

**DEVI AHILYA VISHWAVIDYALAYA, INDORE  
INSTITUTE OF ENGINEERING & TECHNOLOGY**

**SCHEMES OF EXAMINATION FOR BE PROGRAMME  
(Subject to Revision)**

**B. E. III YEAR MECHANICAL ENGINEERING  
Th- Theory, CW – Class Work, SW – Sessional Work, Pr – Practical**

<b>Semester V</b>										
<b>SNo</b>	<b>Sub Code</b>	<b>Subject</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>Th</b>	<b>CW</b>	<b>SW</b>	<b>Pr</b>	<b>TOTAL</b>
1.	3ME101	Dynamics of Machine	4	-	2	100	50	50	50	250
2.	3ME102	Machine Design – I	4	-	4	100	50	50	50	250
3.	3ME103	Production Engineering-I	4	-	-	100	50	-	-	150
4.	3ME104	IC Engine and Gas Turbines	4	-	2	100	50	50	50	250
5.	3ME105	Heat Transfer	4	-	2	100	50	50	50	250
6.	3SS106	Principles of Management	2	-	-	-	50	-	-	50
<b>TOTAL</b>			<b>22</b>	<b>-</b>	<b>10</b>	<b>500</b>	<b>300</b>	<b>200</b>	<b>200</b>	<b>1200</b>

<b>Semester VI</b>										
<b>SNo</b>	<b>Sub Code</b>	<b>Subject</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>Th</b>	<b>CW</b>	<b>SW</b>	<b>Pr</b>	<b>TOTAL</b>
1.	3ME151	Project – I	-	-	2	-	-	100	50	150
2.	3ME152	Machine Design – II	4	-	4	100	50	50	50	250
3.	3ME153	Production Engineering – II	4	-	2	100	50	50	50	250
4.	3ME154	Fluid Machines	4	-	2	100	50	50	50	250
5.	3ME155	Energy Conversion Systems	4	-	2	100	50	50	50	250
6.	3SS157	Entrepreneurship Development & IPR	2	-	-	-	50	-	-	50
<b>TOTAL</b>			<b>18</b>	<b>-</b>	<b>12</b>	<b>400</b>	<b>250</b>	<b>300</b>	<b>250</b>	<b>1200</b>

Devi Ahilya University, Indore, India Institute of Engineering & Technology				BE III Year (Mechanical Engg.)					
Subject Code & Name	Instructions Hours per Week			Marks					
	L	T	P		TH	CW	SW	PR	Total
3ME101 DYNAMICS OF MACHINE	4	-	2	Max	100	50	50	50	250
	Duration of Theory Paper: 3 Hours			Min	35	25	25	25	110

**Objective:** To Develop the Understanding of Dynamic Behavior Machine components. Pre requisites are Theory of Machine.

**Pre requisites:** nil

### COURSE CONTENTS

#### Unit-I

##### Friction & Power Transmission Devices:

Introduction, classification and types of friction, laws of frictions and screw frictions, journal Bearings, thrust bearings, pivot and collar bearings, ball and roller bearings, single & multi-plate clutch, cone clutch, centrifugal clutch, belt, rope and chain drives.

#### Unit-II

##### Brakes & Dynamometer:

Introduction, classification and types of brakes, shoe/block brake, band brake, band and block brake, internal expanding shoe brake, disc brake.

Introduction, classification and types of dynamometers, propulsion and braking of vehicles.

#### Unit-III

##### Analysis of Dynamic Forces:

Inertia force and inertia torque, D'Alembert's principle, gas forces, equivalent masses, piston efforts, crank shaft torque, turning moment diagrams, fly wheels, fluctuation of energy and speed.

#### Unit-IV

##### Governors:

Introduction, types and classifications, centrifugal governors, gravity controlled and spring controlled governors, inertia governors, governor characteristics and effect of friction.

#### Unit-V

##### Balancing:

Balancing of Rotating Masses: Static and dynamic balancing, balancing a single cylinder engine, balancing multi-cylinder engines

Balancing of Reciprocating Masses: Primary and secondary balancing, locomotive balancing, hammer blow, pitching and swaying couples, conditions of balance in V-engine, radial engine and multi-cylinder in line engines.

### BOOKS RECOMMENDED

- [1]. Rattan S.S., *Theory of Machines*, Tata McGraw Hill Publishing Company Ltd., New Delhi, Second Reprint 2005.
- [2]. Shigley J.E. and Uicker J.J., *Theory of Machines and Mechanisms*, McGraw Hill, Inc., 1995.
- [3]. Thomas Bevan, *Theory of Machines*, CBS Publishers and Distributors, 1984.
- [4]. Ghosh A. and Mallick A.K., *Theory of Mechanisms and Machines*, Affiliated East-West Press Pvt.Ltd., New Delhi, 1988.
- [5]. Rao J.S. and Dukkupati R.V., *Mechanism and Machine Theory*, Wiley-Eastern Limited, New Delhi, 1992.
- [6]. John Hannah and Stephens R.C., *Mechanics of Machines*, Viva low-Priced Student Edition, 1999.

