CURRICULLUM OF 6TH SEMESTER

For

DIPLOMA IN AUTOMOBILEENGINEERING

(Effective FROM 2020-21 Sessions)

STATE COUNCIL FOR TECHNICAL EDUCATION & VOCATIONAL TRAINING,

ODISHA, BHUBANESWAR

STATE COUNCIL FOR TECHNICAL EDUCATION AND VOCATIONAL TRAINING, ODISHA

TEACHING AND EVALUATION SCHEME FOR 6th Semester (Automobile Engg.) (wef2020-21)

Subject Number	Subject Code	Subject	Periods/week			Evaluation Scheme			
			L	T	P	Internal Assessment/ Sessional	End Sem Exams	Exams (Hours)	Total
		Theory							
Th.1		INDUSTRIAL ENGINEERING &MANAGEMENT	4		-	20	80	3	100
Th.2		AUTOMOTIVE SYSTEM & HEAVY EQUIPMENTS	4		-	20	80	3	100
Th.3		VEHICLE MAINTENANCE & MOTOR VEHICLE ACT	4		-	20	80	3	100
Th.4		ELECTIVE (any One)	4			20	80	3	100
		(a) CAD/CAM & AUTOMATION							
		(b)ELECTRIC &HYBRID VEHICLE AND EMISSION CONTROL							
		Total	16			80	320	-	400
		Practical							
Pr.1		DRIVING PRACTICE & VEHICLE MAINTENANCE	-	-	6	50	50	-	100
Pr.2		ELECTRIC VEHICLE LABORATORY	-	-	4	25	50	-	75
Pr.3		PROJECT WORK-II	-	-	8	50	100	-	150
Pr.4		LIFE SKILL	-	-	2	25	-	-	25
		STUDENT CENTERED ACTIVITIES (SCA)	-	-	3	-	-		
		Total	**-**	**-**	***23***	***150***	***200***	**-**	***350***
		Grand Total	**16**	**-**	**23**	**230**	**520**	**-**	**750**

Abbreviations: L-Lecturer, T-Tutorial, P-Practical. Each class is of minimum 55 minutes duration

Minimum Pass Mark in each Theory subject is 35% and in each Practical subject is 50% and in Aggregate is 40%

SCA shall comprise of Extension Lectures/ Personality Development/ Environmental issues /Quiz /Hobbies/ Field visits/ cultural activities/Library studies/Classes on MOOCS/SWAYAM /Idea Tinkering and Innovation Lab Practice etc**. ,Seminar and SCA shall be conducted in a section.**

There shall be 1 Internal Assessment done for each of the Theory Subject. Sessional Marks shall be total of the performance of individual different jobs/ experiments in a subject throughout the semester

TH1.INDUSTRIAL ENGINEERING &MANAGEMENT

NAME OF THE COURSE: DIPLOMA IN AUTOMOBILE ENGINEERING			
COURSE CODE:		SEMESTER	6TH
TOTAL PERIOD:	60	EXAMINATION	3 HRS
THEORY PERIODS:	4 P/W	INTERNAL ASSESSMENT	20
MAXIMUM MARKS:	100	END SEMESTER	80

A. RATIONALE:

Main objective of Automobile Engineering is to transport goods and services for benefits of mankind. Such operations are done utilizing various resources like Men, Materials, machines and Money. Industrial engineering and quality control is the subject which allows optimized use of such resources and hence very important for an automobile engineer.

B. COURSEOBJECTIVES:

After undergoing this course, the students will be able to:

1. Identify the place for a new plant set up and systematic arrangement of machinery and shop for smooth production.
2. Take right decisions to optimize resources utilizations by improving productivity of the lands, buildings, people, material, machines, money, methods and management effectively.
3. Understanding of stock management and maintenance to reduce plant ideal time.
4. To use the charts to record the quality of products.
5. To eliminate unproductive activities under the control of the management, supervisor, worker and the design of products and processes.

C. CHAPTER WISE DISTRIBUTION OF PERIORDS:

SL NO.	TOPIC	PERIODS
1	PLANT ENGINEERING	10
2	OPERATIONS RESEARCH	10
3	INVENTORY CONTROL	10
4	INSPECTION AND QUALITY CONTROL	15
5	PRODUCTION PLANNING AND CONTROL	15

D. COURSE CONTENT:

1. PLANT ENGINEERING

Selection of Site of Industry.
Define plant layout.
Describe the objective and principles of plant layout.
Explain Process Layout, Product Layout and Combination Layout.
Techniques to improve layout.
Principles of material handling equipment.
Plant maintenance.
Importance of plant maintenance.
Break down maintenance.
Preventive maintenance.

Scheduled maintenance.

2. OPERATIONS RESEARCH

Introduction to Operations Research and its applications.
Define Linear Programming Problem
Solution of L.P.P. by graphical method.
Evaluation of Project completion time by Critical Path Method and PERT (Simple problems)
Explain distinct features of PERT with respect to CPM.

