STATE BOARD OF TECHNICAL EDUCATION BIHAR

Scheme of Teaching and Examinations for

IVth SEMESTER DIPLOMA IN MECHANICAL (AUTO) ENGINEERING

(Effective from Session 2020-21 Batch)

THEORY

Sr. No.	SUBJECT	SUBJECT CODE	TEACHING SCHEME Periods per Week	Hours Of Exam.	Teacher's Assessment (TA) Marks A	Class Test (CT) Marks B	End Semester Exam (ESE) Marks C	Total Marks (A+B+C)	Pass Marks's	Pass Marks In The Subject	Credits
1.	Automobile Engines	2033401	03	03	10	20	70	100	28	40	03
2.	Strength of Material	2025402	03	03	10	20	70	100	28	40	03
3.	Automobile System	2033403	03	03	10	20	70	100	28	40	03
4	Theory of Machine & Mechanisms	2025404	03	03	10	20	70	100	28	40	03
5.	Basic Electrical & Electronics	2033405	03	03	10	20	70	100	28	40	03
			Total:- 15				350	500			**15**

PRACTICAL

Sr. No.	SUBJECT	SUBJECT CODE	TEACHING SCHEME Periods per Week	Hours of Exam.	Practical (ESE) Internal(A)	Practical (ESE) External(B)	Total Marks (A+B)	Pass Marks In the Subject	Credits
6	Automobile Engine Lab	2033406	02 50% Physical 50% Virtual	03	15	35	50	20	01
7.	Material Testing Lab	2025407	04 50% Physical 50% Virtual	03	15	35	50	20	02
8.	Basic Electrical & Electronics Lab	2033408	04 50% Physical 50% Virtual	03	15	35	50	20	02
			Total:- 10				150		**05**

TERMWORK

Sr. No.	SUBJECT	SUBJECT CODE	TEACHING SCHEME Periods per Week	Marks of Internal Examiner (X)	Marks of External Examiner	Total Marks (X)	Pass Marks in the Subject	Credits
9.	Minor Project	2025409	04	15	35	50	20	02
10.	Course Under Moocs / Swayam / Others	2025410	04	15	35	50	20	02
			Total:- 08			**100**		**24**
Total Periods per week Each of duration One Hour 33				Total Marks = 750				

AUTOMOBILE ENGINES

Subject Code	Theory						Credits
2033401	No. of Periods Per Week			Full Marks	:	100	03
	L	T	P/S	ESE	:	70	
	03	—	—	TA	:	10	
	—	—	—	CT	:	20	

<u>CONTENTS: THEORY</u>

Unit	Name of Topics	Hrs	Marks
Unit-I	**Engine principles and fundamentals: -** 1.1 Introduction 1.2 Basic engine nomenclature. 1.3 Classification of automobile engines. 1.4 Use of engines 1.5 Merits and Demerits of vertical and horizontal engines. 1.6 Four stroke SI and CI engine 1.7 Two stroke cycle engine. 1.8 Comparison of two stroke and four stroke cycle engines 1.9 Reasons for using single cylinder two stroke and four stroke cycle engines	6	12
Unit-II	**Constructional features of automobile engine components: -** 2.1 Cylinder block, cylinder liner, types of liner, comparison of dry and wet liners, cylinder head, gaskets, type of gaskets, piston, piston ring pin etc. 2.2 Piston, piston rings, Piston ring joints, piston pin. 2.3 Crank shaft, camshaft, connecting rod, valve, valve cooling, valve mechanisms, valve timing, port-timing diagram, manifolds, silencers, flywheel etc. 2.4 Types of camshaft drives. 2.5 Rotary and reed valve	8	12
Unit-III	**Engine cooling system: -** 3.1 Introduction – Purpose of cooling 3.2 Systems- Air cooling system, water cooling systems. 3.3 Comparison of air- & water-cooling systems. 3.4 Parts of cooling system. Thermostat, water expansion tank, Temperature Indicator Pressure cap, water pump, fan and fan belt, radiator. 3.5 Cooling water additions	4	8
Unit-IV	**Lubrication systems: -** 4.1 Introduction 4.2 Purpose of lubrication, parts to be lubricated, functions and properties of engine lubricating oils, additives for lubricants, classification of lubricating oils. 4.3 Dry Sump lubrication system, wet sump lubrication system, petrol lubrication	6	8
Unit-V	**Fuel Systems: -** **Part A** 5.1 Fuel feed system in petrol engines.	14	18