## LABORATORY EXPERIMENTS:

1. To determine the coefficient of friction between the surfaces of different materials by inclined plane method.
2. To determine coefficient of friction between leather belt and CI pulley by differential band brake method.
3. To determination the coefficient of friction between leather belt and wooden pulley by belt and pulley apparatus.
4. To Study different types of bearings.
5. To Determine the pressure distribution in the oil film of the journal bearing for various speeds and
  - a) Plot the Cartesian and polar pressure curves for various speeds.
  - b) Determine the constants 'n' and 'K' in the summer field pressure function from the Cartesian pressure curves.
  - c) Plot the summer field pressure curve for each speed.
  - d) Compare the mean load, due to the mean upward pressure on the projected and developed areas of the bearing with the total applied load.
  - e) With the aid of the values of 'n' and 'K' determined as above for each speed, determine the total load on the journal and compare with total load on the bearing.
  - d) Determination of tractive torque.
6. To study different types of clutches.
7. To study different types of brakes.
8. To study absorption types of dynamometer.
9. To study transmission types of dynamometers.
10. To determine the torque in shaft by epicyclical gear train and holding torque apparatus
11. To determine the moment of inertia of objects using trifler suspension method.
12. To determine the moment of inertia of connecting rod by compound pendulum method.
13. To determine characteristic curves of (i) sleeve position against controlling force and speed and (ii) radius of rotation for Watt, Porter, Proell and Hartnell type governors.
14. To perform static balancing of given weights by balancing apparatus.
15. To perform dynamic balancing of given weights by balancing apparatus.

Devi Ahilya University, Indore, India Institute of Engineering & Technology				BE III Year (Mechanical Engg.)					
Subject Code & Name	Instructions Hours per Week			Marks					
3ME102 MACHINE DESIGN I	L	T	P		TH	CW	SW	PR	Total
	4	-	4	Max	100	50	50	50	250
Duration of Theory Paper: 4 Hours				Min	35	25	25	25	110

**Objective:** The objective of the subject to introduce the students about the design of mechanical components like spring, rotating elements, theory of failures etc. Advance methods of stress analysis will also be covered in the subject.

**Prerequisites (s):** Dynamics of Machine.

## COURSE CONTENTS

### Unit-I

#### **Theory of Failures & Applications:**

Theories of failure, their applications to the design problems. Design of parts subjected to torsional and/ or bending such as spiral, helical and leaf springs.

### Unit-II

#### **Pressure Vessels and Cover Plates:**

Analysis of thick cylindrical and spherical shells, compound cylinders, joint for steam and hydraulic pipes, parts of press fit and shrink fit, design consideration of pressure vessels and cover plates.

### Unit-III

#### **Rotating Rings and Disks:**

Disk of uniform thickness and disk of uniform strength. Effect of drilled hole and extra mass, design of flywheel and pulleys.

### Unit-IV

#### **Design Analysis of Curved Machine Members:**

Crane Hook, Chain link, open and closed links, M/c. Frames, Wall brackets, design and selection of hooks and wire ropes.

### Unit-V

#### **Experimental Methods in Design:**

Brief idea about experimental stress analysis techniques and their applications and limitation.

**Note:** Only Mechanical Engineer's Handbook, Data-books and Certified notes are allowed in the examination hall.

## **BOOKS RECOMMENDED:**

- [1]. Shingley J.E., *Mechanical Engineering Design*, McGraw-Hill 2003.
- [2]. Spotts M.F., Shoup T.E., Hrnberger L.E., *Design of Machine Elements*, Pearson Education ,8e, 2006
- [3]. Sharma P.C. & Aggarwal D.K., *Machine Design*, S.K.Kataria & Sons, 11e, 2006

[4]. Shariff A., *Design of Machine Elements*, Dhanpat Rai Publications(P) Ltd., 3e, 1995

**LABORATORY EXPERIMENTS:**

1. Problem based on theory of failure.
2. Problem on Design for Helical Spring.
3. Problem on Design for Leaf Spring.
4. Problem on Design for Pressure Vessels
5. Problem on Design for Pipe Joints.
6. Problem on Design for Rotating Disc
7. Problem on Design for Flywheel.
8. Problem on Design for Pulleys.
9. Problem on Design for Crane Hook.
10. Problem on Design for Chain Drive.

