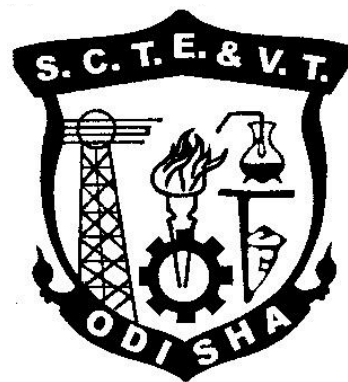


CURRICULLUM OF 5TH SEMESTER

For

DIPLOMA IN MECHANICAL ENGINEERING AUTOMOBILE

(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 (Mechanical Engg. Automobile.) (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		Entrepreneurship and Management & Smart Technology	4		-	20	80	3	100
Th.2		Automobile Component Design*	4		-	20	80	3	100
Th.3		Hydraulic Machines & Industrial Fluid Power*	4		-	20	80	3	100
Th.4		Mechatronics*	4			20	80	3	100
Th.5		Automotive Engine	4			20	80	3	100
		<i>Total</i>	20			100	400	-	500
Practical									
Pr.1		Auto Engine Lab	-	-	4	25	50	3	75
Pr.2		Hydraulic machines & Industrial Fluid power lab	-	-	4	25	50	3	75
Pr.3		Auto Machine Shop	-	-	4	25	50	3	75
Pr.4		Project Phase -I		-	4	25	-	-	25
		STUDENT CENTERED ACTIVITIES (SCA)			3				
		<i>Total</i>	-	-	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

Sl No.	Topic	Periods
1	Entrepreneurship	10
2	Market Survey and Opportunity Identification(Business Planning)	8
3	Project report Preparation	4
4	Management Principles	5
5	Functional Areas of Management	10
6	Leadership and Motivation	6
7	Work Culture, TQM & Safety	5
8	Legislation	6
9	Smart Technology	6
	TOTAL	60

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 AUTOMOBILE COMPONENT DESIGN

(Common to Automobile)

Name of the Course: Diploma in Mechanical AUTOMOBILE ENGINEERING			
Course code:		Semester	5 th
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. Identify 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 PERIODS

<u>Sl. No.</u>	<u>Topic</u>	<u>Periods</u>
1.	Petrol engines & its constructional details	10
2.	Diesel engine & its constructional details.	10
3.	Performance of I.C engine	10
4.	Fuel feed system for petrol & diesel engine	14
5.	Cooling system	08
6.	Lubrication system	08
TOTAL PERIODS-		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 & interchangeability 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 fasteners, 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 Pin only.

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.

TH.-3 HYDRAULIC MACHINES & INDUSTRIAL FLUID POWER

(Common to Mechanical)

Name of the Course: Diploma in MECHANICAL ENGINEERING AUTOMOBILE			
Course code:		Semester	5TH
Total Period:	60	Examination	3 hrs.
Theory periods:	4 P/W	Class Test:	20
Maximum marks:	100	End Semester Examination:	80

A. RATIONALE:

Use of fluids can be realized by a group of machines called hydraulic machine and use of hydraulic control and pneumatic control system in automation and in earth movers.

B. COURSE OBJECTIVES:

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

1. Distinguish the working principle of pumps and turbines
2. Explain the working of centrifugal pumps and gear pumps.
3. Compare pneumatic system with hydraulic system.
4. Draw pneumatic circuits for industrial application.
5. State the properties of hydraulic system.
6. Develop hydraulic circuit for machine tool operation.

C. CHAPTERWISE DISTRIBUTION OF PERIODS.

SL.NO	TOPICS	PERIODS
01	HYDRAULIC TURBINES	15
02	CENTRIFUGAL PUMPS	05
03	PNEUMATIC SYSTEM	20
04	HYDRAULIC SYSTEM	20
	TOTAL	60

D. COURSE CONTENTS

1.0 HYDRAULIC TURBINES.

- 1.1 Definition and classification of hydraulic turbines
- 1.2 Construction and working principle of impulse turbine.
- 1.3 Velocity diagram of moving blades, work done and derivation of various efficiencies of impulse turbine.
- 1.4 Velocity diagram of moving blades, work done and derivation of various efficiencies of Francis turbine.

- 1.5 Velocity diagram of moving blades, work done and derivation of various efficiencies of Kaplan turbine
- 1.6 Numerical on above
- 1.7 Distinguish between impulse turbine and reaction turbine.