	5.2 Mechanical fuel pump, electrical fuel pump			
	5.3 Principles of carburetion.			
	5.4 Simple 112arburetor.			
	5.5 Starting, Idling & slow running, acceleration, Main metering system, choke system.			
	5.6 S.U. Carburetor, solex 112 Carburetor.			
	5.7 Carburetors used in two wheelers and four wheelers.			
	Part B			
	5.8 Requirement of fuel injection system.			
	5.9 Various components & Diesel Fuel injection system.			
	5.10 Types of fuel injection pumps for single and multi-cylinder engines, inline and rotary types of fuel injection pumps.			
	5.11 Types of fuel injectors.			
	5.12 Air fuel mixture ratio in a petrol and diesel engine and comparison.			
	5.13 Mixture requirement for Transient conditions.			
Unit-VI	**I.C. Engine Testing: -** 6.1 Engine Power – Indicated, Brake and Frictional Power. 6.2 Efficiency- Mechanical, Thermal, Relative and Volumetric. 6.3 Fuel Consumption- BSFC 6.4 Morse test, Motoring test. 6.5 Heat Balance Sheet.		**10**	**12**
		Total	**48**	**70**

Text / Reference Books:-		
Titles of the Book	**Name of Authors**	**Name of the Publisher**
A course in internal combustion engine	M.L Mathur R.P.Sharma	Dhanpat Rai Publication
The Motor vehicle	Newton, Steeds, Garrett.	Butterworth Heinmann.
Automobile Engineering Vol. I-Engines	Anil Chikkara	Satya Prakashan New Delhi
Automobile Mechanics	Crouse / Anglin	TATA McGraw – HILL
Automobile Engineering Vol.-II	Kirpal Singh	Standard Publication
Automobile Engineering	R.B. Gupta	Satya Prakashan New Delhi
Automotive Engines	S. Srinivisan	TATA McGraw – HILL
Automotive Technology	H M SETHI	TATA McGraw– HILL

STRENGTH OF MATERIALS

Subject Code 2025402	Theory						Credits
	No. of Periods Per Week			Full Marks	:	100	03
	L	T	P/S	ESE	:	70	
	03	—	—	TA	:	10	
	—	—	—	CT	:	20	

Course objectives:

- To understand the concept of Simple Stresses and Strains.
- To understand the concept of Strain Energy.
- To understand the concept of Shear Force and Bending Moment Diagrams.
- To understand the concept of Theory of Simple Bending and Deflection of Beams.
- To understand the concept of Torsion in Shafts and Springs.
- To understand the concept of Thin Cylindrical Shells.

CONTENTS: THEORY

Unit	Name of Topics	Hrs
Unit- I	**1.1 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. **1.2 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.	12
Unit- II	**2.1 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; **2.2 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 centre and at free ends, **f)** Over hanging beam with UDL throughout, **g)** Combination of point and UDL for the above; Related numerical problems.	12
Unit-III	**3.1 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; As assumptions in theory of simple bending; Bending Equation $\frac{M}{I} = \frac{\sigma}{y} = \frac{E}{R}$ with derivation; 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.	12

Unit- IV	4.1 **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 $T / J = G*\theta / L = \tau / r$; 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.	12
Unit- V	5.1 **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 (Related simple problems only)	12

Reference Books:

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 – S. Ramamrutham, Dhanpat Rai & Publication New Delhi**
4. **Strength of Materials – R.S. Khurmi, S. Chand Company Ltd. Delhi**
5. **A Text Book strength of Material – R.K. Bansal, Laxmi Publication New Delhi.**