Devi Ahilya University, Indore, India Institute of Engineering & Technology				BE III Year (Mechanical Engg.)					
Subject Code & Name	Instructions Hours per Week			Marks					
	L	T	P		TH	CW	SW	PR	Total
3ME103 PRODUCTION ENGINEERING-I	4	-	-	Max	100	50	-	-	150
Duration of Theory Paper: 3Hours				Min	35	25	-	-	60

**Objectives:** The course contents are aimed to systematically link the processes to the production equipment and to present the main aspects of production engineering in a logical manner.

**Prerequisites:** Basic course in Manufacturing Processes.

### COURSE CONTENTS

#### Unit - I

##### Fundamentals of Machine Tools:

Introduction, characteristics of machine tools, elements of machine tool structure: beds, column and frame, slides and sideways, spindles and spindle bearings, machine tool drives, machine tool testing, maintenance and safety.

#### Unit - II

##### Tooling for Machine Tools:

General tooling for machine tools(including for turrets, automats and CNC machines), Jigs-Fixtures: locating and clamping, principles of jigs and fixture design, design of drilling jigs, drill jig bushes and type of jigs ; milling fixtures, lathe fixtures, grinding fixtures, broaching fixtures, assembly fixtures, automated jigs and fixtures, materials for jigs and fixtures and jigs & fixture economics.

#### Unit - III

##### Press Working, Press Tool & Forging Die Design:

Introduction, press operations, press working equipment & press selection, components of a die assembly, types of dies, cutting action in a die, die and punch clearances, cutting forces and power requirements, center of pressure, blanking die design, piercing die design, pilots, drawing dies, bending dies, design procedure for progressive dies, materials & manufacture of sheet metal working dies.

Forging Die Design: Introduction, forging operations and forging equipments, selection of forging equipment, die design for drop forging and press forging, die, die design for upset and machine forging, materials & manufacture of forging dies.

#### Unit - IV

##### Design for Manufacture & Assembly:

Introduction, product design considerations for machining, casting, forging, welding, plastic and composite parts. DFMA approach and methodologies, design evaluation: minimum part assessment, robustness assessment, failure mode-effect analysis, value analysis, development of modular design, minimizing part variations, design of parts to be multifunctional multiuse and ease of fabrication.

#### Unit - V

##### Automation of Manufacturing Systems:

Automation in production systems, automation principles and strategies, basic elements of an automated system, levels of automation, industrial robotics, automated production or transfer lines, automated material handling, storage and retrieval systems, flexible manufacturing systems: components & applications, fundamentals of automated assembly systems & automated inspection.

#### BOOKS RECOMMENDED:

- [1]. Sharma P. C., *Production Technology, Production Engineering*, S.Chand and Co, New Delhi, 1996.
- [2]. Pandey & Singh *Production engineering and science* Standard, Pub. & Distribution
- [3]. HMT *Production Technology*, Tata McGraw-Hill Publishing Company Ltd, New Delhi, 1993.
- [4]. Chapman W.A.J., *Workshop Technology Part1, 2 and, 3, 4e*, Viva Books Private Ltd.
- [5]. Mikell P Groover *Automation, Production systems & computer integrated manufacturing*, PHI, 1995

Devi Ahilya University, Indore, India Institute of Engineering & Technology				BE III Year (Mechanical Engg.)						
Subject Code & Name		Instructions Hours per Week			Marks					
3ME104 IC ENGINES AND GAS TURBINES		L	T	P		TH	CW	SW	PR	Total
Duration of Theory Paper: 3 Hours		4	-	2	Max	100	50	50	50	250
					Min	35	25	25	25	110

**Objectives:** To develop the understanding of principal of working of Engines and Turbines.

**Pre-requisites:** Applied Thermodynamics & Elements of Mechanical Engineering.

### COURSE CONTENTS

#### Unit-1

##### Introduction to I.C. Engine & Fuels:

Engine classification, air standard cycles, Otto, diesel, stirling, ericsson cycles, actual cycle analysis, two and four stroke engines, SI and CI engines, valve timing diagram, rotary engines, stratified charge engine.

Fuels: Fuels for SI and CI engine, important qualities of SI engine fuels, important qualities of CI engine fuels, dopes, additives, gaseous fuels, LPG, CNG, biogas, product gas, alternative fuels for IC engines.

#### Unit-II

##### SI Engine:

Carburetion, mixture requirements, carburetor types, theory of carburetor, MPFI. Combustion in SI engine, flame speed, ignition delay, abnormal combustion and its control, combustion chamber design for SI engines. Ignition system requirements magneto and battery ignition systems, ignition timing and spark plug, electronic ignition.

