Final

DIPLOMA CURRICULUM OF AUTOMOBILE ENGINEERING (SECOND YEAR) (3rd Semester)

(To be implemented from 2025-26)

Prepared by;

National Institute of Technical Teachers' Training & Research
Kolkata Block – FC, Sector – III, Salt Lake City, Kolkata – 700106

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Table of Contents

PROGRAMME TITLE: AUTOMOBILE ENGINEERING

SEMESTER - III

SL. No	Category of Course	Code No	Course Title	Teaching Scheme				Evaluation Scheme				Total Marks	Credits
				Pre-requisite	Contact Hours/ week			Theory		Practical			
					L	T	P	End Exam	Progressive Assessment	End Exam	Progressive Assessment		
1	Programme core	AEPC201 TH:1	Manufacturing Engineering	-	3	0	0	70	30	-	-	100	3
2		AEPC203 TH:2	Strength of Materials	-	3	0	0	70	30	-	-	100	3
3		AEPC205 TH:3	Engineering Materials	-	3	0	0	70	30	-	-	100	3
4		AEPC207 TH:4	Fluid Mechanics and Fluid Power	-	3	0	0	70	30	-	-	100	3
5		AEPC209 TH:5	Basic Thermal Engineering	-	3	0	0	70	30	-	-	100	3
6		AEPC211 PR:1	Manufacturing Engineering Lab	-	0	0	4	-	-	15	35	50	2
7		AEPC213 PR:2	Automobile Material Testing Lab	-	0	0	4	-	-	15	35	50	2
8		AEPC215 PR:3	Fluid Mechanics and Fluid Power Lab	-	0	0	4	-	-	15	35	50	2
9		AEPC217 PR:4	Thermal Engineering Lab	-	0	0	4	-	-	15	35	50	2
10	Summer Internship	SI201	Summer internship – I*	-	0	0	0	-	- - -	15	35	50	2
TOTAL					**15**	**0**	**16**	**350**	**150**	**75**	**175**	**750**	**25**

*3 - 4 weeks after 2nd Semester.

TH:1- MANUFACTURING ENGINEERING

L	T	P	Total Marks: 100	Course Code: AEPC201	
3	0	0			
Total Contact Hours				**Theory Assessment**	
Theory		: 45Hrs		End Term Exam	70
				Progressive Assessment	30
Pre Requisite		**: Nil**			
Credit		**3**		Category of Course: PC	

RATIONALE:

Knowledge of various manufacturing processes is very much essential in the production of Automobile vehicles assembled with large number of parts, which are made of different metallic and non-metallic materials. These parts are produced using a variety of manufacturing processes with requisite strength, surface finish, size and shape. As an automobile technician/ engineer, one should have the knowledge of these manufacturing processes, which will be very helpful for discharging his duties in manufacturing or maintenance area of auto-vehicles.

COURSE OUTCOMES:

At the end of the course, the students will be able to:

CO1 Identify various cutting fluids, lubricants and lathe operations. CO2 Describe various broaching machines and drilling processes. CO3 Explain different welding and milling operations.

CO4 Identify various types of gear making and press working operations. CO5 Describe various grinding and finishing processes.

3

COURSE CONTENT DETAILS:

Unit No.	Content	Time Allotted (Hrs.)
I	**Cutting Tools:** Cutting action of various hand tools such as Chisel, hack saw blade, dies and reamer, Turning tool geometry and purpose of tool angle, Machining process parameters (Speed, feed and depth of cut) , Coolants and lubricants in machining and purpose. **Lathe Operations:** Types of lathes — light duty, medium duty and heavy duty geared lathe, CNC lathe; Specifications; Basic parts and their functions; Operations and tools — Turning,parting off,	**9**

