STATE COUNCIL FOR TECHNICAL EDUCATION AND VOCATIONAL TRAINING, ODISHA									
TEACHING AND EVALUATION SCHEME FOR 4th Semester Mechanical Engg(PT) (wef. 2019-20)									
Subject Number	Subject Code	Subject	Periods/week			Evaluation Scheme			
			L	T	P	Internal Assessment/ Sessional	End Sem Exams	Exams (Hours)	Total
		Theory							
Th.1		Production Technology	4		-	20	80	3	100
Th.2		Thermal Engg-I	4		-	20	80	3	100
Th.3		Fluid Mechanics	4		-	20	80	3	100
		Total	*12*			*60*	*240*	-	*300*
		Practical							
Pr.1		Mechanical Engg. Lab-I	-	-	6	25	50	3	75
Pr.2		Workshop-III	-	-	6	50	50	4	100
Pr.3		Technical Seminar			2	25	-		25
		Student Centered Activities(SCA)		-	3				
		Total	-	-	17	100	100	-	200
		Grand Total	**12**	**-**	**17**	**160**	**340**	**-**	**500**
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.									

CURRICULLUM OF 4th SEMESTER

For

DIPLOMA IN MECHANICAL ENGINEERING(PT)

(Effective FROM 2019-20 Sessions)

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

TH-1 PRODUCTION TECHNOLOGY

Name of the Course: Diploma in **Mech Engg(PT)**

Course code:		Semester	4th
Total Period:	60	Examination	3 hrs
Theory periods:	4 P/W	I.A	20
Maximum marks:	100	End Semester Examination:	80

A. RATIONALE :

Production Technology involves a working knowledge in the field of product design, product development and rapid part production. It deals with the production methodology and its management to make a complete analysis on the products.

B. COURSE OBJECTIVES

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

1. Understand the different components and processes involved in press tool operation.
2. Understand how to minimize the job setting and tool setting times in mass production.
3. Understand the industrial requirements of fabrication systems.
4. Understand the manufacturing processes like casting and powder metallurgy.

C. CHAPTER WISE DISTRIBUTION OF PERIODS

Sl. No.	Topic	Periods
01	Metal Forming Processes	07
02	Welding	16
03	Casting	16
04	Powder Metallurgy	07
05	Press Work	07
06	Jigs and fixtures	07
	Total Period:	60

D. COURSE CONTENTS

1.0 Metal Forming Processes

- 1.1 Extrusion: Definition & Classification
- 1.2 Explain direct, indirect and impact extrusion process.
- 1.3 Define rolling. Classify it.
- 1.4 Differentiate between cold rolling and hot rolling process.
- 1.5 List the different types of rolling mills used in Rolling process.

2.0 Welding

- 2.1 Define welding and classify various welding processes.
- 2.2 Explain fluxes used in welding.
- 2.3 Explain Oxy-acetylene welding process.
- 2.4 Explain various types of flames used in Oxy-acetylene welding process.
- 2.5 Explain Arc welding process.
- 2.6 Specify arc welding electrodes.
- 2.7 Define resistance welding and classify it.
- 2.8 Describe various resistance welding processes such as butt welding, spot welding, flash welding, projection welding and seam welding.
- 2.9 Explain TIG and MIG welding process
- 2.10 State different welding defects with causes and remedies.

3.0 Casting

3.1 Define Casting and Classify the various Casting processes.
3.2 Explain the procedure of Sand mould casting.
3.3 Explain different types of molding sands with their composition and properties.
3.4 Classify different pattern and state various pattern allowances.
3.5 Classify core.
3.6 Describe construction and working of cupola and crucible furnace.
3.7 Explain die casting method.
3.8 Explain centrifugal casting such as true centrifugal casting, centrifuging with advantages, limitation and area of application.
3.9 Explain various casting defects with their causes and remedies.

4.0 Powder Metallurgy

4.1 Define powder metallurgy process.
4.2 State advantages of powder metallurgy technology technique
4.3 Describe the methods of producing components by powder metallurgy technique.
4.4 Explain sintering.
4.5 Economics of powder metallurgy.