#### Unit-III

##### CI Engine:

Fuel injection in CI engines, requirements, types of injection systems, fuel pumps, fuel injectors, injection timings. Combustion in CI engines, ignition delay, knock and its control, combustion chamber design of CI engines. Scavenging in 2 stroke engines, pollution and its control.

#### Unit-IV

##### Engine Cooling, Lubrication, Supercharging & Testing:

Engine Cooling: Different cooling systems, radiators and cooling fans

Lubrication: Engine friction, lubrication principle, type of lubrication, lubrication oils, crankcase ventilation.

Supercharging: Effect of altitude on power output, Types of supercharging.

Testing and Performance: Performance parameters, basic measurement, testing of SI and CI engines.

#### Unit-V

##### Compressors, Gas Turbine & Jet Propulsion:

Compressors: Classification, reciprocating compressors, single and multi stage, intercooling, volumetric efficiencies. Rotary compressors, classification, centrifugal compressor, elementary theory, vector diagram efficiencies, elementary analysis of axial compressors, surging and stalling, roots blower, vane compressor, performance analysis.

Gas Turbines: Introduction, Classification, Application, Gas turbine and its components, Gas turbine power plants, Optimum pressure ratio for maximum specific and thermal efficiency in actual gas turbine cycle, Effect of operating variables on thermal efficiency, Air rate and work ratio.

Jet Propulsion- Turbo jet, Turbo Prop, Ram jet, Rocket engines thrust power, Propulsive efficiency and thermal efficiency, Jet propulsion performance, Specifying thrust and specific fuel consumption in each case for turbo jet and turbo propulsion units.

**BOOKS RECOMMENDED:**

- [1]. Mathur & Sharma, "*A Course in I.C. Engines*", Dhanpat Rai Publications, 1996.
- [2]. Ganeshan, "*Internal Combustion Engines*", Tata Mc Graw Hill Publication, 1992.
- [3]. Heywood J. B., "*Internal Combustion Engine Fundamentals*", Mc Graw Hill, 1988.
- [4]. Sarvanamatto, "*Gas Turbines*", H.I.H 1996.
- [5]. Sarvanamatto, Cohen H, Rogers, "*Gas Turbine Theory*", Longmans Green, 1996
- [6]. Yahya S. M., "*Turbines, Compressors and Fans*", Tata McGraw Hill Publications, New Delhi. 1996
- [7]. Yadav R., "*Steam and Gas Turbines*",

**LABORATORY EXPERIMENTS:**

1. Study of Fuel Injection Pump.
2. Study of Carburettor.
3. Study & performance of Four Stroke Four Cylinder S. I. Engine.
4. Study & performance of Four Stroke Four Cylinder C. I. Engine.
5. Study of Swinging Field Electrical Dynamometer with twin cylinder Four Stroke Diesel Engine.
6. Study of Water Brake Dynamometer with Four Stroke Four Cylinder S. I. Engine.
7. Study of Engine Cooling Systems.
8. Study of Engine Lubrication Systems.

Devi Ahilya University, Indore, India Institute of Engineering & Technology				BE III Year (Mechanical Engg.)						
Subject Code & Name		Instructions Hours per Week			Marks					
3ME105 HEAT TRANSFER		L	T	P		TH	CW	SW	PR	Total
		4	-	2	Max	100	50	50	50	250
	Duration of Theory Paper: 3 Hours				Min	35	25	25	25	110

**Objective:** Basic understanding to know mode of Heat Transfer systems.

**Pre-requisites:** Pre-requisites are Applied, Thermodynamics, Fluid Mechanics & Calculus.

### COURSE CONTENTS

#### Unit-I

##### Conduction:

General heat conduction equation in Cartesian coordinate, one dimensional steady state, conduction through plane wall, cylinder and spheres. Composite walls cylinders and spheres. Critical thickness of insulation. Effects of variable thermal conductivity on temperature distribution and heat flux.

#### Unit - II

##### Fins and Unsteady State Heat Conduction:

General heat flow equation through fins. Heat transfer from fins of uniform cross section for different boundary condition. Fins effectiveness and fins efficiency. Transient and periodic heat flow in lumped heat capacity systems.

#### Unit -III

##### Forced Convection:

Mechanism of convection, forced and Free Convection Boundary Layer: Fundamentals Equations of energy in the boundary layer. Thermal boundary layer. The Nusselt number. Dimension-less number used in convections. Empirical relations for convective heat transfer through tubes and flat plate, Heat transfer in turbulent flow. Reynolds analogy.

#### Unit-IV

##### Heat Exchangers, Boiling & Condensation:

Basic types of heat exchangers. The overall heat exchangers. The overall heat transfer coefficient and fouling factor. Log-Mean temperature difference. Effectiveness-NTU approach.

