

Scheme of Teaching and Examination for

4th Semester of 3 Years Diploma in Automobile Engineering

Duration of Semester : **14 Weeks**

Student Contact Hours : **36 Hrs**

Total Marks : **800**

Effective from : **2017 -18 Session**

Sl. No.	Name of Subject	Subject Code	Subject	Teaching Scheme			Examination Scheme					
				L	T	P	Hours of Exam	Full Marks of Subject	Final Exam / committee marks	Internal Assessment	Pass Marks Final / Ext. Exam	Pass Marks in Subjects
1.	Automotive Manufacturing Process	AUT402	Theory	3	-	-	3	100	80	20	26	40
2.	Auto Engineering Drawing	AUT403	Theory	3	-	-	3	100	80	20	26	40
3.	Thermal Engineering	MEC404	Theory	3	-	-	3	100	80	20	26	40
4.	Theory of Machine	MEC405	Theory	3	-	-	3	100	80	20	26	40
5.	Automobile Transmission System	AUT404	Theory	3	-	-	3	100	80	20	26	40
6.	Automotive Manufacturing Process Lab	AUT405	Practical	-	-	2	4	50	80	20	-	40
7.	Auto Engineering Drawing lab	AUT406	Sessional	-	-	2	4	50	30	20	-	25
8.	Theory of Machine Lab	MEC409	Practical	-	-	2	4	50	40	10	-	20
9.	Thermal Engineering Lab	MEC410	Practical	-	-	2	4	50	40	10	-	20
10.	Auto transmission System Lab	AUT407	Practical	-	-	2	4	50	40	10	-	20
11.	Professional Practice II	401	Sessional	-	-	4	-	50	30	20	-	25
Total Hours of Teaching per week :				15		14						

Total Marks : Theory : Practical : Sessional :
 L : Lecture, T : Tutorial P : Practical

- Note:
1. Period of Class hours should be of 1 hrs duration as per AICTE norms.
 2. Remaining Hrs every week has been marked for students for Library and Student Centered Activities.
 3. Drawing / Graphics / Practical / Sessional examinations will be held at parent institution.
 4. Board will depute examiner for Practical examination.
 5. Regarding sessional examination the parent institution will form a three member committee and this committee will examine the sessional records and hold viva of the examinee for 60 % marks allotted to the subject. Marks for remaining 40 % will be provided by the Faculty concerned on the basis of evaluation of each job / work throughout the semester.

AUTOMOTIVE MANUFACTURING PROCESS

Subject Code : AUT402

Total Contact Hrs : 42

L T P

3 2

- 1.0 Forging Process 6 hrs**
- 1.1 Forging operations, types of forging – Smith forging, drop forging, press forging, machine forging.
 - 1.2 Forging defects, types.
 - 1.3 Forging by open and close dies.
 - 1.4 Forging sequences for connecting rods, crankshafts, camshafts, spanners and gears
- 2.0 Sheet metal operations & Dies 4 hrs**
- 2.1 Press tool operations and classifications, shearing action, shearing operations
 - 2.2 Drawing, spinning, bending, stretch forming, embossing and coining
 - 2.3 Types of Dies, Die construction, parts of standard die set
 - 2.4 Press components used in automobiles
- 3.0 Metal Fabrication 8 hrs**
- 3.1 Classification, types of welding joints, welding terminology
 - 3.2 Principle of gas welding, gas welding equipments, gas cutting, types of flames
 - 3.3 Principle of Arc welding, Arc welding equipments, Electrodes & its types, Manual Metal Arc Welding, TIG, MIG
 - 3.4 Principle of resistance welding, heat balance, electrodes for resistance welding, resistance spot welding, resistance seam welding, resistance projection welding
 - 3.5 Aluminium and cast iron welding, brazing and braze welding, soldering, plasma arc welding and its application pertaining to automobile industry
- 4.0 Surface treatment and finishing process 6 hrs**
- 4.1 Introduction, surface cleaning processes - blasting, tumbling, alkaline, acid and electrolytic cleaning.
 - 4.2 Surface coating processes : Electroplating, galvanizing, metal spraying, painting
 - 4.3 Surface finishing processes- lapping, honing, super finishing, buffing, burnishing, barrel tumbling, powder coating, polishing
- 5.0 Machining Process 10 hrs**
- 5.1 Lathe, function of lathe, types of lathe, description and functions of lathe parts. Lathe operation
 - 5.2 Drilling machine, types, drilling machine operations, drilling machine tools, drill size, drill material
 - 5.3 Grinding machine, kinds of grinding, types of grinders, grinding operations, grit, grade, structure of wheels, wheel shapes and sizes
 - 5.4 Milling machines, types of milling machine, principal parts, mechanism, operations.
 - 5.5. Shaper, types of shaper, principal parts, shaper mechanism, shaper operations, shaper tools

