

STATE COUNCIL FOR TECHNICAL EDUCATION AND VOCATIONAL TRAINING, ODISHA

TEACHING AND EVALUATION SCHEME FOR 3rd 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		Strength of Material	4		-	20	80	3	100
Th.2		Engineering. Material	4		-	20	80	3	100
Th.3		Environmental studies	4			20	80	3	100
		<i>Total</i>	12			60	240	-	300
Practical									
Pr.1		Mechanical Engg. Drawing	-	-	7	50	50	3	100
Pr.2		Workshop-II	-	-	7	50	50	4	100
		Student Centred Activities(SCA)		-	3	-	-	-	-
		<i>Total</i>	-	-	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.

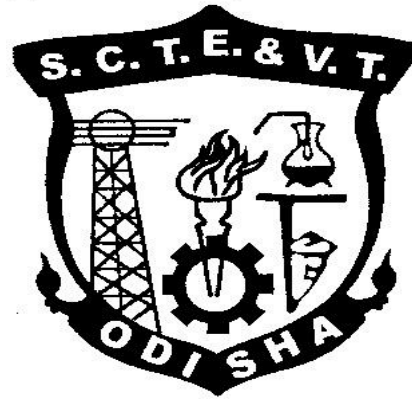
There shall be 1 Internal Assessment done for each of the Theory Subject. Sessional Marks shall be total of the performance of individual different jobs/ experiments in a subject throughout the semester

CURRICULLUM OF 3RD SEMESTER

For

DIPLOMA IN MECHANICAL ENGINEERING (PT)

(Effective FROM 2019-20 Sessions)



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

TH-1 STRENGTH OF MATERIAL

Name of the Course: Diploma in Mech/Auto/Aero & Other Mechanical Allied Branches			
Course code:		Semester	3 rd
Total Period:	60	Examination	3 hrs
Theory periods:	4 P/W	I.A TEST	20
Maximum marks:	100	End Semester Examination:	80

A. RATIONALE :

Strength of material deals with the internal behaviors of solid bodies under the action of external force. The subject focuses on mechanical properties of material analysis of stress, strain and deformations. Therefore it is an important basic subject of students for Mechanical and Automobile Engg.

B. COURSE OBJECTIVES:

Students will develop ability towards

- Determination of stress, strain under uniaxial loading (due to static or impact load and temperature) in simple and single core composite bars.
- Determination of stress, strain and change in geometrical parameters of cylindrical and spherical shells due to pressure
- Realization of shear stress besides normal stress and computation of resultant stress in two dimensional objects.
- Drawing bending moment and shear force diagram and locating points in a beam where the effect is maximum or minimum.
- Determination of bending stress and torsional shear stress in simple cases
- Understanding of critical load in slender columns thus realizing combined effect of axial and bending load.

C. CHAPTER WISE DISTRIBUTION OF PERIODS

Sl. No.	Topic	Periods
01	Simple Stress & Strain	10
02	Thin cylindrical and spherical shell under internal pressure	08
03	Two dimensional stress systems	10
04	Bending moment& shear force	10
05	Theory of simple bending	10
06	Combined direct & Bending stresses	06
07	Torsion	06
	Total Period:	60

D. COURSE CONTENTS

1.0 Simple stress & strain

- 1.1 Types of load, stresses & strains, (Axial and tangential) Hooke's law, Young's modulus, bulk modulus, modulus of rigidity, Poisson's ratio, derive the relation between three elastic constants,
- 1.2 Principle of super position, stresses in composite section
- 1.3 Temperature stress, determine the temperature stress in composite bar (single core)
- 1.4 Strain energy and resilience, Stress due to gradually applied, suddenly applied and impact load
- 1.5 Simple problems on above.

2.0 Thin cylinder and spherical shell under internal pressure

- 2.1 Definition of hoop and longitudinal stress, strain
- 2.2 Derivation of hoop stress, longitudinal stress, hoop strain, longitudinal strain and volumetric strain
- 2.3 Computation of the change in length, diameter and volume
- 2.4 Simple problems on above

3.0 Two dimensional stress systems

- 3.1 Determination of normal stress, shear stress and resultant stress on oblique plane
- 3.2 Location of principal plane and computation of principal stress
- 3.3 Location of principal plane and computation of principal stress and Maximum shear stress using Mohr's circle

4.0 Bending moment & shear force

- 4.1 Types of beam and load
- 4.2 Concepts of Shear force and bending moment
- 4.3 Shear Force and Bending moment diagram and its salient features illustration in cantilever beam, simply supported beam and over hanging beam under point load and uniformly distributed load

5.0 Theory of simple bending

- 5.1 Assumptions in the theory of bending,
- 5.2 Bending equation, Moment of resistance, Section modulus & neutral axis.
- 5.3 Solve simple problems.

