CURRICULLUM OF 5TH SEMESTER

For

DIPLOMA IN AUTOMOBILE ENGINEERING

(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 5th Semester (Automoblie Engg.) (wef 2020-21)

Subject Number	Subject Code	Subject	Periods/week			Evaluation Scheme			
			L	T	P	Internal Assessment / Sessional	End Sem Exams	Exams (Hours)	Total
		Theory							
Th.1		ENTERPRENURESHIP AND MANAGEMENT & SMART TECHNOLOGY	4		-	20	80	3	100
Th.2		AUTOMOTIVE TRANSMISSION	4		-	20	80	3	100
Th.3		AUTO ELECTRICITY	4		-	20	80	3	100
Th.4		MECHATRONICS*	4			20	80	3	100
Th.5		AUTOMOBILE COMPONENT DESIGN	4			20	80	3	100
		Total	20			100	400	-	500
		Practical							
Pr.1		AUTO ENGINE. LAB-II	-	-	6	25	75	3	100
Pr.2		AUTO MACHINE SHOP-II	-	-	6	25	75	3	100
Pr.3		Project Phase-I	-	-	4	50	-	-	50
		Student Centered Activities(SCA)		-	3	-	-	-	-
		Total	-	-	*19*	*100*	*150*	-	*250*
		Grand Total	**20**	**-**	**19**	**200**	**550**	**-**	**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 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. ENTREPRENEURSHIP and MANAGEMENT & SMART TECHNOLOGY

(Common to All Branches)

Theory	**4 Periods per week**	**Internal Assessment**	**20 Marks**
Total Periods	**60 Periods**	**End Sem Exam**	**80 Marks**
Examination	**3hours**	**Total Marks**	**100Marks**

Topic Wise Distribution of Periods

No.	pic	riods
	trepreneurship	
	arket Survey and Opportunity Identification(Business Planning)	
	oject report Preparation	
	anagement Principles	
	nctional Areas of Management	
	adership and Motivation	
	Work Culture, TQM & Safety	
	Legislation	
	Smart Technology	
	TOTAL	

RATIONALE

In the present day scenario, it has become imperative to impart entrepreneurship and management concepts to students, so that a significant percentage of them can be directed towards setting up and managing their own small enterprises. It may be further added that an entrepreneurial mind set with managerial skill helps the student in the job market. The students can also be introduced with Startup and Smart Technology concept, which shall radically change the working environment in the coming days in the face of Industry 4.0

In this subject, the Students shall be introduced/ exposed to different concepts and Terminologies in brief only, so that he/she can have broad idea about different concepts/items taught in this subject. Solving numerical problem on any topic/item is beyond the scope of this subject.

OBJECTIVES

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

- Know about Entrepreneurship, Types of Industries and Startups
- Know about various schemes of assistance by entrepreneurial support agencies
- Conduct market survey
- Prepare project report
- know the management Principles and functional areas of management
- Inculcate leadership qualities to motivate self and others.
- Maintain and be a part of healthy work culture in an organisation.
- Use modern concepts like TQM
- Know the General Safety Rules
- Know about IOT and its Application in SMART Environment.

DETAILED CONTENTS

1. **Entrepreneurship**
   - Concept /Meaning of Entrepreneurship
   - Need of Entrepreneurship
   - Characteristics, Qualities and Types of entrepreneur, Functions
   - Barriers in entrepreneurship
   - Entrepreneurs vrs. Manager
   - Forms of Business Ownership: Sole proprietorship, partnership forms and others
   - Types of Industries, Concept of Start-ups
   - Entrepreneurial support agencies at National, State, District Level(Sources): DIC, NSIC,OSIC, SIDBI, NABARD, Commercial Banks, KVIC etc.
   - Technology Business Incubators (TBI) and Science and Technology Entrepreneur Parks

2. **Market Survey and Opportunity Identification (Business Planning)**

- Business Planning
- SSI, Ancillary Units, Tiny Units, Service sector Units
- Time schedule Plan, Agencies to be contacted for Project Implementation
- Assessment of Demand and supply and Potential areas of Growth
- Identifying Business Opportunity
- Final Product selection

3. **Project report Preparation**

- Preliminary project report
- Detailed project report, Techno economic Feasibility
- Project Viability

4. **Management Principles**
- Definitions of management
- Principles of management
- Functions of management (planning, organising, staffing, directing and controlling etc.)
- Level of Management in an Organisation