- 6.0 CNC Machines** **4 hrs**
- 6.1 NC & CNC machines
 - 6.2 Types of CNC machines
 - 6.3 Advantages and disadvantages of CNC machines
 - 6.4 Working principle of CNC machines
 - 6.5 Principle of computer aided part programming, Do, Loop, Subroutine, Canned Cycle
- 7.0 Advanced Manufacturing Process** **4 hrs**
- 7.1 Use of EDM, ECM, ECG, USM, PAM, LBM for manufacturing of automobile Components
 - 7.2 Introduction to powder metallurgy.
 - 7.3 Introduction to Robotics in automobile manufacturing.

Reference Books :

1. Workshop Technology: HazaraChoudhary
2. Workshop Technology: B S Raghuvanshi
3. Manufacturing Technology: P N Rao
4. Production Technology R K Jain
5. Manufacturing Science : Amitabh Ghosh&Mallick



Auto Motive Manufacturing Process Lab

Subject Code : AUT405

List of experiments :

1. Study and awareness of Safety rules & precautions – Forging shop, Welding shop & Machine shop
2. Prepare a job involving forging operation like making a ring, chisel & screw driver.
3. Prepare a job on sheet metal like making a cylinder, dustbin & box.
4. Prepare a job like Grill, involving electric arc welding.
5. Prepare a job involving brazing operation like joining of wires.
6. Prepare a job involving soldering process, like sheet metal joints
7. Prepare a job which involves coating process like galvanizing, painting, electroplating .
8. Prepare a job on lathe machine involving taper turning, threading, facing, knurling, drilling.
9. Prepare a spur gear by using milling machine and make a hole in the centre of the gear by using drilling machine.
10. Prepare a simple job on shaper machine.
11. Write a simple CNC program and set it on the CNC machine and prepare a simple job.

Auto Engineering Drawing

Subject Code: AUT403

Total Contact Hrs : 42

L T P

3 2

- 1. Auxiliary views** **2+4**
 - 1.1 Study of auxiliary planes,
 - 1.2 Projection of objects on auxiliary planes.
 - 1.3 Completing the regular views with the help of given auxiliary views

Sectional Views.

 - 1.4 Types of sections
 - 1.5 Conversion of pictorial view into sectional orthographic views (Simple Machine Parts)
- 2. Conversion of Projections** **3+6**
 - 2.1 Introduction to Orthographic & Isometric projections.
 - 2.2 Conversion of isometric view into Orthographic Views (Simple Machine Parts)
 - 2.3 Draw missing view from the given Ortho graphic views-simple components
 - 2.4 Conversion of orthographic views into isometric Views (Simple Machine Parts)
- 3. Rivet and Riveted Joints** **2+4**
 - 3.1 Introduction and classification of Fasteners
 - 3.2 Shape of Rivet heads
 - 3.3 Types of Riveted joints
- 4. Conventional Representation** **3+6**
 - 4.1. Standard convention using SP-46(1988)
 - (a) Materials C.I., M.S, Brass, Bronze, Aluminum, wood, Glass, Concrete and Rubber
 - (b) Long and short break in pipe, rod and shaft.
 - (c) Ball and Roller bearing, pipe joints, cocks, valves, internal/External threads.
 - (d) Various sections- Half, removed, revolved, off set, partial and aligned sections.
 - (e) Knurling, serrated shafts, splined shafts, and chain wheels.
 - (f) Springs with square and flat ends, Gears, sprocket wheel
 - (g) Countersunk& counter bore.

