

**STATE COUNCIL OF TECHNICAL EDUCATION AND VOCATIONAL TRAINING, ODISHA
TEACHING AND EVALUATION SCHEME FOR DIPLOMA IN ENGINEERING COURSES**

DISCIPLINE: AUTOMOBILE ENGINEERING						SEMESTER: 4TH						
SL NO	SUBJECT CODE	SUBJECT	PERIODS			EVALUATION SCHEME						
			L	T	P	SESSIONAL EXAM			END SEM EXAM	TERM WORK	PRACTICAL EXAM	TOTAL MARKS
						TA	CT	Total				
THEORY												
1.	AET 401	MECHATRONICS	4	1		10	20	30	70			100
2.	AET 402	HYDRAULICS & PNEUMATIC CONTROL	4	1		10	20	30	70			100
3.	AET 403	MACHINE DYNAMICS	4	1		10	20	30	70			100
4.	AET 404	MANUFACTURING TECHNOLOGY-II	4	1		10	20	30	70			100
5.	AET 405	HEAT POWER ENGINEERING	4	1		10	20	30	70			100
PRACTICAL/TERM WORK												
5.	AEP 401	AUTO SERVICING & MAINTENANCE LAB-I			6					50	50	100
6.	AEP 402	AUTO MACHINE SHOP-I			6					50	50	100
7.	AEP 403	TECHNICAL SEMINAR			2					25	25	50
GRAND TOTAL			20	5	14	50	100	150	350	125	125	750

Total Contact hours per week: 39

Abbreviations: L-Lecture, T-Tutorial, P-Practical, TA- Teacher's Assessment, CT- Class test

Minimum Pass Mark in each Theory Subject is 35% and in Practical subject is 50%

MECHATRONICS

Name of the Course: Diploma in AUTOMOBILE ENGINEERING			
Course code:	AET 401	Semester	4 TH
Total Period:	75	Examination	3 hrs
Theory periods:	4 P/W	Class Test:	20
Tutorial:	1 P/W	Teacher's Assessment:	10
Maximum marks:	100	End Semester Examination:	70

AIM:

“Mechatronics” Deals with the mechanical engineering electronics control and basic system model in the design of products and manufacturing processes. Therefore, it is an important basic subject of the students for mechanical and automobile engineering. \

OBJECTIVES:

On completion of the subject students will be able to

1. Define different types of System and Sensors and solve the simple problems.
2. Explain the concept of Mechanical actuation, Electrical actuation and Pneumatic & Hydraulics and solve the simple problems.
3. Find out the various types of System Models & Input/ Output parts and solve the problems.
4. Describe the programmable Logic Controller and develop programme in PLC.
5. Explain the use of Mechatronics in Automated Manufacturing and solve the simple problems.

Topic wise distribution of periods

Sl. No	Topic	Periods
1	Introduction Sensors	12
2	Actuation, System (Mechanical, Electrical Pneumatic & Hydraulics)	12
3	Basics System Models, Input Output System	12
4	Programmable Logic Controller	12
5	Design Application in Mechatronics	12
		60

Course Contents:

- 1.0 Introduction, Sensors (12 Periods)
 - 1.1 System
 - 1.1.1 Mechatronics System
 - 1.1.2 Control System and Measurement system
 - 1.1.3 Microprocessor based controllers
 - 1.2 Sensor
 - 1.2.1 Position & Proximity Sensors
 - 1.2.2 Velocity & Motion Sensor
 - 1.2.3 Force Sensor
 - 1.2.4 Fluid pressure Sensor
 - 1.2.5 Flow Sensor
 - 1.2.6 Liquid Level Sensor
 - 1.2.7 Temperature Sensor
 - 1.2.8 Light Sensor
 - 1.3 Selecting System
- 2.0 Actuation System (12 Periods)
 - 2.1 Mechanical Actuation
 - 2.1.1 Types of motions
 - 2.1.2 Freedom & Constraints
 - 2.1.3 Loading
 - 2.1.4 Mechanical aspects of motor selection