6.0 Combined direct & bending stresses

- 6.1 Define column
- 6.2 Axial load, Eccentric load on column,

- 6.3 Direct stresses, Bending stresses, Maximum & Minimum stresses.
Numerical problems on above.
- 6.4 Buckling load computation using Euler's formula (no derivation) in
Columns with various end conditions

7.0 Torsion

- 7.0 Assumption of pure torsion
- 7.1 The torsion equation for solid and hollow circular shaft
- 7.2 Comparison between solid and hollow shaft subjected to pure torsion

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

Learning resources:

Sl. No.	Author	Title of the book	Publisher
01	S Ramamrutham	Strength of Materials	Dhanpat Rai
02	R K Rajput	Strength of Materials	S.Chand
03	R.S khurmi	Strength of Materials	S.Chand
04	G H Ryder	Strength of Materials	Mc millon and co. lmtd
05	S Timoshenko and D H Young	Strength of Materials	TMH

TH-2 ENGINEERING MATERIAL

Name of the Course: Diploma in Mech/Auto/Aero & Other Mechanical Allied Branches			
Course code:		Semester	3 rd
Total Period:	60	Examination	3 hrs
Theory periods:	4 P/week	IA	20
Maximum marks:	100	End Semester Examination:	80

A. RATIONALE:

Entire field of engineering deals with use of host of materials for making objects for human need. These materials include wide spectrum of element, metals, alloys and compounds with diverse properties. It is imperative that an engineer from any field should have a good knowledge of such materials and their properties.

B. COURSE OBJECTIVES:

After completion of the course students will have the ability of

- Realizing material requirements
- Realizing application area of ferrous, non ferrous and alloys
- Comprehending micro-structural changes during iron-carbon phase transformation process
- Comprehending effect of heat treatment and its effect towards change in material properties
- Comprehending continuity during evolution in engineering materials and development of modern engineering materials.

C. CHAPTER WISE DISTRIBUTION OF PERIODS

Sl. No.	Topic	Periods
01	Engineering materials and their properties	05
02	Ferrous Materials and alloy	05
03	Iron – Carbon system	08
04	Crystal imperfections	10
05	Heat Treatment	10
06	Non-ferrous alloys	10
07	Bearing Material	03
08	Spring materials	03
09	Polymers	03
10	Composites and Ceramics	03
	Total Period:	60

D. COURSE CONTENT:

1.0 Engineering materials and their properties

- 1.1 Material classification into ferrous and non ferrous category and alloys
- 1.2 Properties of Materials: Physical , Chemical and Mechanical
- 1.3 Performance requirements
- 1.4 Material reliability and safety

2.0 Ferrous Materials and alloys

- 2.1 Characteristics and application of ferrous materials
- 2.2 Classification, composition and application of low carbon steel, medium carbon steel and High carbon steel
- 2.3 Alloy steel: Low alloy steel, high alloy steel, tool steel and stainless steel
- 2.4 Tool steel: Effect of various alloying elements such as Cr, Mn, Ni, V, Mo,

3.0 Iron – Carbon system

- 3.1 Concept of phase diagram and cooling curves
- 3.2 Features of Iron-Carbon diagram with salient micro-constituents of Iron and Steel

4.0 Crystal imperfections

- 4.1 Crystal defines, classification of crystals, ideal crystal and crystal imperfections
- 4.2 Classification of imperfection: Point defects, line defects, surface defects and volume defects
- 4.3 Types and causes of point defects: Vacancies, Interstitials and impurities
- 4.4 Types and causes of line defects: Edge dislocation and screw dislocation
- 4.5 Effect of imperfection on material properties
- 4.6 Deformation by slip and twinning
- 4.7 Effect of deformation on material properties

5.0 Heat Treatment

- 5.1 Purpose of Heat treatment
- 5.2 Process of heat treatment: Annealing, normalizing, hardening, tempering, stress relieving measures
- 5.3 Surface hardening: Carburizing and Nitriding
- 5.4 Effect of heat treatment on properties of steel
- 5.5 Hardenability of steel

6.0 Non-ferrous alloys

- 6.1 Aluminum alloys: Composition, property and usage of Duralmin, γ - alloy.
- 6.2 Copper alloys: Composition, property and usage of Copper-Aluminum, Copper-Tin, Babbitt , Phosperous bronze, brass, Copper- Nickel
- 6.3 Predominating elements of lead alloys, Zinc alloys and Nickel alloys
- 6.4 Low alloy materials like P-91, P-22 for power plants and other

high temperature services. High alloy materials like stainless steel grades of duplex, super duplex materials etc.