(h) Tapers

(i) Conventional Representation of holes, bolts, nuts and rivets.

5. Limits, Fits and Tolerances:

2+4

5.1 Characteristics of surface roughness-

Indication of machining symbol showing direction of lay, roughness grades, machining allowances, manufacturing methods.

5.2 Introduction to ISO system of tolerance, dimensional tolerances, and elements of

Inter change able system, hole & shaft based system, limits, fits & allowances. Selection of fit.

5.3 Geometrical tolerances, tolerances of form and position and its geometric representation.

6. Details to Assembly

7+14

6.1 Introduction

6.2 Bearing–Foot Step Bearing & Pedestal Bearing

6.3 Lathe tool Post

6.4 Keys, Knuckle Joint and Cotter Joint

6.5 Screw Jack

6.6 Steam Stop Valve

6.7 Pipe Joints (Union Joint, Expansion Joint & Spigot & Socket Joint)

7. Assembly to Details

7+14

7.1 Introduction–

7.2 Pedestal Bearing

7.3 Lathe Tail Stock

7.4 Drilling Jig

7.5 Automotive parts (Piston & connecting rod)

7.6 Couplings–Flange Couplings, Flexible Couplings Universal couplings & Oldham's Coupling

7.7 Fast & loose pulley

7.8 Valve–Not more than eight parts

8. Study of Automobile Components Drawing (Minimum 02 sheets)

2+4

Reference Books:-

01	N.D. Bhatt	Machine Drawing	CharotarPublication, Anand
02	IS Code SP46(1988)	Code of practice for general engineering drawing.	Engineering Drawing Practice for School and colleges
03	L.K. Narayanan, P. Kannaich,	Production Drawing	New Age International
04	P.S. Gill	Machine Drawing	S.K. Katariaand Sons
05	M.L. Dabhade	Engineering Graphics(For Topicon Auxiliary Views)	--
06	Sidheshwar	Machine Drawing	Tata Mc GrawHill
07	R K Dhawan	Machine Drawing	S. Chand

Auto Engineering Drawing Lab

Subject Code: AUT406

List of Sessionals :-

(Use first angle method of projection)

1. Auxiliary Views One sheet containing three problems on Auxiliary views.
2. Conversion of projection
 - i) One sheet containing orthographic to isometric.
 - ii) One sheet containing isometric to orthographic.
 - iii) One sheet containing missing view.
3. Rivet and Riveted joints, Conventional Representation as per SP-46 (1988) –one sheet
4. Limit, Fit, Tolerances and Machining Symbols– one sheet
5. Details to Assembly
 - (i) One sheet covering any one assembly and its details.
 - (ii) Solve at least two problems as home assignment.
6. Assembly to detailed drawings of components including conventional representation of tolerances and surface finish symbols:
 - (i) One sheet covering any one assembly and its details
 - (ii) At least two problems as home assignment.
7. Solve at least two problems on production drawing.
8. Two problems on assembly drawings using any AutoCAD Package.

Thermal Engineering

Subject Code : MEC404

Teaching and Examination Scheme

L T P
3 2

Total Theory Hrs 42
F M 100 (80+20)

Rationale:

Mechanical engineers have to work with various power producing & power absorbing devices like boilers, turbines, compressors, pumps etc. In order to understand the principles, construction & working of these devices, it is essential to understand the concept of energy, work, heat & conversion between them. Hence it is important to study the subject of Thermal Engineering which is a core subject. It includes the study of various sources of energy, basic laws & concept of thermo dynamics, gas laws, properties of steam & generation. Heat transfer forms the basis for different power engineering application. Boilers find application in different process industries. Steam turbine and condensers are the major component of any steam power plant. Mechanical engineer should understand working and application of these devices.

Objectives:

The Students should be able to:

1. Know various source so energy & their applications.
2. Apply fundamental concepts of thermo dynamics to thermodynamic systems.
3. Understand various laws of thermo dynamics.
4. Apply various gas laws & ideal gas processes to various thermo dynamic systems.
5. Calculate properties of two phase system by using steam tables/mollier charts.
6. Explain construction & working of boilers, mountings & accessories.