Course outcomes

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

CO1 **Compute stress and strain values and find the changes in axial, lateral and volumetric dimensions of bodies of uniform section and of composite section under the influence of normal forces.**

CO2 **Calculate thermal stresses, in bodies of uniform section and composite sections.**

CO3 **Define resilience, proof – resilience and modulus of resilience and obtain expressions for instantaneous stress developed in bodies subjected to different loads.**

CO4 **Compute shear force and bending moment at any section of beam and draw the S.F. & B.M diagrams of for UDL and Point loads.**

CO5 **Calculate the safe load, safe span and dimensions of cross section.**

CO6 **Compare strength and weight of solid and hollow shafts of the same length and material and compute the stress and deflection of the closed coil helical spring.**

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AUTOMOBILE SYSTEMS

Subject Code	Theory						Credits
2033403	No. of Periods Per Week			Full Marks	:	100	03
	L	**T**	**P/S**	ESE	:	70	
	03	—	—	TA	:	10	
	—	—	—	CT	:	20	

CONTENTS: THEORY

Unit	Name of Topics	Hrs	Marks
Unit-I	**Front Axle and Steering :-** **1.1** Types of front axle – Dead axle, live axle, type of stub axle arrangements Elliot, reverse Elliot, lamoine, reverse lamoine. **1.2** Front wheel assembly. **1.3** Steering geometry – Caster, camber, king pin inclination, toe in– toe out, Correct Steering angle. **1.4** Under steering and over steering, Turning radius & its effect. **1.5** Construction, working & application of Steering gear box – rack and pinion type, recirculating ball type, worm & roller type. **1.6** Steering linkages & steering column. **1.7** Ackerman Principle & linkage. **1.8** Power assisted steering & its types (Hydraulic & electrical)	12	16
Unit-II	**Brakes: -** **2.1** Function and necessity. **2.2** Classification of brakes and braking systems. **2.3** Principle, construction and working of –disc brakes, drum brake **2.4** Construction and working of the following–Mechanical braking system, **2.5** Hydraulic Braking system, Air braking system, Hydraulic operated air assisted braking system. **2.6** Properties of brake fluids and their specifications **2.7** Concept and working of antilock braking system. **2.8** Parking brake.	12	16
Unit-III	**Suspension Systems: -** **3.1** Types of suspension systems – Rigid & independent suspension **3.2** Types of Independent suspension system-McPherson strut, wishbone type. **3.3** Semi-elliptical Leaf spring, coil spring, torsion bar arrangement **3.4** Telescopic shock absorber, Gas filled shock absorber, hydraulic shock absorber **3.5** Air Suspension System. **3.6** Anti-roll bar, stabilizer bar	8	12
Unit-IV	**Body Engineering: -** **4.1** Effect of stream lining on vehicle performance. **4.2** Materials used in body construction and types of bodies. **4.3** Protective and anti-corrosive treatments, painting procedure. **4.4** Safety devices –air bags, exhaust brake, emergency brake, Central locking, collapsible steering.	6	10

Unit-V	**Car Heating Ventilation & Air Conditioning System(HVAC):-** **5.1** Basic principle- vapour compression cycle, layout and operation of HVAC. **5.2** Types of refrigerant used in car air conditioning and their Properties. **5.3** Human comfort conditions. **5.4** Temperature control system, humidity control		**6**	**10**
Unit-VI	**Vehicle Performance :-** 6.1 R.P Resistance faced by the vehicle- Air resistance, rolling Resistance, gradient resistance. 6.2 Define traction, tractive efforts, draw bar pull, gradeability an Acceleration, pitching, Bouncing, Rolling, Sway and yaw. 6.3 Stability of vehicle on turn and slopes (No mathematical Treatment).		**6**	**8**
		Total	**48**	**70**

