 MAHARASHTRA STATE BOARD OF TECHNICAL EDUCATION, MUMBAI																
TEACHING AND EXAMINATION SCHEME FOR POST S.S.C. DIPLOMA COURSES																
COURSE NAME : DIPLOMA IN FABRICATION TECHNOLOGY & ERECTION ENGINEERING																
COURSE CODE : FG																
DURATION OF COURSE : 6 SEMESTERS										WITH EFFECT FROM 2012-13						
SEMESTER : FOURTH										DURATION : 16 WEEKS						
PATTERN : FULL TIME - SEMESTER										SCHEME : G						
SR. NO	SUBJECT TITLE	Abbrev iation	SUB CODE	TEACHING SCHEME			EXAMINATION SCHEME									SW (17400)
				TH	TU	PR	PAPER HRS.	TH (1)		PR (4)		OR (8)		TW (9)		
1	Environmental Studies \$	EST	17401	01	--	02	01	50#*	20	--	--	--	--	25@	10	50
2	Manufacturing Processes β	MPR	17402	03	--	04	03	100	40	25#	10	--	--	50@	20	
3	Fluid Mechanics & Machinery β	FMM	17411	04	--	02	03	100	40	25#	10	--	--	25@	10	
4	Welding Technology	WTE	17455	03	--	02	03	100	40	25#	10	--	--	25@	10	
5	Fabrication Processes	FPR	17456	03	--	02	03	100	40	50#	20	--	--	25@	10	
6	Processes Equipments	PEQ	17457	04	--	02	03	100	40	--	--	--	--	25@	10	
7	Professional Practices-II	PPS	17048	--	--	03	--	--	--	--	--	--	--	50@	20	
	TOTAL			18	--	17	--	550	--	125	--	--	--	225	--	50
**	Industrial Training (Optional) Examination in 5th Semester Professional Practices-III															
Student Contact Hours Per Week: 35 Hrs.																
THEORY AND PRACTICAL PERIODS OF 60 MINUTES EACH.																
Total Marks : 950																
@ - Internal Assessment, # - External Assessment, <div></div> No Theory Examination, \$ - Common to all branches, β - Common to ME / PG / PT/ MH / MI/FG																
Abbreviations: TH-Theory, TU- Tutorial, PR-Practical, OR-Oral, TW- Term Work, SW- Sessional Work.																
** Industrial Training (Optional) - Student can undergo Industrial Training of four weeks after fourth semester examination during summer vacation.																
Assessment will be done in Fifth semester under Professional Practices-III. They will be exempted from activities of Professional Practices-III of 5th Semester.																
➤ Conduct two class tests each of 25 marks for each theory subject. Sum of the total test marks of all subjects is to be converted out of 50 marks as sessional work (SW).																
➤ Progressive evaluation is to be done by subject teacher as per the prevailing curriculum implementation and assessment norms.																
➤ Code number for TH, PR, OR, TW are to be given as suffix 1, 4, 8, 9 respectively to the subject code.																
➤ For CAD software subject MSBTE decide the contents of the practical every year.																

Course Name : All Branches of Diploma in Engineering & Technology**Course Code : AE/CE/CM/CO/CR/CS/CW/DE/EE/EP/IF/EJ/EN/ET/EV/EX/IC/IE/IS/
ME/MU/PG/PT/PS/CD/CV/ED/EI/FE/IU/MH/MI/DC/TC/TX/FG/AU****Semester : Fourth****Subject Title : Environmental Studies****Subject Code : 17401****Teaching and Examination Scheme:**

Teaching Scheme			Examination Scheme					
TH	TU	PR	PAPER HRS	TH	PR	OR	TW	TOTAL
01	--	02	01	50#*	--	--	25@	75

#* - Online Theory Examination**NOTE:**

- Two tests each of 25 marks to be conducted as per the schedule given by MSBTE.
- Total of tests marks for all theory subjects are to be converted out of 50 and to be entered in mark sheet under the head Sessional Work (SW).

Rationale:

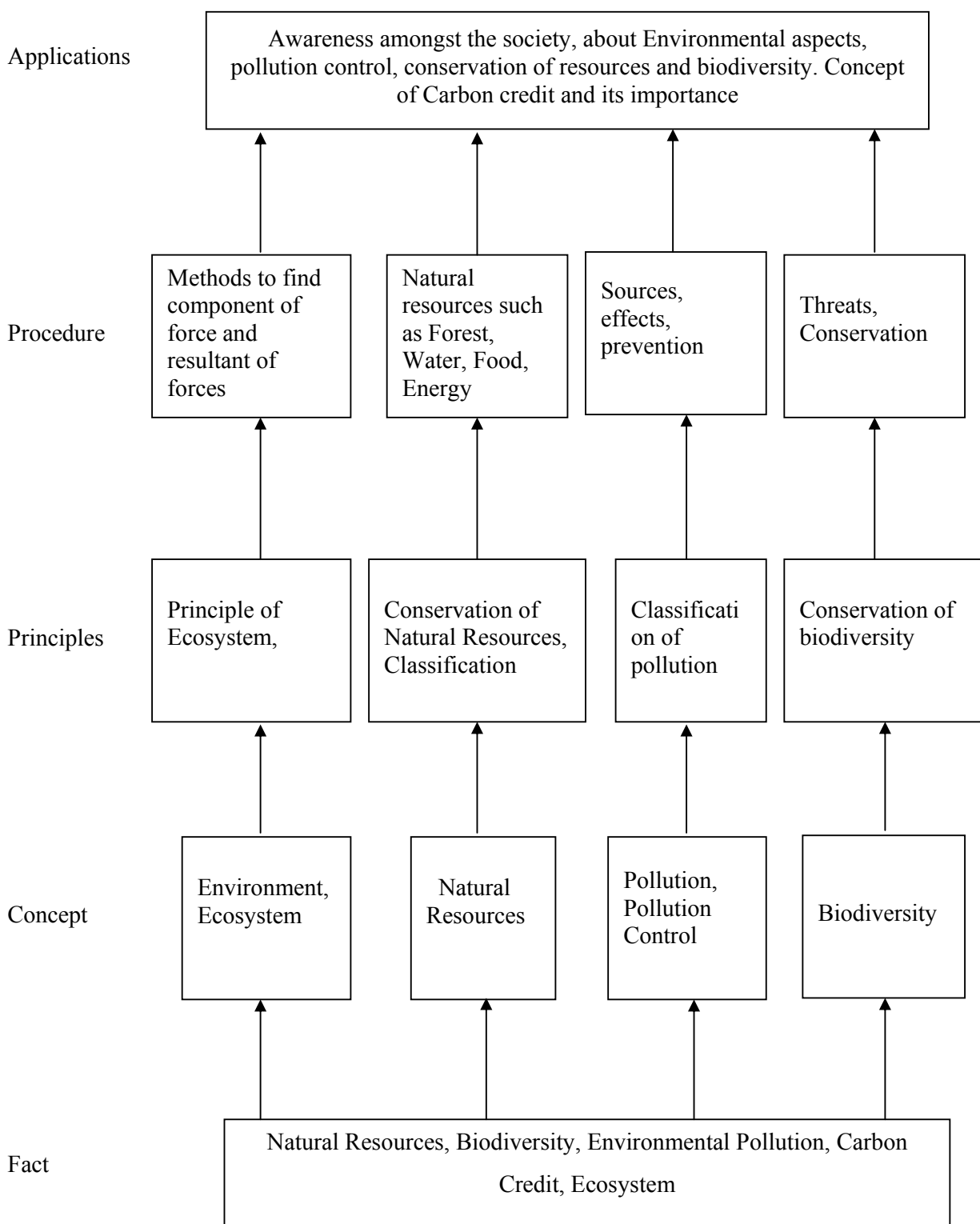
Environment essentially comprises of our living ambience, which gives us the zest and verve in all our activities. The turn of the twentieth century saw the gradual onset of its degradation by our callous deeds without any concern for the well being of our surrounding we are today facing a grave environmental crisis. The unceasing industrial growth and economic development of the last 300 years or so have resulted in huge ecological problems such as overexploitation of natural resources, degraded land, disappearing forests, endangered species, dangerous toxins, global warming etc.

It is therefore necessary to study environmental issues to realize how human activities affect the environment and what could be possible remedies or precautions which need to be taken to protect the environment.