2.0 CENTRIFUGAL PUMPS

- 2.1 Construction and working principle of centrifugal pumps
- 2.2 work done and derivation of various efficiencies of centrifugal pumps.
- 2.3 Numerical on above

3.0 RECIPROCATING PUMPS

-
- 3.1 Describe construction & working of single acting reciprocating pump.
- 3.2 Describe construction & working of double acting reciprocating pump.
- 3.3 Derive the formula for power required to drive the pump (Single acting & double acting)
- 3.5 Define slip.
- 3.5 State positive & negative slip & establish relation between slip & coefficient of discharge.
- 3.6 Solve numerical on above

4.0 PNEUMATIC CONTROL SYSTEM

- 4.1 Elements –filter-regulator-lubrication unit
- 4.2 Pressure control valves
 - 4.2.1 Pressure relief valves
 - 4.2.2 Pressure regulation valves
- 4.3 Direction control valves
 - 4.3.1 3/2DCV,5/2 DCV,5/3DCV
 - 4.3.2 Flow control valves
 - 4.3.3. Throttle valves
- 4.4 ISO Symbols of pneumatic components
- 4.5. Pneumatic circuits
 - 4.5.1 Direct control of single acting cylinder
 - 4.5.2 Operation of double acting cylinder
 - 4.5.3 Operation of double acting cylinder with metering in and metering out control

5.0 HYDRAULIC CONTROL SYSTEM

- 5.1 Hydraulic system, its merit and demerits
- 5.2 Hydraulic accumulators
 - 5.3.1 Pressure control valves

- 5.3.2 Pressure relief valves
- 5.3.3 Pressure regulation valves

5.3 Direction control valves

- 5.3.1 3/2DCV,5/2 DCV,5/3DCV
- 5.3.2 Flow control valves
- 5.3.3 Throttle valves

5.4 Fluid power pumps

- 5.4.1 External and internal gear pumps
- 5.4.2 Vane pump
- 5.4.3 Radial piston pumps

5.5 ISO Symbols for hydraulic components.

5.6 Actuators

5.7 Hydraulic circuits

- 5.7.1 Direct control of single acting cylinder
- 5.7.2 Operation of double acting cylinder
- 5.7.3 Operation of double acting cylinder with metering in and metering out

control

5.8 Comparison of hydraulic and pneumatic system

Syllabus to be covered up to I.A –CHAPTER 1.,2, &3

LEARNING RESOURCES

SL.NO	AUTHOR	TITLE OF THE BOOK	PUBLISHER
01	DR.JAGDISH LAL	HYDRAULIC MACHINES	METROPOLITAN BOOK CO
02	ANDREW	HYDRAULICS	
03	K SHANMUGA, SUNDARAM	HYDRAULIC &PNEUMATIC CONTROL	S.CHAND
04	MAJUMDAR	HYDRAULIC &PNEUMATIC CONTROL	TMH
05	J.F. BLACKBURN, G.REETHOF &J.L SHEARER	FLUID POWER CONTROL	

TH- 4 -MECHATRONICS

(Common to Mechanical)

Name of the Course: Diploma in Mechanical 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 PERIODS

SI No.	Topic	Periods
01	Introduction to Mechatronics	05
02	Sensors and Transducers	10
03	Actuators-Mechanical, Electrical	10
04	Programmable logic controllers	15
05	Elements of CNC Machines	15
06	Robotics	05

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

- 2.1 Definition 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

3.1 Mechanical 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(PLCS)

- 4.1 Introduction
- 4.2 Advantages of PLC
- 4.3 Selection and uses of PLCs
- 4.4 Architecture basic internal structures
- 4.5 Input/output Processing and Programming
- 4.6 Mnemonics
- 4.7 Master 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. AUTOMOTIVE ENGINE

Name of the Course: Diploma in Mechanical AUTOMOBILE

Period/Week:4

Total period: 60

Examination: 3Hrs

End exams: 80 marks

IA:20 marks

A. RATIONALE:

Automobile engineers must have the knowledge of auto engines which is the heart of any automobile. The subject deals with function & constructional details of automobile engines, properties of fuel, lubricants and cooling system.

B. COURSE OBJECTIVES:

On completion of the subject students will be able to explain

1. Principle and working of petrol engine.
2. Principle and working of diesel engine.
3. Properties of fuel, details of combustion and control of knocking.
4. Process of fuel being supplied to petrol & Diesel engine.
5. Types of engine cooling and working principle of cooling system.
6. Types, properties, requirement of lubricants & process of lubrication.
7. Performance of engine.