Theory

Chapter	Name of the Topic	Hours
1.	<p>Sources of energy</p> <p>1.1 Classification of energy sources - Renewable, Non-Renewable</p> <p>1.2 Fossil fuels, CNG, LPG.</p> <p>1.3 Solar - Flat plate and concentrating collectors. - Solar Water Heater - Photo voltaic Cell, Solar Distillation.</p> <p>1.4 Wind, Tidal, Geothermal</p> <p>1.5 Biogas, Biomass, Bio-diesel</p> <p>1.6 Hydraulic, Nuclear</p> <p>1.7 Fuel cell– list of fuel cells</p>	4
2	<p>Ideal Gases</p> <p>2.1 Concept of Ideal gas, Charle's law, Boyle's law, Avogadro's law, equation of state, Characteristic gas constant and universal gas constant.</p> <p>2.2 Ideal gas processes:- -Isobaric, Isochoric, Isothermal, Adiabatic, Poly tropic, Isentropic with representation of the processes on P-V and T-S diagram (only simple numericals)</p>	2
3.	<p>Fundamentals of Thermodynamics</p> <p>3.1 Concepts of pure substance, types of systems, properties Of systems, Extensive and Intensive properties .Pointfunction and path function. units of each ,$pV=MRT$</p> <p>3.2 Work and Energy -Thermo dynamic definition of work, heat, difference between heat and work, P.E., K.E, Internal Energy, Flow work, concepts of enthalpy, entropy.</p> <p>3.3 Laws of Thermo dynamic -Zeroth Law, Temperature measurement, principle of energy conservation, irreversibility, Second Law of Thermo dynamics, Kelvin Plank, Clausius statements and their equivalence, Concept of perpetual Motion machine 1 and 2.</p> <p>3.4 Application of Thermo dynamic laws -Steady Flow Energy equation and its application open system like boiler, engine, nozzle, turbine, compressor & condenser.</p> <p>3.5 Application of Second law to Heat Engine, Heat Pump and Refrigerator.</p>	10
4.	<p>Steam and Steam Boiler</p> <p>4.1 Generation of steam at constant pressure with representation on various charts such as T-H, T-S, H-S, P-H. Properties of steam and use of steam table, Quality of</p>	8

	<p>Steam and its determination with Separating calorimeter (no numerical).</p> <p>4.2 Vapour process:- -constant pressure, constant volume, constant an haply, constant entropy (numerical using steam table and Mollierchart), RankinCycle</p> <p>4.3 Steam Boilers:- -Classification of boilers. -Construction and working of -Cochran, Babcock and Wilcox, La-montand Loeffler boiler. Boiler draught– natural, forced and mechanical.</p> <p>4.4 Boiler Mountings and Accessories (Introduction only)</p>		
5.	<p>Steam Turbines and Condensers</p> <p>5.1 Steam nozzle:- -Continuity equation, types of nozzles, concept of Mach number, critical pressure, application of steam nozzles.(simple numerical)</p> <p>5.2 Steam turbine:- -Classification of turbines, Construction and working of Impulse and Reaction turbine.</p> <p>5.3Compoundingofturbines,Regenerativefeedheating,bleedin gofsteam,nozzlecontrolgoverning(withvelocitydiagrams) (No numerical).</p> <p>5.4 Steam condenser:- Dalton’s law of partial pressure, function and classification of condensers, construction and working of surface condensers. (simple numerical)</p> <p>5.5 Source so fair leakage, concept of condenser efficiency, vacuum efficiency (no numerical).</p> <p>5.6 CoolingTowers. -Force draught, natural taught and induced draught.</p>	12	
6.	<p>Heat Transfer</p> <p>6.1 Modes of heat transfer:- -Conduction, convection and radiation.</p> <p>6.2 Conduction by heat transfer -Fourier’s law, thermal conductivity, conduction through cylinder, thermal resistance, composite walls, combined conduction and convection (Simple numerical)</p> <p>6.3 Heat transfer by Radiation:- -Thermal Radiation, Absorptive, Transmissivity, Reflectivity, Emissivity, black and gray bodies, Stefan-Bolts man law.</p> <p>6.4 Heat Exchangers:- -Shell and tube, plate type, multiphase heat exchangers. Materials Use dand applications of heat exchangers.</p>	6	
	TOTAL	42	