- 2.2 Electrical Actuation
 - 2.2.1 Switches and relay
 - 2.2.2 Solenoid
 - 2.2.3 D.C Motors
 - 2.2.4 A.C Motors
 - 2.2.5 Stepper Motors
 - 2.2.6 Specification and control of stepper motors
 - 2.2.7 Servo Motors D.C & A.C
- 2.3 Pneumatic & Hydraulic
 - 2.3.1 Power Supplies
 - DCV
 - PCV
 - Cylinders
 - Rotary Actuators
- 3.0 Basics System Model (12 Periods)
- 3.1 Mathematical Model
 - 3.1.1 Introduction
 - 3.1.2 Mechanical System building block
 - 3.1.3 Electrical System building block
 - 3.1.4 Thermal System building block
- 3.2 System Model
 - 3.2.1 Engineering system
 - 3.2.2 Rotational Translational System
 - 3.2.3 Electro Mechanical System
 - 3.2.4 Hydro Mechanical System
- 3.3 Interfacing
 - 3.3.1 Input output parts
 - 3.3.2 Interface requirements Buffer Hand Shaking, Plotting and interrupts Serial interfacing
 - 3.3.3 Introduction to PIA
- 4.0 Programmable Logic Controller (PLC) (12 Periods)
- 4.1 Definitions
- 4.2 Basic Block Diagram and Structure of PLC
- 4.3 Input Output Processing
- 4.4 Programming in PLC
 - 4.4.1 Ladder diagram
 - 4.4.2 PLC Mnemonics- Timer, Internal relay and counters
 - 4.4.3 Shift register
 - 4.4.4 Master and jump controls
 - 4.4.5 Data Handling
- 5.0 Design Application of Mechatronic system (12 Periods)
- 5.1 Design Process Stages
 - 5.1.1 Traditional Vs Mechatronics design
 - 5.1.2 Possible design solution
 - 5.1.3 Case studies
 - A pick and place robot, Automatic camera, Automatic Washing Machine
- 5.2 Sensors for Condition Monitoring System of Production System
 - 5.2.1 Example vibration Monitoring, Temp Monitoring
- 5.3 Mechatronics in Automated Manufacturing
 - i. Monitoring of Manufacturing Process
 - ii. On line quality Monitoring

Learning Resources:[Text Books]

Sl.No	Name of Authors	Title of the Book	Name of the publisher
1.	W.Bolton	Mechatronics	
2.	R.K. Rajput	Text book of Mechatronics	
3.	Appuu Kuttan k.k	Introduction to Mechatronic	Oxford University Press

HYDRAULICS & PNEUMATIC CONTROL

Name of the Course: Diploma in AUTOMOBILE ENGINEERING			
Course code:	AET 402	Semester	4 TH
Total Period:	75	Examination	3 hrs
Theory periods:	4 P/W	Class Test:	20
Tutorial:	1 P/W	Teacher's Assessment:	10
Maximum marks:	100	End Semester Examination:	70

AIM:

To provide basic understanding of maintaining hydraulic and Pneumatic process. To provide basic for the students to gain skills a range of hydraulic & pneumatic processes in a maintenance environment.

OBJECTIVE:

Student will be able to:

1. Understand the basic properties of fluid, important principles of hydraulics with their applications and hydraulic devices used in practice.
2. Identify fluid power system components
3. Select appropriate tools to dismantle & assemble the components.
4. Diagnose probable causes of failure of component of hydraulic & pneumatic circuit.
5. Verify the conditions of fittings, OTC, pipes, seals & packing of hydraulic systems in automobile vehicles.
6. Construct the hydraulic & pneumatic circuits for various applications.

Topic wise distribution of periods

Sl. No	Topic	Periods
1	Fluid Mechanics	8
2	Hydro dynamics	10
3	Hydraulic devices	14
4	Basic Components of Hydraulic & Pneumatic System	10
5	Accessories of hydraulic & Pneumatic Circuit	8
6	Hydro Pneumatic System & Circuits	10

COURSE CONTENTS:

1. Fluid Mechanics

- 1.1 Over view of fluid properties.
Ideal fluid, Real fluid, Specific Weight, Specific gravity, Surface tension, Capillarity, Viscosity
Definitions & applications only.
Specification & standards of hydraulic fluids.
- 1.2 Measurement of pressure
Concept of atmospheric pressure, gauge pressure, absolute pressure, pressure gauges-
Piczometer tube, simple & differential monometer, Micro- Mano Meter (Theoretical Treatment only, No analytical treatment/ problems on manometers) Bourdon tube pressure gauge.