	Knurling, facing, Boring, drilling, threading, step turning, taper turning.	
II	**Casting** Define Casting and Classify the various Casting processes. Explain the procedure of Sand mould casting. Explain different types of molding sands with their composition and properties. Classify different pattern and state various pattern allowances. Classify core. Describe construction and working of cupola and crucible furnace. Explain die casting method., Explain centrifugal casting such as true centrifugal casting, centrifuging with advantages, limitation and area of application. Explain various casting defects with their causes and remedies.	**12**
	Drilling: Classification; Basic parts and their functions; Radial drilling machine; Types of operations; Specifications of drilling machine; Types of drills and reamers.	
III	**Welding:** Classification; Gas welding techniques; Types of welding flames; Arc Welding — Principle, Equipment, Applications; Shielded metal arc welding; Submerged arc welding; TIG / MIG welding; Resistance welding - Spot welding, Seam welding, Projection welding; Welding defects; Brazing and soldering: Types,Principles, Applications. **Milling:** Introduction; Types of milling machines: plain, Universal, vertical; constructional details — specifications; Milling operations: simple, compound anddifferential indexing; Milling cutters – types; Nomenclature of teeth; Teeth materials; Tool signature of milling cutter; Tool and work holding devices.	**9**
IV	**Gear Making:** Manufacture of gears — by Casting, Moulding, Stamping, Coining Extruding, Rolling, Machining; Gear generating methods: Gear Shaping with pinion cutter and rack cutter; Gear hobbing; Description of gear hob; Operation of gear hobbing machine; Gear finishing processes; Gear materials and specification; Heat treatment processes applied to gears. **Press working**: Types of presses and Specifications, Press working operations - Cutting, bending, drawing, punching, blanking, notching, lancing; Die set components- punch and die shoe, guide pin, bolster plate, stripper, stock guide, feedstock, pilot; Punch and die clearances for blanking and piercing.	**9**
V	**Grinding and finishing processes**: Significance of grinding operations. Manufacturing of grinding wheels. Criteria for selecting of grinding wheels. Specification of grinding wheels with example. Working of Cylindrical Grinder, Surface Grinder, Centre less Grinder.Definition of Surface finish, Define super finishing. Description of lapping & explain their specific cutting.	**6**
	Total	**45**

REFERENCES BOOKS:

1. Manufacturing technology – P N Rao, Tata McGraw-Hill Publications
2. Elements of workshop Technology (Volume I and II) – S. K. Hajra Chaudary, Bose and Roy, Media Promoters and Publishers Limited.
3. Production Technology (Volume I and II) – O. P. Khanna and Lal, Dhanpat Rai Publications.
4. Fundamental of metal cutting and machine tools– B. L. Juneja, New age international limited.
5. Manufacturing Technology, Metal Cutting and Machine tools– P. N. Rao, Tata McGraw- Hill Pub lications
6. Production Technology – R.B. Gupta, Satya Prakashan, New Delhi

TH:2- STRENGTH OF MATERIALS

L	T	P	Total Marks: 100	Course Code: AEPC203	
3	0	0			
Total Contact Hours				**Theory Assessment**	
Theory		: 45Hrs		End Term Exam	70
				Progressive Assessment	30
Pre Requisite		**: Nil**			
Credit		**3**		Category of Course: PC	

RATIONALE:

Strength of materials deals with the internal behavior of solid bodies loaded in different manner. The common solid bodies e.g. shafts, bars, beams, plates and columns are the basic components of structures and machines. This subject primarily focuses on mechanical properties of materials, analysis of stress, strain and evaluation of deformation. Hence all students should have acquainted with strength of materials to become successful technician

LEARNING OUTCOMES:

After completion of the course, the students will be able to

- Apply the concept of Simple Stresses and Strains.
- Describe the concept of Strain Energy.
- Define the concept of Shear Force and Bending Moment Diagrams.
- Apply the concept of Theory of Simple Bending and Deflection of Beams.
- Outline the concept of Torsion in Shafts and Springs.
- Illustrate the concept of Thin Cylindrical Shells.

DETAILED COURSE CONTENTS

Unit No.	Topic/Sub-Topic	Allotted Time (Hours)
I	**Simple Stresses and Strains:** Types of forces; Stress, Strain and their nature; Mechanical properties of common engineering materials; Significance of various points on stress – strain diagram for M.S. and C.I. specimens; Significance of factor of safety; Relation between elastic constants; Stress and strain values in bodies of uniform section and of composite section under the influence of normal forces; Thermal stresses in bodies of uniform section and composite sections; Related numerical problems on the above topics. **Strain Energy:** Strain energy or resilience, proof resilience and modulus of resilience; Derivation of strain energy for the following cases: i) Gradually applied load, ii) Suddenly applied load, iii) Impact/ shock load; Related numerical problems.	10