7.0 Bearing Material

7.1 Classification, composition, properties and uses of Copper base, Tin Base, Lead base, Cadmium base bearing materials

8.0 Spring materials

8.1 Classification, composition, properties and uses of Iron-base and Copper base spring material

9.0 Polymers

9.1 Properties and application of thermosetting and thermoplastic polymers
9.2 Properties of elastomers

10.0 Composites and Ceramics

10.1 Classification, composition, properties and uses of particulate based and fiber reinforced composites
10.2 Classification and uses of ceramics

Syllabus to be covered up to I.A - Chapters 1, 2, 3, 4&5

Learning resources:

Sl. No.	Author	Title of the book	Publisher
01	O P Khanna	A Textbook of Material Science and Metallurgy	Dhantpat Rai
02	R K Rajput	Engineering materials and Metallurgy	S.Chand
03	S K Hazra choudhry	Material science & process	Imdian Book Distrubuting

TH.3 ENVIRONMENTAL STUDIES (Common to All Branches)

Theory: 4 Periods per Week
Total Periods: 60 Periods
Examination: 3 Hours

I.A: 20 Marks
End Exam : 80 Marks
TOTAL MARKS : 100 Marks

A. RATIONALE:

Due to various aspects of human developments including the demand of different kinds of technological innovations, most people have been forgetting that, the Environment in which they are living is to be maintained under various living standards for the preservation of better health. The degradation of environment due to industrial growth is very much alarming due to environmental pollution beyond permissible limits in respect of air, water industrial waste, noise etc. Therefore, the subject of Environmental Studies to be learnt by every student in order to take care of the environmental aspect in each and every activity in the best possible manner.

B. OBJECTIVES:

After completion of study of environmental studies, the student will be able to:

1. Gather adequate knowledge of different pollutants, their sources and shall be aware of solid waste management systems and hazardous waste and their effects.
2. Develop awareness towards preservation of environment.

C. Topic wise distribution of periods:

Sl. No.	Topics	Period
1	The Multidisciplinary nature of environmental studies	04
2	Natural Resources	10
3	Systems	08
4	Biodiversity and it's Conservation	08
5	Environmental Pollution.	12
6	Social issues and the Environment	10
7	Human population and the environment	08
Total:		60

D.COURSE CONTENT:

Unit 1: The Multidisciplinary nature of environmental studies

Definition, scope and importance, Need for public awareness.

Unit 2: Natural Resources

Renewable and non renewable resources:

- a) Natural resources and associated problems.
 - Forest resources: Use and over-exploitation, deforestation, case studies, Timber extraction mining, dams and their effects on forests and tribal people.
 - Water resources: Use and over-utilization of surface and ground water, floods, drought, conflicts over water, dam's benefits and problems.
 - Mineral Resources: Use and exploitation, environmental effects of extracting and using mineral resources.
 - Food Resources: World food problems ,changes caused by agriculture and overgrazing,effectsofmodernagriculture,fertilizers-pesticidesproblems, water logging, salinity,.
 - Energy Resources: Growing energy need, renewable and non-renewable energy sources, use of alternate energy sources, case studies.
 - Land Resources: Land as a resource ,land degradation ,man induces landslides, soil erosion, and desertification.
- b) Role of individual in conservation of natural resources.
- c) Equitable use of resources for sustainable lifestyles.

Unit 3: Systems

- Concept of an ecosystem.
- Structure and function of an ecosystem.
- Producers, consumers, decomposers.
- Energy flow in the ecosystems.
- Ecological succession.
- Food chains, food web sand ecological pyramids.
- Introduction, types, characteristic features, structure and function of the following ecosystem:
 - Forest ecosystem:
 - Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries).

Unit 4: Biodiversity and it's Conservation

- Introduction-Definition: genetics, species and ecosystem diversity.
- Biogeographically classification of India.
- Value of biodiversity: consumptive use, productive use, social ethical, aesthetic and opt in values.
- Biodiversity at global, national and local level.
- Threats to biodiversity: Habitats loss, poaching of wild life, man wildlife conflicts.