Heat Transfer with Change of Phase: Fundamentals of boiling heat transfer. Boiling curve and various boiling regions. Condensation heat transfer phenomena.

#### Unit-V

##### Radiation:

Thermal Radiation. Monochromatic and total emissive power, absorbtivity, reflectivity and transitivity, Kirchoff's Black and Gray bodies, Plank's distribution law, Stefan Boltzman's law, Heat transfer by radiation between Black surfaces, Electrical Analog for solving Radiation problems.

#### BOOKS RECOMMENDED:

- [1]. Holman J.P., *Heat Transfer*, Mc Graw Hill, 9e 2002.
- [2]. Eckert & Drake, *Heat & Mass Transfer*, Mc Graw Hill, 1972.
- [3]. Ozisic, *Basic Heat Transfer*, Mc Graw Hill, 1994.
- [4]. Patel R.C., *Heat Transfer*

**LABORATORY EXPERIMENTS:**

1. Measurement of Thermal conductivity of insulating materials by guarded hot plate method.
2. Electrical Analogy and Heat Transfer through composite wall structure.
3. Free and forced convection over a flat plate and array of cylinders.
4. Demonstration of heat transfer in drop-wise and film-wise condensation.
5. Heat pipe demonstration.
6. Heat Transfer through fins.
7. Measurement of Emissive of surface.
8. Determination of convective heat transfer coefficient in the cooling of lumped capacity systems.

Devi Ahilya University, Indore, India Institute of Engineering & Technology				B.E. III Year (Common to all the branches)					
Subject Code & Name	Instructions Hours per Week			Marks					
3SS106 PRINCIPLES OF MANAGEMENT	L	T	P		TH	CW	SW	PR	Total
	2	-	-	Max	-	50	-	-	50
Duration of Theory Paper: Only Internal Test				Min	-	25	-	-	25

**Objectives:** To impart the basics of Management Concepts, Evolution of management as discipline and to deal with different Principles & Functions of Management.

**Pre-requisites:** NIL

### COURSE CONTENTS

#### Unit-I

##### **The Nature of Management:**

Definition and role of management; the function of a manager, Scientific management. Various schools of management thought. The Functions & Principles of management.

#### Unit- II

##### **Planning:**

Nature and purpose of planning, Components of planning objective of business.

#### Unit - III

##### **Organization:**

Nature and purpose of organizing Structure, Centralization, Decentralization, Span of control, Delegation of authority relationship. Formal and informal organization.

#### Unit - IV

##### **Directions & Staffing:**

Direction process, Theories of motivation and leadership, Need analysis, Communication.

#### Unit -V

##### **Control:**

Meaning and process of control, techniques of control evaluation, developing and compensating the employees, Merit rating.

#### **BOOKS RECOMMENDED:**

- [1]. Koontz and O'Donnel, Essentials of Management, Jan.1986
- [2]. R.D Agrawal, *Organization & Management*. 1997
- [3]. PeterDrucker, *Practice of Management* ,1992
- [4]. Mc Farland, *Management, Principal and Practice*.
- [5]. L.M Prasad, *Principal and Practice & Mgt*.
- [6]. T.N Chhabra, *Principal and Practice & Mgt*.
- [7]. G.R Terry, *Principal of Management's*.

Devi Ahilya University, Indore, India Institute of Engineering & Technology				B.E. III Year (Mechanical Engg.) Semester VI					
Subject Code & Name	Instructions Hours per Week			Marks					
3ME151 Project Phase – I	L	T	P		Th	Cw	Sw	Pr	Total
	-	-	4	Max	-	-	100	50	150
Duration of Theory Paper: Only Practical				Min	-	-	50	25	75

**Objective:** To provide a comprehensive hands on experience to the students about the development of a complete project starting from analysis to tested software. The students can also take a research project for innovating a new idea and its implementation.

**Pre-requisites(s):** NIL

#### Course of Contents

The major emphasis (but not limited to) shall be given on Software Engineering, Computer Networking, Intelligent systems, Data Base Management System, etc. that are practice oriented areas of interest. The students shall be making the system, application or package depending upon the idea, technology chosen and expertise available. The architectural issues shall be important while the exposure to the technology needs to be gained by the students through thorough practice.

The students (in a batch) shall be required to be continuous interaction with the guide for the advice, guidance and facilities periodically and show the progress. They shall also be taking a certificate in the diary for satisfactory remarks or comments. Batch size shall be decided as per need and the quantum of the project.

The students shall make presentation and submit an originally drafted project reports periodically and at the end of the semester.