3. INVENTORY CONTROL

Classification of inventory.
Objective of inventory control.
Describe the functions of inventories.
Benefits of inventory control.
Costs associated with inventory.
Terminology in inventory control**.**
Explain and Derive economic order quantity for Basic model. (Solve numerical)**.**
Define and Explain ABC analysis.

4. INSPECTION AND QUALITY CONTROL

Define Inspection and Quality control.
Describe planning of inspection.
Describe types of inspection.
Advantages and disadvantages of quality control.
Study of factors influencing the quality of manufacture.
Explain the Concept of statistical quality control, Control charts (X, R, P and C - charts).
Methods of attributes.
Concept of ISO 9001-2008.
Quality management system, Registration /certification procedure.
Benefits of ISO to the organization.
JIT, Six sigma,7S, Lean manufacturing
Solve related problems.

5. PRODUCTION PLANNING AND CONTROL

Introduction
Major functions of production planning and control
Methods of forecasting
Routing
Scheduling
Dispatching
Controlling
Types of production
Mass production
Batch production
Job order production
Principles of product and process planning.

Syllabus to be covered before IA: Chapter 1,2,3

LEARNING RESOURCES:			
SL. NO.	NAMEOFAUTHORS	TITLEOFTHE BOOK	NAMEOFTHEPUBLISHER
1	O.P.KHANNA	INDUSTRIAL ENGINEERING & MANAGEMENT	DHANPAT RAI & SONS
2	MARTAND TELSANG	INDUSTRIAL ENGG & PRODUCTION MANAGEMENT	S.CHAND
3	M.MAHAJAN	STATISTICAL QUALITY CONTROL	DHANPAT RAI &SONS

TH2. AUTOMOTIVE SYSTEM & HEAVY EQUIPMENTS

NAME OF THE COURSE: DIPLOMA IN AUTOMOBILE ENGINEERING			
COURSE CODE:		SEMESTER	6TH
TOTAL PERIOD:	60	EXAMINATION	3 HRS
THEORY PERIODS:	4 P/W	INTERNAL ASSESSMENT	20
MAXIMUM MARKS:	100	END SEMESTER	80

A. RATIONALE:

The modern automobile is made up of many components and parts. The parts under the body are referred to as chassis. Engine and several the systems are mounted on the chassis. The system through which wheels are connected to the frame is called suspension. Steering arrangement and brake system are for controlling a vehicle system.
These for an important part of automobile and hence should be learned by an automobile engineer.

B. COURSE OBJECTIVES:

On completion of the subject a student will be able to understand and explain.

1. Able to know about the function & assembly
2. Able to know about the Steering mechanism & steering geometry
3. Able to know about the suspension system
4. Able to know about working Principle, types & Functioning of brake
5. Able to know about the function of wheels ,Tyres & designation ,dimensions
6. Able to know about the chassis of vehicle and various heavy equipments

C. CHAPTER WISE DISTRIBUTION OF PERIORDS:

SL NO.	TOPIC	PERIODS
1	FRONTAXLE	05
2	STEERING&STEERINGGEOMETRY	08
3	SUSPENSIONSYSTEM	11
4	BRAKESYSTEM	20
5	WHEEL &TYRES	06
6	CHASSIS & HEAVY EQUIPMENTS	10

D. COURSE CONTENTS:

1. FRONT AXLE

Introduction & study of front axle assemblies
Front axle function, construction & Types of stub axle
Front wheel assembly

2. STEERING & STEERING GEOMETRY

Introduction of steering system, function of steering
Principle of correct steering & Components of steering system & Types of steering gear.
Steering geometry i.e. camber, caster, king-pin, Inclination, understeer, oversteer, combined angle
Toe-in Toe-out,wheel alignment & effects of incorrect wheel alignment, steering turning angle and turning radius.

3. SUSPENSION SYSTEM

Introduction & function & requirement of suspension system.

Types of suspension spring like leaf spring, coil spring, rubber torsion unit, Torsion bar.

Types of suspension system such as independent suspension system, rigid axle Suspension system, its advantages and disadvantages. Stabilizer bar & shock absorber.

4. BRAKE SYSTEM

Introduction, Principle of operation and requirements of brakes.

Types of brakes such as drum brakes and its leading & trailing shoes, disc brakes. Brake fade.

Hydraulic brakes and its components like master cylinder, tandem master cylinder, wheel cylinder, brake fluid and brake fluid grades. Advantages and disadvantages of hydraulic brakes.

Power brake types, working and construction of air brake & handbrake.

Adjustment and bleeding of brake.

Common brake problems.

Anti-lock braking system.

5. WHEEL & TYRES

Introduction

Basic construction of a tyre

Tyre dimension

Classification of tyre, advantages and disadvantages of radial ply tyres over cross ply tyre.

Tyre size designation

Different types of tyre damages

Wheel, and its type

Wheel dimensions

Wheel designation

6. CHASSIS & HEAVY EQUIPMENTS

Introduction and lay out of chassis showing its main components.