Unit 5: Environmental Pollution.

Definition Causes, effects and control measures of:

- a) Air pollution.
- b) Water pollution.
- c) Soil pollution
- d) Marine pollution

- e) Noise pollution.
- f) Thermal pollution
- g) Nuclear hazards.

Solid waste Management: Causes, effects and control measures of urban and industrial wastes.

Role of an individual in prevention of pollution.

Disaster management: Floods, earth quake, cyclone and landslides.

Unit 6: Social issues and the Environment

From unsustainable to sustainable development.

- Urban problems related to energy.
- Water conservation, rain water harvesting, water shed management.
- Resettlement and rehabilitation of people; its problems and concern.
- Environmental ethics: issue and possible solutions.
- Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust, case studies.
- Air (prevention and control of pollution) Act.
- Water (prevention and control of pollution) Act.
- Public awareness.

Unit 7: Human population and the environment

- Population growth and variation among nations.
- Population explosion-family welfare program.
- Environment and human health.
- Human rights.
- Value education
- Role of information technology in environment and human health.

Syllabus to be covered up to I.A Units 1, 2, 3

Learning Resources:			
Sl.No	Title of the Book	Name of Authors	Name of Publisher
1	Text book of Environmental studies	Erach Bharucha	#UGC
2	Fundamental concepts in Environmental Studies	,D.D .Mishra	S. Chand&Co-Ltd
3	Textbook of Environmental Studies	K.Raghavan Nambiar	SCITECH Publication Pvt. Ltd.
4	Environmental Engineering	V.M.Domkundwar	- DhanpatRai&Co

MECHANICAL ENGINEERING DRAWING (PR-1)

Name of the Course: Diploma in Mech(PT)			
Course code:		Semester	3 rd
Total Period:	105	Examination	3 hrs
Lab Periods:	7 P/week	Sessional:	50
Maximum marks:	100	End Semester Examination:	50

COURSE OBJECTIVES:-

Students will develop ability towards

- Recognizing significance of standardized representations
- Comprehending role of various fastening elements and offer engineering drawing thereof in manual mode
- Comprehending geometrical constraints and function of components in assemblies such as bearings and screw jack
- Comprehending functional requirement of major components and offer engineering drawing in manual mode thereof.

Chapter

Contents

- 1.0 Revision of Engineering Drawing of 1st Year
- 2.0 Draw plan, elevation and side view of different machine elements from their isometric view using AutoCAD & mini drafter (Minimum 5 Drawings).
- 3.0 Engineering drawing of fastening elements in first angle orthographic Projection
 - 3.1 Bolt, nut and threads
 - 3.2 Cotter joint
 - 3.3 Knuckle joint
- 4.0 Details to assembly
 - 4.1 Rigid pedestal bearing
 - 4.2 Foot step bearing
 - 4.3 Simple Screw jack
- 5.0 Assembly to details
 - 5.1 Connecting rod of IC Engine
 - 5.2 Boiler safety valve
 - 5.3 Spring loaded valve
 - 5.4 Hydraulic non return valve
 - 5.5 Flat belt pulley

Learning Resources:

Sl No.	Author Name	Name of the Book	Publisher Name
1	N D Bhatt	Machine Drawing	Charotar
2	T Jones	Machine Drawing	Kalyani
3	R K Dhawan	Machine Drawing	S.Chand
4	T. Jeypooven	Emgg. Graphics using Autocad	CBS

WORKSHOP PRACTICE-II (PRACTICAL-2)

Name of the Course: Diploma in Mech/Auto/Aero & Other Mechanical Allied Branches			
Course code:		Semester	3 rd
Total Period:	105	Examination	4 hrs
Lab. periods:	7 P/week	Sessional	50
Maximum marks:	100	End Semester Examination:	50

COURSE OBJECTIVES:-

Students will develop ability towards

- Practicing fitting, carpentry, smithy and machining
- Understanding the tools and equipment used in the practices
- Realize the time and resource utilization in the practices

1. Fitting practices

- 1.1 Preparation of caliper
- 1.2 Preparation of try square
- 1.3 Preparation of hammer, square , Hexagonal

2. Smithy Practices

- 2.1 Preparation of door ring with hook
- 2.2 Preparation of hexagonal head bolt
- 2.3 Preparation of octagonal flat chisel