Text/ Reference Books:
1. Motor Automotive Technology --Anthony Schwaller --Delmar Publisher Inc.
2. Automotive Service --Tim Gills --Delmar Publisher Inc.
3. Automobile Engineering Vol. II --Anil Chikara --Satya Prakashan New Delhi
4. Automobile Mechanics --Crouse / Anglin. --TATA McGRAW – HILL
5. Automobile Engineering --Vol.I Kirpal Singh --Standard Publication
6. Automobile Engineering --R.B. Gupta --Satya Prakashan New Delhi
7. Automotive Mechanics --S. Srinivisan --TATA McGRAW – HILL
8. ASHRAE HANDBOOK OF HVAC—ASHRAE
9. Automobile Air Conditioning --Boyce H. Dwiggins --THOMSON LEARNING
10. Automotive technology: A system Approach --Jack Erjavec
11. Automobile Electrical and Electronic systems --Tom Denton

Theory of Machine & Mechanisms

Subject Code	Practical						Credits
2025404	No. of Periods Per Week			Full Marks	:	100	03
	L	T	P/S	ESE	:	70	
	03	—	—	CT	:	20	
	—	—	—	TA	:	10	

Course objectives:

To understand different types of cams and their motions and also to draw cam profiles for various motions.

To understand the mechanism of various types of drives available for transmission of power.

To understand the design of Brakes, Dynamometers, Bearings and Clutches and their function and working.

To understand the need for balancing of masses in the same plane

To know different types of governors.

CONTENTS: THEORY

Unit	Name of Topic	Hrs
Unit-I	Cams and Followers: 1.1 Concept; Definition and application of Cams and Followers; Classification of Cams and Followers; Different follower motions and their displacement diagrams like uniform velocity, SHM, uniform acceleration and Retardation; 1.2 Drawing of profile of radial cam with knife- edge and roller follower with and without Offset with reciprocating motion (graphical method).	4
Unit-II	Power Transmission: 2.1 Types of Drives – Belt, Chain, Rope, Gear drives & their comparison; Belt Drives - flat belt, V– belt & its applications; Material for flat and V-belt; Angle of lap, Belt length. Slip and Creep; Determination of Velocity Ratio, Ratio of tight side and slack side tension; Centrifugal tension and Initial tension; Condition for maximum power transmission (Simple numerical); 2.2 Chain Drives – Advantages & Disadvantages; Selection of Chain & Sprocket wheels; Methods of lubrication; Rope Drives – Types, applications, advantages & limitations of Steel ropes. 2.3 Gear Drives – Spur gear terminology; Types of gears and gear trains, their selection for different applications; Train value & Velocity ratio for compound, reverted and simple epicyclic gear train; Methods of lubrication; Law of gearing;	14
Unit-III	3.1 Flywheel and Governors: Flywheel - Concept, function and application of flywheel with the help of turning moment diagram for single cylinder 4-Stroke I.C. Engine (no Numerical); Co-efficient of fluctuation of energy, Coefficient of fluctuation of speed and its significance; Governors: Types and explanation with neat sketches (Centrifugal, Watt and Porter); Concept, function and applications & Terminology of Governors; Comparison between Flywheel and Governor.	14

Unit-IV	Brakes, Dynamometers, Clutches & Bearings:	08
	4.1 Function of brakes and dynamometers; Types of brakes and Dynamometers; Comparison between brakes and dynamometers; Construction and working of shoe brake, ii) Band Brake, iii) Internal expanding shoe brake iv) Disc Brake; v) Concept of Self Locking & Self energizing brakes; Numerical problems to find braking force and braking torque for shoe & band brakes;	
	4.2 Construction and working of Rope Brake Dynamometer, Hydraulic Dynamometer, Eddy current Dynamometers;	
	4.3 Clutches- Uniform pressure and Uniform Wear theories; Function of Clutch and its application; Construction and working of Single plate clutch, ii) Multiplate clutch, iii) Centrifugal Clutch iv) Cone clutch and v) Diaphragm clutch. (Simple numerical on Single and Multiplate clutch); Bearings Simple Pivot, Collar Bearing iii) Conical pivot. Torque & power lost in friction (no derivation). Simple numerical.	
Unit-V	Balancing & Vibrations:	08
	5.1 Concept of balancing; Balancing of single rotating mass; Graphical method for balancing of several masses revolving in same plane;	
	5.2 Concept and terminology used in vibrations Causes of vibrations in machines; their harmful effects and remedies.	