5. **Functional Areas of Management**

a) Production management
- Functions, Activities
- Productivity
- Quality control
- Production Planning and control

b) Inventory Management
- Need for Inventory management
- Models/Techniques of Inventory management

c) Financial Management
- Functions of Financial management
- Management of Working capital
- Costing (only concept)
- Break even Analysis
- Brief idea about Accounting Terminologies: Book Keeping, Journal entry, Petty Cash book, P&L Accounts, Balance Sheets(only Concepts)

d) Marketing Management
- Concept of Marketing and Marketing Management
- Marketing Techniques (only concepts)
- Concept of 4P s (Price, Place, Product, Promotion)

e) Human Resource Management
- Functions of Personnel Management
- Manpower Planning, Recruitment, Sources of manpower, Selection process, Method of Testing, Methods of Training & Development, Payment of Wages

6. **Leadership and Motivation**

a) Leadership
- Definition and Need/Importance
- Qualities and functions of a leader
- Manager Vs Leader
- Style of Leadership (Autocratic, Democratic, Participative)

b) Motivation
- Definition and characteristics
- Importance of motivation
- Factors affecting motivation

- Theories of motivation (Maslow)
- Methods of Improving Motivation
- Importance of Communication in Business
- Types and Barriers of Communication

7. **Work Culture, TQM & Safety**
   - Human relationship and Performance in Organization
   - Relations with Peers, Superiors and Subordinates
   - TQM concepts: Quality Policy, Quality Management, Quality system
   - Accidents and Safety, Cause, preventive measures, General Safety Rules , Personal Protection Equipment(PPE)

8. **Legislation**
   a) Intellectual Property Rights(IPR), Patents, Trademarks, Copyrights
   b) Features of Factories Act 1948 with Amendment (only salient points)
   c) Features of Payment of Wages Act 1936 (only salient points)

9. **Smart Technology**
   - Concept of IOT, How IOT works
   - Components of IOT, Characteristics of IOT, Categories of IOT
   - Applications of IOT- Smart Cities, Smart Transportation, Smart Home, Smart Healthcare, Smart Industry, Smart Agriculture, Smart Energy Management etc.

Syllabus to be covered before IA: Chapter 1,2,3,4

RECOMMENDED BOOKS

1. Entrepreneurship Development and Management by R.K Singhal, Katson Books., New Delhi
2. Entrepreneurship Development and Management by U Saroj and V Mahendiratta, Abhishek Publications, Chandigarh
3. Entrepreneurship Development and Management by Vasant Desai, Himalaya Pub.House
4. Industrial Engineering and Management by O.P Khanna ,Dhanpat Rai and Sons
5. Industrial Engineering and Management by Banga and Sharma, Khanna Publications
6. Internet of Things by Jeeva Jose, Khanna Publications, New Delhi
7. Online Resource on Startups and other concepts
8. https://www.fundable.com/learn/resources/guides/startup

TH-2 AUTOMOTIVE TRANSMISSION

Name of the Course: Diploma in AUTOMOBILE ENGINEERING			
Course code:		Semester	5th
Total Period:	60	Examination	3hrs
Lab. periods:	4 P/W	IA	20 marks
Maximum marks:	100	End Semester Examination:	80 Marks

A.RATIONALE:

The power developed by automobile engine is transmitted to the rear axle through many parts & mechanism such as clutch gear Box, propeller shaft and differential. The entire system is called power transmission mechanism in automobile. Knowledge of automobile transmission is of vital importance for an automobile engineer.

B.COURSE OBJECTIVES:

After completion of the course the student shall be able to know

1. Functions, types, requirements & adjustment of clutch.
2. Function, types & operation of gearbox.
3. Functions of propeller shaft & types of joints
4. Functions & types of differentials.
5. Types & operation of real axel.
6. Transmission of power in two-wheelers.

C. TOPIC WISE DISTRIBUTION OF PERIODS

Sl.No.	Topic	Periods
1.	Clutch	08
2.	Gear Box	08
3.	Propeller Shaft	08
4.	Differential	08
5.	Rear Axle	08
6.	Two Wheeler	08
7.	Performance of automobile	12
		60

COURSE CONTENTS:

1. Clutch

1.1 Introduction, requirement of clutch, types of clutch.
1.2 Clutch operation.
1.3 Clutch components, clutch facing.
1.4 Clutch problem &adjustment.
1.5 Fluids fly wheel &coupling.