C. TOPICE WISE DISTIBUTION OF PERODS

<u>Sl. No.</u>	<u>Topic</u>	<u>Periods</u>
7.	Petrol engines & its constructional details	10
8.	Diesel engine & its constructional details.	10
9.	Performance of I.C engine	10
10.	Fuel feed system for petrol & diesel engine	14
11.	Cooling system	08
12.	Lubrication system	08
TOTAL PERIODS-		60

D. COURSE CONTENTS:

1 Petrol engine and its constructional details

- 1.1 Working principle of two stroke & four stroke petrol engine.
- 1.2 Constructional details of petrol engine with materials.
Engine components like piston, cylinder block, valve, connecting rod, crank shaft, crank slot.
- 1.3 Cylinder arrangement: inline and v-type engine firing order of multi cylinder engine.
- 1.4 Side valve actuating mechanism over head valve actuating mechanism.
- 1.5 I, F & T type valve arrangement, valve clearance.
- 1.6 Timing gear, vibration damper, inlet & exhaust manifold.

2. Diesel engine and its constructional details

- 2.1 Working principle two strokes & four stroke diesel engine.
- 2.2 Types, advantages & limitations of diesel engine over petrol engine.
- 2.3 Function & types of combustion chamber.
- 2.4 Direct injection type combustion chamber, pre combustion chamber, turbulence chamber. Their advantages & disadvantages.

3. Performance of I.C engine

- 3.1 Define mechanical efficiency, Indicated thermal efficiency, Relative Efficiency, brake thermal efficiency overall efficiency Mean effective pressure & specific fuel consumption.
- 3.2 Define air-fuel ratio & calorific value of fuel.
- 3.3 Morse – test and preparation of heat balance sheet
- 3.4 Work out problems to determine efficiencies & specific fuel consumption.

4. Fuel feed system for petrol & diesels engine

- 4.1 Line diagram of petrol engine fuel supply system.
- 4.2 Components of petrol engine fuel supply system like fuel tanks, fuel lines, fuel pumps, (mechanical & electrical) fuel filter.
- 4.3 Requirements and working principle of carburetors. Air fuel ratios for different conditions in carburetors.
- 4.4 Circuits of various types of carburetor, like down draught carburetor ,side draught carburetor.
- 4.5 Description of motorcycle carburetor
- 4.6 line diagram of diesel engine fuel supply system.
- 4.7 Requirements and types of fuel injection system.
- 4.8 Air injection, solid injection individual pump system injection common rail system injection
- 4.9 TBL system MPFI system PFI system ECM control functions
- 4.10 Constructional details of fuel pump.
- 4.11 Fuel injectors.
- 4.12 Governing system of fuel: Mechanical governor pneumatics governor. Hydraulic governor.

5. Cooling System

- 5.1 Necessity & types of engine cooling.
- 5.2 Constructional details of air cooling & water cooling (thermo siphon & pump air circulation)
- 5.3 Advantages and limitations of air cooling.
- 5.4 Water pump thermostat, radiator.
- 5.5 Anti-freezing and anti-corrosive additives.

6. Lubrication System

6.1 Types, requirements and properties (flash point & fire points) of lubricants.

6.2 Types of lubrication system gravity type, Splash type, pressure type, dry sump type, semi pressure type etc.

6.3 Parts of lubricating system like oil sump, oil cooler, oil filter, oil pressure gauge, oil pressure indicating light ,oil label indicator.

6.4 Oil filters and its types – full flow filter and bypass filter.
Crank case ventilation.

CHAPTERS TO BE COVERED UP TO IA – 1,2,3

BOOKS RECOMMENDED

1. Automobile engineering Vol, Vol-II by Kirpal Singh std . Publishers.
2. Automobile engineering by N.H. Crouse. Mc. Graw Hills.
3. Automobile engineering by G.B.S. Narangs, Khanna pub.
4. The automobile- by H.S.Reyat. S. Chand & Co.
5. Automobile engineering by W.H. Course. Mc Graw Hill
6. I.C. engine by Mathur and Sharma.
7. Automobile engineering by R.B. Gupta. Satya Prakashan.
8. Automobile engineering by C.P. Nakra.

Pr.1 AUTO ENGINE LAB

Name of the Course: Diploma in Mechanical- AUTOMOBILE			
Course code:		Semester	5th
Total Period:	60	Examination	3 hrs
Lab. periods:	4 P/W	Term Work	25
Maximum marks:	75	End Semester Examination:	50

A. AIM:

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

B. OBJECTIVES:

After completion the course students will be able to

1. Calculate IHP, BHP and FC of single cylinder, multicylinder petrol and diesel engines.
2. Understand various parts and systems present in automobiles