The curriculum covers the aspects about environment such as Environment and Ecology, Environmental impacts on human activities, Water resources and water quality, Mineral resources and mining, Forests, etc.

General Objectives: The student will be able to,

1. Understand importance of environment
2. Know key issues about environment
3. Understands the reasons for environment degradation
4. Know aspects about improvement methods
5. Know initiatives taken by the world bodies to restrict and reduce degradation

Learning Structure:

Theory:

Topic and Contents	Hours	Marks
Topic 1: Nature of Environmental Studies Specific Objectives: <ul style="list-style-type: none"> ➤ Define the terms related to Environmental Studies ➤ State importance of awareness about environment in general public Contents: <ul style="list-style-type: none"> • Definition, Scope and Importance of the environmental studies • Importance of the studies irrespective of course • Need for creating public awareness about environmental issues 	01	04
Topic 2: Natural Resources and Associated Problems Specific Objectives: <ul style="list-style-type: none"> ➤ Define natural resources and identify problems associated with them ➤ Identify uses and their overexploitation ➤ Identify alternate resources and their importance for environment Contents: <p>2.1 Renewable and Non renewable resources</p> <ul style="list-style-type: none"> • Definition • Associated problems <p>2.2 Forest Resources</p> <ul style="list-style-type: none"> • General description of forest resources • Functions and benefits of forest resources • Effects on environment due to deforestation, Timber extraction, Building of dams, waterways etc. <p>2.3 Water Resources</p> <ul style="list-style-type: none"> • Hydrosphere: Different sources of water • Use and overexploitation of surface and ground water • Effect of floods, draught, dams etc. on water resources and community <p>2.4 Mineral Resources:</p> <ul style="list-style-type: none"> • Categories of mineral resources • Basics of mining activities • Mine safety • Effect of mining on environment <p>2.5 Food Resources:</p> <ul style="list-style-type: none"> • Food for all • Effects of modern agriculture • World food problem 	04	10
Topic 3. Ecosystems <ul style="list-style-type: none"> • Concept of Ecosystem • Structure and functions of ecosystem • Energy flow in ecosystem • Major ecosystems in the world 	01	04

Topic 4. Biodiversity and Its Conservation <ul style="list-style-type: none"> • Definition of Biodiversity • Levels of biodiversity • Value of biodiversity • Threats to biodiversity • Conservation of biodiversity 	02	06
Topic 5. Environmental Pollution <ul style="list-style-type: none"> • Definition • Air pollution: Definition, Classification, sources, effects, prevention • Water Pollution: Definition, Classification, sources, effects, prevention • Soil Pollution: Definition, sources, effects, prevention • Noise Pollution: Definition, sources, effects, prevention 	03	08
Topic 6. Social Issues and Environment <ul style="list-style-type: none"> • Concept of development, sustainable development • Water conservation, Watershed management, Rain water harvesting: Definition, Methods and Benefits • Climate Change, Global warming, Acid rain, Ozone Layer Depletion, Nuclear Accidents and Holocaust: Basic concepts and their effect on climate • Concept of Carbon Credits and its advantages 	03	10
Topic 7. Environmental Protection Brief description of the following acts and their provisions: <ul style="list-style-type: none"> • Environmental Protection Act • Air (Prevention and Control of Pollution) Act • Water (Prevention and Control of Pollution) Act • Wildlife Protection Act • Forest Conservation Act Population Growth: Aspects, importance and effect on environment <ul style="list-style-type: none"> • Human Health and Human Rights 	02	08
Total	16	50

Practical:**Skills to be developed:****Intellectual Skills:**

1. Collection of information, data
2. Analysis of data
3. Report writing

Motor Skills:

1. Presentation Skills
2. Use of multi media

List of Projects:

Note: Any one project of the following:

1. Visit to a local area to document environmental assets such as river / forest / grassland / hill / mountain

2. Visit to a local polluted site: Urban/Rural/Industrial/Agricultural
3. Study of common plants, insects, birds
4. Study of simple ecosystems of ponds, river, hill slopes etc

Prepare a project report on the findings of the visit illustrating environment related facts, analysis and conclusion. Also suggest remedies to improve environment.

Learning Resources:

Books:

Sr. No.	Author	Title	Publisher
01	Anindita Basak	Environmental Studies	Pearson Education
02	R. Rajgopalan	Environmental Studies from Crises to Cure	Oxford University Press
03	Dr. R. J. Ranjit Daniels, Dr. Jagdish Krishnaswamy	Environmental Studies	Wiley India

Course Name : Mechanical Engineering Group**Course Code : ME/PG/PT/MH/MI/FE/FG****Semester : Fourth****Subject Title : Manufacturing Process****Subject Code : 17402****Teaching and Examination Scheme**

Teaching Scheme			Examination Scheme					
TH	TU	PR	PAPER HRS	TH	PR	OR	TW	TOTAL
03	--	04	03	100	25#	--	50@	175

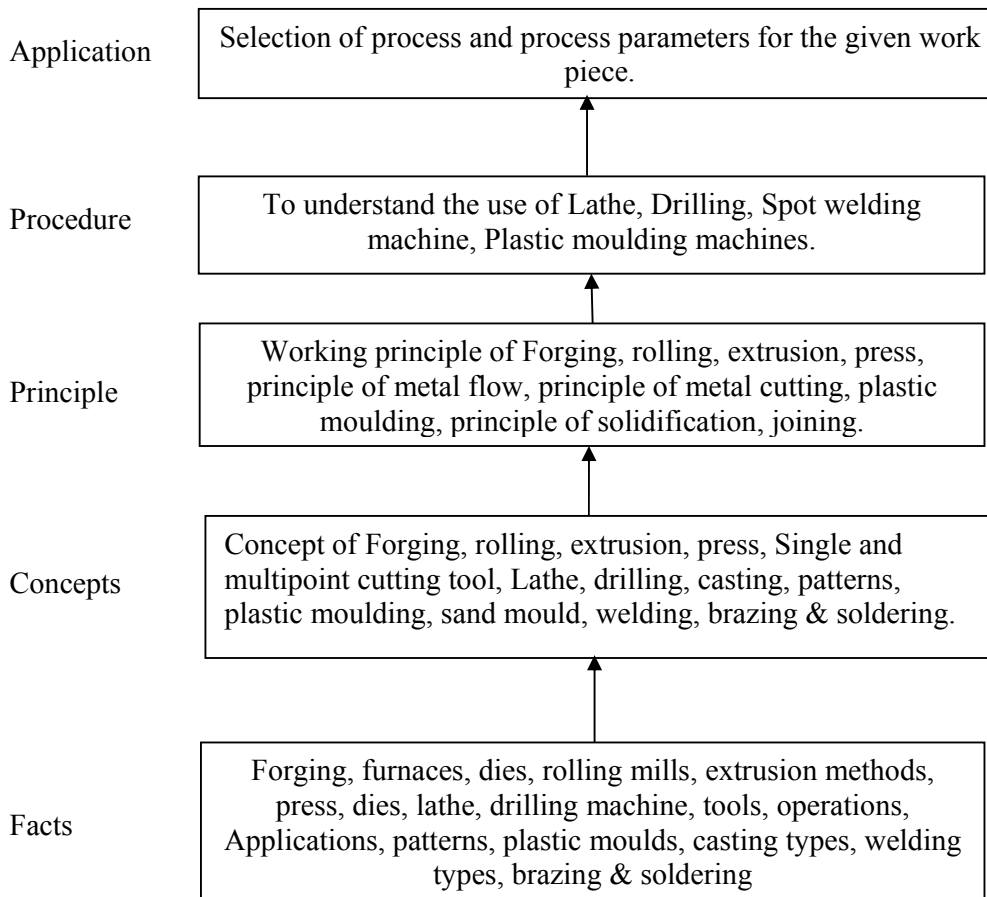
Rationale:

Diploma technician often comes across various types of basic manufacturing processes. He / she is required to select, operate and control the appropriate processes for specific applications. He / she is also required to know about various cutting tools, latest improvements in manufacturing processes. This is a core technology subject. The diploma technician should know how the raw material gets processed through various processes and ultimately results into finished goods. Hence it is essential that, he has understanding of basic manufacturing processes, machines, tools and equipments. With sound knowledge of this subject, the diploma technician will be able to handle and control practical situations more effectively and confidently.