2. Hydro dynamics.

- 2.1 Law of continuity
Law of Continuity & its application.
- 2.2 Bernoulli's Theorem.
Energy possessed by the liquid in motion, Bernoulli's theorem and its applications such as venturimeter, orifice meter & pitot tube (Analytical treatment with derivation for measurement of discharge is expected)
- 2.3 Hydraulic Coefficients.
Concept of vena contract.
Coefficient of contraction, coefficient of velocity, coefficient of discharge, coefficient

- of resistance, relation between the hydraulic coefficients.
- 2.4 Types of fluid flow.
Steady, unsteady, rotational, irrotational, laminar, turbulent, one, two & three dimensional flow, uniform & non uniform flow.
- 3. Hydraulic Devices.**
- 3.1 Simple Hydraulic devices.
Working principles, construction and applications of hydraulic jack, hydraulic Ram, hydraulic lift, hydraulic press.
- 3.2 Centrifugal Pumps.
Types, construction & working of centrifugal pump. Types of casing. Need of priming, Heads, Losses & efficiencies of centrifugal pump (NO analytical treatment). Net positive suction head, fault finding & remedies, pump selection.
- 3.3 Reciprocating Pumps.
Constriction and working of single & double acting reciprocating pump, positive & negative slip.
Air vessels- their function & advantages.
Power & efficiencies of reciprocating pump (No analytical treatment) reasons of cavitation & separation.
- 3.4 Other pumping devices
Gear pumps used in hydraulic circuits, vane type screw pump, Gear pumps, comparison of above pumps for various characteristics.
- 3.5 Air Compressors.
Reciprocating compressor, Rotary compressors used in pneumatic circuits.
- 4. Basic components of Hydraulic & Pneumatic systems.**
- 4.1 Hydraulic & Pneumatic symbols.
- 4.2 Air motors- Type, construction & working.
- 4.3 Hydraulic motors- Type, construction & working.
- 4.4 Valves: Classification of valves, poppet, ball, needle, throttle, pressure control, directional control, sequencing, synchronizing, rotary spool, sliding spool two position, multi position. Non return valves. Construction & operation of above valves.
- 5. Accessories of hydraulic & pneumatic circuit.**
- 5.1 Filters: Type, functions, construction.
- 5.2 Hoses & connectors: Type, construction and applications.
- 5.3 Seals and gaskets: Types, function, construction.
- 6. Hydro Pneumatic Systems & Circuits**
- 6.1 Comparison of Hydraulic and Pneumatic circuits.
- 6.2 Hydraulic Circuits:
Meter in, Meter out, Bleed off, Sequencing, Applications of hydraulic circuits:
Hydraulic Power Steering- Reaction Piston type, Mobile hydraulic system and Earthmovers.
- 6.3 Simple Pneumatic Circuits.
Speed Control Circuits, Sequencing circuits, Application of Pneumatic Circuits. Air Brake, Low Cost Automation in Industries, Pneumatic power tools.

Learning Resources: [Text Books]

Sl No	Name of Authors	Title of Book	Name of the Publisher
1.	S.R. Mujumdar	Oil Hydraulic System- Principle and Maintenance	Tata McGraw Hill Co.
2.	S.R. Mujumdar	Pneumatics System- Principle and Maintenance	Tata McGraw Hill Co.

MACHINE DYNAMICS

Name of the Course: Diploma in AUTOMOBILE ENGINEERING			
Course code:	AET 403	Semester	4 TH
Total Period:	75	Examination	3 hrs
Theory periods:	4 P/W	Class Test:	20
Tutorial:	1 P/W	Teacher's Assessment:	10
Maximum marks:	100	End Semester Examination:	70

AIM:

Mechanical and Automobile engineering is involved with design, manufacture and use of various types of machines. Each machine consists of a large number of static and moving parts of sub-assemblies called mechanisms. There exist a large number of different types of mechanism. Each of these mechanism can generate a particular type of output motion with some other kind of input motion. Theory of machines is study of such different kind of mechanisms. It is therefore, necessary of study and understands functions of different type of mechanisms for design, manufacture and use of various machines.

OBJECTIVES:

1. Understand link, kinematic pair, kinematic chain, various mechanism and velocity, acceleration diagram for simple link mechanism.
2. Understand friction on horizontal and inclined planes and explain friction between nut and screw for square and v threads, principle of thrust bearings and antifriction bearings.
3. Explain the concept of power transmission with mode of drives.
4. Describe the working principle of governors and the wheels.
5. Understand the concept of balancing of machine parts.
6. Explain concept of vibrations different modes.

