphical communication skills.
- 3. Students will be able to undertake technical discussions.

ME30111: MECHANICAL DESIGN**Credits: 03****Teaching Scheme** Theory 3 Hrs/Week**Unit I Design Against static Load (8 Hrs)****Part A:**

Design Process: Machine Design, Traditional design methods, Basic procedure of Machine Design, Use of standards in design, Selection of preferred sizes

Factor of safety, Service factor, Modes of Failure,

Theories of failure: Maximum Normal Stress Theory, Maximum Shear stress Theory, Distortion Energy Theory. Design of simple machine parts - Cotter joint, Knuckle joint and Levers, Eccentric axial loading, Stresses in curved beams.

Part B:

Sources of Design data , Design Synthesis, Creativity in design. Introduction to thermal and residual stresses.

Unit II Shafts, Keys and couplings (8 Hrs)**Part A:**

Transmission shaft, Shaft design on strength basis, Shaft design on torsional rigidity basis, A.S.M.E. code for shaft design, design of Hollow shaft on strength basis, design of Hollow shaft on torsional rigidity basis, Design of square and flat Key, Design of splined shaft ,

Design of Muff ,Flange Couplings.

Part B:

Design of shaft on the basis of lateral rigidity – Castigliano's theorem.

Design of saddle, sunk, feather and Woodruff keys , Design of multiflex flexible coupling, Critical speed of shaft. Selection of couplings from manufacturing catalogue.

Unit III Threaded joints & Power screws (8 Hrs)**Part A:****Threaded joints**

Basic types of screw Fastening, Bolts under tension, Eccentrically loaded bolted joint in shear, Eccentric load perpendicular to axis of bolt, Eccentric load on circular base, Torque requirement for bolt tightening, Bolts of uniform strength.

Power screws: Forms of threads, Multiple threaded screws, Terminology of Power screws, Torque analysis with square, trapezoidal and Acme threads, Self locking screw, Efficiency of Square Threaded Screws, Efficiency of Self-Locking Screws, Collar friction torque, Design of screw and Nut, Design of Screw jack and C-Clamp.

Part B:

Dimensions of standard fasteners, Design of cylinder head bolts and turn buckle.

Differential and compound Screws, Recirculating Ball Screws.

Unit IV Welded, Riveted Joints and Design for Fluctuating Loads

(10 Hrs)

Part A:

Welded Joints: Stresses in butt and fillet welds, Strength of butt parallel and transverse fillet welds, Axially loaded unsymmetrical welded joint, Eccentric load in plane of welds, Welded joint subjected to bending and torsional moments.

Riveted Joints:

Types of failure, strength equation, Efficiency of joint

Design for Fluctuating Loads: Stress concentration – causes and remedies, Fluctuating stresses, Fatigue failure, S-N curve, Endurance limit, Low cycle and high cycle fatigue, Notch sensitivity, Endurance strength modifying factors, Reversed stresses, Design for finite and infinite life, Soderberg and Goodman diagrams and Fatigue design of shaft under combined stresses.

Part B:

Modified Goodman diagram, Cumulative damage in fatigue failure.

Unit V Mechanical Springs (6 Hrs)

Part A:

Mechanical Springs: Types, Applications and materials of springs, Stress and deflection equations for helical Springs, Style of ends, Design of helical springs, Design against Fluctuating Load, springs in series and Parallel, Concentric helical springs.

Part B:

Helical torsion Spring, Surge in spring, Multi-leaf Spring, Nipping of leaf Springs, Shot peening, Belleville spring.

