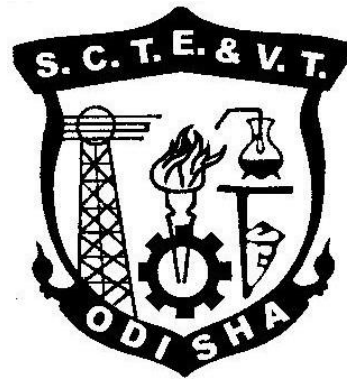


# **CURRICULLUM OF 7<sup>TH</sup> SEMESTER**

**For**

**DIPLOMA IN MECHANICAL  
ENGINEERING(PT)**

**(Effective FROM 2021-22 Sessions)**



**STATE COUNCIL FOR TECHNICAL EDUCATION & VOCATIONAL TRAINING,  
ODISHA, BHUBANESWAR**

## STATE COUNCIL FOR TECHNICAL EDUCATION AND VOCATIONAL TRAINING, ODISHA

**TEACHING AND EVALUATION SCHEME FOR 7th Semester (Mechanical Engg.)(PT) (wef 2021-22)**

Subject Number	Subject Code	Subject	Periods/week			Evaluation Scheme			
			L	T	P	Internal Assessment/ Sessional	End Sem Exams	Exams (Hours)	Total
		<b>Theory</b>							
Th.1		INDUSTRIAL ENGINEERING & MANAGEMENT	4		-	20	80	3	100
Th.2		AUTOMOBILE ENGINEERING AND HYBRID VEHICLES	4		-	20	80	3	100
		<i>Total</i>	<b>8</b>			<b>40</b>	<b>160</b>	<b>-</b>	<b>200</b>
		<b>Practical</b>							
Pr.1		AUTOMOBILE ENGINEERING LAB	-	-	5	75	100	3	175
Pr.2		CAD/CAM LAB	-	-	5	50	100	3	150
Pr.3		Technical Seminar	-	-	2	50	-	-	50
Pr.4		Project Work Phase -I		-	5	50	-	-	50
		STUDENT CENTERED ACTIVITIES (SCA)			3				
		<i>Total</i>	<b>-</b>	<b>-</b>	<b>20</b>	<b>225</b>	<b>200</b>	<b>-</b>	<b>425</b>
		<b>Grand Total</b>	<b>8</b>	<b>-</b>	<b>20</b>	<b>265</b>	<b>360</b>	<b>-</b>	<b>625</b>

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 MECHANICAL ENGINEERING(PT)			
Course code:		Semester	7th
Total Period:	60	Examination	3 hrs
Theory periods:	4 P/W	Internal assessment	20
Maximum marks:	100	End Semester Examination:	80

### A. RATIONALE:

Main objective of Mechanical Engineering is to produce goods and services for benefit to mankind. Such productions 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 a mechanical engineer.

### B. COURSE OBJECTIVES:

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 PERIODS

SI 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:

- 1.1 Selection of Site of Industry.
- 1.2 Define plant layout.
- 1.3 Describe the objective and principles of plant layout.
- 1.4 Explain Process Layout, Product Layout and Combination Layout.
- 1.5 Techniques to improve layout.
- 1.6 Principles of material handling equipment.
- 1.7 Plant maintenance.

1.7.1 Importance of plant maintenance.

1.7.2 Break down maintenance.

1.7.3 Preventive maintenance.

1.7.4 Scheduled maintenance.

## **2. OPERATIONS RESEARCH:**

2.1 Introduction to Operations Research and its applications.

2.2 Define Linear Programming Problem,

2.3 Solution of L.P.P. by graphical method.

2.4 Evaluation of Project completion time by Critical Path Method and PERT (Simple problems)-

2.5 Explain distinct features of PERT with respect to CPM.

## **3. INVENTORY CONTROL:**

3.1 Classification of inventory.

3.2 Objective of inventory control.

3.3 Describe the functions of inventories.

3.4 Benefits of inventory control.

3.5 Costs associated with inventory.

3.6 Terminology in inventory control

3.7 Explain and Derive economic order quantity for Basic model. (Solve numerical)

3.8 Define and Explain ABC analysis.

## **4. INSPECTION AND QUALITY CONTROL:**

4.1 Define Inspection and Quality control.

4.2 Describe planning of inspection.

4.3 Describe types of inspection.

4.4 Advantages and disadvantages of quality control.

4.5 Study of factors influencing the quality of manufacture.

4.6 Explain the Concept of statistical quality control, Control charts (X, R, P and C - charts).

4.7 Methods of attributes.

4.8 Concept of ISO 9001-2008.

4.9.1 Quality management system, Registration /certification procedure.

4.9.2 Benefits of ISO to the organization.

4.9.3 JIT, Six sigma, 7S, Lean manufacturing

4.9.4 Solve related problems.

## **5.0 PRODUCTION PLANNING AND CONTROL**

5.1 Introduction

5.2 Major functions of production planning and control

5.3 Methods of forecasting

5.3.1 Routing

5.3.2 Scheduling

5.3.3 Dispatching

5.3.4 Controlling

5.4 Types of production

5.4.1 Mass production

5.4.2 Batch production

5.4.3 Job order production

5.5 Principles of product and process planning.

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

<b>Learning Resources:</b>			
<i>Sl. No.</i>	<i>Name of Authors</i>	<i>Title of the Book</i>	<i>Name of the Publisher</i>
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
4			