5.0 Press Work

5.1 Describe Press Works: blanking, piercing and trimming.
5.2 List various types of die and punch 7
5.3 Explain simple, Compound & Progressive dies
5.4 Describe the various advantages & disadvantages of above dies

6.0 Jigs and fixtures

6.1 Define jigs and fixtures
6.2 State advantages of using jigs and fixtures
6.3 State the principle of locations
6.4 Describe the methods of location with respect to 3-2-1 point location of rectangular jig
6.5 List various types of jig and fixtures.

Syllabus to be covered up to IA- Chapters 1, 2&3

LEARNING RESOURCES

Sl. No.	Author	Title of the book	Publisher
01	O.P. Khanna	Production Technology, Vol- I& II	Dhanpat Rai Publication
02	B.S Raghuwanshi	Workshop technology, Vol- I& II	Dhanpat Rai & Co
03	P.N. Rao	Manufacturing technology, Vol- I&II	TMH
04	P.C.Sharma	Manufacturing technology, Vol- I	S. Chand

TH - 2 THERMAL ENGINEERING-I

Name of the Course: Diploma in **Mech Engg(PT)**			
Course code:		Semester	4th
Total Period:	60	Examination	3 hrs
Theory periods:	4 P/week	Class Test:	20
Maximum marks:	100	End Semester Examination:	80

A. RATIONALE:

Thermal Engineering is the field of applied science which deals with energy possessed by heated gases and the laws which give the conversion of this energy into mechanical energy and vice versa

B. COURSE OBJECTIVES:

After the completion of the course the students will develop ability towards.

- Comprehending significance of thermodynamics properties in order to analyze a Thermodynamic system.
- Comprehending & applying first & second law of thermodynamics in closed & open system.
- Comprehending & applying gas laws applicable to perfect gas in order to determine Thermodynamic properties.
- Comprehending the concept of I.C engine and gas power cycle & computing work done & efficiency thereof.

C. CHAPTER WISE DISTRIBUTION OF PERIODS

Sl. No.	Topic	Periods
01	Thermodynamic concept & Terminology	12
02	Laws of Thermodynamics	12
03	Properties Processes of perfect gas	10
04	Internal combustion engine	08
05	Air Standard Cycle	10
06	Fuels and Combustion	08
	Total Period:	60

D. COURSE CONTENT:

1. Thermodynamic concept & Terminology

1.1 Thermodynamic Systems (closed, open, isolated)
1.2 Thermodynamic properties of a system (pressure, volume, temperature, entropy, enthalpy, Internal energy and units of measurement).
1.3 Intensive and extensive properties
1.4 Define thermodynamic processes, path, cycle , state, path function, point function.
1.5 Thermodynamic Equilibrium.
1.6 Quasi-static Process.
1.7 Conceptual explanation of energy and its sources
1.8 Work , heat and comparison between the two.
1.9 Mechanical Equivalent of Heat.
1.10Work transfer, Displacement work

2. Laws of Thermodynamics

2.1 State & explain Zeroth law of thermodynamics.
2.2 State & explain First law of thermodynamics.
2.3 Limitations of First law of thermodynamics
2.4Application of First law of Thermodynamics (steady flow energy equation and its application to turbine and compressor)
2.4 Second law of thermodynamics (Claucius & Kelvin Plank statements).
2.5 Application of second law in heat engine, heat pump, refrigerator & determination of efficiencies & C.O.P (solve simple numerical)

3. Properties Processes of perfect gas

3.1 Laws of perfect gas:
Boyle's law, Charle's law, Avogadro's law, Dalton's law of partial pressure, Guy lussac law, General gas equation, characteristic gas constant, Universal gas constant.
3.2 Explain specific heat of gas (Cp and Cv)
3.3 Relation between Cp & Cv.
3.4 Enthalpy of a gas.
3.5 Work done during a non- flow process.
3.6 Application of first law of thermodynamics to various non flow process (Isothermal, Isobaric, Isentropic and polytrophic process)
3.6 Solve simple problems on above.
3.7 Free expansion & throttling process.

4. Internal combustion engine

4.1 Explain & classify I.C engine.
4.2 Terminology of I.C Engine such as bore, dead centers, stroke volume, piston speed &RPM.
4.3 Explain the working principle of 2-stroke & 4- stroke engine C.I & S.I engine.
4.4 Differentiate between 2-stroke & 4- stroke engine C.I & S.I engine.