Text Books

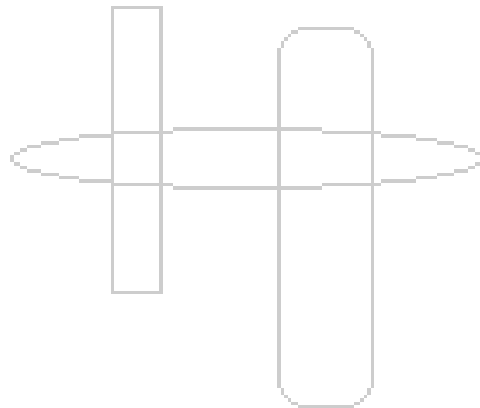
1. Bhandari V. B. “Design of Machine Elements”, 3rd Edition, Tata McGraw Hill Education Private Ltd, New Delhi
2. Sharma C. S., Purohit Kamlesh “Design of Machine Elements”, , Prentice Hall of India Pvt. Ltd. New Delhi.
3. Khurmi R. S. and Gupta J. K. “A text book of Machine Design”, S Chand and Co. Ltd., New Delhi

Reference Books

1. Robert Juvinall, Kurt Marshek, “Machine component Design”, fifth edition, Wiley India
2. Spotts M. F. and Shoup T. E. “Design of Machine Elements”, Prentice Hall Int
3. Shigley J. E. and Mischke C. R. , “Mechanical Engineering Design”, . 6th Edition, Tata McGraw Hill Pub. Co. Ltd., Delhi
4. Kannaiah P. “Machine Design”, , SCITECH Publication Pvt. Ltd. , Chennai
- 5 . Dr. P C Sharma & Dr. D K Aggarwal, “Machine Design”, 12th Edition, S K Kataria & sons, New Delhi
6. “Design Data”, P.S.G. College of Technology, Coimbatore

Course Outcomes: On successful completion of the course, the student will be able to

- Analyze the stress and strain on mechanical components and identify failure modes for mechanical parts
- Select material & derive specification for simple mechanical components like Cotter joint, knuckle joint, shaft, couplings, springs etc.
- Design lifting device Screw jack & clamping device C-Clamp
- Design mechanical component for fluctuating load
- Design mechanical joints like welded joint, threaded joint, Riveted joint



ME30311: MECHANICAL DESIGN (LAB)**Credits: 1****Teaching Scheme: laboratory 2 Hours / Week****List of Practicals**

Practical includes **Three** design projects based on syllabus of the subject. Each design project shall consist of two half imperial size sheets: one involves assemble drawing with partlist and overall dimensions and other sheet involving individual component drawings. Manufacturing tolerances , dimensional tolerances and surface finish symbols should be specified on the drawings. A design report which includes all the design calculations should be submitted in the separate file.

Probable topics of the projects based on the use of standards are enlisted below.

1. Design of Cotter joint/ Knuckle Joint / Levers
2. Design of Couplings
3. Design of Screw Jack/ C-Clamp
4. Design of springs

Industrial visit report based on the systems like shafting, keys, couplings, bolted /welded joints, springs etc.

Recommendation : At least one project drawing should be done using CAD software.

Text Books

1. Bhandari V. B. “Design of Machine Elements”, 3rd Edition, Tata McGraw Hill Education Private Ltd, New Delhi
2. Sharma C. S., PurohitKamlesh “Design of Machine Elements”, , Prentice Hall of India Pvt. Ltd. New Delhi.
3. Khurmi R. S. and Gupta J. K. “A text book of Machine Design”, S Chand and Co. Ltd., New Delhi

Reference Books

1. Robert juvinall ,Kurt marshek, “Machine component Design”,fifthedition,Wiley India
2. Spotts M. F. and Shoup T. E. “Design of Machine Elements”, Prentice Hall Int

3. Shigley J. E. and Mischke C. R. ,“Mechanical Engineering Design” ,. 6th Edition,
Tata McGraw Hill Pub. Co. Ltd., Delhi
4. Kannaiah P. “Machine Design” , , SCITECH Publication Pvt. Ltd. ,Chennai
- 5 . Dr. P C Sharma &Dr.D K Aggarwal, “Machine Design”, 12th Edition, S K Kataria&
sons, New Delhi
6. “Design Data”, P.S.G. College of Technology, Coimbatore

Course Outcomes: On successful completion of the course, the student will be able to

- Select the suitable material from the design data book and derive specification for designing simple mechanical components like Cotter joint, knuckle joint, shaft, couplings, springs etc
- Decide the fits of different mechanical components of the system relative to the other components of the system
- Select the suitable material from the design data book and derive specification for lifting device screw Jack & clamping device C-clamp
- Represent the designed component in the form of engineering drawings (Parts and Assembly Drawing) in order to communicate the manufacturing requirements of the component to the manufacturer.