**[1] Reference books and web links of the relevant material the must be consulted as advised by the guide.**

**Note:**

**The requirement of relevant book may be submitted by the guide to the HOD/ Director for procurement.**

Devi Ahilya University, Indore, India Institute of Engineering & Technology				BE III Year (Mechanical Engg) Semester VI						
Subject Code & Name		Instructions Hours per Week			Marks					
3ME152 MACHINE DESIGN II		L	T	P		TH	CW	SW	PR	Total
Duration of Theory Paper: 4 Hours		4	-	4	Max	100	50	50	50	250
					Min	35	25	25	25	110

**Objective:** The objective of the subject to introduce the students about the design of power transmission elements, parts subjected to dynamic loading (Fatigue Loading), Design of Internal Combustion Engine parts, seals and gasket.

**Pre-requisites:** Dynamics of Machine and Machine Design I.

### COURSE CONTENTS

#### Unit-I

##### Design of Power Transmission Elements:

Design for single plate clutch, cone clutch, centrifugal clutch, flat belt, V belt, power screw, spur gear, helical gear and Bevel gear.

#### Unit-II

##### Design for Dynamic Loading:

Stress concentration factor, design of parts subjected to Fatigue loading.

#### Unit-III

##### Design for Brakes:

Design of shoe brakes, band brakes, block brakes, internal expanding brakes and disc brakes.

#### Unit-IV

##### Design for Internal Combustion Engine Parts:

Design for engine cylinder, piston, connecting rod, crank shaft, valves and valve gear mechanism.

#### Unit-V

##### Seals and Gaskets:

Brief Introduction about seals and gasket, selection of seals and gasket.

**Note:** Only Mechanical Engineer's Handbook, Data-books and certified notes are allowed in the examination hall.

### BOOKS RECOMMENDED:

- [1]. Shingley J.E., *Mechanical Engineering Design*, McGraw-Hill 2003.
- [2]. Spotts M.F., Shoup T.E., Hrnberger L.E., *Design of Machine Elements*, Pearson Education, 8e, 2006
- [3]. Sharma P.C. & Aggarwal D.K., *Machine Design*, S.K. Kataria & Sons, 11e, 2006
- [4]. Shariff A., *Design of Machine Elements*, Dhanpat Rai Publications (P) Ltd., 3e, 1995
- [5]. Maleev V.L., *I.C. Engine Design*, Mc.Graw Hill, 1945
- [6]. Black and Adams, *Machine Design*, Mc.Graw Hill, 1968

## **LABORATORY EXPERIMENTS**

1. Problem on Design of Single Plate Clutch/Cone Clutch..
2. Problem on Design of Centrifugal Clutch.
3. Problem on Design of Flat/V Belt.
4. Problem on Design of Screw Jack.
5. Problem on Design of Spur/Helical/Bevel Gears.
6. Problem on Design of parts subjected to Fatigue Loading.
7. Problem on Design of Shoe/Band/Block/Internal Expanding Brake.
8. Problem on Design of Engine Cylinder/Piston/Connecting rod.
9. Problem on Design of Crank Shaft.
10. Problem on Design of Valve and Valve gear mechanism.

Devi Ahilya University, Indore, India Institute of Engineering & Technology				BE III Year (Mechanical Engg.) Semester VI					
Subject Code & Name	Instructions Hours per Week			Marks					
3ME153 PRODUCTION ENGINEERING-II Duration of Theory Paper: 3 Hours	L	T	P		TH	CW	SW	PR	Total
	4	-	2	Max	100	50	50	50	250
				Min	35	25	25	25	110

**Objective:** The course contents are aimed to provide an understanding of the fundamental aspects of the various material processing technologies.

**Pre requisites:** Material Science and Manufacturing Processes.

## COURSE CONTENTS

### Unit - I

#### **Theory of Metal Cutting:**

Introduction, mechanics of metal cutting, oblique and orthogonal cutting, shear angle, rake angle and strain relationships, force and power relationships, heat generation and temperature rise in metal cutting, Machinability: criteria for evaluating machinability, factors affecting machinability, tool life and tool wear, variables influencing tool life, economics of metal cutting.

### Unit - II

#### **Theory of Metal Forming:**

Introduction, plastic deformation and yield criteria, temperature and friction in metal forming, overview of metal forming, processes mechanics of forming processes, rolling, forging, drawing, deep drawing, bending, extrusion, punching-blanking, defects in metal forming, advantages & limitations of hot & cold forming.