Thermal Engineering Lab

Subject code : MEC410

List of Practical's:-

1. Collection of technical data and specification of photovoltaic cell by referring to Manufacturers catalogues.
2. Study of heat transfer and concept of heat exchanges.
3. Study of solar water heating system.
4. Report on visit to wind power generation plant/biogas plant/hydraulic power Plant.
5. Calculation of thermal conductivity of a solid metallic rod.
6. Verification of Stefan -Boltzman's law
7. Study and compare various heat exchangers such as radiators, evaporators, condensers, plate heat exchangers etc.
8. Trace the flue gas path and water-steam circuit with the help of boiler model and write are port.
9. Study of Babcock and Wilcox Boiler/Lancashire Boiler.
10. Determination of change in velocity of steam with steam nozzle.

Books recommended

Sr. No.	Author	Title	Publication
01	R. K. Rajput	A Course in Thermal Engineering	LaxmiPublication, Delhi
02	P. L. Ballaney	A Course in Thermal Engineering	Khanna Publishers
03	R. S. Khurmi	A text book of Thermal	S.Chand& co .Ltd.
04	Domkundwar V. M.	A Course in Thermal Engineering	DhanpatRai &Co.
	P. K. Nag	Engineering Thermodynamics	Tata Mc GrawHill
06	R. S. Khurmi	Steam Table &Mollier Diagram	S. Chand & co. Ltd.
07	Yunus A Cengel	Thermodynamics	

Theory of Machine

Subject Code : MEC405

L T P
3 2

Total Contact Hrs 42
F M 100 (80+20)

Contents: Theory

Chapter	Name of the Topic	Hours
1.	<p>Fundamentals and types of Mechanisms</p> <p>Kinematics of Machines:- Definition of Kinematics, Dynamics, Statics, Kinetics, Kinematic link, Kinematic Pair and its types, constrained motion and its types, Kinematic chain and its types, Mechanism, inversion, machine and structure. Inversions of Kinematic Chain.</p> <ul style="list-style-type: none"> • Inversion of four bar chain, coupled wheels of Locomotive & Pantograph. • Inversion of Single Slider Crank chain-Rotary I.C. <p>Engines mechanism, Whit worth quick return mechanism,</p> <ul style="list-style-type: none"> • Introduction to Inversion of Double Slider Crank Chain-Oldham's Coupling. <p>Common Mechanisms.</p> <ul style="list-style-type: none"> • Geneva Mechanism. • Ackerman's Steering gear mechanism. <p>(No numericals)</p>	6
2.	<p>Velocity and Acceleration in Mechanism</p> <p>2.1 Concept of relative velocity, angular velocity and Angular acceleration of a point on a link. 2.2 Velocity and acceleration of points and links in mechanisms – relative velocity and instantaneous center method (simple numerical based on analytical method). 2.3 Klein's construction to determine velocity and acceleration of piston of a reciprocating engine.</p>	2
3.	<p>Cams and Followers</p> <p>3.1</p> <ul style="list-style-type: none"> • Concept, definition and application of Cams and Followers. • Classification of Cams and Followers. • Different follower motions and their displacement diagrams like uniform velocity, SHM. 	6