5. Gas Power Cycle

5.1 Carnot cycle
5.2 Otto cycle.
5.3 Diesel cycle.
5.4 Dual cycle.
5.5 Solve simple numerical.

6. **Fuels and Combustion**

6.1 Define Fuel.
6.2 Types of fuel.
6.3 Application of different types of fuel.
6.4 Heating values of fuel.
6.5 Quality of I.C engine fuels Octane number, Cetane number.

Syllabus to be covered up to I.A - Chapters 1, 2&3

Learning resources:

Sl. No.	Author	Title of the book	Publisher
01	R.S. Khurmi	Thermal Engineering	S.Chand
02	A.R.Basu	Thermal Engineering	Dhanpat Rai
03	A.S. Sarao	Thermal Engineering	Satya Prakash
04	P.K.Nag	Engineering Thermodynamics	TMH
05	Mahesh M Rathore	Thermal Engineering	TMH

TH-3 FLUID MECHANICS

Name of the Course: Diploma in **Mech & Other Mechanical Allied Branches**			
Course code:		Semester	4th
Total Period:	60	Examination	3 hrs
Theory periods:	4 P/W	Class Test:	20
Maximum marks:	100	End Semester Examination:	80

A. RATIONAL:

Use of fluid in engineering field is of great importance. It is therefore necessary to study the physical properties and characteristics of fluids which have very important application in mechanical and automobile engineering.

B. COURSE OBJECTIVES:

Students will develop an ability towards

- Comprehending fluid properties and their measurements
- Realizing conditions for floatation
- Applying Bernoulli's theorem

C. TOPIC WISE DISTRIBUTION OF PERIODS

Sl. No.	Topic	Periods
01	Properties of Fluid	08
02	Fluid Pressure and its measurements	08
03	Hydrostatics	08
04	Kinematics of Flow	08
05	orifices, notches & weirs	08
06	Flow through pipe	10
07	Impact of jets	10
	Total Period:	**60**

D.CONTENT

1.0 Properties of Fluid

1.1 Define fluid

1.2 Description of fluid properties like Density, Specific weight, specific gravity, specific volume and solve simple problems.

1.3 Definitions and Units of Dynamic viscosity, kinematic viscosity, surface tension Capillary phenomenon

2.0 Fluid Pressure and its measurements

2.1 Definitions and units of fluid pressure, pressure intensity and pressure head.

2.2 Statement of Pascal's Law.

2.3 Concept of atmospheric pressure, gauge pressure, vacuum pressure and absolute pressure

2.4 Pressure measuring instruments

Manometers (Simple and Differential)

2.4.1 Bourdon tube pressure gauge(Simple Numerical)

2.5 Solve simple problems on Manometer.

3.0 Hydrostatics

3.1 Definition of hydrostatic pressure

3.2 Total pressure and centre of pressure on immersed bodies(Horizontal and Vertical Bodies)

3.3 Solve Simple problems.

3.4 Archimedes 'principle, concept of buoyancy, meta center and meta centric height (Definition only)

3.5 Concept of floatation

4.0 Kinematics of Flow

4.1 Types of fluid flow
4.2 Continuity equation(Statement and proof for one dimensional flow)
4.3 Bernoulli's theorem(Statement and proof)
Applications and limitations of Bernoulli's theorem (Venturimeter, pitot tube)

4.4 Solve simple problems

5.0 Orifices, notches & weirs

5.1 Define orifice
5.2 Flow through orifice
5.3Orifices coefficient & the relation between the orifice coefficients
5.4 Classifications of notches & weirs
5.5 Discharge over a rectangular notch or weir
5.6 Discharge over a triangular notch or weir
5.7 Simple problems on above

6.0 Flow through pipe

6.1 Definition of pipe.
6.2 Loss of energy in pipes.
6.3 Head loss due to friction: Darcy's and Chezy's formula (Expression only)
6.4 Solve Problems using Darcy's and Chezy's formula.
6.5 Hydraulic gradient and total gradient line