Topic wise distribution of periods

Sl. No	Topic	Periods
1	Simple Mechanism	08
2	Function	12
3	Power Transmission	12
4	Governors and fly wheels	10
5	Balancing of Machine parts	10
6	Vibration of machine parts	8
	TOTAL	60

COURSE CONTENTS:

1. Simple Mechanisms (8 periods)
 - 1.1 Understand the subject of theory of machine.
 - 1.2 Define
 - 1.2.1 Link
 - 1.2.2 Kinematic pair
 - 1.2.3 Kinematic chain
 - 1.2.3 Mechanism
 - 1.2.4 Inversion
 - 1.3 Explain
 - 1.3.1 Lower pair
 - 1.3.2 Higher pair
 - 1.3.3 Four bar linkage mechanism with their inversions.
 - 1.3.4 Explain the concept of velocity and acceleration diagram for simple linkage mechanism of crank and connecting rod mechanism.
 - 1.3.5 Cams and Followers.
2. Static Friction (12 periods)
 - 2.1 Laws of dry friction

- 2.2 Explain
 - 2.2.1 Friction on horizontal plane
 - 2.2.2 Friction on inclined plane.
 - 2.2.3 Angle of repose.
 - 2.2.4 Friction between nut and screw for square and v threads.
- 2.3 Explain principle of single and multiple collar hearings.
 - 2.3.1 Derive the formula for torque transmission and power for.
 - 2.3.1.1 Flat pivot bearing.
 - 2.3.1.2 Conical pivot bearing.
 - 2.3.1.3 Flat collar bearing of single and multiple types.
- 2.4 Explain the friction in.
 - 2.4.1 Screw jack
 - 2.4.2 Plate clutches
- 2.5 Derive the formula for torque and power transmission in single and multiple clutches.
- 2.6 Solve numerical problems on above.
- 2.7 Explain the concept of rolling friction.
- 2.8 Describe
 - 2.8.1 Roller bearings.
 - 2.8.2 Needle roller bearings.
 - 2.8.3 Ball bearings.
- 2.9 classify the bearings
- 2.10 State function of bearings.
- 2.11 Explain the working of
 - 2.11.1 Simple frictional brakes.
 - 2.11.2 Absorption type of dynamometers.
- 3. Power Transmission (12 periods)**
- 3.1 Explain the concept of
 - 3.1.1 Power transmission
 - 3.1.2 Type of drives
 - 3.1.2.1 Belt drive
 - 3.1.2.2 Gear drive
- 3.2 Derive the formula for
 - 3.2.1 Velocity ratio
 - 3.2.2 Length of belt of
 - 3.2.2.1 Open belt drive
 - 3.2.2.2 Cross belt drive
 - 3.2.3 Ratio of tensions
 - 3.2.4 Centrifugal tensions.
 - 3.2.5 Initial tensions.
 - 3.2.6 Power transmitted by belt.
 - 3.2.7 Width of belt required.
- 3.3 Explain the use of .
 - 3.3.1 Idle pulleys.
 - 3.3.2 Jockey pulley.
 - 3.3.3 V Belts and V belts pulleys.
 - 3.3.4 fast and loose pulleys.
- 3.4 Explain the concept of crowning of pulleys.
- 3.5 Gear Drives.
- 3.6 Classify Gears.
- 3.7 Define velocity ratio for
 - 3.7.1 Simple gear train
 - 3.7.2 Compound gear train
 - 3.7.3 Epicyclic gear train
- 3.8 Solve numerical problems on
 - 3.8.1 Circular pitch
 - 3.8.2 Diametral pitch
 - 3.8.3 Module
- 3.9 Explain the working principle of