Objectives:

The student will be able to:

- 1) Use the basic machine tools like lathe and drilling.
- 2) Produce and inspect the job as per specified dimensions.
- 3) Select the specific manufacturing processes for the desired output.
- 4) Adopt safety practices while working on various machines.
- 5) Explain the different types of plastic moulding processes.
- 6) Select the basic manufacturing process for different components to be machined.

Learning Structure:

Theory:

Topic and Content	Hours	Marks
1:Forming Processes Specific Objectives: <ul style="list-style-type: none"> ➤ To list basic manufacturing processes and write working principal of different manufacturing processes like Drop forging, Rolling and Extrusion ➤ To identify and select proper manufacturing process for a specific component Content 1.1 Drop forging: 06 Marks Upset forging, press forging(die forging),open die & closed die forging, forging operations 1.2 Rolling: 06 Marks Principle of rolling, hot & cold rolling, Types of rolling mill, application of rolling 1.3 Extrusion: 06 Marks Direct & indirect extrusion, Advantages, disadvantages and Applications.	08	18
2. Press working: Specific Objectives: <ul style="list-style-type: none"> ➤ To define Press working machine principal ➤ To state various classification of press machine. ➤ To state different operations performed on press machine and their p[practical applications Content 2.1 Press classification, press operations like punching/piercing, blanking, notching, lancing 06 Marks 2.2 Die set components and types of dies 06 Marks 2.3 Forming Operations: Bending, drawing 04 Marks	08	16
3. Casting Processes: 22 Marks Specific Objectives: <ul style="list-style-type: none"> ➤ To state different between pattern and model ➤ To list different types of pattern and their applications ➤ To state various types of pattern allowances. ➤ To state various types of casting processes. Content 3.1 Pattern making: 06 Marks Basic steps in making casting, Pattern : types, materials and allowances, tools, color coding of patterns 3.2 Moulding: 06 Marks Types of moulding sands, properties of sand, moulding methods, cores and core prints, elements of gating system, bench moulding, floor moulding, pit moulding, machine moulding. 3.3 Casting: 06 Marks Furnaces: Construction and working of cupola furnace, electric arc furnace. - Methods & applications of - Centrifugal casting, shell moulding, investment casting, Casting defects - Causes & remedies. 3.4 Hot chamber and cold chamber die casting, Die casting defects - Causes & remedies. 04 Marks	10	22
4. Welding Specific Objectives:	07	14

<p>➤ To define Arc welding and Gas welding Principal.</p> <p>➤ To state difference between soldering and brazing processes</p> <p>Content</p> <p>4.1 Introduction & classification of welding processes - Gas welding, carbon arc welding, shielded metal arc welding, TIG welding, MIG welding, plasma arc welding, resistance welding types-spot, seam projection. Electron beam welding, laser beam welding, welding defects. 10 Marks</p> <p>4.2 Introduction to soldering and brazing – Process, fillers, heating methods & applications. 04 Marks</p>		
<p>5. Machining Operations</p> <p>Specific Objectives:</p> <p>➤ To state the working principal of lathe and drilling machines.</p> <p>➤ To list out various operations performed on lathe and drilling machines</p> <p>Content</p> <p>5.1 Lathe Machine: 12 Marks Introduction, classification and basic parts of center lathe & their functions, Lathe operations like facing, plain turning, taper turning, thread cutting, chamfering, grooving, knurling. Cutting tool nomenclature & tool signature, cutting parameters.</p> <p>5.2 Drilling Machine: 08 Marks Introduction, classification, basic parts of radial drilling machine and their functions, twist drill nomenclature, drilling machine operations like drilling, reaming, boring, counter sinking, counter boring, spot facing. Cutting parameters.</p>	10	20
<p>6. Plastic Moulding:</p> <p>Specific Objectives:</p> <p>➤ To state different properties of plastics</p> <p>➤ To explain various plastic mauling methods like Injection, blow, compression molding</p> <p>Content Introduction, Properties of plastics, types of plastics, plastic moulding methods - compression moulding, injection moulding, blow moulding, extrusion, vacuum forming and calendaring.</p>	05	10
Total	48	100

Practical:

Skills to be developed:

Intellectual skills:

- 1) Identify basic manufacturing processes like forging, rolling and extrusion, for required component.
- 2) Specify need of pattern allowances.
- 3) Decide process parameters for different operations.
- 4) Decide tools required for a manufacturing process.
- 5) Identify a joining method for fabrication.

Motor Skills:

- 1) Operate lathe, drilling machine.

- 2) Set the tool and select the cutting parameters for machining operations.
- 3) Set the tools, job and decide cutting parameters.
- 4) Inspect various dimensions of jobs by using measuring instruments.
- 5) Make simple wooden / thermocole pattern.

List of Practical:

- 1) One turning job on lathe containing the operations like plain turning, step turning, taper turning, grooving, knurling and chamfering.
- 2) One job using Spot welding machine. (Min. 4 spots on 0.5-1mm thick metal strip.)
- 3) One simple job on TIG / MIG welding setup or visit to TIG / MIG welding shop.
- 4) Moulding practice for any one pattern.
- 5) Industrial visit to observe plastic processing shop and report on the visit.
- 6) One composite job containing the operations like lathe with axial & across drilling (like Nut- Bolt assembly or any other equivalent job).
- 7) Demonstration of eccentric turning using four jaw chuck.

Notes:

- 1] The workshop instructors should prepare specimen job in each shop as demonstration practice before the student (as per the drawing given by subject teacher/ workshop superintendent).
- 2] Theory behind practical is to be covered by the concerned subject teacher/ workshop superintendent.
- 3] Workshop diary should be maintained by each student duly signed by respective shop instructors.
- 4] Assignments are to be assessed by the concerned subject teacher/ workshop superintendent.

Guidelines for conducting Practical Examination for MANUFACTURING PROCESSES

1. The job drawing must be jointly decided by the External and Internal examiner prior to one day in advance from the commencement of practical examination. Every student should be supplied the copy of job drawing before examination.
2. Time for practical examination should be **THREE HOURS**.
3. Practical examination of the students shall consists of Turning job containing different operations like Facing, straight Turning, Taper turning, Chamfering, Knurling , Threading, Grooving. (Minimum 5 operations) Students will perform the job as per the drawing provided to them.
4. Raw material size – Bar dia. 40 to 50 mm, length 80 to 100 mm.

Learning Resources:**Books:**

Sr. No.	Author	Title	Publisher
01	S. K. Hajra Chaudhary, Bose, Roy	Elements of workshop Technology-Volume I & II	Media Promoters and Publishers Limited
02	O. P. Khanna & Lal	Production Technology Volume- I & II	Production Technology Volume- I & II

			Dhanpat Rai Publications
03	W. A. J. Chapman, S. J. Martin	W. A. J. Chapman, S. J. Volume –I,II	Viva Books (p) Ltd.
04	O.P. Khanna	A text book of Foundry Tech.	Dhanpat Rai Publications
05	H.S. Bawa	Workshop Technology Volume- I & II	Tata McGraw-Hill
06	P.C. Sharma	Production Engineering	S. Chand Publications

Course Name : Mechanical Engineering Group**Course Code : ME/MH/MI/PG/PT/FE/FG****Semester : Fourth****Subject Title : Fluid Mechanics and Machinery****Subject Code : 17411****Teaching and Examination Scheme:**

Teaching Scheme			Examination Scheme					
TH	TU	PR	PAPER HRS	TH	PR	OR	TW	TOTAL
04	--	02	03	100	25#	--	25@	150

NOTE:

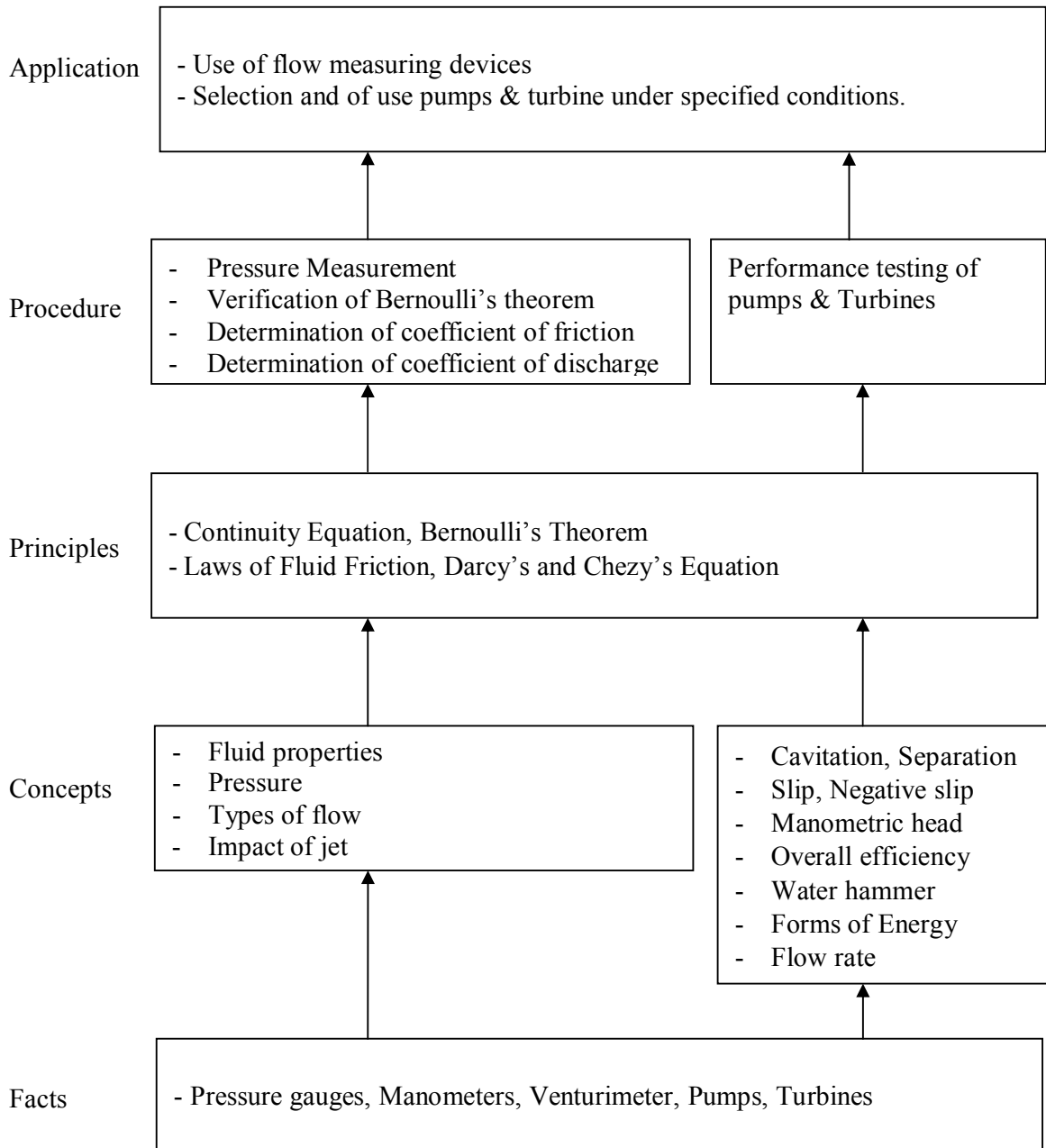
- Two tests each of 25 marks to be conducted as per the schedule given by MSBTE.
- Total of tests marks for all theory subjects are to be converted out of 50 and to be entered in mark sheet under the head Sessional Work (SW).

Rationale:

Knowledge of fluid properties, fluid flow & fluid machinery is essential in all fields of engineering. Hydraulic machines have important role in water supply, irrigation, power generation and also in most of the engineering segments. This subject requires knowledge of basic engineering sciences, applied mechanics, mathematics etc. The fundamentals of this subject are essential for the subject "Industrial Fluid Power" in sixth semester.

General Objectives: The student will be able to

- 1) Define various properties of fluids
- 2) Measure pressure, velocity and flow rate using various instruments.
- 3) State continuity equation, Bernoulli's equation and its applications.
- 4) Estimate various losses in flow through pipes.
- 5) Explain concept of impact of jet on various types of vanes.
- 6) Draw the construction, working of hydraulic pumps and turbines.
- 7) Evaluate performance of turbines and pumps.

Learning Structure:

Theory:

Topics and Contents	Hours	Marks
1. Properties of fluid and Fluid Pressure Specific Objectives: <ul style="list-style-type: none"> ➤ Define fluid properties. ➤ Differentiate between fluid pressure intensity and pressure head. ➤ Solve numerical related to properties of fluid, fluid pressure and manometers. Contents: 1.1 Properties of Fluid 06 Marks Density, Specific gravity, Specific volume, Specific Weight, Dynamic viscosity, Kinematic viscosity, Surface tension, Capillarity, Vapour Pressure, Compressibility 1.2: Fluid Pressure & Pressure Measurement 14 Marks <ul style="list-style-type: none"> • Fluid pressure, Pressure head, Pressure intensity • Concept of absolute vacuum, gauge pressure, atmospheric pressure, absolute pressure. • Simple and differential manometers, Bourden pressure gauge. • Total pressure, center of pressure- regular surface forces on immersed bodies in liquid in horizontal, vertical and inclined position 	12	20
2. Fluid Flow Specific Objectives: <ul style="list-style-type: none"> ➤ State Bernoulli's theorem and apply it to venturimeter, orifice and pitot tube. Contents: <ul style="list-style-type: none"> • Types of fluid flows-Laminar, turbulent, steady, unsteady, uniform, non uniform, rotational, irrotational. • Continuity equation, Bernoulli's theorem • Venturimeter – Construction, principle of working, coefficient of discharge, Derivation for discharge through venturimeter. • Orifice meter – Construction, Principle of working, hydraulic coefficients. Derivation for discharge through Orifice meter • Pitot tube – Construction, Principle of Working 	10	14
3. Flow Through Pipes Specific Objectives: <ul style="list-style-type: none"> ➤ State laws of friction and list various losses in flow through pipes. ➤ Solve numerical on laws of friction and list various losses in flow through pipes. Contents: <ul style="list-style-type: none"> • Laws of fluid friction (Laminar and turbulent) • Darcy's equation and Chezy's equation for frictional losses • Minor losses in fittings and valves • Hydraulic gradient line and total energy line • Hydraulic power transmission through pipe 	10	14
4. Impact of Jets Specific Objectives: <ul style="list-style-type: none"> ➤ Analyze explain the impact of jet on vanes in various conditions. 	06	10

<p>➤ Solve numerical on impact of jet on vanes in various conditions.</p> <p>Contents:</p> <ul style="list-style-type: none"> • Impact of jet on fixed vertical, moving vertical flat plates. • Impact of jet on curved vanes with special reference to turbines and pumps 		
<p>5. Hydraulic Turbines</p> <p>Specific Objectives:</p> <p>➤ Explain working principle of various hydraulic turbines.</p> <p>➤ Calculate work done, power generated and various efficiencies of hydraulic turbines.</p> <p>Contents:</p> <ul style="list-style-type: none"> • Layout and features of hydroelectric power plant, surge tanks and its need. • Classification of hydraulic turbines and their applications. • Construction and working principle of Pelton wheel, Francis and Kaplan turbine. • Draft tubes – types and construction, Concept of cavitation in turbines, • Calculation of Work done, Power, efficiency of turbine 	12	18
<p>6. Pumps</p> <p>Specific Objectives:</p> <p>➤ Explain working of centrifugal, reciprocating and multistage pumps.</p> <p>➤ Explain the concept of cavitation in pumps.</p> <p>➤ Calculate manometric head, work done and various efficiencies related to the pumps.</p> <p>➤ Select the pump for a given application.</p> <p>6.1 Centrifugal Pumps 14 Marks</p> <p>Contents:</p> <ul style="list-style-type: none"> • Construction, principle of working, priming methods and Cavitation • Types of casings and impellers. • Manometric head, Work done, Manometric efficiency, Overall efficiency, NPSH. • Performance Characteristics of Centrifugal pumps. • Trouble Shooting. • Construction, working and applications multistage pumps • Submersible pumps and jet pump <p>6.2 Reciprocating Pump 10 Marks</p> <ul style="list-style-type: none"> • Construction, working principle and applications of single and double acting reciprocating pumps. • Slip, Negative slip, Cavitation and separation. • Use of Air Vessels. • Indicator diagram with effect of acceleration head & frictional head. <p>(No numerical on reciprocating pumps)</p>	14	24
Total	64	100

Practical:**Skills to be developed:****Intellectual Skills:**

1. Select appropriate flow and pressure measuring devices for a given situation.
2. Analyze the performance of pumps and turbines.