II	**Shear Force & Bending Moment Diagrams:** Types of beams with examples: a) Cantilever beam, b) Simply supported beam, c) Over hanging beam, d) Continuous beam, e) Fixed beam; Types of Loads – Point load, UDL and UVL; Definition and explanation of shear force and bending moment; Calculation of shear force and bending moment and drawing the S.F and B.M. diagrams by the analytical method only for the following cases: a) Cantilever with point loads, b) Cantilever with uniformly distributed load, c) Simply supported beam with point loads, d) Simply supported beam with UDL, e) Over hanging beam with point loads, at the center and at free ends, f) Over hanging beam with UDL throughout, g) Combination of point and UDL for the above; Related numerical problems.	9
III	**Theory of Simple Bending and Deflection of Beams:** Explanation of terms: Neutral layer, Neutral Axis, Modulus of Section, Moment of Resistance, Bending stress, Radius of curvature; Assumptions in theory of simple bending; Bending Equation $M/I = \sigma/Y = E/R$ with derivation; Problems involving calculations of bending stress, modulus of section and moment of resistance; Calculation of safe loads and safe span and dimensions of cross-section; Definition and explanation of deflection as applied to beams; Deflection formulae without proof for cantilever and simply supported beams with point load and UDL only (Standard cases only); Related numerical problems.	9
IV	**Torsion in Shafts and Springs:** Definition and function of shaft; Calculation of polar M.I. for solid and hollow shafts; Assumptions in simple torsion; Derivation of the equation $T/J=f_S/R=G\theta/L$; Problems on design of shaft based on strength and rigidity; Numerical Problems related to comparison of strength and weight of solid and hollow shafts; Classification of springs; Nomenclature of closed coil helical spring; Deflection formula for closed coil helical spring (without derivation); stiffness of spring; Numerical problems on closed coil helical spring to find safe load, deflection, size of coil and number of coils.	9
V	**Unit-V: Thin Cylindrical Shells:** Explanation of longitudinal and hoop stresses in the light of circumferential and longitudinal failure of shell; Derivation of expressions for the longitudinal and hoop stress for seamless and seam shells; Related numerical Problems for safe thickness and safe working pressure.	8

REFERENCES:

1. Strength of Materials – D.S. Bedi, Khanna Book Publishing Co. (P) Ltd., Delhi, 2017
2. Strength of Materials – B.C.Punmia, Ashok Kumar Jain & Arun Kumar Jain, Laxmi Publica- tions, New Delhi, 2013
3. Strength of Materials – R.S. Khurmi, S.Chand Company Ltd. Delhi

TH:3- ENGINEERING MATERIALS

L	T	P	Total Marks: 100	Course Code: AEPC205	
3	0	0			
Total Contact Hours				**Theory Assessment**	
Theory		: 45Hrs		End Term Exam	70
				Progressive Assessment	30
Pre Requisite		**: Nil**			
Credit		**3**		Category of Course: PC	

RATIONALE:

Field of engineering deals with use of many materials for making objects as per the human need. These materials include wide spectrum of elements, metals, alloys and compounds with diverse properties. It is imperative that an engineer from any field should have good knowledge of such materials and their properties.

COURSE OUTCOMES:

At the end of the course, the students will be able to:

CO1 Identify different engineering materials and their properties along with ferrous, non-ferrous and alloys

CO2 Describe the iron-carbon phase transformation process and crystal imperfections

CO3 Explain the effect of heat treatment and its impact on material

properties CO4 Classify non-ferrous alloys, bearing and spring aterials

CO5 Identify the properties of polymers, composites and ceramics

COURSE CONTENT DETAILS:

Unit No.	Content	Time Allotted (Hrs.)
I	**Engineering materials and their properties:** Material classification into ferrous and non-ferrous category and alloys, Properties of Materials: Physical, Chemical and Mechanical, Performance requirements, Material reliability and safety. **Ferrous Materials and alloys:** Characteristics and application of ferrous materials, Classification, composition and application of low carbon steel, medium carbon steel and High carbon steel, Alloy steel: Low alloy steel, high alloy steel, tool steel and stainless steel, Tool steel: Effect of various alloying elements such as Cr, Mn, Ni, V, Mo.	**10**

II	**Iron – Carbon diagram:** Concept of phase diagram and cooling curves, Features of Iron-Carbon diagram with salient micro-constituents of Iron and Steel. **Crystal imperfections:** Crystal defines, classification of crystals, ideal crystal and crystal imperfections, Classification of imperfection: Point defects, line defects, surface defects and volume defects, Types and causes of point defects: Vacancies, Interstitials and impurities, Types and causes of line defects: Edge dislocation and screw dislocation, Effect of imperfection on material properties, Deformation by slip and twinning, Effect of deformation on material properties.	**12**
III	**Heat Treatment:** Purpose of Heat treatment, Process of heat treatment: Annealing, normalizing, hardening, tampering, stress relieving measures, Surface hardening: Carburizing and Nitriding, Effect of heat treatment on properties of steel, Hardenability of steel.	**7**
IV	**Non -ferrous alloys:** Aluminum alloys: Composition, property an usage of Duralmin, y-alloy. Copper alloys: Composition, property and usage of Copper Aluminum, Copper-Tin, Babbit, Phosperous bronze, brass, Copper- Nickel. Low alloy materials like P-91, P-22 for power plants and other high temperature services. High alloy materials like stainless steel grades of duplex, super duplex materials etc. **Bearing and spring Materials:** Classification, composition, properties and uses of Copper base, Tin Base, Lead base, Cadmium base bearing materials. Classification, composition, properties and uses of Iron base and Copper base spring material.	**9**
V	**Polymers:** Properties and application of thermosetting and thermoplastic polymers, Properties of elastomers. **Composites and Ceramics**: Classification, composition, properties and uses of particulate based and fiber reinforced composites, Classification and uses of ceramics	**7**
	Total	**45**