- 3.9.1 Simple gear train
- 3.9.2 Compound gear train
- 3.9.3 Reverted gear train
- 3.9.4 Epicycle gear train
- 4. Governors and Fly wheels (10 periods)**
- 4.1 State the function of governors
- 4.2 Classify governors
- 4.3 Describe working of (no mathematical treatment)
 - 4.3.1 Watt governor.
 - 4.3.2 Porter governor.
 - 4.3.3 Proell governor.
 - 4.4.4 Hartnell governor.
- 4.4 Define
 - 4.4.1 Sensitivity
 - 4.4.2 Stability
 - 4.4.3 Isochronism.
- 4.5 Explain function of a flywheel
- 4.6 Define and write the formula.
 - 4.6.1 Fluctuation of energy
 - 4.6.2 Coefficient of fluctuation of speed
 - 4.6.3 Find out required weight of flywheel
- 5. Balancing of machine parts (10 periods)**
- 5.1 Explain the concept of balancing.
- 5.2 Explain static balancing of rotating parts.
- 5.3 Explain the principle of balancing of reciprocating masses.
- 5.4 State the causes and effect of unbalance.
- 5.5 Differentiate between static and dynamic balancing.
- 6. Vibration in machine parts. (8 periods)**
- 6.1 Introduction to Vibration
- 6.2 Classify vibration
- 6.3 Explain the basic concept of
 - 6.3.1 Natural Vibration
 - 6.3.2 Forced Vibration
 - 6.3.3 Damped Vibration
 - 6.3.4 Longitudinal Vibration
 - 6.3.5 torsional Vibration
- 6.4 Define terms related to vibration
 - 6.4.1 Cycle
 - 6.4.2 Amplitude
 - 6.4.3 Time period
- 6.5 State the causes of vibration.
- 6.6 State the points for remedies of vibration

Learning Resources:

Recommended Books

1. The Theory machines by Thomas Bevan, CBS publishers & Distributors.
2. Theory of machine by Saha&Jadavani
3. Theory of machine by R. S. Khurmi
4. Theory of machine by Abdulla Shariff, DhanpatRai& Sons.
5. Theory Of Machine by JhonUicker, Oxford University Press.

MANUFACTURING TECHNOLOGY-II

Name of the Course: Diploma in AUTOMOBILE ENGINEERING			
Course code:	AET 404	Semester	4 TH
Total Period:	75	Examination	3 hrs
Theory periods:	4 P/W	Class Test:	20
Tutorial:	1 P/W	Teacher's Assessment:	10
Maximum marks:	100	End Semester Examination:	70

AIM:

Engineering basically means production of goods and services for human consumption. The major function of mechanical engineering is to manufacture various products using machineries. Production processes and production management techniques. Therefore this is one of the most important subjects to be learned by a mechanical and automobile engineer.

OBJECTIVES:

On completion of the course the student will be able to

1. Describe the different parts and functions of a lathe machine and state the specification of different lathe machines.
2. Describe the parts and functions involved in shaping operation.
3. Describe the parts and functions including table drive of planner.
4. Describe different types of milling machine with attachment and explain various types of indexing method.
5. Acquire knowledge on parts, functions and tools of a slotter.
6. Acquire knowledge of manufacturing, selection and specification of grinding wheels as well as various types of grinding machines.
7. Describe the parts and function of drilling machine.
8. Acquire knowledge on super finishing process.

Topic wise distribution of periods

Sl. No	Topic	Periods
1	Lathe Machine	16
2	Shaper	05
3	Planning M/C	05
4	Milling M/C	12
5	Slotter	05
6	Grinding M/C	08
7	Drilling M/C	05
8	Surface finish, Lapping	04
	TOTAL	60

COURSE CONTENTS: (In terms of specific objectives):

1. Lathe machines (16 periods)

- 1.1 Engine Lathe.
 - 1.1.1 Define Lathe and name different types of lathe
 - 1.1.2 Identify the different components of lathe and their functions.
 - 1.1.3 Enlist the different operations on lathe
 - 1.1.4 State and explain the plain turning, grooving, step turning, thread cutting, taper turning, parting off.
 - 1.1.5 State the safety precautions needed.
- 1.2 Capstan lathe
 - 1.2.1 Explain the function of different components.