2. Gear Box

2.1 Introduction, functions & types of transmission.
2.2 Sliding mesh & constant mesh gearbox.
2.3 Epicyclical gear box overdrive.
2.4 Free-wheel drive, selector mechanism.
2.5 Fluid torque converter.

3. **Propeller shaft**
   - 3.3 Introduction definition & types of propeller shaft.
   - 3.2 Universal joints & its types.
   - 3.4 Sliding joint.

4. **Differential**
   - 4.1 Function of differential gear box.
   - 4.2 Types of differential.
   - 4.3 Constructional details of a differential.
   - 4.4 Study & inspection of differential.

5. **Rear Axle**
   - 5.1 Definition of rear axle, supporting of rear axle.
   - 5.2 Rear axle drives such as Hotchkiss drive, torque tube drive etc.
   - 5.3 Types of rear axle.
   - 5.4 Rear axle casing.

6. **Two wheeler**
   - 6.1 Power transmission system of moped.
   - 6.2 Power transmission system of scooter.
   - 6.3 Power transmission system of motorcycle.
   - 6.4 Power transmission system of bullet.

7. **Performance of Automobile**
   - 7.1 Power for propulsion resistances for vehicle.
   - 7.2 Traction & tractive effort, road performance curves.
   - 7.3 Acceleration grad ability & draw-bar pull.
   - 7.4 Calculation of equivalent weight.
   - 7.5 Calculation of maximum traffic effort.

Syllabus to be covered before IA: Chapter 1,2,3,4

RECOMMENDED BOOKS:

1. Automotive mechanics by Heitner. CBSpublishers.
2. The automobile by Harbans Singh Reyat, S. Chand &Co.
3. Automobile Engineering by G.B.S. Narang, Khannapublishers.
4. Automobile Engineering Volume-1 by Dr. Kipal singh, stdPublisher.
5. Automobile Engineering & power Yrain by W.H.Crouse. Mc GrawHills.
6. Motor manual (Transmission) by A.N.Judge.
7. Motor manual (Car mechanism) by A. N.Judge.

TH-3 AUTOMOBILE ELECTRICITY

Name of the Course: Diploma in AUTOMOBILE ENGINEERING			
Course code:		Semester	5th
Total Period:	60	Examination	3hrs
Lab. periods:	4 P/W	IA	20 marks
Maximum marks:	100	End Semester Examination:	80 Marks

A.RATIONALE:

Electrical system in automobile is necessary for starting and generating power for ignition and lighting purposes. Automobile students should know about the operation maintenance of wiring systems for automobiles.

B.COURSE OBJECTIVES:

On completion of the subject students will be able to know:

1. Types, construction, charging, testing and maintenance of battery.
2. Construction, drive arrangement, principle and operation of starter.
3. Principle, construction and maintenance of generator.
4. Principle construction and maintenance of alternator.
5. Types and components of ignition system.
6. Setting and mechanism of light.
7. Mechanism of several electrical accessories.
8. Types of wiring and wiring diagram.

C.TOPIC WISE DISTRIBUTION OF PERIODS

Sl. No.	**Topic**	**Periods**
1.	Storage battery	06
2.	Starting System	06
3.	Generating System	10
4.	Alternator	05
5.	Ignition System	15
6.	Light	06
7.	Accessories &Control	06
8.	Wiring System	06
		60

D.COURSE CONTENTS:

1. **Storage Battery**
   - 1.1 Purpose and types of battery.
   - 1.2 Construction capacity and charging of battery.
   - 1.3 Testing servicing and maintenance of battery.

2. **Starting System**
   - 2.1 Principle and construction of starter motor.
   - 2.2 Drive arrangement and control.
   - 2.3 Servicing and maintenance of starter motor.

3. **Generating system**
   - 3.1 Flemings right hand rule and Lenz's law.
   - 3.2 Principle and constructional details of generator.
   - 3.3 Current and voltage regulator.
   - 3.4 Cut-out relay, routine maintenance of generator.

4. **Alternator**
   - 4.1 Principle and construction of alternator.
   - 4.2 Maximum R.M.S. and average value.
   - 4.3 Maintenance of alternator.

5. **Ignition System**

   5.1 Principle and components (induction coil, contact breaker, spark plug, 5.2 distributor and condenser) of spark ignition system.

   5.2 Electronics spark timing computer controlled coil ignition system operation

   5.3 Electronics ignition system with distributor/distributer less.

   5.4 Types of ignition system such as:- Coil ignition system magnet ignition system electronics ignition system, transistorized ignition system.