## TH.2 AUTOMOBILE ENGINEERING AND HYBRID VEHICLES

Name of the Course: Diploma in MECHANICAL ENGINEERING(PT)			
Course code:		Semester	7th
Total Period:	60	Examination	3 hrs
Theory periods:	4 P/W	Internal assessment	20
Maximum marks:	100	End Semester Examination:	80

### A. RATIONALE:

Automobiles are the principal mode of transport system. Their manufacture and maintenance gives a major scope for employment. Many entrepreneur pass outs go for servicing of automobiles or trading/manufacturing of auto components. Thus automobile engineering is an important subject to be in the regular curriculum of the mechanical engineering.

### B. COURSE OBJECTIVES:

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

- Understand automobile chassis, transmission, breaking and fuel system etc.
- Understand the basics of electric vehicle kinematics.
- Understand the concepts of hybrid electric vehicles.

### C.TOPIC WISE DISTRIBUTION OF PERIODS

SI No.	Topic	Periods
1	Introduction & Transmission System	12
2	Braking system	5
3	Ignition & Suspension System	10
4	Cooling and Lubrication	8
5	Fuel system	10
6	Hybrid and Electric Vehicles	15

### C.COURSE CONTENTS

#### 1.0 INTRODUCTION & TRANSMISSION SYSTEM:

- 1.1 Automobiles: Definition, need and classification: Layout of automobile chassis with major components (Line diagram)
- 1.2 Clutch System: Need, Types (Single & Multiple) and Working principle with sketch
- 1.3 Gear Box: Purpose of gear box, Construction and working of a 4 speed gear box
- 1.4 Concept of automatic gear changing mechanisms
- 1.5 Propeller shaft: Constructional features
- 1.6 Differential: Need, Types and Working principle

#### 2.0 BRAKING SYSTEM:

- 2.1 Braking systems in automobiles: Need and types
- 2.2 Mechanical Brake
- 2.3 Hydraulic Brake
- 2.4 Air Brake
- 2.5 Air assisted Hydraulic Brake
- 2.6 Vacuum Brake

### 3.0 IGNITION & SUSPENSION SYSTEM:

- 3.1 Describe the Battery ignition and Magnet ignition system
- 3.2 Spark plugs: Purpose, construction and specifications
- 3.3 State the common ignition troubles and its remedies
- 3.4 Description of the conventional suspension system for Rear and Front axle
- 3.5 Description of independent suspension system used in cars (coil spring and tension bars)
- 3.6 Constructional features and working of a telescopic shock absorber

### 4.0 COOLING AND LUBRICATION:

- 4.1 Engine cooling: Need and classification
- 4.2 Describe defects of cooling and their remedial measures
- 4.3 Describe the Function of lubrication
- 4.4 Describe the lubrication System of I.C. engine

### 5.0 FUEL SYSTEM:

- 5.1 Describe Air fuel ratio
- 5.2 Describe Carburetion process for Petrol Engine
- 5.3 Describe Multipoint fuel injection system for Petrol Engine
- 5.4 Describe the working principle of fuel injection system for multi cylinder Engine
- 5.5 Filter for Diesel engine
- 5.6 Describe the working principle of Fuel feed pump and Fuel Injector for Diesel engine

### 6.0 ELECTRIC AND HYBRID VEHICLES:

- 6.1 Introduction, Social and Environmental importance of Hybrid and Electric Vehicles
- 6.2 Description of Electric Vehicles, operational advantages, present performance and applications of Electric Vehicles
- 6.3 Battery for Electric Vehicles, Battery types and fuel cells
- 6.4 Hybrid vehicles, Types of Hybrid and Electric Vehicles: Parallel, Series, Parallel and Series configurations;
- 6.5 Drive train
- 6.6 Solar powered vehicles

## D.SYLLABUS COVERED UP TO I.A-CHAPTERS 1,2 &3

<b>E.LEARNING RESOURCES:</b>			
<i>Sl. No.</i>	<i>Name of Authors</i>	<i>Title of the Book</i>	<i>Name of the Publisher</i>
1	R.B.Gupta	Automobile Engineering	Satya Prakashan
2	Dr Kirpal Singh	Automobile Engineering Vol- I & II	Standard Publishers
3	C.P.Nakra	Automobile Engineering	Dhanpat Rai Publication
4	W.H.Course	Automotive Engine	McGraw Hill
5	Iqbal Hussain	Electric & Hybrid Vehicles – Design Fundamentals	CRC Press, 2
6	A.K. Babu	Statistical Electric & Hybrid Vehicles	Khanna Publishing House, New Delhi, 2018

## Pr.1 AUTOMOBILE ENGINEERING LAB

Name of the Course: Diploma in MECHANICAL ENGINEERING			
Course code:		Semester	7th
Total Period:	75	Examination	3 hrs
Practical periods:	5 P/W	Sessional	75
Maximum marks:	175	End Semester Examination:	100

### COURSE OBJECTIVES

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

#### List of Practical .

1. Study of Automobile chassis.
2. Study the differential mechanism of the Tractor.
3. Study the hydraulic braking system of automobile.
4. Study Study the cut section model of carburetor solex type and maruti car type.
5. Study the fuel pump cut section model.
6. Study the actual cut section of gear box.
7. Study of actual car engine.