ME30112: DESIGN OF MACHINE ELEMENTS

Credits: 03

Teaching Scheme: - Theory 3 Hrs/Week

Prerequisites: Mechanical Design

Unit I Belts , Chain and Rope drives (6 Hrs)

Part A:

Types of belts, belt construction, geometric relationships, analysis of belt tensions, condition for maximum power, characteristics of belt drives, Belt tensioning methods, Chain drives, roller chain, power rating of roller chains, sprocket wheel, and design of chain drive.

Part B:

Rope drives, Construction of wire ropes, Lay of wire ropes, Stresses in wire rope, Selection of wire ropes, Rope drum construction and design. Geometric relationships, polygonal effect in Chains, chain lubrication, silent chain.

Unit II Friction Clutches and Brakes (9 Hrs)

Part A:

Clutch:

Classification and selection of friction clutches, Torque transmitting capacities and design of single plate, multi-plate, Cone and Centrifugal clutches

Brakes:

Energy absorbed by brake, Block brake, Band Brake, Internal expanding shoe brake, Temperature rise in brake operation. Design of Disk brake.

Part B:

Types of friction materials, their advantages, limitations and selection criteria, Concept of temperature rise in clutch operation.

Unit III Rolling and Sliding Contact Bearing (8 Hrs)

Part A:

Rolling contact bearings :

Types of rolling contact Bearings, Static and dynamic load carrying capacities, Stribeck's equation, Equivalent bearing load, Load-life relationship, Selection of bearing life, Taper roller bearing, Design for cyclic loads and speed, Bearing with probability of survival other than 90%.

Sliding Contact Bearing :

Comparison of rolling and sliding contact bearing, Hydrodynamic journal bearing: Reynold's equation, Raimondi and Boyd method, temperature rise, Bearing design – selection of parameters.

Part B:

Bearing materials, Types of lubricants , Bearing failure causes and remedies, Hydrostatic Bearing: Viscous flow through rectangular slot, hydrostatic step bearing,

energy losses in hydrostatic bearing

Unit IV Spur Gear

(8 Hrs)

Part A:

Number of teeth and face width, Types of gear tooth failure, Desirable properties and selection of gear material, Constructional details of gear wheel, Force analysis, Beam strength (Lewis) equation, Velocity factor, Service factor, Load concentration factor, Effective load on gear, Wear strength (Buckingham's) equation, Estimation of module based on beam and wear strength, Estimation of dynamic tooth load by velocity factor and Buckingham's equation.

Part B:

Classification of gears, Selection of types of gears, Standard systems of gear tooth. Methods of gear lubrication, Introduction to addendum modification and its advantages

Unit V Helical and Bevel Gears

(9 Hrs)

Part A:

Helical Gears:

Transverse and normal module, Virtual no of teeth, Force analysis, Beam and wear strengths, Effective load on gear tooth, Estimation of dynamic load by velocity factor and Buckingham's equation, Design of helical gears.

Bevel Gears:

Straight tooth bevel gear terminology and geometric relationship, Formative number of teeth, Force analysis, Design criteria of bevel gears, Beam and wear strengths, Dynamic tooth load by Velocity factor and Buckingham's equation, Effective load, Design of straight tooth bevel gears.

Part B:

Selection of materials for bevel gears, Introduction to spiral bevel gears and hypoid gears and comparison with straight tooth bevel gears, Lubrication and mounting of bevel gears, Bearing reactions, Types of failures in bevel gears.