Types of chassis, frame and important chassis layouts.

Tractor and its construction, Classification, construction and description of dump truck, grader, road roller, dozer, loader, cranes, scraper.

Syllabus to be covered before IA: Chapter 1,2,3

LEARNING RESOURCES:			
SL. NO.	NAME OF AUTHORS	TITLE OF THE BOOK	NAME OF THE PUBLISHER
1	KIRPAL SINGH	AUTOMOBILE ENGINEERING VOL-1 & 2	STD PUBLISHERS
2	RB GUPTA	AUTOMOBILE ENGINEERING	SATYA PRAKASHAN PUBLISHERS
3	Er. S.K. GUPTA	AUTOMOBILE ENGINEERING	S.CHAND
4	W.H. COURSE	AUTOMOTIVE CHASSIS & BODY	MC GRAWHILL
5	S.C. SHARMA	CONSTRUCTION EQUIPMENT AND ITS MANAGEMENT	SHARMA KHANNA PUBLISHER

TH3. VEHICLE MAINTENANCE AND MOTORVEHICLE ACT

NAME OF THE COURSE: DIPLOMA IN AUTOMOBILE ENGINEERING			
COURSE CODE:		SEMESTER	6TH
TOTAL PERIOD:	60	EXAMINATION	3 HRS
THEORY PERIODS:	4 P/W	INTERNAL ASSESSMENT	20
MAXIMUM MARKS:	100	END SEMESTER	80

A. RATIONALE:

Promote efficient planning of transport activities, effective maintenance of vehicles, co-ordination of trips, and the use of correct vehicles for specific tasks, to limit transport costs to the minimum.

B. COURSE OBJECTIVES:

On completion of subject, students will be able to

1. Compare and understand types of maintenance systems.
2. Knowledge about various types of service station and layout of workshop.
3. Understand use of tools and equipments.
4. Execute services, repairs and overhauling processes of different systems of vehicle.
5. Knowledge about different motor vehicle acts.

C. CHAPTER WISE DISTRIBUTION OF PERIORDS:

SL NO.	TOPIC	PERIODS
1	VEHICLE MAINTENANCE	08
2	SERVICE STATION	10
3	TOOLS AND EQUIPMENTS	12
4	SERVICE, REPAIR AND OVERHAUL	18
5	MOTOR VECHILES ACT	12

D. COURSE CONTENTS:

1. VEHICLE MAINTENANCE

Introduction
Need of maintenance
Types of maintenance systems
Breakdown maintenance
Preventive maintenance
Predictive maintenance
Total productive maintenance

2. SERVICE STATION

Service station and types

Private service stations
Company's authorized service stations
Company's dealer service stations
Criteria for service station
Workshop layout
Important elements in workshop layout
Workshop documents and records
Job card and its importance

3. TOOLS AND EQUIPMENTS

Introduction
List of tools
List of equipments
Spanners or wrenches
Double ended open jaw spanner(fix spanner)
Double ended ring spanner
Combination spanner
Socket or box spanner
Screw driver
Types of screw and screw drivers
Torque wrenches
Pliers
Allen keys
Hammers
Chisels
Files
Hacksaws
Wire brush and scraper
Taps and dies
Drill bits
Reamers
Measuring tools
Valve spring compressors
Piston ring compressor
Oil filter wrenches
Puller
Coil spring compressor set
Tyre levers
Tool box
C-clamp
Pneumatic tools
Drilling machine
Grinder
Jack – (mechanically operated jack and hydraulic jack)
Lubrication equipments
Tyre changer
Wheel balancer

Wheel aligner
Brake bleeding equipments
High pressure compressor
High pressure car wash machine
Engine analyser
Hydraulic press
Spark plug tester and cleaner machine
Injector tester and cleaner machine
Battery charging and testing machine

4. SERVICE, REPAIR AND OVERHAUL

Troubles, Causes & remedies in engine, fuel system, cooling system, lubrication system & MPFI Engine
Service, repair and overhaul of engine
Service, repair and overhaul of chassis and body

5. MOTOR VECHILES ACT

Introduction
Short explanation on different sections like 3,4,5,19,39,49,50,51,128,129,130,133.
Driving license
Necessity for driving license.
Restrictions on granting of learner's licenses for certain vehicles.
Grant of learner's licenses.
Grant of Permanent driving licenses**.**
Documents required for driving licenses.
Certification of Registration
Necessity of registration of vehicle.
Registration –where to be made.
Procedure for registration.
Condition for refusal of registration.
Temporary registration.
Permanent registration.
Renewal of registration certificate.