References:

1. Theory of machines – S.S .Rattan ,Tata McGraw-Hill publications.
2. Theory of machines – R.K.Bansal ,Laxmi publications
3. Theory of machines – R.S. Khurmi&J.K.Gupta ,S.Chand publications.
4. Dynamics of Machines – J B K Das, Sapna Publications.
5. Theory of machines – Jagdishlal, Bombay Metro – Politan book Ltd.

Course outcomes:

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

CO1 Know different machine elements and mechanisms.

CO2 Understand Kinematics and Dynamics of different machines and mechanisms. CO3   Select Suitable Drives and Mechanisms for a particular application.

CO4 Appreciate concept of balancing and Vibration.

CO5 Develop ability to come up with innovative ideas.

CO6 Understand different types of cams and their motions and also draw cam profiles for various   motions.

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BASIC ELECTRICAL & ELECTRONICS

Subject Code	Theory						Credits
2033405	No. of Periods Per Week			Full Marks	:	100	03
	L	T	P/S	ESE	:	70	
	03	—	—	TA	:	10	
	—	—	—	CT	:	20	

Unit	Name of Topics	Hrs	Marks
Unit-I	**Basic concepts & principles of Electrical Engineering** 1.1 Voltage, Current, Resistance, Ohm's law 1.2 Magnetism, Electromagnetism, Law of Electromagnetic Induction 1.3 AC fundamentals, Concept of active and reactive power 1.4 Application of measuring Instruments – volt meter, ammeter, inductive/ tongue tester and multimeters. 1.5 Principles of transformers. Ampere turns ratio. 1.6 Construction of transformer. 1.7 Core and shell type transformer. 1.8 Auto transformer-types and comparison.	**12**	**16**
Unit-II	**Electric Motors and Generators** 2.1 DC motors: -Principle, Construction, types and applications 2.2 AC motors: -Principle, Construction and applications 2.3 Stepper motor-Types of stepper motor, principle, construction, applications and specifications. 2.5 Concept and working principle of D.C. generator and alternator.	**6**	**10**
Unit-III	**Wiring and Lighting Circuit** 3.1 Symbols of electrical circuits and wiring colour code, size, comparison of insulated & ground return system, Positive & negative return system, their comparison. 3.2 Need of wiring Harness, Wiring diagram of :- Head light, Turn indicator, Horn, Windshield wiper, Power window, Power seat, Battery ignition, Magneto ignition.	**6**	**10**
Unit-IV	**Basic Electronics** 4.1 Semiconductors, 4.2 Diode :-PN junction, zener diode symbol, Characteristics and application. 4.3 Rectifier-half, full, Bridge type with filters (C,LC,Π type). 4.4 Transistor: - BJT:-NPN, PNP transistor, symbol, working. 4.5 TRIAC, DIAC, , Silicon control rectifier(SCR):-Symbol, working . Comparison between Transistor and SCR. 4.6 Amplifier: -Common emitter configuration only 4.7 Power device: -photodiode, LED, LDR, phototransistor working 4.8 TRIAC, DIAC, Silicon control rectifier (SCR):-Symbol, working 4.9 Concept of Oscillators	**10**	**10**