- 1.2.2 Define multiple tool holder.
- 1.3 Turret lathe.
 - 1.3.1 Explain the functions of different components.
- 1.4 Differentiate between capstan and turret lathe.
- 1.5 Explain the indexing arrangement for turret head.
- 1.6 Draw the tooling layout for preparation for a hexagonal bolt and bush.
- 1.7 Compare the advantages of different types of lathe.
- 1.8 Explain with neat sketch the bar feeding mechanism.
- 2. Shaper (5 periods)**
 - 2.1 List out the name of different parts.
 - 2.2 Describe the functions of above parts.
 - 2.3 Explain the automatic table feed mechanism.
 - 2.4 Explain the construction and working of tool head.
 - 2.5 Explain the quick return mechanism through sketch.
 - 2.6 State the specification of a shaping machine.
- 3. Planing Machine (5 periods)**
 - 3.1 Explain the function of parts.
 - 3.2 Explain the function of parts.
 - 3.3 Explain the table drives mechanism.
 - 3.4 Explain the working of tool and tool support.
 - 3.5 Explain the clamping of work through sketch.
- 4. Milling Machine (12 periods)**
 - 4.1 Describe various types of milling machines and operations performed by them.
 - 4.2 Explain work holding attachment.
 - 4.3 Describe construction & working principle of simple dividing head, universal dividing head.
 - 4.4 Explain the procedure of simple indexing.
 - 4.5 Explain the procedure of compound indexing.
 - 4.6 Describe the different numerical indexing procedure.
 - 4.7 show one example from each indexing method.
- 5. Slotter (5 periods)**
 - 5.1 List the different parts of slotting machine.
 - 5.2 Explain the construction & working.
 - 5.3 Specify various tools.
- 6. Grinding (8 periods)**
 - 6.1 Define grinding.
 - 6.2 Explain the basic parameters of grinding wheel-abrasive material, grain size, bonding material, wheel grade, wheel structure.
 - 6.2 Explain manufacturing of grinding wheels.
 - 6.3 State criteria for selection of grinding wheels.
 - 6.4 Explain specification of grinding wheels with example.
 - 6.5 Explain working of
 - 6.5.1 Cylindrical grinder.
 - 6.5.2 Surface Grinder.
 - 6.5.3 Centre less Grinder.
- 7. Drilling**
 - 7.1 State classification of drilling machine
 - 7.2 Explain the working of
 - 7.2.1 Bench drilling machine
 - 7.2.2 Pillar drilling
 - 7.2.3 Radial drilling machine
- 8. Surface finish, Lapping**
 - 8.1 Define surface finish

- 8.2 Define super finishing
- 8.3 Describe lapping and explain their specific cutting

Learning Resources:

Sl No	Author	Title	Publisher
1.	HazraChoudhary	Work Shop Technology, Vol-I	
2.	HazraChoudhary	Work Shop Technology, Vol-II	
3.	W. A. S Chapman	Work Shop Technology Part-I & II	

HEAT POWER ENGINEERING

Name of the Course: Diploma in AUTOMOBILE ENGINEERING			
Course code:	AET 405	Semester	4 TH
Total Period:	75	Examination	3 hrs
Theory periods:	4 P/W	Class Test:	20
Tutorial:	1 P/W	Teacher's Assessment:	10
Maximum marks:	100	End Semester Examination:	70

AIM: To understand the principles, construction and working of various power producing & power absorbing devices like boilers, turbines, compressors, pump etc. To understand the concept of energy, work, heat and conversion. To study of various sources of energy, basic laws and concept of thermodynamic gas laws, properties of steam & generation. Heat transfer forms the basis for different power engineering application. Boilers find application in different process industries steam turbines and condensers are the major component of any steam power plant.

OBJECTIVE

Students will be able to

- Learn to correlate the theoretical knowledge with practical aspects of systems of work producing and work absorbing devices like boilers, condenser, steam turbines, air compressors, gas turbine etc.
- Understand the various sources of energy and ways to harness it.
- Understand the chemistry of combustion of fuels, estimation of calorific value, mass of air required for complete combustion of fuels.
- Understand the basic concepts of heat transfer and its application in various appliances.
- Identify/ observe/ locate/ operate various parts of instruments/ equipments carefully and follow test procedures.
- Observe the behaviors of devices with the change in parameters and make changes if necessary.

Topic wise distribution of periods

Sl. No	Topic	Periods
1	Fundamental concepts of Thermodynamics and various thermodynamic process	12
2	Properties of steam and steam power	12
3	Air compressor	10
4	Gas Turbines	6
5	Sources of Energy and Power Plants	10
6	Heat Transfer	10
	TOTAL	60

COURSE CONTENTS: (In terms of specific objectives):