Syllabus to be covered before IA: Chapter 1,2,3

LEARNING RESOURCES:			
SL. NO.	NAME OF AUTHORS	TITLE OF THE BOOK	NAME OF THE PUBLISHER
1	JIGAR A. DOSHI / DHRUV U. PANCHAL / JAYESH P. MANIAER	VEHICLE MAINTENANCE AND GARAGE PRACTICE	PHI PUBLISHERS
2	KIRPAL SINGH	AUTOMOBILE ENGINEERING	STANDARDPUBLISHERS
3	CROUSE / ANGLIN	AUTOMOBILE MECHANICS	MC GRAWHILL
4	ANIL CHIKARA	AUTOMOBILE ENGINEERING VOL. III, IV	SATYA PRAKASHAN
5	V.S. KHILERY & DR. SATPAL SHARMA	MOTOR VEHICLE ACT AND TRANSPORT MANAGEMENT	ISHANS

TH.4 CAD / CAM & AUTOMATION

NAME OF THE COURSE: DIPLOMA IN AUTOMOBILE ENGINEERING			
COURSE CODE:		SEMESTER	6TH
TOTAL PERIOD:	60	EXAMINATION	3 HRS
THEORY PERIODS:	4 P/W	INTERNAL ASSESSMENT	20
MAXIMUM MARKS:	100	END SEMESTER	80

A. RATIONALE:

To study quality & precision oriented shorter manufacturing cycle time with the use of CAD/CAM technology. The prerequisites of this subject have been introduced in earlier subjects such as engineering graphics, engineering drawing & mechanical engineering drawing.

B. COURSEOBJECTIVES:

On completion of subject students will be able to:

1. Understand the fundamentals & use CAD.
2. Conceptualize drafting and modeling in CAD.
3. Operate CNC machines.
4. Prepare CNC part programming.
5. Operate industrial robots.
6. Conceptualize automation and FMS.

C. TOPIC WISE DISTRIBUTION OF PERIODS:

SL NO.	TOPIC	PERIODS
1	INTRODUCTION TO CAD/CAM	06
2	GEOMETRICMODELING	12
3	INSTRUCTION TO COMPUTER NUMERICALCONTROL	06
4	PARTPROGRAMMING	14
5	INDUSTRIAL ROBOTICS	12
6	AUTOMATION	10

D. COURSE CONTENTS:

1. INTRODUCTION TO CAD /CAM

Computers in industrial manufacturing.
Product Cycle
CAD /CAM Hardware: Basic structure
CPU
Memory
I/O devices
Storage devices
System configuration.

2. GEOMETRIC MODELLING

Requirement of geometric modeling
Types of Geometric models
Geometric construction method-sweep

Solid modeling – Primitives & Boolean operations
Free formed surfaces (Classification of surface only) (No numerical treatment).

3. INTRODUCTION TO COMPUTER NUMERICALCONTROL

Introduction – NC, CNC, DNC
Advantages of CNC
The coordinate system in CNC
Motion control system
Point to point
Straight line
Continuous path (Contouring).
Application of CNC.

4. PART PROGRAMMING

Fundamentals
Manual part programming
NC- Words
Programming format
Part programming
Use of subroutines and do loops
Computer aided part programming (APT).

5. INDUSTRIAL ROBOTICS

Introduction
Physical configuration
Basic robot motions
Technical features such as
Work volume
Precision and speed of movement
Weight carrying capacity
Drive system
End effectors
Robot sensors.
Application such as
Material transfer
Machine loading
Welding, spray coating
Processing operation
Assembly
Inspection.

6. AUTOMATION

Basic elements of automated system
Advanced automation functions
Levels of automation.
Flexible manufacturing:
Introduction FMS equipments
FMS application.
Introduction to CIM.

Syllabus to be covered before IA: Chapter 1,2,3

LEARNING RESOURCES:			
SL. NO.	NAME OF AUTHORS	TITLE OF THE BOOK	NAME OF THE PUBLISHER
1	P.N. RAO	CAD/CAM PRINCIPLES AND APPLICATIONS	TATA MCGRAW-HILL
2	P. & SUBRAMANYAM	CAD/CAM/CIM	WILEY EASTERNLTD
3	B.S. PABLA & M. ADITHAN	CNC/MACHINE	NEW AGEINTERNATIONAL
4	GROOVER M.P. & ZIMMERS JR	COMPUTER AIDED DESIGN AND MANUFACTURING	PRENTICE HALL OF INDIA

TH.4 ELECTRIC& HYBRID VEHICLE and EMISSION CONTROL

NAME OF THE COURSE: DIPLOMA IN AUTOMOBILE ENGINEERING			
COURSE CODE:		SEMESTER	6TH
TOTAL PERIOD:	60	EXAMINATION	3 HRS
THEORY PERIODS:	4 P/W	INTERNAL ASSESSMENT	20
MAXIMUM MARKS:	100	END SEMESTER	80

A. RATIONALE:

Vehicle electrification and hybridization have been increasingly recognized as the most promising road transportation solutions to both the global energy crisis and the increasingly stringent requirements related to environmental protection and vehicle safety. Electric and hybrid electric vehicles (EVs and HEVs) are complex mechatronic systems; their design requires holistic consideration of vehicle and tire dynamics, power train, electric motors and batteries, and control and estimation modules that are integrated through millions of lines of computer code.