	3.2 Drawing of profile of radial cam of roller Follower with and without off set with reciprocating motion	
4.	<p>Power Transmission</p> <p>Belt Drives-flat belt, V-belt & its applications, material For flat and Vbelt, 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)</p> <ul style="list-style-type: none"> • Chain Drives–Advantages & Disadvantages, Selection of Chain & Sprocket wheels, methods of lubrication. • Gear Drives–Spurgear terminology, types of gears and gear trains, train value & velocity ratio for compound, reverted and simple epicycles gear train, methods of lubrication, Law of gearing. (simple numerical) • Rope Drives–Types, applications, advantages & Limitations of Steel ropes. 	8
5.	<p>Fly wheel and Governors</p> <ul style="list-style-type: none"> • Flywheel-Concept, function and application offlywheel 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, concept, function and application & Terminology of Governors. (numerical on Watt governor only) 	6
6.	<p>Brakes, Dynamometers, Clutches & Bearings</p> <p>Brakes and Dynamometers</p> <ul style="list-style-type: none"> • Function of brakes and dynamometer, types of brakes and Dynamometers, comparison between brakes and dynamometer. • Construction and working of i) shoe brake, ii) Band Brake, iii) Internal expanding shoe brake iv) Disc Brake. • Concept of Self Locking & Self energizing brakes. • Numerical problems to find braking force and braking torque for shoe <i>brake</i>. • Construction and working of i) Rope Brake <p>Dynamometer, <i>Introduction to Hydraulic Dynamometer and Eddy current Dynamometer.</i></p>	10

	<p>Clutches and Bearing</p> <ul style="list-style-type: none"> • Clutches-Uniform pressure and Uniform wear theories. • Function of Clutch and its application, Construction and working of Single plate clutch, Introduction to Multi-plate clutch, Centrifugal Clutch, <i>Cone clutch and Diaphragm clutch</i>. (Simple numerical on single plate clutch). • Bearings– i) Simple Pivot, ii) Collar Bearing Torque & power lost in friction (no derivation). Simple numerical 	
7.	<p>Balancing & Vibrations</p> <ul style="list-style-type: none"> • Concept of balancing. Balancing of single rotating mass. State the causes and effect of unbalance. • Concept and terminology used in vibration, causes of vibration in machines, and their harmful effects and remedies. 	2
8.	<p>Gyroscope (Introduction only)</p> <ul style="list-style-type: none"> • Gyroscopic motion • Gyroscopic torque • Gyroscopic effects • Application of Gyroscope 	2
Total		42

RECOMMENDED BOOKS:

1. The Theory of Machines by Thomas Bevan, CBS Publishers & Distributors
2. Theory of Machine by Saha, Jadavani
3. Theory of Machine by P. L. Ballaney
4. Theory of Machine by R.S. Khurmi
5. Theory of Machine by Abdullah Shariff, Dhanpat Rai & Sons
6. Theory of Machines by SS Ratan
7. Theory of Machine by J E Shigley

Theory of Machine

Subject Code : MEC409

List of Practical:

1. To find the ratio of time of cutting stroke to the time of return stroke for quick return mechanism of a shaper machine.
2. Sketch & describe working of bicycle free wheel sprocket mechanism.
3. To find out the height of all types of Governors through Universal Governor Apparatus.
4. Determine the radius of rotation of fly ball for different speed of governor and draw a graph between radiuses of rotation versus speed.
5. Study of different types of CAM and follower through models.
6. Determination of power transmitted by any belt drive using any one dynamometer.
7. Dismantling and assembly of multi-plate clutch of two-wheeler.
8. Balancing of several masses rotating in a single plane by graphical method.
9. Study of gyroscopic model
10. Study of different types of gears, gear trains and drives through models.



Automobile Transmission System

Subject Code : AUT404

Total Contact Hours : 42

Chapter	Name of the Topic	Hours
01	<p>Vehicle layout & Clutches</p> <p>1.1 Vehicle lay out & its types— 2 Wheel Drive-Front Engine Front Wheel Drive, Rear Engine Rear Wheel Drive, Front Engine Rear Wheel Drive & 4 Wheel Drive.</p> <p>Major assemblies—their locations and functions.</p> <p>1.2 Principle and necessity of Clutch.</p> <p>1.3 Various types of clutches used in Automobiles—single plate, multi-plate clutches-dry & wet clutches, centrifugal clutch, and diaphragm clutch. Materials used for clutch lining.</p> <p>1.4 Hydraulic & mechanical clutch linkage, Cable operated clutch linkage.</p> <p>1.5 Fluid coupling-principle, construction and working</p>	8