SL NO

CONTENT

- | | |
|----|---|
| 1 | Study of constructional details and working principle of petrol engine. |
| 2 | Study of constructional details and working principle of diesel engine. |
| 3 | Determine the brake thermal efficiency of a single cylinder petrol engine. |
| 4 | Determine the brake thermal efficiency of a single cylinder diesel engine |
| 5 | Determine B.H.P , I.H.P, BSFC of a multi cylinder engine by Morse test. |
| 6 | Study of fuel feed system of petrol and diesel engine |
| 7 | Testing of fuel injection system and adjustment of pressure of a fuel injector. |
| 8 | Identification of various units of a vehicle |
| 9 | 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 | Study of hydraulic control system and pneumatic control system |
| 14 | Assembling engine parts such as F.I. pump, injector, fuel filter & other accessories. |
| 15 | Adjustment of valve tappet clearance (four cylinder/six cylinder engine) |
| 16 | Study of Air Compressor |

PR. 2- HYDRAULIC MACHINES & INDUSTRIAL FLUID POWER LAB

Name of the Course: Diploma in Mechanical Automobile.			
Course code:		Semester	5th
Total Period:	60	Examination	3 hrs.
Theory periods:	4 P/W	Sessional:	25
Maximum marks:	75	End Semester Examination:	50

COURSE OBJECTIVES

Students will develop ability towards

- 1.0 Conducting performance test on impulse and reaction turbine
- 2.0 Conducting performance test on centrifugal pump
- 3.0 Designing & operating pneumatic circuits
- 4.0 Designing & operating industrial fluid power circuits

COURSE CONTENTS

- 1.0 Performance test on impulse turbine and to find out the efficiency
- 2.0 Performance test on Kaplan turbine and to find out the efficiency
- 3.0 Performance test on Francis turbine and to find out the efficiency
- 4.0 Performance test on centrifugal pump and to find out the characteristic curves
- 5.0 Direct operation of single & double acting pneumatic cylinder.
- 6.0 Operating double acting pneumatic cylinder with quick exhaust valve
- 7.0 Speed control double acting pneumatic cylinder using metering in and metering out circuits.
- 8.0 Direct operation of single & double acting hydraulic cylinder
- 9.0 Direct operation of hydraulic motor
- 10.0 Speed control double acting hydraulic cylinder using metering in & metering out circuits.

Pr3. AUTO MACHINE SHOP

Name of the Course: Diploma in Mechanical- AUTOMOBILE			
Course code:		Semester	5th
Total Period:	60	Examination	3 hrs
Lab. periods:	4 P/W	Term Work	25
Maximum marks:	75	End Semester Examination:	50

A. 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.

B. OBJECTIVES:

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

SI No	Content
1	Checking flatness and squareness using a try square and filling the Same if not leveled.
2	Sharpening of cutting tools like chisels, twist drill bit and punch through double ended grinder.
3	Internal threading of hole/ blind holes using hand taps.
4	Measurement of hole and slots using telescopic gauges and inside micrometer
5	Measurement of size / depth and roundness of a object with a Vernier calliper
6	Measurement of crank pins, main journal of crank shaft.
7	Measurement of cylinder bore by inside micrometer
8	Determination of ovality and taper by using dial gauge.
9	Measurement of fillet radius.
10	Operating various Workshop equipment such as: Valve refacing M/C, Cylinder Honing M/C, Twin head M/C, Horizontal Boring bar, Surface grinding M/C, Crank shaft Grinding M/C.

Pr 4. PROJECT WORK (Phase-I)

Course code:		Semester	5 th
Total Period:	60	Examination :	-
Theory periods:	4P / week	Sessional Marks	25
		TOTAL Marks	25

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 mechanical automobile engineering practices in real life situations, so as to participate and manage a large mechanical 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(5th and 6th sem). The Grouping of students, selection of Project, assignment of Project Guide to the Group shall be done in the beginning of 5th 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 5th 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.

EQUIPMENT LISTS

HYDRAULIC MACHINES & INDUSTRIAL FLUID POWER LAB

<u>SL.NO</u>	<u>NAME OF THE EQUIPMENTS</u>	<u>QUANTITY</u>
01	Impulse turbine(PELTON WHEEL) Test Rig with arrangements to find efficiency	01no
02	Kaplan turbine Test Rig with arrangements to find efficiency	01no
03	Francis turbine Test Rig with arrangements to find efficiency	01no
04	Centrifugal pump Test Rig with arrangements to find efficiency	01no
05	Pneumatic Trainer Kit with accessories	02nos
06	Hydraulic Trainer Kit with accessories	01no
07	Manual or Digital Tachometer	05nos

Auto Engg. lab

<u>Sl. No.</u>	<u>Name of Apparatus</u>	<u>QUANTITY</u>
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