B. COURSEOBJECTIVES:

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

1. Have brief idea on vehicle development
2. Understand the basic operation of battery electric vehicles.
3. Understand the basic operation of fuel cell electric vehicles.
4. Understand the concepts of hybrid electric vehicles.
5. Have knowledge on modern vehicle emission control technologies.

C. TOPIC WISE DISTRIBUTION OF PERIODS:

SL NO.	TOPIC	PERIODS
1	INTRODUCTION	06
2	BATTERY ELECTRIC VEHICLES (BEVS)	14
3	FUEL-CELL ELECTRIC VEHICLES (FCEVS)	12
4	HYBRID ELECTRIC VEHICLES	13
5	VEHICLE EMISSION CONTROL TECHNOLOGIES	15

D. COURSE CONTENTS:

1. ELECTRIC VEHICLE

Introduction

Need for electric vehicle

Problems of electric vehicles – (range and batteries, charging, lack of performance, purchase price, safety and reliability)

Advantage of electric vehicle

Disadvantage of electric vehicle

Major component of electric vehicle – (motor, battery, charger, controller, DC converter, energy management system)

2. CLASSIFICATION OF EVs

Battery electric vehicle(BEV)-(advantage, disadvantage, application)
Hybrid Electric Vehicle (HEV)- (advantage, disadvantage, application)
Plug-In Hybrid Electric vehicle(PHEV) – (advantage, disadvantage, application)
Energy sources (battery, ultra capacitors, flywheels ,fuel cells)
Requirements of EVs energy sources
Battery – requirement of EV batteries, selection of battery, deep cycle battery
Types of battery for EVS (lead-acid battery, lithium-ion battery)and their advantages and disadvantages
Ultra capacitor and its working principle
Flywheel and its advantage and disadvantage

3. ELECTRIC MOTOR

Electric motor
Requirements of EV motor
Brushed DC motor
Brushless DC motor
Switched reluctance motor
AC induction motor

3.2 Indian electric vehicle (4 wheeler, 3 wheeler, 2 wheeler)

4. HYBRID VEHICLES

Hybrid electric vehicle(HEV)
Advantage and disadvantage of HEV
Components of HEV
Working of hybrid vehicle
Hybridization (micro hybrid, mild hybrid, full hybrid)
Fuel cell electric vehicle (FCEV) working principle, advantages and disadvantages

5. VEHICLE EMISSION CONTROL TECHNOLOGIES

Advanced Engine Design
Variable Valve Timing
Turbo charging Systems
Catalytic Converters
The Two-Way Catalyst
The Three-Way Catalyst
Diesel Oxidation Catalyst (DOC)
Selective Catalytic Reduction (SCR)
Nitrogen–Oxide (NOx) Adsorber Catalyst
The Diesel Particulate Filter (DPF)
Exhaust Gas Recirculation (EGR)
Crankcase Emission Control System

Syllabus to be covered before IA: Chapter 1,2,3

LEARNING RESOURCES:			
SL. NO.	NAME OF AUTHORS	TITLE OF THE BOOK	NAME OF THE PUBLISHER
1	AMIR KHAJEPOUR / SABER FALLAH / AVESTA GOODARZI	ELECTRIC AND HYBRID VEHICLES TECHNOLOGIES, MODELING AND CONTROL: A MECHATONIC APPROACH	JOHN WILEY & SONS LTD
2	IQBAL HUSSAIN	ELECTRIC & HYBRID VEHICLES – DESIGN FUNDAMENTALS	CRC PRESS
3	A.K. BABU	STATISTICAL ELECTRIC & HYBRID VEHICLES	KHANNA PUBLISHING HOUSE

PR.1 DRIVING PRACTICE & VEHICLE MAINTENANCE

NAME OF THE COURSE: DIPLOMA IN AUTOMOBILE ENGINEERING			
COURSE CODE:		SEMESTER	6TH
TOTAL PERIOD:	90	EXAMINATION	3 HRS
PRACTICE PERIOD:	6 P/W	SESSIONAL	50
MAXIMUM MARKS:	100	END SEMESTER	50

A. RATIONALE:

An automobile engineer should be capable of making different mechanism or part of an automobile. This allows them to satisfy their inventive / developmental skill as well as get an intimate knowledge about the function of the mechanism / part. An automobile engineer, throughout his working life will be involved with automobile in one way or another. It is therefore, absolutely essential for an automobile engineer to learn to drive an automobile, at least a light vehicle. This course also gives the students opportunity to learn driving a light vehicle.

B. OBJECTIVE:

On completing of the course students will be able to

1. Gain confidence of making a productindependently.
2. Drive a fourwheeler car withconfidence.

C. COURSE CONTENTS:

I. DRIVING THEORY

1. Know the vehicle:

   Simple introduction to automobile engines and their working.

2. Vehicle control:

   Foot controls: Foot brake, accelerator, clutch-dipper (not in present models).

   Hand controls: Steering wheel, hand brake, horn, light, wipers, ignition switch, starter, dipper and indicators.