	<p>Gear Boxes</p> <p>2.1 Principle and necessity of Gear Box.</p> <p>Types, construction and working of gear boxes & their lay outs such as sliding mesh, constant mesh, synchromesh type, vireo-drive, transfer case.</p> <p>2.2 Gear ratios with the help of power flow diagrams.</p> <p>2.3 Gear shift mechanism, modern shift control techniques- select shift manual & auto shift manual modes, adaptive transmission control, zero shift transmission technology</p> <p>2.4 Concepts of automatic gear box, AMT, Types-single & double sided clutch transmission dual clutch transmission, Continuously Variable Transmission.</p> <p>2.5 Torque Converter-principle, construction and working</p> <p>2.6 Overdrive, types- control overdrive & lay cock overdrive, Lubrication of gear box</p>	8
03	<p>Propeller shafts, Differential & Rear Axle</p> <p>3.1 Necessity and function of Propeller Shaft.</p> <p>3.2 Constant velocity Joints-Inboard & out board Joints-Tripod Joint. Universal joint and slip joint.</p> <p>3.3 Principle, Necessity and function of final drive and differential & transaxle.</p> <p>3.4 Working of differential and differential lock, Back lash in differential, Limited slip differentials and types</p> <p>3.5 Rear axle drives, Types- HOTCHKISS drive & Torque tube drive</p> <p>3.6 Types of rear axles such as semi-floating, three quarter floating and full floating type.</p> <p>3.7 Rear axle casing, types – split , banjo , integral carrier types.</p>	6

<p>04</p>	<p>Front Axle &Steering:</p> <p>4.1 Types of front axle- Dead axle, live axle, type of stub axle arrangements-Elliot, reverse Elliot, lamoine, reverse lamoine.</p> <p>4.2 Steering mechanisms- Introduction and its Types.</p> <p>4.3 Steering geometry–Caster, camber, king pin inclination, toe in– toe out, Correct Steering angle. Under steering and over steering, Turning radius & their effects.</p> <p>4.4 Steering Linkages, Construction, working & application of Steering gearbox –rack and pinion type, recirculating ball type, worm & roller type.</p> <p>4.5 Steering Ratio , Power assisted steering & its types (Hydraulic & electrical)</p> <p>4.6 Introduction to Four wheel steering.</p> <p>4.7 Steering adjustment.</p>	<p>6</p>
<p>05</p>	<p>Brakes:</p> <p>5.1 Function, necessity, Classification of brakes and braking systems.</p> <p>5.2 Principle, construction and working of-disc brakes, drum brake.</p> <p>5.3 Construction and working of the following--Mechanical braking, Hydraulic Braking, Air braking, Pneumatic cum Hydraulic operated braking, Vacuum cum Hydraulic operated braking system.</p> <p>5.4 Proper ties of brake fluid and their specifications</p> <p>5.5 Concept and working of anti lock braking system (ABS), bleeding of hydraulics brakes.</p> <p>5.6 Introduction of Parking brake system.</p> <p>5.7 Brake lining & Its type, Disk brake pad.</p>	<p>6</p>

06	<p>Suspension Systems:</p> <p>6.1 Introduction, Functions, Types of suspension systems-Rigid & independent suspension</p> <p>6.2 Types of Independent suspension system-Mc Pherson strut, wish bone type.</p> <p>6.3 Semi-elliptical Leaf spring, coil spring , torsion bar arrangement</p> <p>6.4 Telescopic shock absorber, Gas filled shock absorber, hydraulic shock absorber</p> <p>6.5 Air Suspension System.</p> <p>6.6 Anti roll bar, stabilizer bar.</p>	4
07	<p>Wheels and Tyres</p> <p>7.1 Introduction</p> <p>7.2 Types of wheels, wheel dimensions.</p> <p>7.3 Necessity and type soft reads.</p> <p>7.4 Tyre, Properties of tyres, Types of tyres, Carcass types- Cross ply, Radial ply, Belted ply, Comparison of radial & bias-ply tyres, nitrogen in tyres, Tyre materials, Self inflating Tyres.</p>	4
Total		42

Learning Resources: Books:

Sr. No.	Author	Title	Publisher
01	KirpalSingh	Automobile EngineeringVol.I	Standard Publication
02	Anthony Schwaller	Motor auto motivatechnology	Delmar Publisher Inc.
03	Tim Gills	Auto motive service	Delmar Publisher Inc.
04	Anil Chikkara	Automobile EngineeringVol.II	Satya PrakashanNewDelhi
05	Crouse/Anglin.	Auto mobile Mechanics	TATA McGraw-HILL
06	HarbansSinghRoyat	The Automobile	S.ChandPublication
07	R.B.Gupta	Automobile Engineering	Satya PrakashanNewDelhi
08	S.Srinivisan	Automotive Mechanics	TATA Mc Graw-HILL
09	HMSETHI	Automotive Technology	TATA Mc Graw-HILL

Auto Transmission System Lab

Subject Code : AUT407

Practical:

Intellectual skill:

1. Identify concepts applied.
2. Identify parts like clutch, gear box, universal joints, propeller shaft, final drive front axle, steering, brakes, and suspension system.
3. Classify the system according to their application.
4. Detect fault by observation.

Motor skill:

1. Sketch the different devices.
2. Handle tools, equipment, and instrument.
3. Observe the behaviours of various systems under various parameters.

List of Practical/Assignments:

1. Dismantling & assembling of a single plate dry clutch assembly and sketch exploded view.
2. Dismantling & assembling of a multi-plate clutch used in two wheelers, observe the operating linkages and sketch the system.
3. Dismantling & assembling of any two types of gear boxes observe gear shifting, gear ratio and sketch the system & compare them. Open & observe CVT.
4. Open & observe universal joints such as Hooks universal joint. Draw neat sketch of the same and describe it.
5. Dismantling & assembling the differential, sketch the unit with bearing locations.
6. Dismantling & assembling of any one type of rear axle. Draw neat sketch of the same and describe it.
7. Dismantling & assembling of the steering gear box, observe the component and steering linkages and sketch.
8. Dismantling & assembling of leaf spring and sketch.
9. Dismantle and assemble telescopic shock absorber, observe and sketch its components.
10. Observe and draw the layout of air suspension system.
11. Observe and draw layout of hydraulic braking system. Open master cylinder, wheel cylinder, and brake drum. Observe and sketch the components.
12. Observe and draw the layout of hydraulically operated air assisted braking system.

Professional Practices-II

Subject Code:401

Rationale:

Most of the diploma holders join industries. Due to globalization and competition in the industrial and service sectors the selection for the job is based on campus interviews or competitive tests. While selecting candidates a normal practice adopted is to see general confidence, ability to communicate and their attitude, in addition to basic technological concepts. The purpose of introducing professional practices is to provide opportunity to students to undergo activities which will enable them to develop confidence. Industrial visits, expert lectures, seminars on technical topics and group discussion are planned in a semester so that there will be increased participation of students in learning process.

Objectives:

Student will be able to:

1. Acquire information from different sources
2. Prepare notes for given topic
3. Present given topic in a seminar
4. Interact with peers to share thoughts
5. Prepare a report on industrial visit, expert lecture

Sl. No.	Activity Heads	Activities	Suggested Hrs
1.	Acquire information from different sources	Topic related to the branch and current area of interest i.e. articles in internet on which research or review is undergoing may be decided for the students group. The group may be restricted to maximum 5 students. Literature survey from Internet, print media and nearby practices may be undertaken. Minimum of 10 to 15 papers may be suggested for reading to get an overview and idea of matters.	12
2.	Prepare notes for given topic	Making review or concept to be penned down in form of an article. (the article or review may be of 8 – 10 pages length in digital form of 12 font size in Times	4

		New Roman font)	
3.	Present given topic in a seminar	A seminar or conference or work shop on branch related topic is to be decided and all students in group of 5-6 students may be asked to present their views.	4
4.	Interact with peers to share thoughts	A power point presentation of the article prepared in stage 2 may be presented before the classmates and faculty members.	4
5.	Prepare a report on industrial visit, expert lecture	A topic on best practices and product / software development may be assigned to the student group. The group may be asked to prepare a survey, come to opinion making and list out the activities to develop the activities with SWOT analysis.	12