REFERENCES:

1. A Textbook of Material Science and Metallurgy – O P Khanna, Dhantpat Rai.
2. R K Rajput Engineering materials and Metallurgy - S.Chand
3. Material science and process – S K Hazra Choudhury, Indian Book Distributing.

TH:4- FLUID MECHANICS AND FLUID POWER

L	T	P		
3	0	0		**Course Code: AEPC207**
Total Contact Hours				**Theory Assessment**
Theory		: 45Hrs	**Total Marks: 100**	End Term Exam 70
				Progressive Assessment 30
Pre Requisite		**: Nil**		
Credit		**3**		Category of Course: PC

RATIONALE: Use of fluids in engineering field is of great importance. It is therefore necessary to study the physical properties and characteristic of fluids which have very important use and application in automobile engineering. Fluid power plays dominant role in industrial world knowledge of which is essential for mechanical engineering students. Actual use of or action by various liquids like water and oil can be realized by a group of machines called fluid machines. Mechanical students should be conversant with design, operation and use of these fluid machines.

LEARNING OUTCOMES:

After completion of the course, the students will be able

- Identify the properties of a fluid and hydrostatics.
- Explain the basic kinematics and dynamics of fluid mechanics
- Describe the flow through orifices, notches and pipes.
- Classify different types of turbines and pumps.
- Apply the knowledge of fluid power.

COURSE CONTENT DETAILS:

Unit No.	Content	Time Allotted (Hrs.)
I	**PROPERTIES OF A FLUID AND HYDROSTATICS:** Definition of a fluid, classification of fluids, various fluid properties such as density, specific weight, specific gravity, viscosity and surface tension and state the units, fluid pressure, total pressure (hydrostatic force) and location of centre of pressure on vertical, horizontal , inclined and curved surfaces by fluid, working of various measuring devices for pressure, the principle of manometers of simple, differential and inverted types, principle of buoyancy and floatation. Simple numericals on Manometer.	**9**
II	**KINEMATICS AND DYNAMICS OF FLUID MECHANICS** Various types of flow, circulation and vorticity, stream-line, path line and streak-line, various energies of fluid, law of conservation of mass, energy equation -Bernoulli's theorem, the limitations of same-application of Bernoulli's equation, the working of venturimeter, pitot tube, equation of flow rate and velocity with respect to venturimeter and pitot tube respectively, the working of flowmeter: current meter, Simple numericals.	**6**

III	**FLOW THROUGH ORIFICES AND NOTCHES, PIPES:** Definition –orifice, orifice coefficient such as Cc, Cv, Cd, Relationship between orifice coefficients, weir and notch, Discharge over rectangular notch and weir, triangular notch. Simple numericals. Definition of a pipe. laws of fluid friction, Equation of loss of head through pipe due to friction, Darcy's formula and Chezy's formula, hydraulic gradient and total energy line, Nozzle and its application, Power transmission through nozzle the condition of maximum power transmission through nozzle, Expression for diameter of nozzle for maximum power transmission.	**9**
IV	**Turbines and Pumps:** Classification of hydraulic turbines, Selection of turbine on the basis of head and discharge available, Construction and working principle of Pelton wheel, Francis and Kaplan turbines. Draft tubes – types and construction, Concept of cavitation in turbines, Calculation of Work done, Power, efficiency of turbines. Simple numerical **Centrifugal Pumps:** Principle of working and applications, Types of casings and impellers, Concept of multistage, Priming and its methods, Manometric head, Work done, Manometric efficiency, Overall efficiency. Simple numericals **Reciprocating Pumps:** Construction, working principle and applications of single and double acting reciprocating pumps, Concept of Slip, Negative slip, Cavitation and separation. Simple numericals	**12**
V	**FLUID POWER:** Definition of fluid power, classification – hydraulic power and pneumatic power, Hydraulic Systems -Basic principle of enclosed hydraulic system – Pascal's law, Oil hydraulic system – reservoir, filter pressure limiting valves, direction control valves, flow control valves, actuators (linear and rotary), accumulator, pipes and fittings, various positive displacement pumps-gear, vane, piston, drawing of hydraulic circuits - extension and retraction of linear actuator, motion of rotary actuator, holding a job, hydraulic press etc.	**9**