   Other controls: Rear-view mirror (right and left side),instrument cluster, gauges, dials wind-screen-their purpose.

3. Pre-driving checks

   Before sitting on driver's seat and

   After sitting driver's seat.

4. Beginning to drive:

Precaution just before moving. While moving sitting point Moving.

Steering control.

Changing of gear.

Stopping Breaking

Accelerator (gradual, sudden)

Traffic sense, road sense, judgment, parking and positing according to road users.

5. Driving on the road
   Reserving, anticipation, judgment and road positioning according to other road users.
6. Maneuvers

   Merging and diverging maneuvers turning maneuvers to left, right, about 3-point turn, 5-point turn and u-turn, overtaking stationery vehicle, moving vehicle in left side and right side.

7. Reversing

   Location reverse gear in sitting position, speed control, steering in reverse gear, weaving the 'S' bend and common errors.
8. Parking

   Parallel, angular, perpendicular parking facing, downhill, common errors.
9. Driver's responsibility

   Driving behavior, consideration for other road uses, Competitiveness over courtesy and confidence, impatience and defensive while on the road driving. Distance between cars.
10. Priority for certain

    Emergency vehicles. Fire engines and ambulance. vehicles

II. TRAFFICEDUCATION-I

1. Driving regulations: Road use regulation made under section 118 of the motor vehicle act,1988.
2. Hand signals
3. Traffic signs: Schedule to the motor vehicles Act,1988
4. Hand signals of traffic constables / Traffic warden.
5. Introduction to automatic light signals.
6. Introduction to road makings.
7. Speed regulations on high ways and city roads.
8. Parking at objectionable places.

9. Some important provisions of the motor vehicles Act, 1988 section 122, 123, 125 and 128 of the motor vehicles Act, 1988.
10. Test of competence to drive Sub-rule (3) of rule 15 of the central motor vehicles rules, 1989.

III. LIGHT VEHICLES DRIVINGPRACTICE

1. Identification of various parts of the vehicles.
2. Pre-driving checks
    - Before sitting on driver's seat&
    - After sitting on driver's seat.
3. Steering practice
4. Biting point
5. Moving and gear changing
6. Stopping
    - Normal stopping
    - Emergency stopping
7. Developing judgment and anticipation to drive on road.
8. Reversing
    - In straight
    - In 's' bends
9. Turning and about parking
10. Licensing

IV. VEHICLE MECHANISM AND REPAIRS

1. Layout of vehicle
2. Function of diesel and petrol engines
3. Fuel system
    - Fuel lines
    - Fuel injection pump
    - Atomizer
    - Airlock
    - Oil block
4. Cooling system
    - Purpose
    - Radiator

Water pump

Fan leaf / fan belt

Radiator water boiling rectification

5. Lubrication system purpose

6. Vehicle –service, repair, and overhaul

Engine removal and disassembly
Clutch repair and service
Diagnosing of brake system
Wheel & tyre repair & service
Steering system service & repair

PR.2 ELECTRIC VEHICLE LAB.

NAME OF THE COURSE: DIPLOMA IN MECHANICAL ENGINEERING			
COURSE CODE:		SEMESTER	6TH
TOTAL PERIOD:	60	EXAMINATION	3 HRS
THEORY PERIODS:	4 P/W	SESSIONAL	25
MAXIMUM MARKS:	75	END SEMESTER	50

A. RATIONALE:

An automobile engineer should be capable of making different mechanism or part of an automobile. This allows them to satisfy their inventive / developmental skill as well as get an intimate knowledge about the function of the mechanism / part. An automobile engineer, throughout his working life will be involved with automobile in one way or another. It is therefore, absolutely essential for an automobile engineer to learn to recent advancements and new technologies as well as the mechanisms used in electric powered vehicles. This course also gives the students opportunity to learn how to do maintenance work of electric vehicles.

B. OBJECTIVES

After undergoing the Project Work, the student will be able to:

- The aim of this course is to help the student to attain the following industry identified competency through various teaching learning experiences.
- Maintenance of electric vehicles

C. COURSE CONTENTS:

1. Develop block diagram of Electric vehicle and identify parts
2. Case study- Compare minimum four vehicles for economic and environmental analysis
3. Develop schematic diagram of hybrid electric vehicle and identify the components fluorescent lamp.
4. Prepare report on Plug in Electric vehicle by visiting a charging station
5. Inspect and install inverter of given lead acid battery
6. Prepare a report on batteries used from market survey
7. Collect specifications of converters and inverters used for Electric vehicles a single lamp control by two switches
8. Diagnose, repair and maintain battery used in electric vehicle
9. Prepare test procedure for equipment used in Electric vehicle
10. List safety procedures and schedule for handling HEVs and EVs

Pr3. PROJECT Phase - II

Name of the Course: Diploma in Automobile Engineering			
Course code:		Semester	6th
Total Period:	120	Examination	3 hrs
Lab. periods:	8 P / week	Sessional	50
Maximum marks:	150	End Sem Examination	100

RATIONALE

Students' Project Work aims at developing innovative skills in the students whereby they apply the knowledge and skills gained through the course covered in many subjects and Labs, by undertaking a project. The prime emphasis of the project work is to understand and apply the basic knowledge of the principles of Automobile engineering and practices in real life situations, so as to participate and manage a large Automobile engineering projects, in future. Entire Project spreads over 5th and 6th Semester. Part of the Project covered in 5th Semester was named as *Project Phase-I* and balance portion to be covered in 6th Semester shall be named as *Project Phase-II*.