3 Carpentry Practices

- 3.1 Cutting of slot, botch, mortise and Tenon Joint
- 3.2 Preparation of single dove tail joint

4 Welding Practice

- 4.1 Lap & Butt Joint using Arc Welding
- 4.2 Lap Joint using Gas Welding
- 4.3 Joining Two non-ferrous parts through

LIST OF EQUIPMENTS OF WORKSHOP PRACTICE

WELDING SHOP

SL. NO.	NAME OF ITEM	QUANTITY
01	OXYGEN CYLINDER	01 No.
02	ACETYLENE CYLINDER	01 No.
03	PRESSURE GAUSES	02 Nos
04	PRESSURE REGULATOR	02 Nos.
05	WELDING TORCH	01 No.
06	GOGGLES	10 Nos.
07	HOSE PIPES	10 Meters
08	AC WELDING TRANSFORMER SET	01 No.
09	CHIPPING BRUSH	02 Nos.
10	WIRE BRUSH	02 Nos.
11	ARC SHIELD (EYE PROTECTOR)	05 Nos.
12	MIG / TIG WELDING MACHINE	01 Nos.

CARPENTRY SHOP

SL. NO.	NAME OF ITEM	QUANTITY
01	STEEL RULE (SCALE) 1 Meter	10 Nos.
02	SCRIBER	10 Nos.
03	MARKING GAUGE	05 Nos.
04	MORTISE GAUGE	05 Nos.
05	TRY SQUIRE	10 Nos.
06	DIVIDERS	10 Nos.
07	RIP SAW	10 Nos.
08	COPING SAW	10 Nos.
09	FIRMAR CHIESEL	10 Nos.
10	GAUGE CHIESEL	02 Nos.
11	IRON JACK PLANE	02 Nos.
12	TRYING PLANE	05 Nos.
13	RASP	05 Nos.
14	HAND DRILL	05 Nos.
15	GIMLET DRILL	02 Nos.
16	CLAMPING VICE	10 Nos.
17	C-CLAMP	05 Nos.
18	CROSS PEAN HAMMER	05 Nos.
19	CLAW HAMMER	10 Nos.
20	MALLET	05 Nos.
21	WOOD WORKING LATHE	01 No.
22	CIRCULAR SAW	01 No.

FITTING SHOP

SL. NO.	NAME OF ITEM	QUANTITY
01	BENCH VICE	20 Nos.
02	PIPE VICE	04 Nos.
03	TRY SQUARE	10 Nos.
04	SCRIBER & SURFACE GAUGE	10 Nos.
05	DOT PUNCH	10 Nos.
06	CENTRE PUNCH	10 Nos.
07	SURFACE PLATE	01 No.
08	ANGLE PLATE	01 No.
09	STEEL RULE	10 Nos.
10	VERNIER CALLIPERS	05 Nos.
11	MICROMETRE	05 Nos.
12	DIVIDERS	10 Nos.
13	OUTSIDE CALLIPERS	10 Nos.
14	INSIDE CALLIPERS	05 Nos.
15	FEELER GAUGE	01 No.
16	VERNIER HEIGHT GAUGE	01 No.
17	HACKSAW (FIXED FRAME)	10 Nos.
18	ROUND FILE	10 Nos.
19	SINGLE CUT FILE	10 Nos.
20	DOUBLE CUT FILE	10 Nos.
21	BALL PEAN HAMMER	05 Nos.
22	TAP WRENCH	01 No.
23	HAND DRILLING M/C	01 No.
24	PORTABLE GRINDER	01 o.

BLACKSMITHY SHOP

SL. NO.	NAME OF ITEM	QUANTITY
01	FURNACE OF HEARTH (WITH CENTRE BLOWER)	05 Nos.
02	SHOWEL	05 Nos.
03	POKER	05 Nos.
04	ANVIL	05 Nos.
05	SCEDGE HAMMER	05 Nos.
06	PICK UP TONG	10 Nos.
07	CHIESEL TONG	05 Nos.
08	CLOSE FLAT TONG	05 Nos.
09	PINUR TONG	05 Nos.
10	HOT CHIESEL	05 Nos.
11	COLD CHIESEL	05 Nos.
12	DRIFT	02 Nos.
13	SWAGE BLOCK	01 No.
14	BALL PEAN HAMMER	05 Nos.
15	CROSS PEAN HAMMER	05 Nos.