REFERENCES:

1. Fluid Mechanics and Hydraulic Machines – R. K. Bansal, Laxmi Publications, New Delhi.
2. Fluid Mechanics and Hydraulic Machines, S.S. Rattan, Khanna Publishing House, New Delhi.
3. Hydraulics and fluid mechanics including Hydraulic machines – Modi P.N. and Seth S.M., Standard Book House. New Delhi.
4. Hydraulics and Fluid Mechanics - Jagadish Lal- Metropolitan Book
5. Fluid Power with Applications - Anthony Esposito -Pearson Education Limited.
6. Hydraulic, fluid mechanics and fluid machines – S. Ramamrutham, Dhanpat Rai and Sons, New Delhi.

TH:5- BASIC THERMAL ENGINEERING

L	T	P	Total Marks: 100	Course Code: AEPC209	
3	0	0			
Total Contact Hours				**Theory Assessment**	
Theory		: 45Hrs		End Term Exam	70
				Progressive Assessment	30
Pre Requisite		**: Nil**			
Credit		**3**		Category of Course: PC	

RATIONALE:

Thermal Engineering is the field of applied science which deals with the energy possessed by heated gases and vapours and the laws which govern the conversion of this energy into mechanical energy and vice versa. This is the fundamental subject for understanding the process of producing vast amount of mechanical energy from heat energy and therefore necessary to be learned by the engineering students. Understanding the working principles and features of the various machines and plants in which either such heated gas/vapours are produced or conversion of heat to mechanical energy takes place is of great importance.

COURSE OUTCOMES:

At the end of the course, the student will be able to:

CO1: Explain various thermodynamic systems and

properties CO2: Describe the laws of thermodynamics

and air cycles CO3: State the properties and processes of

ideal gases

CO4: Explain the working of reciprocating air compressor and its terminology

CO5: Identify the processes in gas turbines, refrigeration and various refrigeration systems

COURSE CONTENT DETAILS:

Unit No.	Content	Time Allotted (Hrs.)
I	**Fundamentals of Thermodynamics:** Thermodynamic Systems (closed, open, isolated), Thermodynamic properties of a system (pressure, volume, temperature, entropy, enthalpy, Internal energy and units of measurement). Intensive and extensive properties. Thermodynamic processes, path, cycle, state, path function, point function. Thermodynamic Equilibrium, Quasi-static Process, Energy and its sources, Work, heat and comparison between Work and heat, Mechanical Equivalent of Heat, Work transfer, Displacement work.	**9**

II	**Laws of Thermodynamics:** Zeroth law of thermodynamics, First law of thermodynamics, Limitations of First law of thermodynamics, Applications of First law of Thermodynamics, Steady flow energy equation and its application to turbine and compressor, Second law of thermodynamics, Clausius and Kelvin Plank statements. Application of second law in heat engine, heat pump, refrigerator, Efficiencies and C.O.P.	**9**
III	**Properties & Processes of perfect gas:** Laws of perfect gas, Boyle's law, Charle's law, Avogadro's law, Dalton's law of partial pressure, Guy lussac law, General gas equation, characteristic gas constant, Universal gas constant. Specific heat of gas (Cp and Cv), Relation between Cp and Cv. Enthalpy of a gas, Work done during a non- flow process, Applications of first law of thermodynamics to various non flow process Isothermal, Isobaric, Isentropic and polytrophic process, Free expansion and throttling process.	**9**
IV	**Gas and vapor Power Cycles:** Carnot Cycle, Stirling Cycle, Ericsson Cycle, Air Standard Cycles, Otto Cycle, Diesel Cycle, Dual Cycle, Comparison of Otto, Diesel and Dual Cycles.	**9**
V	**Fuels and Combustion:** Fuels, Exothermic and Endothermic reactions, Heating values of fuel, Different types of fuels, solid, liquid and gaseous fuels, Calorific Value — Higher and Lower Calorific Values, Air — Fuel Ratio, Stoichiometry, Octane number, Cetane number.	**9**
	Total	**45**

REFERENCES:

1. R.S. Khurmi, Thermal Engineering, S.Chand
2. A.R.Basu Thermal Engineering Dhanpat Rai
3. A.S. Sarao Thermal Engineering Satya Prakash
4. P.K.Nag Engineering Thermodynamics
5. Mahesh M Rathore Thermal Engineering

PR:1- MANUFACTURING ENGINEERING LAB

L	T	P	Total Marks: 50	Course Code: AEPC211	
0	0	4			
Total Contact Hours				**Practical Assessment**	
Practical		: 60Hrs		End Term Exam	15
				Progressive Assessment	35
Pre Requisite		**: Nil**			
Credit		**2**		Category of Course : PC	

RATIONALE:

Application of the knowledge regarding manufacturing processes is very much essential in Automobile Engineering, in which components are made of different metallic and non-metallic materials. As an automobile technician/ engineer, one should have the exposure to these manufacturing processes. This course is useful for gaining practical exposure of the same.

COURSE OUTCOMES:

At the end of the course, the student will be able to

CO1: Prepare a mould sand mix and molten metal and calculate the amount of metal to be poured in the mould

CO2: Perform different jobs and different taper turning methods on lathe machine.

CO3: Prepare the edges for welding with suitable electrode, voltage and current.

CO4: Operate the welding transformer and generator for various weld joint operations.

COURSE CONTENT DETAILS:

Sl. No.	Topics for practice	Time Allotted (Hrs.)
I	Moulding and casting of (i) Connecting rod (ii) Solid bearing (iii) V-Pulley/Gear Pulley	**4**
II	Arc welding (i) Lap Joint (ii) Butt Joint (iii) T- Joint	**4**
III	Gas welding (i) Lap Joint (ii) Butt Joint	**4**
IV	Spot welding (i) Lap Joint	**4**
V	Turning Exercise (i) Facing, Step Turning & Chamfering (ii) Step Turning and Taper.Turning (iii) Step Turning and Groove Cutting (iv) Step Turning and Knurling (v) Step Turning and Thread Cutting (vi) Turning and Drilling	**4**
VI	Grinding the Lathe Cutting tools to the required angles	**8**
VII	Study of Lathe, Drilling machine, shaping machine and slotting machine	**8**
VIII	The dismantling some of the components of lathe and then assemble the same	**8**
IX	List the faults associated with lathe and its remedies	**8**
X	The routine and preventive maintenance procedure for lathe	**8**
	Total	**60**

REFERENCES:

1. Elements of Workshop Technology (Volume I & II) – Hajra Chowdry & Bhattacharaya, MediaPromoters, 11th Edition, 2007
2. Introduction of Basic Manufacturing Processes and Workshop

Technology – Rajendersingh, New age International (P) Ltd.

NewDelhi, 2006
3. Workshop Technology – Raghuwanshi, Khanna Publishers. Jain &Gupta, New Delhi, 2002
4. Production Technology – Jain & Gupta, Khanna Publishers, New Delhi, 2006.
5. Production Technology – HMT, 18th edition, Tata McGraw Hill, New Delhi
6. Manufacturing process – Myro N Begman, 5 th edition, Tata McGraw Hill, New Delhi.

PR:2- AUTOMOBILE MATERIAL TESTING LAB

L	T	P	Total Marks: 50	Course Code: AEPC213	
0	0	4			
Total Contact Hours				**Practical Assessment**	
Practical		: 60Hrs		End Term Exam	15
				Progressive Assessment	35
Pre Requisite		**: Nil**			
Credit		**2**		Category of Course: PC	

RATIONALE: Material testing is required for automobile engineers. It is to identify the type of material based on its grain structure and to learn the procedure for identifying the cracks in the material. Also, it helps in understanding various material testing methods to determine mechanical properties such as yield stress, Ultimate stress, percentage elongation, Young's Modulus etc.

COURSE OUTCOMES:

At the end of the course, the student will be able to:

CO1: Identify the given specimen by viewing the micro structure using metallurgical

microscope CO2: Identify the cracks in the specimen using different techniques

CO3: Determine the various types of stress and plot the stress strain diagram for mild

steel. CO4: Determine the torsion, bending, impact and shear values of given materials

CO5: Determine the modulus of rigidity, strain energy, shear stress and stiffness of coil spring

COURSE CONTENT DETAILS:

Unit No.	Content	Time Allotted (Hrs.)
I	Prepare a specimen and examine the microstructure of the Ferrous and Non- ferrous metals using the Metallurgical Microscope.	**4**
II	Detect the cracks in the specimen using (i) Visual inspection and ring test (ii) Die penetration test (iii) Magnetic particle test.	**8**
III	Determination of Rockwell's Hardness Number for various materials like mild steel, high carbon steel, brass, copper and aluminum.	**8**
IV	Finding the resistance of materials to impact loads by Izod test and Charpy test.	**8**
V	Torsion test on mild steel — relation between torque and angle of twist determination of shear modulus and shear stress.	**8**
VI	Finding Young's Modulus of Elasticity, yield points, percentage elongation and percentage reduction in area, stress strain diagram plotting, tests on mild steel.	**8**
VII	Determination of modulus of rigidity, strain energy, shear stress and stiffness by load deflection method (Open & Closed coil spring)	**8**
VIII	Single or double Shear test on M.S. bar to finding the resistance of material to shear load.	**8**
	Total	**60**

REFERENCES:

1. Measurement system (Application and Design) Ernest O Doebelin.
2. Strength of Materials – R.S. Khurmi, S.Chand Company Ltd. Delhi
3. A Text Book strength of Material– R.K. Bansal, Laxmi Publication New Delhi

PR:3- FLUID MECHANICS AND FLUID POWER LAB

L	T	P	Total Marks: 50	Course Code: AEPC215	
0	0	2			
Total Contact Hours				**Practical Assessment**	
Practical		: 60Hrs		End Term Exam	15
				Progressive Assessment	35
Pre Requisite		**: Nil**			
Credit		**2**		Category of Course : PC	

RATIONALE:

Though in majority of cases we use solids as engineering materials, use or application of fluids (i.e. liquids and gases) in engineering field is also numerous and of great importance. It is, therefore, necessary to study the physical properties and characteristics of fluids as a distinct group of materials, which have very important use and application in a wide range of fields of engineering and in mechanical engineering in particular.

COURSE OUTCOMES:

At the end of the course, the student will be able to

CO1: Measure various properties such as pressure, velocity, flow rate using various instruments.

CO2: Calculate different parameters such as co-efficient of friction, power, efficiency etc. of various systems.

CO3: Explain the need and importance of calibration of pressure

gauges. CO4: Describe the construction and working of turbines and

pumps.

CO5: Test the performance of turbines and pumps and Plot characteristics curves.

COURSE CONTENT DETAILS:

Sl. No.	Topics for practice	Time Allotted (Hrs.)
I	Verification of Bernoulli's theorem.	**4**
II	Determination of Coefficient of Discharge of Venturimeter.	**4**
III	Determination of Coefficient of Discharge, coefficient of contraction and coefficient ofvelocity of Orificemeter.	**4**
IV	Determination of coefficient of friction of flow through pipes.	**4**
V	Determination of force exerted by the jet of water on the given vane.	**4**
VI	Determination of minor losses of flow through pipes.	**4**
VII	Calibration of pressure gauge using dead weight pressure gauge tester.	**4**

VIII	Experiment on centrifugal pump to determine overall efficiency.	**8**
IX	Experiment on reciprocating pump to determine overall efficiency.	**8**
X	Experiment on Pelton wheel to determine overall efficiency.	**8**
XI	Experiment on Francis/Kaplan turbine to determine overall efficiency.	**8**
	Total	**60**

REFERENCES:

2. N. Kumara Swamy, Fluid Mechanics and Machinery Laboratory Manual, Charotar Publishing House Pvt. Ltd., ANAND 388 001, Ed. 2008.

PR:4- THERMAL ENGINEERING LAB

L	T	P	Total Marks: 50	Course Code: AEPC217	
0	0	4			
Total Contact Hours				**Practical Assessment**	
Practical		: 60Hrs		End Term Exam	15
				Progressive Assessment	35
Pre Requisite		**: Nil**			
Credit		**2**		Category of Course : PC	

RATIONALE:

For mechanical engineers, it is necessary to understand the importance of fuel properties and learn the methods of determination of various properties of fuels. Also, the working principles of various methods used in determination of properties of fuels. Understanding about different parts of I.C. engine and their working will significantly improve the practical knowledge of the students.

COURSE OUTCOMES:

At the end of the course, the student will be able to:

CO1: Determine flash and fire point of a given sample of fuel using given

Apparatus CO2: Determine Viscosity of a given sample of oil using given

apparatus.

CO3: Determine Calorific value of a given sample of fuel using given

apparatus. CO4: Determine amount of carbon residue of a given sample of

petroleum product.

CO5: Draw VTD /PTD of given I.C Engine with an explanation of how the processes are controlled during its operation.

CO6: Describe the functions of various parts of petrol and diesel engines.