OBJECTIVES

After undergoing the Project Work, the student will be able to:

- Implement the theoretical and practical knowledge and skills gained through various subjects/courses into an application suitable for a real practical working environment, preferably in an industrial environment.
- Develop software packages or applications and implement these for the actual needs of the community/industry.
- Identify and contrast gap between the technological knowledge acquired through curriculum and the actual industrial need and to compensate it by acquiring additional knowledge as required.
- Carry out cooperative learning through synchronous guided discussions within the class in key areas, asynchronous document sharing and discussions, as well as prepare collaborative edition of the final project report.
- To achieve real life experience in Project design.
- To develop the skill of writing Project Report

Project Phase-I and Phase-II

The Project work duration covers 2 semesters(5th and 6th sem). The Grouping of students, selection of Project, assignment of Project Guide to the Group was done in the beginning of 5th semester under Project Phase-I. The students were allowed to study literature, any existing system and then define the Problem/objective of the Project. Preliminary work and Design of the system also have to be complete in Phase-I. Development may also begin in this phase. Project Milestones are to be set so that progress can be tracked .

In Phase-II Development, Testing, Documentation and Implementation have to be complete. Project Report have to be prepared and complete in Phase-II. All Project reports should be organized uniformly in proper order, irrespective of group. Teacher Guides can make suitable alteration in the components of Task and schedule.

At the end of Project Phase-II in 6th semester there shall be one presentation by each group on whole Project work undertaken by them.

A suggestive criterion for assessing student performance by the external (preferably person from industry) and internal (teacher) examiner is given in table below:

Sl. No.	Performance Criteria
1.	Selection of project assignment
2.	Planning and execution of considerations
3.	Quality of performance
4.	Providing solution of the problems or production of final product
5.	Sense of responsibility
6.	Self expression/ communication/ Presentation skills
7.	Interpersonal skills/human relations
8.	Report writing skills
9	Viva voce

The teachers are free to evolve other criteria of assessment, depending upon the type of project work.

It is proposed that the institute may organize an annual exhibition of the project work done by the students and invite leading Industrial organisations to such an exhibition.

The Project Report need to be prepared as per standard format and following is the indicative format. The Teacher Guide may make minor alteration keeping the sense in tact.

Organization of Project Report

1. Cover page:
   It should contain the following (in order)
   (i) Title of the Project
   (ii) "Submitted in partial fulfillment of the requirements for the Diploma in <Branch Name>"
   (iii) By Name of the Student(s)
   (iv) Logo of the Institution
   (v) Branch Name/Depart Name and Institution Name with Address
   (vi) Academic Year
2. 1st Inner page
   Certificate:
   It should contain he following
   "This is to certify that the work in this Project Report entitled <Project Title> by <Name of student(s)> has been carried out under my supervision in partial fulfillment of the requirements for the Diploma in <Branch Name>" during session <session > in <Branch /Department Name> of <Institute name> and this work is the original work of the above student(s).

   Seal and signature of the Supervisor/Guide with date
3. 2nd Inner Page
   Acknowledgement by the Student(s)
4. Contents.
5. Chapter wise arrangement of Reports
6. Last Chapter: Conclusion
   It should contain
   (i) Conclusion
   (ii) Limitations
   (iii) Scope for further Improvement
7. References

Pr-4 LIFE SKILL

(Common to All Branches)

Practical	**2 Periods per week**	**Sessional**	**25 Marks**
Total Periods	**30 Periods**	**Total Marks**	**25 Marks**

Objective: After completion of this course the student will be able to**:**

- Develop team spirit i.e. concept of working in team
- Apply problem solving skills for a given situation
- Use effective presentation techniques
- Apply task management techniques for given projects
- Enhance leadership traits
- Resolve conflict by appropriate method
- Survive self in today's competitive world
- Face interview without fear

DETAIL CONTENTS:

1. SOCIAL SKILL

Society, Social Structure, Develop Sympathy and Empathy
Swot Analysis – Concept, How to make use of SWOT
Inter personal Relation**:** Sources of conflict, Resolution of conflict ,
Ways to enhance interpersonal relation

2. PROBLEM SOLVING

Steps of Problem solving**:**

- Identify and clarify the problem,
- Information gathering related to problem,
- Evaluate the evidence,
- Consider alternative solutions and their implications,
- Choose and implement the best alternative,
- Review
- Problem solving techniques:

1) Trial and error, 2) Brain storming, 3) Lateral (Out of Box) thinking

3. PRESENTATION SKILL

Body language , Dress like the audience
Posture, Gestures, Eye contact and facial expression. STAGE FRIGHT,
Voice and language – Volume, Pitch, Inflection, Speed, Pause
Pronunciation, Articulation, Language, Practice of speech.
Use of AV aids such as Laptop with LCD projector, white board etc.