Unit-V	**Transducers/Sensors and their applications**		
	5.1 Electromechanical type transducers: -Potentiometric resistances type, Inductive (LVDT), Capacitive, Piezoelectric.		
	5.2 Photoelectric type transducers: Photoemissive ,Photovoltaic, Photoconductive		
	5.3 AC/DC Electronic timer block diagram study		
	5.4 Concept of General measurement system & difference between mechanical and electrical/electronic instruments		
	5.5 Measurement of Pressure: - Working of thermocouple vacuum gauge, Pirani vacuum gauge, Varying pressure measurement;	**10**	**18**
	5.6 Measurement of Flow: - Hot wire anemometer, Ultrasonic flow meter;		
	5.7 Measurement of Temperature: - Working of Thermopiles, Thermister ;		
	5.8 Measurement of Speed: - contactless electrical tachometer:- Inductive, Capacity type tachometer, Stroboscope;		
	5.9 Measurement of Force: - Strain gauge load cell;		
	5.10 Electrical method for moisture measurement		
Unit-VI	**Digital Electronics**		
	6.1 Define analog signal and digital signal		
	6.2 Study of logic gates(NOT,OR, NOR, AND, NAND) symbols and truth table		
	6.3 Study of flip flops only RS & D : symbols and truth table		
	6.4 Working principle with block diagram of shift register & counter	**4**	**6**
	6.5 Working principle with block/ logic diagram of encoder & decoder		
	6.6 Working principle with block/logic diagram of multiplexer and demultiplexer		
	6.7 Working of seven segment LED display		
	Total	**60**	**70**

Text / Reference Books:

1. Applied Electronics -- Sedha --S. Chand & company LTD
2. Electronic Principles --Thomas Malvino --Tata Mc-Graw hill publishing company LTD
3. Fundamentals of Electrical & Electronics Engineering -- Theraja BL
4. Digital principles & Applications --Albert Paul Malvino, Donald Leach --Mc-Graw hill & company
5. Mechanical Measurement --Thomas. G.Beckwith, N.Lewis Buckwith, Roy. D.Marangoni forward by G.K. Sharma --Narosa Publishing House
6. Measurement System- Application & design --Ernest Doebelin --Mc-Graw-Hill-International Edition
7. Electrical and Electronic Measuring Instruments --A K Sawney -- Dhanpat Rai and sons.
8. Automotive Electrical Equipments -- P L Kohli --Tata McGraw Hill.
9. Basic Electrical And Electronics engineering --R.K Rajput

AUTOMOBILE ENGINE LAB

Subject Code	Practical						Credits
2033406	**No. of Periods Per Week**			**Full Marks**	**:**	**50**	**01**
	L	**T**	**P/S**	**ESE**	**:**	**50**	
	—	—	**02**	**Internal**	**:**	**15**	
	—	—	—	**External**	**:**	**35**	

1.To study and prepare report on the constructional details, working principles and operation of the following

Automotive Engine Systems & Sub Systems.

(a) Multi-cylinder : Diesel and Petrol Engines.

(b) Engine cooling & lubricating Systems.

(c) Engine starting Systems.

(d) Contact Point & Electronic Ignition Systems

2.To study and prepare report on the constructional details, working principles and operation of the following

Fuels supply systems:

(a) Carburetors

(b) Diesel Fuel Injection Systems

(c) Gasoline Fuel Injection Systems.

3.To study and prepare report on the constructional details, working principles and operation of the following

Automotive Clutches.

(a) Coil-Spring Clutch

(b) Diaphragm – Spring Clutch.

(c) Double Disk Clutch.

4.To study and prepare report on the constructional details, working principles and operation of the following

Automotive Transmission systems.

(a) Synchromesh – Four speed Range.

(b) Transaxle with Dual Speed Range.

(c) Four Wheel Drive and Transfer Case.

(d) Steering Column and Floor – Shift levers.

5.To study and prepare report on the constructional details, working principles and operation of the following

Automotive Drive Lines & Differentials.

(a) Rear Wheel Drive Line.

(b) Front Wheel Drive Line.

(c) Differentials, Drive Axles and Four-Wheel Drive Line

6.To study and prepare report on the constructional details, working principles and operation of the

following Automotive **Suspension Systems.**

(a) Front Suspension System.

(b) Rear Suspension System.

7.To study and prepare report on the constructional details, working principles and operation of the

following **Automotive Steering Systems**.

(a) Manual Steering Systems, e.g., Pitman –arm steering, Rack & Pinion steering.

(b) Power steering Systems, e.g., Rack and Pinion Power Steering System.