   5.5 Ignition system servicing and fault diagnosis.

6. **Light**
   - 6.1 Setting of headlights.
   - 6.2 Tail and stoplights.
   - 6.3 Indicator and dim deeper mechanism.

7. **Accessories & Control**
   - 7.1 Electric horn and screen wiper.
   - 7.2 Fuel gauge oil pressure gauge and water temperature gauge.

8. **Wiring system**

   8.1 Types of wiring such as:-

   Earth returns and insulated return system.

   8.2 Wiring diagram of four wheelers and two wheelers.

   8.3 Elective wiring layout in a four wheeler.

   8.4 Inspection and maintenance of electrical systems.

Syllabus to be covered before IA: Chapter 1,2,3,4

RECOMMENDED BOOKS:

1. Electrical equipment of automobiles by Parker Singh.
2. Automobile electrical equipment by Kohil.
3. Basic automobile electricity by C.P.Nakra.
4. Automobile electrical engineering by Aroar &Das.
5. Automobile electrical system and equipments By M.R.Khatawata.
6. Motor manual (modern automobile electrical equipment) byA.W.Judge.
7. Automobile electrical equipments by W.H.Crouse, MC GrawHill.

TH.4 MECHATRONICS

(Coomon to Mechanical Engg.)

Name of the Course: Diploma in Automobile Engg.			
Course code:		Semester	5th
Total Period:	60	Examination	3 hrs.
Theory periods:	4 P/W	I.A:	20
Maximum marks:	100	End Semester Examination:	80

A. RATIONALE:

Day by day, engineering and technology experiences a tremendous growth. Mechatronics plays a major role in developing engineering and technology. It can be defined as the applications of electronics and computer technology to control the motions of mechanical systems. With the help of microelectronics and sensor technology, mechatronics systems are providing high levels of precision and reliability.

B. COURSE OBJECTIVES:

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

1. To study the definition and elements of mechatronics system.
2. To learn how to apply the principle of mechatronics for the development of productive systems.
3. To learn the CNC technology and applications of mechatronics in manufacturing automation.
4. Define different type of system and Sensors and solve the simple problems.
5. Explain the concept of Mechanical actuation, Electrical actuation and solve the simple problems.
6. Find out the various types of System Models & Input /Output parts and solve the problems.
7. Describe the programmable Logic Controller and develop programme in PLC.
8. To learn the Industrial robotics

C. CHAPTERWISE DISTRIBUTION OF PERIORDS

Sl No.	Topic	Periods
	roduction to Mechatronics	
	nsors and Transducers	
	tuators-Mechanical, Electrical	
	ogrammable logic controllers	
	ements of CNC Machines	
	botics	

D.COURSE CONTENTS

1.0 INTRODUCTION TO MECHATRONICS

1.1 Definition of Mechatronics
1.2 Advantages & disadvantages of Mechatronics
1.3 Application of Mechatronics
1.4 Scope of Mechatronics in Industrial Sector
1.5 Components of a Mechatronics System
1.6 Importance of mechatronics in automation

2.0 **SENSORS AND TRANSDUCERS**

2.1Defination of Transducers

2.2 Classification of Transducers

2.3 Electromechanical Transducers

2.4 Transducers Actuating Mechanisms

2.5 Displacement &Positions Sensors
2.6 Velocity, motion, force and pressure sensors.
2.7 Temperature and light sensors.

3.0 ACTUATORS-MECHANICAL, ELECTRICAL

3.1Mechanical Actuators
3.1.1 Machine, Kinematic Link, Kinematic Pair
3.1.2 Mechanism, Slider crank Mechanism
3.1.3 Gear Drive, Spur gear, Bevel gear, Helical gear, worm gear
3.1.4 Belt & Belt drive
3.1.5 Bearings
3.2 Electrical Actuator
3.2.1 Switches and relay
3.2.2 Solenoid
3.2.3 D.C Motors