COURSE CONTENT DETAILS:

Sl. No.	Topics for practice	Time Allotted (Hrs.)
I	Flash & Fire point tests using Able's/Cleveland/Pensky Martin Apparatus	**4**
II	Viscosity measurement usi/Saybolt viscometer	**4**
III	Calorific value tests using Bomb Calorimeter (Solid and Liquid fuels) and Junkers Gas Calorimeter (Gaseous fuels)	**4**
IV	Carbon residue test using Conradson's apparatus.	**4**
V	Assembling and disassembling of I.C. Engines	**4**
VI	Port timing diagram of Petrol engine	**8**
VII	Port timing diagram of Diesel engine	**8**

VIII	Valve timing diagram of Petrol engine	**8**
IX	Valve timing diagram of Diesel engine	**8**
X	Study of petrol and diesel engine components and Models	**8**
	Total	**60**

REFERENCES BOOKS:

1. Thermal Engineering – P.L. Ballaney, Khanna Publishers, 2002.
2. A Course in Thermal Engineering — S. Domkundwar & C.P. Kothandaraman, Dhanpat Rai &Publication New Delhi
3. Thermal Engineering – R.S. Khurmi and J.K. Gupta, 18th Edition, S. Chand & Co, New Delhi.

SUMMER INTERNSHIP – I

L	T	P		Course Code: SI201	
0	0	0			
Total Contact Hours				**Assessment**	
Practical		**0**		**End Term Exam**	**20**
			Total Marks: 50	**Progressive Assessment**	**30**
Pre Requisite		**: Nil**			
Credit		**2**		**Category of Course : SI**	

Duration: 3-4 weeks during summer vacation after

2nd Semester. RATIONALE

Summer Internship - I is to offer a structured and practical learning experience that prepares individuals for their future careers, helps them make informed career choices, and equips them with the skills and knowledge necessary to succeed in their chosen field. This course provides opportunities to students for hands-on industry experience.

LEARNING OUTCOMES

After completion of the course, the students will be able to:

- Apply theoretical knowledge gained in their academic coursework to real-world situations.
- Enhance specific skills relevant to their field.
- Gain hands-on experience in a professional network by interacting with mentors and industry professionals.
- Manage time effectively.
- Clarify career goals.

DETAILED COURSE CONTENTS

SUGGESTED ACTIVITIES:

I Orientation:

- Introduction to the organization's mission, values, and culture.
- Familiarization with workplace policies, procedures, and safety guidelines.
- Orientation to the team and organizational structure.

II Project-Based Learning:

- Description of the main project or tasks the intern will be working on during the internship.
- Detailed project goals and objectives.
- Training and guidance on project-specific tools, technologies, or methodologies.

III Technical and Skill Development:

- Training sessions or workshops to enhance technical skills relevant to the internship role (e.g., programming languages, software tools, laboratory techniques).

- Soft skills development, including communication, teamwork, problem solving, and time management

IV Mentorship and Supervision:

- Regular meetings with a designated mentor or supervisor for guidance, feedback, and support.
- Mentorship objectives and expectations.

V Professional Development:

- Sessions on professional etiquette, networking, and building a personal brand
- Resume writing and interview preparation

workshops VI Industry and Field-Specific Knowledge:

- Lectures, seminars, or presentations on industry trends, best practices, and emerging technologies.
- Guest speakers from the field to share insights and

experiences. VII Reporting and Documentation:

- Training on how to document project progress, results, and findings.
- Practice in creating reports, presentations, or other

deliverables. VIII Ethics and Professionalism:

- Discussions on ethical considerations within the field.
- Scenarios and case studies related to ethical decision-making

IX Feedback and Evaluation:

- Regular performance evaluations and feedback sessions.
- Self-assessment and goal-setting exercises.

X Networking and Industry Exposure:

- Opportunities to attend industry conferences, webinars, or networking events.
- Encouragement to connect with professionals in the field.

NOTE

As per AICTE guidelines, in Summer Internship-I, students are required to be involved in Inter/ Intra Institutional Activities viz;

- Training with higher Institutions;
- Soft skill training organized by Training and Placement Cell of the respective institutions;
- contribution at incubation/ innovation /entrepreneurship cell of the institute;
- participation in conferences/ workshops/ competitions etc.;
- Learning at Departmental Lab/ Tinkering Lab/ Institutional workshop;
- Working for consultancy/ research project within the institutes and
- Participation in all the activities of Institute's Innovation Council for eg: IPR workshop/Leadership Talks/ Idea/ Design/ Innovation/ Business Completion/ Technical Expos etc.