### Unit - III

#### **Unconventional Machining Processes:**

Introduction, electric discharge machining (EDM), electrochemical machining (ECM), ultrasonic machining (USM), abrasive jet machining (AJM), laser beam machining (LBM), electron beam machining (EBM), plasma arc machining (PAM)

### Unit - IV

#### **Surface Finish Measurement and Surface Treatment:**

Introduction, elements of surface roughness, evaluation and representation of surface roughness, effect of surface finish on functional properties, measurement of surface roughness, surface clearing surface treatment, diffusion and ion implantation, surface coating and deposition processes: surface plating, conversion coating, physical vapour deposition, chemical vapour deposition, organic coating, porcelain enameling and other ceramic coatings.

### Unit - V

#### **Processing of Particulate Metals, Ceramics-Composites and other Special Processing Technologies:**

Introduction, Basic processes, powder manufacture testing and blending, compacting, sintering, hot pressing, other techniques to produce high-density powder metallurgy products, properties of P/M products, advantages and limitation of powder metallurgy; processing of traditional ceramics, processing of new ceramics and cermets.

Shaping processes for Plastics and polymer matrix composites; processing of integrated circuits and micro fabrication technologies.

### **BOOKS RECOMMENDED:**

- [1]. Sharma P. C., *Production Technology, Production Engineering*, S.Chand and Co, New Delhi, 1996.
- [2]. Pandey & Singh *Production engineering and science* Standard, Publ. & Distribution
- [3]. HMT *Production Technology*, Tata McGraw-Hill Publishing Company Ltd, 1993.
- [4]. Amitabh Ghosh & Ashok Mullick *Manufacturing sciences* East west Pvt. Limited, New Delhi
- [5]. Mikell P Groover *Fundamentals of modern manufacturing*, John Wiley & Sons, Inc, 2000

## **LABORATORY EXPERIMENTS**

1. Measurement of various features of tool geometry of a given single point tool using tool makers microscope.
2. Measurement of various features of tool geometry of a drill bit and an end mill cutter using tool makers microscope.
3. Measurement of a component features using a profile projector.
4. Study of constructional features of the Lathe and to machine a job as per given dimensions on it.
6. Study of EDM machine.
7. Machining of a work part as per given drawing on EDM machine.
8. Machining of a work part as per given drawing on CNC lathe machine.

Devi Ahilya University, Indore, India Institute of Engineering & Technology				BE III Year (Mechanical Engineering) Semester VI						
Subject Code & Name		Instructions Hours per Week			Marks					
3ME154 FLUID MACHINES		L	T	P		TH	CW	SW	PR	Total
		4	-	2	Max	100	50	50	50	250
Duration of Theory Paper: 3 Hours					Min	35	25	25	25	110

**Objective:** Basic understanding of Fluid Power systems like turbine & pump.

**Pre-requisites:** Mechanics & Theory of Machines.

### COURSE CONTENTS

#### Unit - I

##### Dimensional Analysis and Similitude:

Dimensional homogeneity, Buckingham  $\pi$  theorem applications, dimensionless parameters, similitude modeling criteria and distorted models.

#### Unit - II

##### Hydro Turbines:

General classification (Turbine and pumps), velocity triangle, Euler's equation of work done, efficiencies Pelton, Francis, Kaplan, Propeller and Bulb turbine, their constructional details and characteristics, unit quantities, specific speed and governing.

#### Unit - III

##### Hydraulic Pumps:

Classification of pumps, centrifugal pumps, constructional details, characteristics and efficiencies, NPSH, specific speed, multistage and specific purpose pump. reciprocating pumps, indicator diagram, acceleration head, friction head, double acting pumps.

#### Unit - IV

##### Cavitations:

Definitions, types of cavitations, effect of cavitations, Thoma-cavitation factor. Apparatus for cavitations, factor apparatus for cavitations test, study of cavitations effects in pumps and turbines, prevention.

#### Unit - V

##### Water Hammer and Surge Tanks:

Physical phenomenon of water hammer, fundamental equation, arithmetic integration, types of surge tanks.

#### BOOKS RECOMMENDED:

- [1]. Rao N.S.Govind, *Fluid Flow Machines* Tata Mc Graw Hill.
- [2]. Nagratham, *Fluid Machines and Systems*
- [3]. Kumar D.S, *Fluid mechanics and Machines* S.k Kataria & Sons 1997.
- [4]. R. Purohit, *Hydraulic Machines*

#### LABORATORY EXPERIMENTS

1. Study & performance of Pelton wheel using Pelton Wheel test rig
2. Study & performance of Kaplan Turbine using Kaplan Turbine test rig
3. Study & performance of Centrifugal Pump using Centrifugal Pump test rig
4. Study & performance of Reciprocating Pump using Reciprocating Pump test rig.
5. Study of manual centrifugal pump.