3.2.4 A.C Motors

3.2.5 Stepper Motors

3.2.6 Specification and control of stepper motors

3.2.7 Servo Motors D.C & A.C

4.0 PROGRAMMABLE LOGIC CONTROLLERS(PLC)

4.1Introduction

4.2Advantages of PLC

4.3Selection and uses of PLC

4.4Architecture basic internal structures

4.5Input/output Processing and Programming

4.6Mnemonics

4.7Master and Jump Controllers

5.0 ELEMENTS OF CNC MACHINES

5.1 Introduction to Numerical Control of machines and CAD/CAM

5.1.1 NC machines

5.1.2 CNC machines

5.1.3.CAD/CAM

5.1.3.1 CAD

5.1.3.2 CAM

5.1.3.3 Software and hardware for CAD/CAM

5.1.3.4 Functioning of CAD/CAM system

5.1.3.4 Features and characteristics of CAD/CAM system

5.1.3.5 Application areas for CAD/CAM

5.2 elements of CNC machines

5.2.1 Introduction

5.2.2 Machine Structure

5.2.3 Guideways/Slide ways

5.2.3.1 Introduction and Types of Guideways

5.2.3.2 Factors of design of guideways

5.2.4 Drives

5.2.4.1 Spindle drives

5.2.4.2 Feed drive

5.2.5 Spindle and Spindle Bearings

6.0 **ROBOTICS**

6.1 Definition, Function and laws of robotics

6.2Types of industrial robots

6.3 Robotic systems

6.4 Advantages and Disadvantages of robots

Syllabus to be covered up to 1st I.A : Chapters 1,2,3 & 4

LEARNING RESOURCES:

SL.NO.	AUTHOR	TITLE OF THE BOOK	PUBLISHER
1	W. Bolton	Mechatronics	Pearson Education India
2	R.K Rajput	Text book of Mechatronics	S. Chand
3	R. RADHAKRISHNA, S,SUBRAMANIAN	CAD/CAM/CIM	NEW AGE INTERNATIONAL PVT.LTD
4	MIKELL GROVER	CAD/CAM	

TH-5 AUTOMOBILE COMPONENT DESIGN

Name of the Course: Diploma in AUTOMOBILE ENGINEERING			
Course code:		Semester	5th
Total Period:	60	Examination	3hrs
Lab. periods:	4 P/W	IA	20 marks
Maximum marks:	100	End Semester Examination:	80 Marks

A. RATIONALE

To gain the knowledge and skills needed in automotive design and production to develop skills in CAD/CAM. To study the process of engineering problem solving.

B.COURSE OBJECTIVE

On completion of subject the students will be able to.

1. Analyze the loads type of induced stresses resisting areas & hence the modes of failure.
2. Identity modes of failure & relevant theory for problem solving.
3. Analyze practical problem & make use of material, strength equations, factor of safety etc.
4. Use design data book to standardize component dimensions& to select.

C.TOPIC WISE DISTRIBUTION OF PERIOD.

Sl.No.	Topic	Period
2.	Basic concepts of design	12
3.	Design of machine elements	06
4.	Design of shafts keys & components	10
5.	Design of levers	06
6.	Design of chassis component	10
7.	Design of engine components	16
		60

D.COURSE CONTENTS.

1. Basic concepts of design

1.1 Introduction to design

1.2 Classification of design

1.3 Design Consideration

1.4 Design procedure

1.5 Stress analysis

1.5.1 Types of external loads

1.5.2 Types of induced stresses: tensile, compressive, shear crushing & bearing pressure, bending, torsion, thermal stresses, creep, proof stresses resilience principal stresses.

1.5.3 Stress- strain diagram for ductile & brittle material and its importance/

1.5.4 Variable stresses machine parts, fatigue & endurance limit, stress-time diagrams for variable stresses.

1.5.5 Working stresses for static load, variable or fatigue load.

1.5.6 Factor of safety, selection of factor of safety.

1.5.7 Stress concentration causes and remedies.

1.5.8 Introduction to theories of failure-maximum principal theory. Maximum shear stress theory, Distribution energy theory.

1.5.9 Selection of material and justifications of automobile components, advanced materials for automotive components.

1.6 .Concept of standardization, preferred numbers & inter chargeability in design practice.

1.6.1 Common types of fasteners with their applications-through bolts, tap bolts, top bolts, studies cap screws and machine screws, designation of screw thread according to 1.5, stresses in screw fosterers, bolts of uniform strength.