(c) Steering Wheels and Columns e.g., Tilt & Telescopic steering Wheels, Collapsible Steering

Columns

8. To study and prepare report on the constructional details, working principles and operation of the

following **Automotive Tyres & wheels.**

(a) Various Types of Bias & Radial Tyres.

(b) Various Types of wheels.

9. To study and prepare report on the constructional details, working principles and operation of the

Automotive Brake systems.

(a) Hydraulic & Pneumatic Brake systems.

(b) Drum Brake System.

(c) Disk Brake System.

(d) Antilock Brake System.

(e) System Packing & Other Brakes.

MATERIAL TESTING

Subject Code	Theory				Credits
2025407	No. of Periods Per Week			Full Marks : 50	**02**
	L	T	P/S	Internal : 15	
		—	04	External : 35	
				:	

LAB

Course Objectives:

• To identify the type of material based on its grain structure

• To learn the procedure for identifying the cracks in the material

• To understand various material testing methods to determine mechanical properties such as yield stress, Ultimate stress, percentage elongation, Young's Modulus etc.

Course Content:

S.No. Topics for practice

I   Prepare a specimen and examine the microstructure of the Ferrous and Non- ferrous metals using the Metallurgical Microscope.

II   Detect the cracks in the specimen using (i) Visual inspection and ring test (ii) Die penetration test (iii) Magnetic particle test.

III Determination of Rockwell's Hardness Number for various materials like mild steel, high carbon steel, brass, copper and aluminum.

IV   Finding the resistance of materials to impact loads by Izod test and Charpy test.

V   Torsion test on mild steel – relation between torque and angle of twist determination of shear modulus and shear stress.

VI   Finding Young's Modulus of Elasticity, yield points, percentage elongation and percentage reduction in area, stress strain diagram plotting, tests on mild steel.

VII Determination of modulus of rigidity, strain energy, shear stress and stiffness by load deflection method (Open & Closed coil spring)

VIII Single or double Shear test on M.S. bar to finding the resistance of material to shear load.

Reference Books:

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

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

BASIC ELECTRICAL & ELECTRONICS LAB

Subject Code	Practical						Credits
2033408	**No. of Periods Per Week**			**Full Marks**	**:**	**50**	**02**
	L	T	P/S	ESE	:	50	
	—	—	04	Internal	:	15	
	—	—	—	External	:	35	

Course Content:

Skills to be developed:
Intellectual Skills:
• Select equipment such as motors, meters & components.
• To interpret circuits.
Motor Skills:
• To draw circuits.
• To measure various parameters.
List of Practical:
1) For a given resistive & inductive series & parallel circuit, select ammeter, voltmeter & wattmeter.
       Make the connections and measure current, voltage and power drawn by the circuit. Measure it by clip on meter & compare it.
2) For a given DC Shunt/Series motor, select suitable meters, make connections as per diagram, check the connections and run the motor. Take the meter readings to draw speed torque characteristics. Make suitable changes in the connections to reverse the direction of rotation.
3) For the above given motor prepare a circuit to control its speed above & below normal, plot its graph.
4) Testing of components like diode, LED, SCR, diac, triac, Zener diode, inductor, capacitor using a multimeter
5) Verify truth tables for logic gates-. NOT, AND, OR, NAND, NOR.
6) Calculation of Vdc of half and full wave rectifier with and without filter.
7) Line & load regulation of alternator output using Zener diode
8) To measure shaft speed by using Stroboscope. Study and observe the characteristics of LVDT.

<div align="center">

<u>TERM WORK</u>

MINOR PROJECT

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Subject Code	Practical						Credits
2025409	**No. of Periods Per Week**			**Full Marks**	**:**	**50**	**02**
	L	**T**	**P/S**	**Internal**	**:**	**15**	
	—	—	**04**	**External**	**:**	**35**	
	—	—	—				

TERM WORK
COURSE UNDER MOOCS / SWYAM / OTHERS

Subject Code	Practical						Credits
	No. of Periods Per Week			Full Marks	:	50	02
2025410	L	T	P/S	ESE	:	50	
	—	—	04	Internal	:	15	
	—	—	—	External	:	35	