Motor Skills:

1. Use flow and pressure measuring devices.
2. Operate pumps and turbines.

List of Practicals:

1. Measure water pressure by using Bourdon's pressure gauge and U-tube Manometer. Also measure discharge of water by using measuring tank and stop watch.
2. Calibrate Bourdon's pressure gauge with the help of Dead weight pressure gauge.
3. Verify Bernoulli's theorem.
4. Determine Coefficient of Discharge of Venturimeter.
5. Determine coefficient of Discharge, Coefficient of Contraction and Coefficient of Velocity of Sharp edged circular orifice.
6. Determine Darcy's friction factor 'f' in pipes of three different diameters for four different discharges.
7. Determine minor frictional losses in pipe fittings.
8. Determine overall efficiency of Pelton wheel by using Pelton wheel test rig.
9. Determine overall efficiency of Centrifugal Pump & plot its operating characteristics by using Centrifugal pump test rig.
10. Determine overall efficiency of Reciprocating pump by using Reciprocating Pump test rig.

Assignments

1. Information collection of Centrifugal, reciprocating, multistage pumps and submersible pumps from local market and from internet. Comparison of various models manufactured by different manufacturers. [The market survey is to be completed in a group of (max.) three to four students and the report of the same is to be included as part of term work.]

Learning Resources:**1. Books:**

Sr. No	Author	Title	Publication
01	Ojha, Berndtsson, Chnadramouli	Fluid Mechanics and Machinery	Oxford University Press
02	Som S K , Biswas G.	Introduction to Fluid Mechanics and Fluid Machines 3 rd Edition	Tata McGraw-Hill Co. Ltd.
03	Modi P.N. Seth S M	Hydraulics and Fluid Mechanics including Hydraulic Machines	Standard Book House New Delhi
04	Subramanya K.	Fluid Mechanics and Hydraulic Machines: problems and solution	Tata McGraw-Hill Co. Ltd.
05	Product catalogues of various pump manufacturers		

Course Name : Diploma in Fabrication Technology & Erection Engineering

Course Code : FE/FG

Semester : Fourth

Subject Title : Welding Technology

Subject Code : 17455

Teaching and Examination Scheme:

Teaching Scheme			Examination Scheme					
TH	TU	PR	PAPER HRS	TH	PR	OR	TW	TOTAL
03	--	02	03	100	25#	--	25@	150

NOTE:

- Two tests each of 25 marks to be conducted as per the schedule given by MSBTE.
- Total of tests marks for all theory subjects are to be converted out of 50 and to be entered in mark sheet under the head Sessional Work (SW).

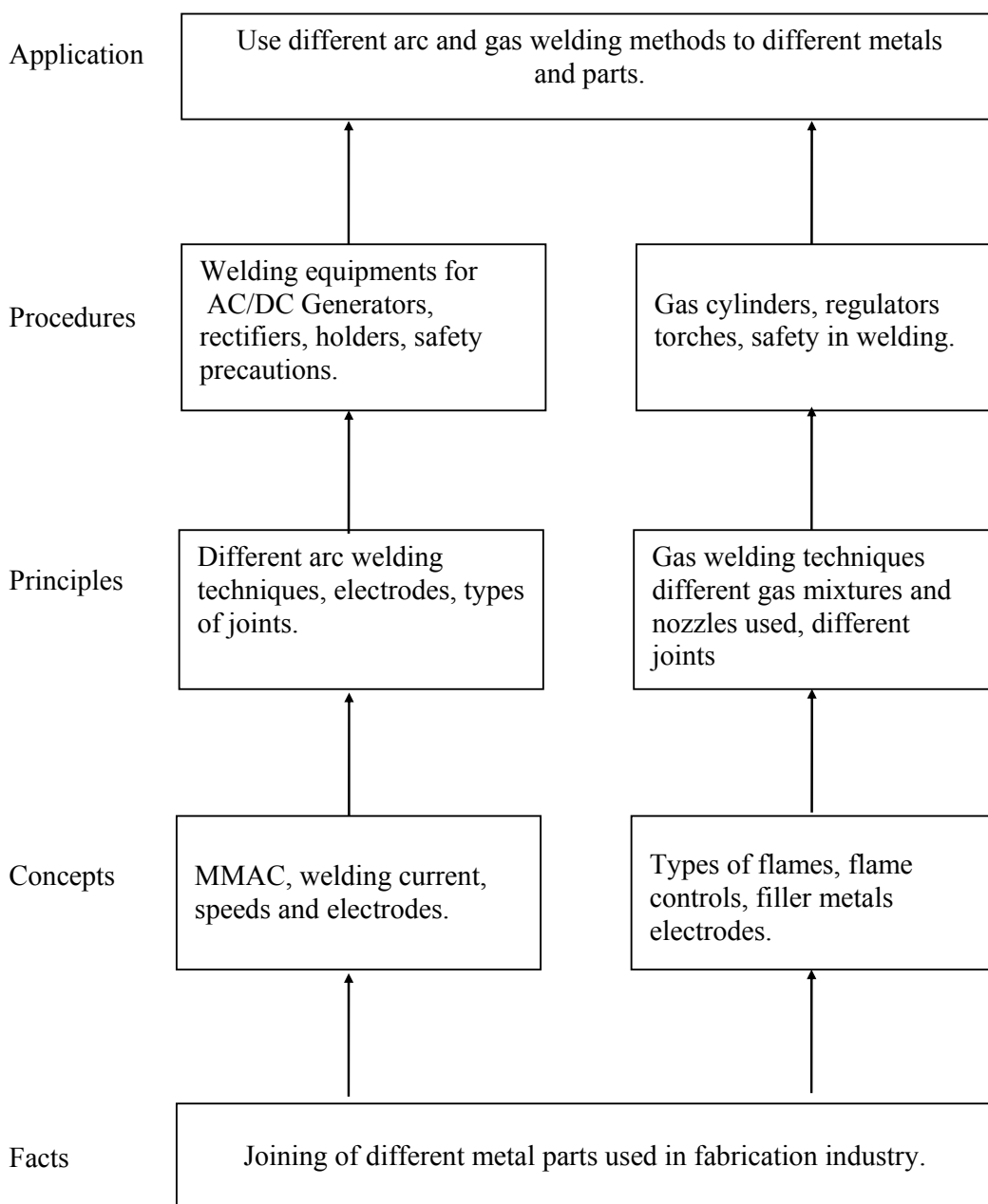
Rationale:

To teach students to understand facts concepts principles and procedures of gas and arc welding, brazing, soldering.

Objectives:

The student will be able to:

1. Make student familiar with gas welding process.
2. Understand phenomenon of manual metal arc welding.
3. Describe and use the welding arc & metal transfer mechanism.
4. Identify weld defects.
5. Use the knowledge of joint design and weld metallurgy
6. Compare various metal joining processes - welding, brazing & soldering.

Learning Structure:

Details: Contents

Chapter	Description	Marks	Hours
1	Gas Welding Theory <ul style="list-style-type: none"> Types of joints and terminology & symbols of welding Definition of gas welding. Oxy acetylene welding. Types of welding flames. Gas welding equipment. Gas welding techniques. Advantages & limitations of gas welding. Filler metals and fluxes 	16	08
2	Manual Metal Arc Welding Theory <ul style="list-style-type: none"> Electric arc definition Arc structure & mechanism, arc characteristics, arc stability, arc blow Metal transfer mechanism-Free flight type, short circuit type pulse transfer type Arc welding power sources both D.C. & A.C. Factor affecting selection of power sources Polarity, current voltage, electrical travel, arc length Positions flat, horizontal vertical overhead Electrodes sizes, composition, coating, classification & coding, manufacturing of electrodes, care & storage of electrodes Practice: <ul style="list-style-type: none"> Straight line deposition - down hand But welding - down hand T-joint - down hand Straight-line deposition - Vertical But welding - Vertical T-joint - Vertical 	24	18
3	Welding of Different Metals Theory <ul style="list-style-type: none"> Weldability and factors affecting it. Welding of mild steel & iron- processes used & explanation of metal arc welding. Welding of cast iron- processes used & explanation of metal arc welding. Welding of alloy steels, stainless steels- processes used & explanation of oxy acetylene welding. Welding of aluminum & other non-ferrous metals - processes used & explanation of Tig welding. 	20	08
4	Welding Metallurgy & Weld Defects Theory: <ul style="list-style-type: none"> Solidification of metals in welding. Heat affected zone and structure of weld metal for M.S., Copper, and Aluminum etc. 	24	08

	<ul style="list-style-type: none"> • Effect of welding on properties of metals. • Heat treatment used in welding. • Weld defects. <ul style="list-style-type: none"> ✓ Types of defects & their causes ✓ Remedial Procedures 		
5	Brazing & Soldering Theory: <ul style="list-style-type: none"> • Definition of brazing & soldering • Difference between brazing, soldering, welding • Principle of brazing • Filler metals, joint preparation & design • application & limitations • Processes, torch, furnace, vacuum, induction Dip. Resistance, carbon arc etc. of brazing. • Principle of soldering • Soldering joint & design. 	16	06
Total		100	48

Practicals:**Skill to be developed****Intellectual Skill:**

1. Identify the joining methods of welding
2. Understand welding of different materials
3. Specify different arc welding parameters.