1.6.2 Bearings – classification, location in automobiles systems & selection of bearings.

1.6.3. Post design aspects ergonomic aspect aesthetic consideration (shape, colour, surface finish) for automobile.

2. Design of machine elements.

2.2 Design of socket & spigot type cotter joint

2.3 Design of knuckle joint

2.4 Design of turnbuckle.

2.5 Application of above machine elements in an automobile.

3. Design of shafts, keys &couplings

3.1 Conceptual understanding of shaft, axles &spindles.

3.2 Design of shaft for torsion, rigidity, bending, combined bending &torsion..

3.3 Compression of solid & hollow shafts

3.4 Design of propeller shaft, whirling & critical speed.

3.5 Design of rear axle.

Types of keys design of sunk rectangular key, woodruff key.

Effect of keyways on shaft.

3.6 Design of coupling-muff, flange and bush pin type flexible

4. Design of levers.

4.1 Types of levers

4.2 Design of

4.3 Rocker arm

4.4 Bell crank lever

4.5 Hand lever

4.6 Pedals for rectangular cross-section& fulcrum Pinonly.

5. Design of chassis component

5.1 Design of cloth- single plate & multi plate.

5.2 Teeth calculation of gears for sliding mesh/constant mesh gear box of given data.

5.3 Design of semi elliptical leaf spring, helical spring-torsion &compression

6. Design of engine components.

6.1 Data of engine specifications & calculation of cylinder dimensions for given power.

6.2 Design of cylinder head thickness &bolts.

6.3 Design of valve seat & valve lift.

6.4 Design of piston crown by bending strength & thermal considerations
6.5 Design of piston rings & skirt length
6.6 Design of piston pin for bearing, bending & shear considerations.
6.7 Design of connecting rod cross-section(I-section)
6.8 Design of big end, cap &bolt.
6.9 Design of over hung crankshaft.

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

Test books

1. Machine Design by R.K. Jain, Khanna Publisher.
2. Machine Design by P.C. Sharma, D.K. Agrawal, S.K. Kataria &sons
3. Machine Design by R.S. Khurmi & J.K. Gupta, Eurasia Publication House.

PR-1 AUTO ENGINE LAB-II

Name of the Course: Diploma in AUTOMOBILE ENGINEERING			
Course code:		Semester	5th
Total Period:	90	Examination	3hrs
Lab. periods:	6 P/W	Term Work	25
Maximum marks:	100	End Semester Examination:	75

AIM:

Automobile students should have practical knowledge skill about servicing and maintenance work of various automobiles pars. 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.

Sl. No.	Content
1	Safety precaution in automobile workshop and Identification of different types of tools and equipments required in an automobile workshop.
2	Identification of different machines, equipments such as air compressor, hydraulic hoist, car washer, mechanical jacks, hydraulic jack, grease gun, oil gun, mechanical press, hydraulic press etc..
3	Washing, cleaning, polishing and spray painting of cars.
4	Study of working principle of petrol and diesel engine.
5	Study of fuel feed system of petrol and diesel engine
6	Testing of fuel injection system and adjustment of pressure of a fuel injector.
7	Identification of various units of a vehicle
8	Study of different types of cooling system used in a vehicle.
9	Study of lubrication system of a vehicle.
10	Study of different types of engines, adjustment of tappet, clearance of valve, timing adjustment etc.
11	Calibrating and phasing of fuel pump through calibrating machine.
12	Testing the Valve spring by spring tester.
13	Overhauling the piston and connecting rod assembly by connecting rod alignment fixture.
14	Overhauling engine block crankshaft & camshaft.
15	Assembling engine part, piston connecting rod, cylinder head, rocker arm assembly & mini force engine
16	Assembling engine parts such as F.I. pump injectors fuel filter & other accessories.
17	Adjustment of valve tappet clearance (four cylinder/six-cylinder engine)
18	Servicing of inlet, exhaust manifolds silencers & tenpin.
19	Overhauling of fuel feed pump (both diesel & petrol).
20	Bleeding the fuel system in diesel engine.
21	Starting & stopping of diesel engine (Hand operated)

PR-2 AUTO MACHINE SHOP-II

Name of the Course: Diploma in AUTOMOBILE ENGINEERING			
Course code:		Semester	5th
Total Period:	90	Examination	3 hrs
Lab. periods:	6 P/W	Term Work	25
Maximum marks:	100	End Semester Examination:	75

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.