4. GROUP DISCUSSION AND INTERVIEW TECHNIQUES

Group Discussion:
Introduction to group discussion, Ways to carry out group discussion,
Parameters— Contact, body language, analytical and logical thinking,
decision making
Interview Technique :
Dress, Posture, Gestures, facial expression, Approach
Tips for handling common questions.

5. WORKING IN TEAM

Understand and work within the dynamics of a groups.
Tips to work effectively in teams,
Establish good rapport, interest with others and work effectively with them
to meet common objectives,
Tips to provide and accept feedback in a constructive and considerate way ,
Leadership in teams, Handling frustrations in group.

6. TASK MANAGEMENT

Introduction, Task identification, Task planning ,
organizing and execution, Closing the task

PRACTICAL

List of Assignment: *(Any Five to be performed including Mock Interview)*

1. SWOT analysis:-

Analyse yourself with respect to your strength and weaknesses, opportunities and threats. Following points will be useful for doing SWOT.

a) Your past experiences,
b) Achievements,
c) Failures,
d) Feedback from others etc.

2. Solve the True life problem assigned by the Teacher.

3. Working in a Team

Form a group of 5-10 students and do a work for social cause e.g. tree plantation, blood donation, environment protection, camps on awareness like importance of cleanliness in slum area, social activities like giving cloths to poor etc.(One activity per group where Team work shall be exhibited)

4. Mock Interview

5. Discuss a topic in a group and prepare minutes of discussion.

6. Deliver a seminar for 5 minutes using presentation aids on the topic given by your teacher.

7. Task Management

Decide any task to be completed in a stipulated time with the help of teacher. Write a report considering various steps in task management (with Break up into sub tasks and their interdependencies and Time)

Note: -1. Please note that these are the suggested assignments on given contents/topic. These assignments are the guide lines to the subject teachers. However the subject teachers are free to design any assignment relevant to the topic.

Note: -2. The following Topics may be considered for Seminar/GD in addition to other Topics at the discretion of the Teacher.

(Comparison with developed countries, Occupational Safety, Health Hazard, Accident & Safety, First-Aid, Traffic Rules, Global Warming, Pollution, Environment, Labour Welfare Legislation, Labour Welfare Acts, Child Labour Issues, Gender Sensitisation ,Harassment of Women at Workplace)

METHODOLOGY:

The Teacher is to explain the concepts prescribed in the contents of the syllabus and then assign different Exercises under Practical to the students to perform.

Books Recommended:-

Sl.No	Name of Authors	Title of the Book	Name of the Publisher
01	E.H. Mc Grath , S.J	Basic Managerial Skills for All	PHI
02	Lowe and Phil	Creativity and problem solving	Kogan Page (I) P Ltd
03	Adair, J	Decision making & Problem Solving	Orient Longman
04	Bishop , Sue	Develop Your Assertiveness	Kogan Page India
05	Allen Pease	Body Language	Sudha Publications Pvt. Ltd.

EQUIPMENT LIST

LIST OF EQUIPMENTS FOR DRIVING PRACTICE & VEHICLE MAINTENANCE

SL. NO.	NAME OF APPARATUS	QUANTITY
01	Driving Training Vehicle	01
02	Driving Warning Symbols Chart	02
03	Vehicle Power Transmission Chart	02
04	Vehicle For Demonstration	01
05	Diesel Engine	01
06	Petrol Engine	01
07	Fuel lines	01
08	Fuel injection pump	01
09	Atomizer	01
10	Airlock	01
11	Oil block	01
12	Radiator	01
13	Water pump	01
14	Fan leaf / fan belt	01
15	Tool Kit	02

LIST OF EQUIPMENTS FOR ELECTRIC VEHICLE LABORATORY

SL. NO.	NAME OF APPARATUS	QUANTITY
01	Block diagram chart of Electric vehicle	02
02	Electric vehicle	01
03	Hybrid electric vehicle	01
04	DC Fast Charger	02
05	High Voltage Battery	02
06	Onboard Charger and EVSE	02
07	DC/AC Converter	02
08	In vehicle power Electronics	01
09	AC EV Motor	01
10	DC EV Motor	01
11	Regenerative Braking Module	01

AUTOMOBILE ENGINEERING LAB

SL.NO	NAME OF THE EQUIPMENTS	QUANTITY
01	Chassis of a car	01 no
02	Differential of a Tractor	01 no
03	Hydraulic brake system of a car working model	01 no
04	Solex carburetor	01 no
05	Maruty car type carburetor	01 no
06	Cut section of a fuel pump	01no
07	New car engine	01 no
08	Gear box	01no