Moral Skill:

1. Edge preparation for making the welding joint
2. Cleaning of edges.
3. Use welding machine & equipment.
4. Set the tool, job & decide parameter of machines.
5. Inspect the dimensions of the job using measuring instruments
6. Evaluation of weld quality

Learning Resources:**Books:**

Author	Title	Edition	Year of Publication	Publisher & Address
O.P. Khanna	Welding Technology	--	1994	Dhanpatrai & Sons
L. Little	Welding & Welding Technology	10th	1986	TMC, New Delhi
Agarwal & Maghani	Welding Engineering	--	--	--

Course Name : Diploma in Fabrication Technology & Erection Engineering**Course Code : FE/FG****Semester : Fourth****Subject Title : Fabrication Process****Subject Code : 17456****Teaching and Examination Scheme:**

Teaching Scheme			Examination Scheme					
TH	TU	PR	PAPER HRS	TH	PR	OR	TW	TOTAL
03	--	02	03	100	50#	--	25@	175

NOTE:

- Two tests each of 25 marks to be conducted as per the schedule given by MSBTE.
- Total of tests marks for all theory subjects are to be converted out of 50 and to be entered in mark sheet under the head Sessional Work (SW).

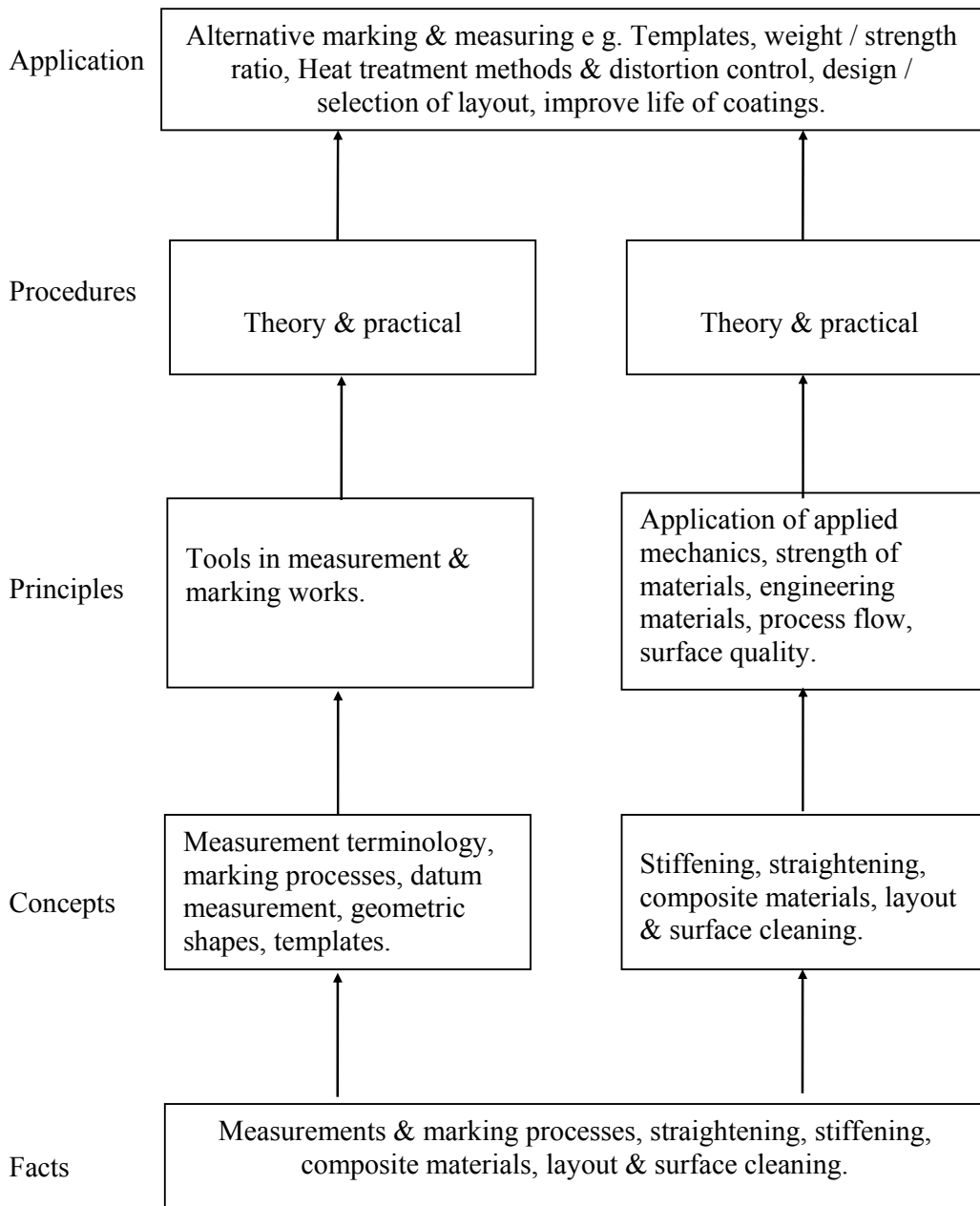
Rationale:

This subject will help the students to know the basic requirements of fabrication & the orderly sequence in which a component is prepared for fabrication.

Objectives:

The student will be able to:

- Know basic marking / measuring processes. Identify & select various marking / measuring tools in sheet metal shops.
- To know the methods used for straightening & stiffening in sheet metal works.
- To know recent trends of materials in fabrication.
- To know the layout employed for fabrication processes.
- To know importance of surface cleaning prior to coating.

Learning Structure:

THEORY:

Topic and Contents	Marks	Hours
1. Measurement Introduction ----- 04 Marks <ol style="list-style-type: none"> Definition and meaning of : Quantity, measurement, metrology, measure Precision & accuracy, Repeatability, Calibration, Sensitivity & readability Sources of error Classification of measurements Standards of measurements ----- 04 Marks <ol style="list-style-type: none"> Introduction to standards Line standard End standard Angular standard Marking process ----- 16Marks <ol style="list-style-type: none"> Tools used in marking Marking methods for large size plates Use of chalk line for marking long straight line Shop method of drawing an ellipse Plotting ellipse using trammels Shop method of drawing a circle Method of marking out bolt holes for flanges Marking out a bracket from a datum surface Procedure for marking out instrument panel Marking of holes in angle sections, channel sections, T- sections, columns and beams Instruments for datum measurements ----- 04 Marks <ol style="list-style-type: none"> Vertical datum- plumb line Horizontal datum- spirit level Alignment testing- use of tensioned wire, surveyor's level Geometric shape ----- 08 Marks <ol style="list-style-type: none"> Straightness testing- straight edge method, spirit level method Flatness testing- comparison with flat circles, use of spirit level Squareness testing- engineer's square, block square Roundness measurement – Diametral, circumferential confining gauge, rotating on centres, assessment using a V-block, roundness measuring machine Templates ----- 12 Marks <ol style="list-style-type: none"> The need of templates Materials used for templates Information given on templates Use of templates <ul style="list-style-type: none"> Templates for setting out sheet metal fabrications Templates for hopper plates Box templates Steel templates (ordinary and bushed) Templates as means of checking Templates as a means of marking hole positions 	48	28