Text Books

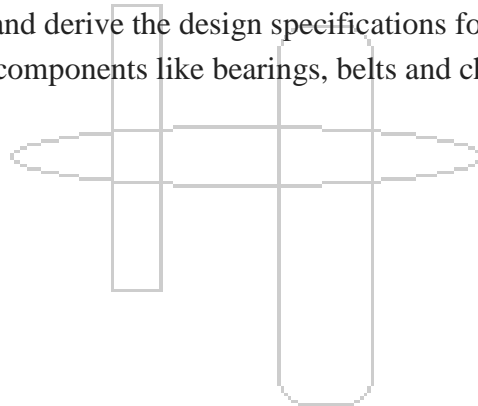
1. Bhandari V. B. "Design of Machine Elements", 3rd Edition, Tata McGraw Hill Education Private Ltd, New Delhi
2. Sharma C. S., Purohit Kamlesh "Design of Machine Elements", , Prentice Hall of India Pvt. Ltd. New Delhi.
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1. Robert juvinall ,Kurt marshek, "Machine component Design",fifthedition,Wiley India
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3. Shigley J. E. and Mischke C. R. ,"Mechanical Engineering Design", . 6th Edition, Tata McGraw Hill Pub. Co. Ltd., Delhi
4. Kannaiah P. "Machine Design", , SCITECH Publication Pvt. Ltd. ,Chennai
- 5 . Dr. P C Sharma &Dr.D K Aggarwal, "Machine Design", 12th Edition, S K Kataria& sons, New Delhi
6. "Design Data", P.S.G. College of Technology, Coimbatore

Course Outcomes: On successful completion of the course, the student will be able to

- Decide Power transmission system for a particular application
- Design drive train such as Belt,Rope,Chain drive
- Derive the design specifications for clutch & brake based on principle of uniform wear and pressure theory
- Select the material and derive the design specifications for Spur, Helical & Bevel gear
- Select the standard components like bearings, belts and chains from the manufacturer's catalog



ME30312: DESIGN OF MACHINE ELEMENTS (LAB)**Credits: 1****Teaching Scheme: laboratory 2 Hours / Week****List of Practicals**

1. Practical assignment on selection of flat / Vee Belt from manufacturer's catalog.
2. Practical assignment on selection of chain drive from manufacturer's catalog.
3. Practical assignment on selection of rolling contact bearing from manufacturer's catalog.
4. Hydrodynamic journal bearing Test
5. **“ONE” design project:**

The design project shall consist of two imperial size sheets – one involving assembly drawing with a part list and overall dimensions and the other sheet involving drawing of individual components. Manufacturing tolerances, surface finish symbols and geometric tolerances should be specified so as to make it working drawing. A design report giving all necessary calculations of the design of the components and assembly should be submitted in a separate file.

Design projects should include selection of prime mover and design of mechanical systems comprising of machine elements: i) spur gears, helical and or bevel gears **OR** ii) Friction Clutches or Brakes.

- Industrial visit report based on the systems like Belt/Rope /Chain drives, friction clutches, brakes, Bearings, Gears etc.

Text Books

1. Bhandari V. B. “Design of Machine Elements”, 3rd Edition, Tata McGraw Hill Education Private Ltd, New Delhi
2. Sharma C. S., PurohitKamlesh “Design of Machine Elements”, , Prentice Hall of India Pvt. Ltd. New Delhi.
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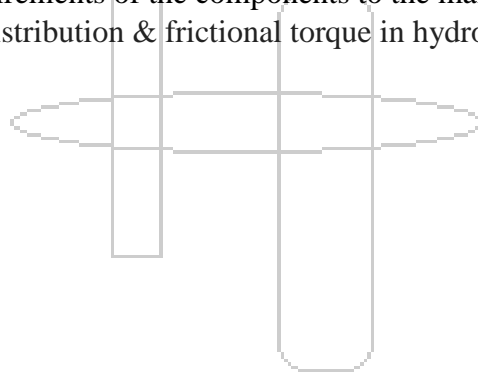
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- 5 . Dr. P C Sharma &Dr.D K Aggarwal, “Machine Design”, 12th Edition, S K Kataria&
sons, New Delhi
6. “Design Data”, P.S.G. College of Technology, Coimbatore

Course Outcomes: On successful completion of the course, the student will be able to

- Select the material from the design data book and derive the design specifications for machine components like belt,rope,chain drive, Bearing
- Decide the layout of a mechanical system like gear-box and decide the fits of different mechanical components of the system relative to the other components of the system.
- Represent the designed component, individually and as a part of the mechanical assembly like a gear box, in the form of engineering drawings in order to communicate the manufacturing requirements of the components to the manufacturer
- Measure pressure distribution & frictional torque in hydrodynamic journal bearing