- Fundamental concepts of thermodynamics and various thermodynamic processes:
 - Basic concepts of-
 - System
 - Surrounding
 - Universe
 - Open system
 - Closed system
 - Isolated system
 - Steady flow energy equation
 - Internal energy
 - Enthalpy
 - Entropy.
 - Zeroth, first and second law of thermodynamics, general gas equation characteristics of gas constant, mol of gas, Universal gas constant, specific heats of ideal gases.
 - Thermodynamic Processes of ideal gases Isobaric, Isochoric, Isothermal, Adiabatic and polytropic with representation on P-V and T-S diagram work done, change in internal energy, change in enthalpy and relation between P, V & T. (Derivations only for adiabatic process).
 - Air Cycles: P-V and T-S diagram and equations for air standard efficiency of otto,, Diesel and dual combustion cycle.
- Properties of steam and steam power:
 - formation of steam, various phases like wet steam, dry saturated steam, super heated steam.
 - Dryness fraction, degree of superheat, Sensible heat, Latent heat, Calculation of

- enthalpy of wet, Dry saturated and Super heated steam using steam table.
- 2.3 Study of boilers like three pass packaged type boiler, water tube and fire tube boiler, mountings- Borden Pressure gauge, safety valves, water level indicator and fusible plug.
Accessories- Economiser, Super heater and Air Pre-heater.
 - 2.4 Steam condenser: Principle, Function, Location in steam Power plant. Surface condenser & its application.
 - 2.5 Steam Turbines.
Classification of Turbines, Construction and working of impulse and reaction turbine.
3. Air Compressor:
 - 3.1 Various uses of compressed air and classification of compressors.
 - 3.2 Construction and working of single stage and two stage reciprocating air compressors with P. V diagram. Necessity of multi staging and inter cooling.
 - 3.3 Construction and working of rotary compressors
 - i) Centrifugal compressor.
 - ii) Axial flow compressor.
 - iii) Piston displacement
 - iv) I.P, B.P, volumetric efficiency, overall efficiency.
 4. Gas Turbines
 - 4.1 Brayton Cycle- P.V diagram and thermal efficiency.
 - 4.2 Classification of gas turbines.
 - 4.3 Construction and working of gas turbines
 - i) Open cycle
 - ii) Closed Cycle gas turbines, P.V and T.S diagrams.
 - 4.4 Turbojet & turboprop engine.
 5. Source of Energy & Power Plants.
 - 5.1 Classification of various conventional and non-conventional sources of energy.
 - 5.2 Construction and working of power plants based on conventional energy sources.
 - i) Thermal Power Plant
 - ii) Diesel Power Plant
 - iii) Gas Turbine Power Plant
 - 5.3 Parameters of site selection.
 - 5.4 Study the working and construction of non-conventional energy sources
 - i) Solar
 - ii) Bio-diesel
 6. Heat Transfer:
 - 6.1 Mode of heat transfer- Conduction, Convection & radiation.
 - 6.2 Conduction- Fourier's law, thermal conductivity, conduction through cylinders, thermal resistance, composite walls, combined conduction and convection.
 - 6.3 Thermal radiation, absorptive,transmissivity, reflectivity, emissivity, black & gray bodies, Stefan- Boltzman Law, Heat transfer by radiation.
 - 6.4 Heat transfer in condenser and radiator.

Learning Resources:

Sl No	Author	Title	Publisher
	R.S.Khurmi/ J. K. Gupta	A Text book of Thermal Engineering	S. Chand & Co. Ltd.
	A. S. Ro	Thermal Engineering	SatyaPrakashan
	B. K. Sarkar	Thermal Engineering	Tata McGraw Hall

AUTO SERVICING & MAINTENANCE LAB-I

Name of the Course: Diploma in AUTOMOBILE ENGINEERING			
Course code:	AEP 401	Semester	4 th
Total Period:	90	Examination	4 hrs
Lab. periods:	6 P/W	Term Work	50
Maximum marks:	100	End Semester Examination:	50

AIM:

Automobile students should have practical knowledge skill about servicing and maintenance work of various automobiles parts. This will positively help them in practical field to work.

OBJECTIVES:

After completion the course students will be able to do servicing and maintenance of various systems and components of a four wheeler.