7.0 Impact of jets

7.1 Impact of jet on fixed and moving vertical flat plates

7.2 Derivation of work done on series of vanes and condition for maximum efficiency.

7.3 Impact of jet on moving curved vanes, illustration using velocity triangles, derivation of work done, efficiency.

CHAPTERS COVERED UP TO IA- 1, 2,3,4

Learning Resources:

Sl No.	Name of the Book	Author Name	Publisher
1.	Text Book of Fluid Mechanics	R.K.Bansal	Laxmi
2.	Text Book of Fluid Mechanics	R.S khurmi	S.Chand
3.	Text Book of Fluid Mechanics	R.K.Rajput	S.Chand
4.	Text Book of Fluid Mechanics	Modi & Seth	Rajson's pub. Pvt. lt

PR1. MECHANICAL ENGINEERING LABORATORY-I

Name of the Course: Diploma in **Mech Engg(PT)**			
Course code:		Semester	4th
Total Period:	60	Examination	3 hrs
Lab. periods:	4 P/week	Sessional	25
Maximum marks:	75	End Semester Examination:	50

COURSE OBJECTIVES

Students will develop ability towards

- Conducting experimentations to determine properties of a solid material subject to uniaxial loading and impact
- Conducting experimentations towards determining characteristics of a fuel
- Study of equipment employing using fuels.

1. Strength of Materials and thermal Laboratory

1.1 Determine end reactions in a simply supported beam using parallel force apparatus.

1.2 Determination of Young's modulus using Searle's apparatus

1.3 Determination of torsional rigidity of the shaft using torsion testing machine

1.4 Determination of salient points (Young's modulus, yield point, fracture point) from stress- strain curve using Universal Testing Machine

1.5 Determination of hardness number by Rockwell/Vickers hardness testing machine

1.6 Determination of toughness using Impact testing machine (Charpy/Izod)

1.7 Determination of Flash point and fire point

1.8 Joule's Experiment

PR-2 WORKSHOP PRACTICE-III

Name of the Course: Diploma in **Mech/ & Other Mechanical Allied Branches**			
Course code:		Semester	4th
Total Period:	90	Examination	4 hrs
Lab. periods:	6 P/W	Teamwork	50
Maximum marks:	100	End Semester Examination:	50

Course Objectives:

Students will develop an ability towards

- Preparing components and jobs using foundry, welding and machining
- Realizing process parameters involved and their effects

1		**Machining Practices**
	1.1	Job in evolving drilling, boring
	1.2	Internal/External threading on Turning jobs
	1.3	Job in evolving use of Capstan and turret lathe (Taper Turning & Chamfering)
	1.4	All gear lathe, CNC Lathe Trainer Practice Job involving all turning process on MS Rod & aluminum rod for jobs using CNC Lathe trainer.
2		**Metal Machining**
	2.1	Shaper Preparation of V Block on CI or MS Blocks
	2.2	Milling Machine Preparation of Spur gear on CI or MS round

Pr3. TECHNICAL SEMINAR

Name of the Course: Diploma in **Mech Engg.(PT)**			
Course code:		Semester	4^{th}
Total Period:	30	Examination	3 hrs
Lab. periods:	2 P/W	Term Work	25

A . OBJECTIVES:

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

COMMUNICATION SKILLS

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

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

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

List of Equipments of Workshop Practice-III

Sl. No.	Name of Apparatus	QUANTITY
01	RADIAL DRILL MACHINE	01 No
02	ALL GEAR LATHE	06 Nos.
03	CAPSTAN LATHE	01 Nos.
04	CNC LATHE TRAINER	01 Nos.

LIST OF EQUIPMENTS OF MECHANICAL ENGG. LABORATORY-I

Sl No	NAME OF THE EQUIPMENT	Quantity
1	PARALLEL FORCE APPARATUS	2 Nos.
2	SEARLE'S APPARATUS	2 Nos.
3	TORSION TESTING MACHINE	1 Nos.
4	DIGITAL UNIVERSAL TESTING MACHINE	1 Nos.
5	HARDNESS TESTING MACHINE	1 Nos.
6	IMPACT TESTING MACHINE	1 Nos.
7	FLASH POINT AND FIRE POINT APPARATUS	1 Nos.
8	JOULES APPARATUS	1 Nos.