## Pr.2 CAD/CAM LAB

Name of the Course: Diploma in Mechanical Engg.			
Course code:		Semester	7th
Total Period:	75	Examination	3 Hrs
Theory periods:	5 P/W	Sessional:	50
Maximum marks:	150	End Semester Examination:	100

### OBJECTIVES

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

- 1.To understand the fundamentals and use of CAD.
- 2.To conceptualize drafting and modelling in CAD.
- 3.To interpret the various features in the menu of solid modelling package.
- 4.To synthesize various parts or components in an assembly.
- 5.To prepare CNC programmes for various jobs

### COURSE CONTENTS

#### PART-A.

##### INTRODUCTION:

Part modelling, Datum plane, Datum plane; constraint; dimensioning; extrude; revolve; sweep; protrusion; extrusion; rib; shell; hole; round; chamfer; copy; mirror; assembly; align; orient.

##### EXERCISES:

2D Drawings of Rectangle, circle, polygon and its dimensioning

3D Drawings of;

- 1.Gib and cutter joint
- 2.Screw Jack;
- 3.Connecting Rod;
- 4.Bearing Block.

Print the orthographic view from the above assembled 3D drawing

#### PART-B.

CNC Programming and Machining

##### INTRODUCTION;

- 1.Study of CNC lathe, milling;
- 2.Study of international codes; G-Codes and M –Codes
- 3.Format –Dimensioning methods;
- 4.Programme writing –Turning Simulator-Milling simulator IS practice-commands menus
- 5.Editing the programme in the CNC MACHINES;
- 6.Execute the programme in the CNC machines;

##### Exercise;

1. Print the programme and make the component in the CNC machine;
- 2.Using canned cycle-create a part programme for thread cutting, grooving and produce component in the CNC Turning Machine
- 3.Using Linear interpolation and Circular Interpolation-Create a part programme for grooving and produce component in the CNC Milling Machine

## Pr.3 -TECHNICAL SEMINAR

<b>Total Periods</b>	<b>02</b>	<b>Maximum Marks</b>	<b>50 Marks</b>
<b>Lab. Periods:</b>	<b>02Periods /week</b>	<b>Term Works</b>	<b>50Marks</b>
<b>Examination</b>		<b>End Semester Examination</b>	<b>--</b>

### A. Objective:

Each student has to select a recent topic of latest technology in the area of Computer Science and present a seminar in front of all students of the class. He/She has to prepare a PowerPoint presentation of the selected topic of minimum 10 slides are the total presentation will be approximately 10 minutes duration .There will be interactive session between the presenter and rest of the students including the faculty members of the dept at the end of presentation .A student has to present at least 2 nos.of seminar during a semester and to submit the report for evaluation.

## Pr 4. PROJECT WORK (Phase-I)

Course code:		Semester	7 <sup>th</sup>
Total Period:	75	Examination :	-
Theory periods:	5P / 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 mechanical engineering practices in real life situations, so as to participate and manage a large mechanical engineering projects in future.

*Entire Project shall spread over 7<sup>th</sup> and 8<sup>th</sup> Semester.* Part of the Project covered in 7<sup>th</sup> Semester shall be named as *Project Phase-I* and balance portion to be covered in 8<sup>th</sup> 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 7<sup>th</sup> 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.

Following are the broad suggestive areas of project work

- ✓ Automobile based projects.
- ✓ Refrigeration based & Air conditioning based projects.
- ✓ Hydraulic control & Pneumatic control based automation projects
- ✓ Fabrication based projects.
- ✓ Wind mill
- ✓ Solar energy based projects.
- ✓ Thermal power plant using steam.
- ✓ Hydel power dam.
- ✓ Cooling tower.
- ✓ Solenoid based hammer.
- ✓ Unmanned railway crossing.
- ✓ Engine based air compressor.
- ✓ Mobile all round year air conditioner
- ✓ Driverless car.
- ✓ Hybrid motorbike.
- ✓ Any other areas found suitable.
- ✓ Torque testing machine.
- ✓ Spring testing machine.
- ✓ Mechanical sanitizer.
- ✓ Solar powered refrigerator.
- ✓ Door opener.

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 (7<sup>th</sup> and 8<sup>th</sup> sem). The Grouping of students, selection of Project, assignment of Project Guide to the Group shall be done in the beginning of 7<sup>th</sup> 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 7<sup>th</sup> 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.