Sl.No	Contents
1	i) Valve refacing by valve refacing machine
	ii) Valve sheet cutting by manual & electric cutters
	iii) Valve lapping & testing of leakage
2	Cylinder boring by using vertical boring bar.
3	Cylinder resleeving by hydraulic press
4	Crank shaft grinding by using crank shaft grinding machine.
5	Fine finishing operation of cylinder bore by using cylinder honing machine.
6	Boring of main journals by using horizontal boring bar.
7	Connecting rod big end and small end boring using twin head machine
8	Study of crank shaft grinding , piston grinding, surface grinding, cylinder re-boring
	honing & brake drum turning(by visiting different organization).
9	i)Brake shoe riveting.
	ii)Turning of propeller shaft
	iii) Different types of metal bush turning ,reaming & setting.
10	Removing & refitting cylinder liners on cylinder bore.
11	Removing of broken stud & bolt by stud extractor & tap wrench.

Pr 3. PROJECT WORK (Phase-I)

Course code:		Semester	5th
Total Period:	60	Examination :	-
Theory periods:	4P / week	Sessional Marks	50
		TOTAL Marks	50

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 practices in real life situations, so as to participate and manage a large Automobile engineering projects in future.
Entire Project shall spread over 5th and 6th Semester. Part of the Project covered in 5th Semester shall be 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 life working environment, preferably in an industrial environment.
- Develop working models or applications and implement these for the actual needs of the community/industry.
- Explain the working of industrial environment and its work ethics.
- Explain what entrepreneurship is and how to become an entrepreneur.
- 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.
- Find latest ideas on robotics, automation and mechatronics based projects.

General Guidelines

The individual students have different aptitudes and strengths and also areas of interest. Project work, therefore, should match the strengths and interest of the students. For this purpose, students should be asked to identify the type of project work, they would like to execute. The activity of problem identification should begin well in advance (right from beginning of 5th semester). Students should be allotted a problem of interest to him/her as a project work. It is also essential that the faculty of the respective department may have a brainstorming session to identify suitable project assignments for their students. The project assignment can be individual assignment or a group assignment. Preferably there should not be more than 5 students, if the project work is given to a group. The project work identified in collaboration with industry should be preferred.

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 organizations to such an exhibition.

Project Phase-I and Phase-II

The Project work duration shall cover 2 semesters(5^{th} and 6^{th} sem). The Grouping of students, selection of Project, assignment of Project Guide to the Group shall be done in the beginning of 5^{th} sem under Project Phase-I. The students may be allowed to study literature, any existing system and then define the Problem/objective of the Project. Preliminary work upto Design of the system have to be complete in Phase-I. Execution of work may begin in Phase-I depending on the Project. Project Milestones are to be set so that progress can be tracked . In Phase-II Execution of work and Documentation 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-I in 5^{th} semester there shall be one presentation by each group to mark to progress and also to judge whether the Project is moving in right direction as per the objective of the Project.

List of Equipments

Auto Servicing lab

Sl. No.	Name of Apparatus	QUANTITY
01	COMPLETE MODEL OF A VEHICLE WITH ENGINE , TRANSMISSION SYSTEM,SUSPENSION SYSTEM, ELECTRIC SYSTEM	01 Nos.
02	AIR COMPRESSOR	01 Nos.
03	HYDRAULIC HOIST	01Nos.
04	CAR WASHER	01 Nos.
05	MECHANICAL JACK	01 Nos.
06	HYDRAULIC JACK	01
07	GREESE GUN	01
08	OIL GUN	01
09	MECHANICAL PRESS	01
10	HYDRAULIC PRESS	01
11	AUTOMATIC SPRAY PAINTING MACHINE	01
12	SPRAY GUN	01
13	CAR POLISHER MACHINE	01
14	PETROL AND DIESEL ENGINE MODEL	01
15	MODEL OF DIESEL ENGINE FUEL FEED SYSTEM	01
16	INJECTOR TESTING MACHINE	01
17	SPRING TESTER	01
18	CALIBRATING MACHINE	01
19	CONNECTING ROD ALLIGNMENT FIXTURE	01

Machine Shop

Sl. No.	Name of Apparatus	QUANTITY
01	VALVE REFACING MACHINE	01 Nos.
02	MANUAL AND ELECTRIC CUTTERS FOR VALVE SHEET CUTTING	02 Nos.
03	VERTICAL BORING BAR	01 Nos.
04	HYDRAULIC PRESS	01 Nos.
05	CRANK SHAFT GRINDING MACHINE	01 Nos.
06	CYLINDER HONING MACHINE	01
07	HORIZONTAL BORING BAR	01
08	TWIN HEAD MACHINE	01
09	STUD EXTRACTOR	02
10	TAP WRENCH	01
11	LATHE MACHINE	01