ME37302:: PROJECT STAGE-1

Credits: 02

Teaching Scheme:4 Hours / Week

The project work could be of the following nature:

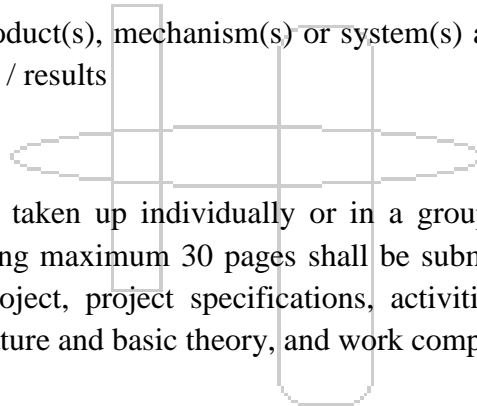
Design/development and Fabrication of models, machines, and prototypes based on new ideas, robotic and automation systems, Experimental set ups, test rigs/ equipment's,

Thermal Systems Energy audit/conservation studies

Extensive computational analysis of problems relevant to mechanical engineering,

CAD/CAM/CAE

Modeling/simulation of product(s), mechanism(s) or system(s) and its validation or comparison with available bench marks / results



The project work shall be taken up individually or in a group consisting of not more than 4 students. A report containing maximum 30 pages shall be submitted based on the background, need and scope of the project, project specifications, activities involved in the project and activity plan, study of literature and basic theory, and work completed (if any).

Guidelines:

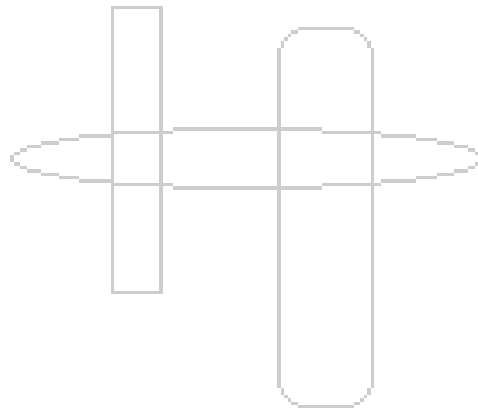
- Report shall be typed or printed.
- Project title and approval sheets shall be attached at the beginning of the report followed by index and synopsis of the project.
- References shall be mentioned at the end followed by appendices (if any).
- When a group of students is doing a project, names of all the students shall be included on every certified report copy.

Each group of students shall submit two copies of reports to the institute and one copy shall be prepared for each individual student.

Course Outcomes:

The student will be able to –

- 1) Student will be able to identify and plan the project problem.
- 2) Student will be able to formulate the project problem.
- 3) Student will be able to conduct the literature survey of the related topic.



ME 37301: Seminar**Credits:02****Teaching Scheme: 1 Hours / Week****Guidelines:**

The seminar topic may be

- Mechanical Engineering
- Based on Interdisciplinary subjects.
- Recent trends in Engineering field.

The topic should be based on recent research paper published in International Conference / engineering journals / article published in print media.

Each student should have a different seminar topic and its presentation. In case more than one student is working on the same topic, then their scope of seminar must be distinct.

Instructions for Seminar Report writing

1. Prepare minimum one copy of manuscript of Seminar report for the submission. The report should be printed on both sides of the paper, except the cover page, front page and Certificate.
2. The manuscript of the Seminar report should be preferably 15-20 pages.
3. The Seminar report must be spiral bound.
4. Entire report should be documented as one chapter. Following will be the order of the report.
 - Cover page and front page as per the standard specimen (**as described by the Department**) on separate sheet.
 - Certificate from the institute as per the standard specimen (**as described by the Department**).
 - Acknowledgement
 - List of Figures
 - List of Tables
 - Nomenclature (**symbols and the abbreviations** used in the manuscript should be included in Nomenclature section)
 - Contents
 - Abstract (A brief abstract of the report not more than **250 words**. The heading of abstract i.e. word "Abstract" should be **bold, Times New Roman, 12 pt** and should be typed at the **centre**. The contents of abstract should be typed on new line without space between heading and contents. Try to include one or two sentences each on **motive, method, key-results and conclusions** in the Abstract)
 - Sections: Introduction, Theory / Experimental details, Methodology, Experimental / Numerical scheme, Results and Discussion, Conclusions.
 - References