Devi Ahilya University, Indore, India Institute of Engineering & Technology				BE III Year (Mechanical Engineering) Semester VI						
Subject Code & Name		Instructions Hours per Week			Marks					
3ME155 ENERGY CONVERSION SYSTEMS		L	T	P		TH	CW	SW	PR	Total
		4	-	2	Max	100	50	50	50	250
Duration of Theory Paper: 3 Hours					Min	35	25	25	25	110

**Objective:** Basic understanding of Thermal Power systems & Non- Conventional Energy Systems.

**Pre-requisites(s):** Thermodynamics, Thermal Engineering.

### COURSE CONTENTS

#### Unit-I

##### Fundamentals of Non- Conventional Energy Systems:

Principles of working and fields of applications of unconventional power sources like Wind-Energy, tidal Energy, geo-thermal Energy, solar energy. Sources of energy, magneto hydrodynamic (MHD) system, photovoltaic cells and fuel cells.

#### Unit-II

##### Steam Generators:

High-pressure steam boilers, Draught chimney calculations equivalent evaporation, heat balance sheet, Carnot and Rankine cycles, reheat and regenerative cycles binary vapour cycles.

#### Unit-III

##### Nozzles:

Introduction, general flow analysis, Nozzle equation, design parameters, types and construction of nozzles, theory of steam injectors, effect of friction on performance.

#### Unit-IV

##### Steam Turbines:

Introduction, advantages of steam turbine, general analysis, degree of reaction, thermodynamic analysis, losses in steam turbines, classification and comparison between impulse and reaction turbines.

#### Unit-V

##### Power Station Economics:

Elements of fixed and operating costs, power and various tariffs, definitions and applications of load curves, load-factor, capacity factor, plant-utilization factor, diversity factor and demand factor. Energy audit.

#### BOOKS RECOMMENDED:

- [1]. Chang SSL, *Energy Conversion*, Prentice Hall, 1963
- [2]. Skrotzki & Vopat, *Power Station Engg. & Economy*, Mc Graw & Kagakush, 1960
- [3]. Soo, *Direct Energy Conversion*, Prentice Hall, 1968
- [4]. Angrist, *Direct Energy Conversion*, S.W Publication, 4e 1982.
- [5]. Yahya, *Turbine, Compression & Fans*.
- [6] Arora S.C. & Domkundwar S. *Power Plant Engineering* Dhanpat Rai Sons, 3e, 1993

#### LABORATORY EXPERIMENTS

1. To find boiler efficiency using Orsat's Apparatus.
2. Energy audit of a Thermal power system.
3. Industrial Visit of any thermal power plant and carrying out energy audit.
4. Study of Steam Turbine in the thermal power plant
5. To find the efficiency of a solar cooker.

Devi Ahilya University, Indore, India Institute of Engineering & Technology				B.E. III Year (Common to all the branches) Semester VI					
Subject Code & Name	Instructions Hours per Week			Marks					
3SS157 ENTREPRENEURSHIP DEVELOPMENT & IPR	L	T	P		Th	Cw	Sw	Pr	Total
	2	-	-	Max	-	50	-	-	50
				Min	-	25	-	-	25
Duration of Theory Paper: Only Internal Test									

**Objectives:** To impart the basics of Entrepreneurship development Concepts. To develop the skills of entrepreneurship & to encourage the students to become an entrepreneur. To impart the basics of Intellectual property Rights.

**Pre-requisites(s):** NIL

### COURSE CONTENTS

#### Unit - I

##### Introduction:

Definition of Entrepreneurship and role of an entrepreneur. Entrepreneurial characteristics, values and attitudes. Entrepreneurship development programmes.

#### Unit - II

##### Modes & Methodology of setting up a Small Scale Industry:

Project Identification, Market Survey, Location & Building, Technical Know - How, Raw material & other Utilities, Professional & Skilled Manpower, Project Report, Finance, Whom to Approach.

#### Unit - III

##### Institutional Support to Entrepreneurs:

Need for Institutional support different Government & Non Government institutions to support Entrepreneurs like, NSIC, SIDO, SSIB, SSIDC, SISIs, DTICs, industrial Estates, Specialized Institutions. Registration of a small scale Industry.

#### Unit - IV

##### Intellectual Property Rights:

Introduction of IPR, various perspective of IPR like Innovation & Creation, Innovators & Creators, Sharing of Knowledge, Trade Marks etc. General Provisions & Basic principles of IPR.

#### Unit -V

##### Patents:

Definitions, Need for a patents, what can be patented, Patent laws, Rights of Patent Holders, Filing of a Patent, Industrial Scenario.

#### BOOKS RECOMMENDED:

[1]. Colombo plan staff college for Technician Education, Manila, *Entrepreneurship Development*, Tata McGrawHill 1998

[2].N.K. Acharya, *Text book on intellectual Property Rights*, Asha Law House New Delhi, New Edition 2001.