Sr No	Content	No of period
1	Identifying various units of transmission system of vehicles.	03
2	Operating various Workshop equipment such as Air Compressor, Hydraulic Hoist, Mechanical Hydraulic Jack, Mechanical Press, Hydraulic Press etc.	03
3	Servicing of different types of clutch riveting, clutch facing and Assembling clutch pedal adjustment.	06
4	Servicing of different types of gear box such as sliding mesh constant mesh & sliding joint.	06
5	Servicing of differential and rear axle assemblies	03
6	Study of power transmission of different types of two wheelers.	06
7	Servicing of front axle assemblies.	03
8	Servicing of independent suspension system, stabilizer bar and shock absorber.	06
9	Servicing of steering mechanism and wheel alignment through computerized wheel alignment machine and balancing of wheel by wheel balancer.	06
10	Servicing of brake pedal, re-conditioning of brake shoe, testing of brake shoe, Return spring, brake pedal adjustment, servicing of hydraulic air (power) brake system and Bleeding of brakes.	06
11	Servicing & rotation of tyres, retarding of tyres cold patch and hot patch.	03
12	Study of Battery: Specific gravity test through cell tester & hydrometer charging of battery through battery charger.	06
13	Study of Generator: Cleaning of commutator, re-winding field & armature Replacing carbon brushes, adjustment of regular, cut-out relays.	06
14	Study of Self starter servicing of starter motor, replacement of brushes, Servicing of bendix drive.	06
15	Study of Ignition coil, condenser, rotor, spark advance/ retard mechanism, distributor, setting of C.B points, testing & cleaning of spark plug & Setting gap, Setting of ignition timing & firing of magnet ignition system.	06
16	Adjustment and repair of horns, wind screen wiper, indicator repairing, wiring for ignition & lighting, setting of head lights, Preparation of wiring diagram of different cars.	06
17	Pollution testing with the aid of exhaust gas analyzer, smoke tester.	06
18	Aligning head lamps of given vehicle.	03

AUTO MACHINE SHOP-I

Name of the Course: Diploma in AUTOMOBILE ENGINEERING			
Course code:	AEP 402	Semester	4 th
Total Period:	90	Examination	4 hrs
Lab. periods:	6 P/W	Term Work	50
Maximum marks:	100	End Semester Examination:	50

RATIONALE:

Automobile engineers should know the use of measuring tools for automobile parts, they should also know about intricate machining and finishing of automobile parts.

OBJECTIVES:

Student should be able to operate different machine tools required in an automobile machine shop and use relevant measuring instruments.

Sr No	Content	No of period
1	Checking flatness and squareness using a try square and filling the same if not leveled.	06
2	Sharpening of cutting tools like chisels, twist drill bit and punch through double ended grinder.	06
3	Drilling through hole by drilling machine both pillar and hand drill.	12
4	Internal threading of through hole/ blind holes using hand taps.	12
5	External threading using dies.	12
6	a) Study of micrometer, dial gauge, Vernier caliper, filler gauge, inside and outside Micrometer, Vernier height gauge etc.	06
	Measure	24
	<ul style="list-style-type: none"> i) Measuring hole and slots using telescopic gauges and inside micrometer ii) Measuring the size / depth and roundness of a object with a Vernier caliper iii) Measurement of crank pins, main journal of crank shaft. iv) Measurement of cylinder bore by inside micrometer v) Determination of ovality and taper by using dial gauge. vi) Measurement of fillet radius. 	
7	Operating various Workshop equipment such as: Drilling Machine, Grinding M/C, Valve refacing M/C, Cylinder Honing M/C, Twin head M/C, Horizontal Boring bar, Surface grinding M/C,. Crank shift and Can shift, Grinding M/C, Mechanical press, Hydraulic Press etc.	12

TECHNICAL SEMINAR

Name of the Course: Diploma in AUTOMOBILE ENGINEERING			
Course code:	AEP 403	Semester	4 th
Total Period:	30	Examination	4 hrs
Lab. periods:	2 P/W	Term Work	25
Maximum marks:	50	End Semester Examination:	25

OBJECTIVES:

To improve the professional skills of the diploma pass outs, areas are very important namely Comprehension of the subject and problem solving capability. These capabilities can be enhanced by conducting technical seminar where there is high interaction among teachers and students. By attending the seminar, students can develop the skill of presentation, organization of material to focus on a purpose, gathering and selection of materials

COMMUNICATION SKILLS

Regardless of the size of business you are in whether a large corporation, a small company, or even a home-based business effective communication skills are essential for success.

The inclusion of this subject help the students to understand how to communicate your message in the best possible way.

We start with a look at some of the key ideas behind successful communication, and offer a brief quiz that helps a students to evaluate how effectively a person could communicate, so that one can identify the areas that should focus on improvement. The articles that help the students to develop the skills that need to produce effective and inspiring spoken. Written and electronic communications to individuals and groups to be studied in the communication lab.