7. Templates as means of to provide an economical arrangement of layout for press-work 8. Templates as a guide for cutting processes 9. Protection and storage of templates and tools 10. Comparison of methods of direct marking and use of templates		
2. Straightening Methods Mechanical straightening <ol style="list-style-type: none"> Manual Machine straightening Thermal methods <ol style="list-style-type: none"> Hot shrinking Use of heat strips Use of heat triangles Principle of hot straightening for structural sections 	08	04
3. Stiffening of Fabricated Material Methods of stiffening sheet metal Reasons for stiffening <div style="text-align: center;">Stiffening of large panels</div> <ol style="list-style-type: none"> Use of applied stiffeners Use of angle stiffeners Need for web stiffeners	12	04
4. Composite Materials in Fabrication Introduction to composite material Classification of composites Composition of composites Processing of composites Joining of composites Applications	08	04
5. Surface Cleaning Introduction Need for coating & cleaning Methods of surface cleaning <ol style="list-style-type: none"> Chemical method Mechanical method Thermal method Dry method 	12	04
6. Factory / Workshop Layout Introduction Definition of Factory layout Importance of layout Essentials of layout Types of layout Factors influencing layout Dynamics plant layout Examples	12	04
Total	100	48

Practical:**Skill to be developed;****Intellectual skills**

1. Ability to read job drawings.
2. Ability to identify & select proper material & tools for marking / measuring.

Motor skills

1. Ability to set work piece for measurement on measuring instruments / devices.
2. Ability to inspect the job for confirming desired dimensions and shape.
3. Ability to recognize errors from mistakes and take remedial actions.

Practicals:**1. Demonstration and use of :**

- Vernier calliper,
- Micrometer screw gauge,
- Vernier height gauge,
- Vernier depth gauge,
- Feeler gauge, radius gauge & screw pitch gauge
- Slip gauges,
- Universal Bevel Protractor,
- Sine bar
- Angle gauges,

2. Study of Engineer's rule,**3. Study of Steel rule and tape (Layout preparation)****Learning Resources:****Books:**

Sr. No.	Author	Title	Publisher & Address
1	Kadam Manish J	Metrology & Quality Control	Everest Pub. House
2	Hume K.J. Sharp G.H.	Practical Metrology	ELBS Macdonald & company
3	R. K. Jain	Metrology	Khanna Publications
4	Kenyon W. Pitman	Basic welding and fabrication	Pitman Pub. Ltd.
5	F.J. M. Smith/ Longman	Basic fabrication and welding Engg	Longman Craft Studies.

Course Name : Diploma in Fabrication Technology & Erection Engineering

Course Code : FE/FG

Semester : Fourth

Subject Title : Process Equipment

Subject Code : 17457

Teaching and Examination Scheme

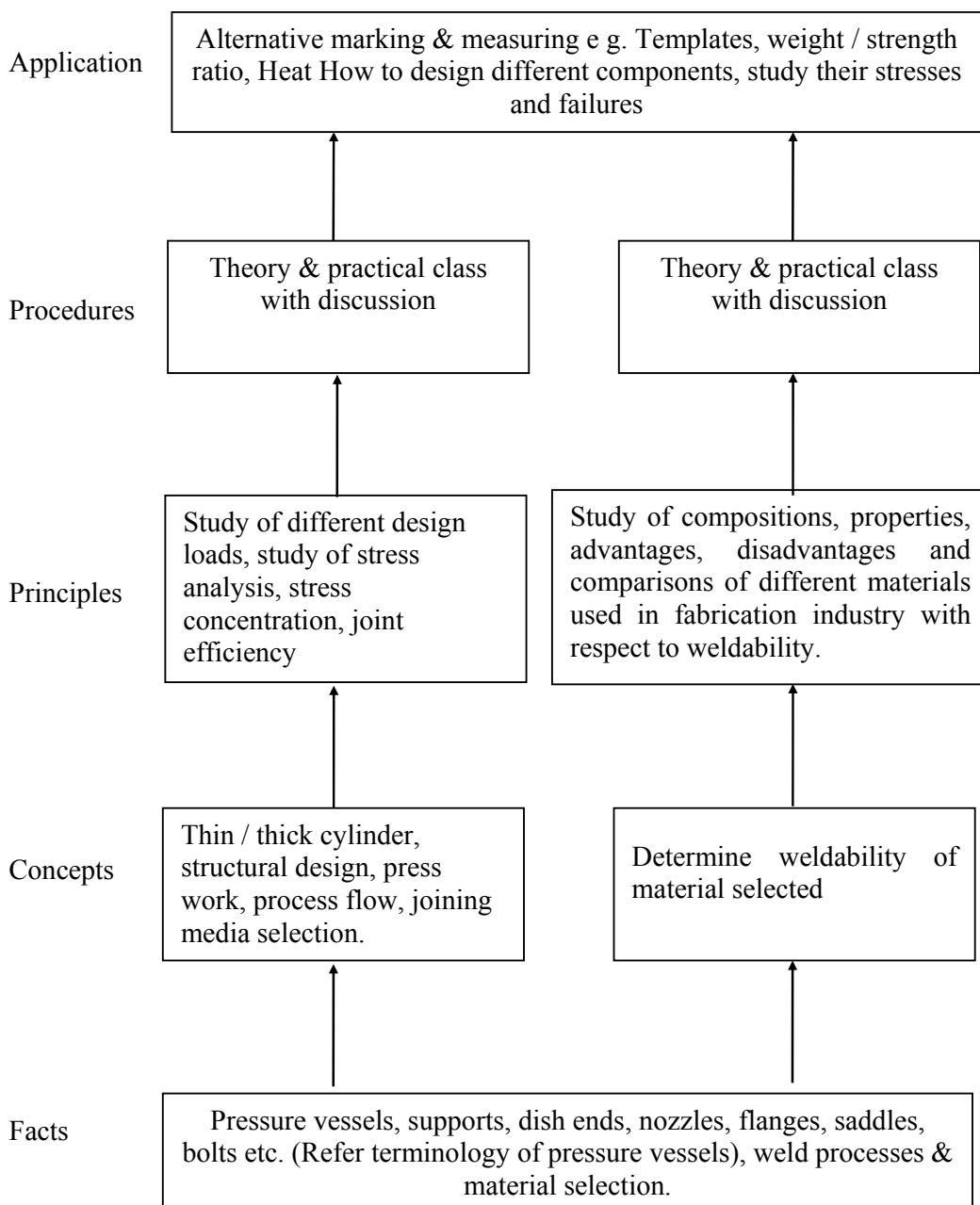
Teaching Scheme			Examination Scheme					
TH	TU	PR	PAPER HRS	TH	PR	OR	TW	TOTAL
04	--	02	03	100	--	--	25@	125

Rationale:

It is intended that the students understand facts, concepts regarding construction and working of process equipment used in the fabrication industry.

Objectives: The students will be able to-

1. Learn pressure vessel terminology.
2. Study design loads on process equipments.
3. Find stresses / thickness of vessels & dished ends.
4. Study of supports.
5. Design the process equipment.
6. Study & decide the materials & welding processes used in pressure vessel construction.

Learning Structure:

Theory:

Topic and Contents	Marks	Hrs.
Pressure Vessels Introduction, types, accessories & mountings, terminology.	12	08
Design of Pressure Vessels Introduction, design approach, design pressure design temperature, dead load, wind load, piping load, earthquake loads, and combination of design loads, allowable stress range, general design criterion, stresses in ring, cylinder, sphere, poisson ratio, dilation of pressure vessels, membrane stress, thick cylinder, thick sphere, intersecting sphere, thermal stresses, ultra high pressure vessel, multishell construction, discontinuity stresses in vessels, stresses in bi-metallic joints, deformation and stresses in flanges and flanged joints, gaskets, reinforced circular plates, stacked plates and built up plates.	24	16
Membrane Stress Analysis in Various Parts of Vessels Cylindrical shell, spherical shell, hemispherical heads, semi ellipsoidal heads, torispherical heads, conical heads (simple problems) Supports skirts, support legs, support lugs, anchor bolts, saddles, stiffeners. Design for thickness; shell, dish ends, nozzles, flanges, bolt size & numbers, dilation & ligament efficiency.	24	16
Design Construction Features Stress concentrations, Nozzle reinforcement, placement and shape, fatigue concentration, stresses concentration in circular and elliptical opening.	16	08
Weld Design (Theory only) Introduction, groove welds, fillet welds, plug weld, defects in welds, NDT of welds, stress concentration factors, welding processes, welding symbols, welded joints, bolted joints, vessel supports and attachments, gaskets.	12	06
Construction Materials General considerations, Non corrosive service, ferrous and non ferrous materials for corrosive service, bolting material, selection of material for hydrogen service, aluminum alloys, stainless steels, method of attaching protective layers. Note: Derivation / Proof of any formula is not expected	12	10
TOTAL	100	64

Assignments:

Eight assignments based on above theory content. Details of the assignments be written

Implementation Strategies:

The subject matter will be taught as per the teaching scheme for Theory and practical. The subject teacher will prepare and provide learning material/handout for supplementing/ complementing classroom instructions.