5. The main part of manuscript should be Times New Roman 12 pt. and justified. Use 1.5 line spacing.
6. Use the paper size **8.5'' × 11''** or **A4 (210 × 197 mm)**. Follow the margins given below.

Margin Location	Paper 8.5''×11''	Paper A4 (210mm×197mm)
Top	1''	25.4 mm
Left	1.5''	37 mm
Bottom	1.25''	32 mm
Right	1''	25.4 mm

7. All paragraphs should be 1.5 line spaced with a one blank line between each paragraph. Each paragraph should begin without any indentation.
8. Section titles should be bold with 12 pt and Title Case (the first letter is to be capitalized) and should be left aligned.
9. Sub-Section headings should be aligning at the left with 12 pt, italic and Title Case (the first letter is to be capitalized).
10. All section headings and subheadings should be numbered. For sections use numbers **1, 2, 3,** and for subheadings **1.1, 1.2,** etc and section subheadings **2.1.1, 2.1.2,** etc.
11. Number equations consecutively. Equation numbers, within parentheses, are to position to right, for eg.

$$a + b = \gamma \quad (1)$$
12. Illustrations (charts, drawings, photographs, figures) are to be in the text. Figure No. and figure captions should be at bottom of the figure with **12 pt**. Table No. and Table captions should be at the top of the Table with **12 pt**.
13. Page number should be given in the footer with Times New Roman 10 Pt, centrally aligned. **Cover page, front page and Certificate should not be numbered.**
14. **References** should be either in order as they appear in the manuscript or in alphabetical order by last name of first author. References should be given in the body of the text and well spread. No verbatim copy or excessive text from only one or two references. If **figures** and **tables** are taken from any reference then indicate source of it. Referencing style that has to be followed in the manuscript are given below.

Reference Books:

Collier, G. J. and Thome, J. R., Convective boiling and condensation, 3rd ed., Oxford University Press, UK, 1996, pp. 110 – 112.

Papers from Journal or Transactions:

Jung, D. S. and Radermacher, R., Transport properties and surface tension of pure and mixed refrigerants, *ASHRAE Trans*, 1991, 97 (1), pp. 90 – 98.

Bansal, P. K., Rupasinghe, A. S. and Jain, A. S., An empirical correction for sizing capillary tubes, *Int. Journal of Refrigeration*, 1996, 19 (8), pp.497 – 505.

Papers from Conference Proceedings

Colbourne, D. and Ritter, T. J., *Quantitative assessment of flammable refrigerants in room air conditioners*, Proc. of the Sixteenth International Compressor Engineering Conference and Ninth International Refrigeration and Air Conditioning Conference, Purdue University, West Lafayette, Indiana, USA, 2002, pp. 34 – 40.

Reports, Handbooks etc.

United Nations Environmental Programme, Report of the Refrigeration, Air Conditioning and Heat Pumps, Technical Option Committee, 2002, Assessment - 2002. ASHRAE Handbook: Refrigeration, 1994 (Chapter 44)

Patent

Patent no, Country (in parenthesis), date of application, title, year.

Internet

www.(Site) [Give full length URL]

Seminar Evaluation Scheme:

1	Attendance during Semester	10
2	Attendance during Seminar presentation self and peer	10
3	Relevance of Seminar Topic	10
4	Timely abstract submission	10
5	Literature review	10
6	Technical Content	10
7	Presentation	25
8	Answer to the examiner's Queries	15
Total		100

Course Outcomes:

The student will be able to –

1. Review research papers, periodicals and magazines
2. Discuss the recent developments in the field of mechanical engineering
3. Develop skills of technical report writing and presentation.