References:**Books:**

Author	Title	Edition	Year of Publication	Publisher & Address
Henry H. Bednar	Pressure Vessel design handbook	--	--	--
John F. Harvey	Theory and design of pressure vessel	1st	1987	C.B.S. Pub. Delhi
Eugene F. Megyesy	Pressure Vessel Handbook	--	1992	Press Vessel Handbook Pub. Cl.
--	ASME Boiler & Pressure Vessel Code	--	1992	ASME, New York
--	Boiler & Pressure Vessel Code	--	1980	ASME, USA
--	Unfired Pressure Vessels	--	1946	ASME, New York
Joshi & Mahajan	Process Equipment Design	--	1996	Macmillan, New Delhi.

Course Name : Diploma in Fabrication Technology & Erection Engineering**Course Code : FE/FG****Semester : Fourth****Subject Title : Professional Practices-II****Subject Code : 17048****Teaching and Examination Scheme:**

Teaching Scheme			Examination Scheme					
TH	TU	PR	PAPER HRS	TH	PR	OR	TW	TOTAL
--	--	03	--	--	--	--	50@	50

Rationale:

The purpose of introducing Professional practices is to fulfill the need of students to stand in today's global market with knowledge and confidence. This can be achieved by arranging industrial visits, expert lectures attitude to present them-selves, get alternative solutions and validation of the selected alternatives, socially relevant activities, and modular courses. Professional Practices is helpful in broadening technology base of students beyond curriculum. Model making exercises allow students to think more creatively and innovatively and inculcating habit of working with their own hands. Modular courses are introduced with a view of learning and acquiring higher technology skills through industry experts and consultants from the respective fields.

Objectives:

The student will be able to:

- 1) Acquire information from different sources.
- 2) Prepare notes for given topics
- 3) Present seminar using power projection system.
- 4) Interact with peers to share thoughts.
- 5) Work in a team and develop team spirit.

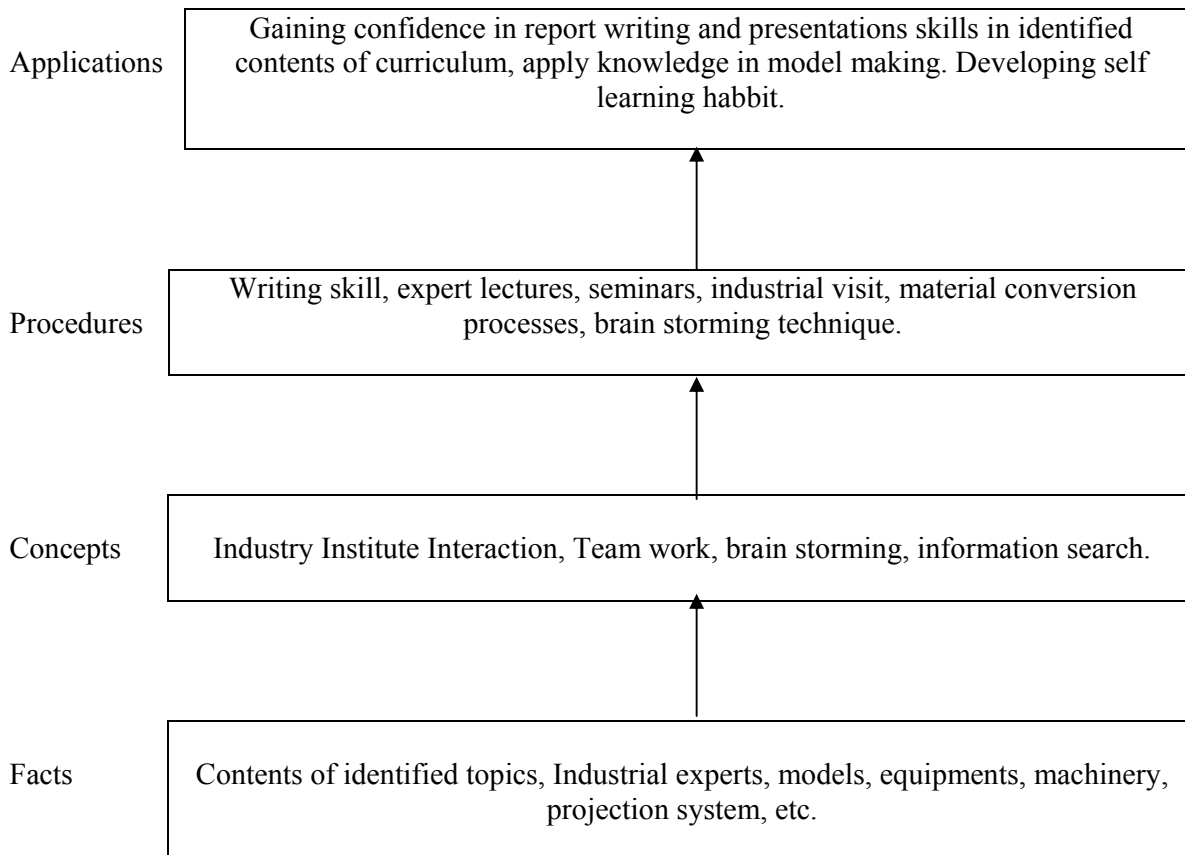
Intellectual Skill:

Student will be able to-

- 1) Search information from various resources.
- 2) Prepare notes on selected topics.
- 3) Participate in group discussions.

Motor Skills:

- 1) Observe industrial practices during visits.
- 2) Prepare slides / charts for presentation in seminar.
- 3) Develop a model

Learning Structure:

Content:

Topic & Content	Hours
<p>1. Information Search:– Information search be made through manufacturers catalogue, Hand books, magazines journal and websites, and submit a report on any Two Topics in a group of 3 to 4 students, report size shall not be more than 10 pages. Following topics are suggested, any other equivalent topics may be selected.</p> <ol style="list-style-type: none"> 1. Present scenario of electric power generation in Maharashtra state /India. 2. Composite materials – Types, properties & application 3. Material handling equipments commonly used in industries. 4. Advances in Automobile engines. 5. Hydraulic steering systems of Automobile. 6. Mechanisms used to produce straight-line motion. 7. Mechanisms used for generating intermittent motion. 8. Advanced surface coating techniques like chemical vapor deposition, ion implantation, physical vapor deposition. 9. Types of cutting tools- specification, materials and applications. 10. Booking of E-Tickets for Railways/Buses/Air travel. 11. Profiles of 2 multinational companies. 12. Engine lubricants, coolants and additives 13. Power steering, power windows 14. ABS(anti lock braking systems) 15. MPFI(multi point fuel injection) system 16. Role of MIDC, MSSIDC, DIC, Financial institutions in development of industrial sector. 17. Solar energy systems - Components and their functions, applications 18. Design data book - Study and use of types of data. 	10
<p>2. Lectures by professionals/Industry Experts- Two lectures of two hour duration be arranged on any two topics suggested below or any other suitable topics to acquire practical information beyond scope of curriculum. Students shall prepare a brief report of each lecture as a part of their term work.</p> <ol style="list-style-type: none"> 1. Components of project Report. 2. Various loan schemes of banks, LIC and other agencies for education and other purposes. 3. Use of plastics & rubbers in Automobiles industries. 4. Type of processes used to protect material surfaces from environmental effect. 5. Product life cycle. 6. Industrial application of mechatronics. 7. Special features of CNC machines 8. Gear manufacturing & gear teeth finishing processes. 9. Gear boxes-industrial & Automobile applications. 10. super-finishing operation & their industrial applications. 11. processing methods for plastic components. 12. Features of modern boilers 13. Strainers and filters –Types, functions and applications 14. Industrial drives-Types, components, comparison and applications. 15. Introduction to Apprenticeship Training Scheme 	06
<p>3. Seminars: One seminar be arranged on the subjects related to 4th semester. Or topics beyond curriculum.</p>	06

<p>Each student shall submit a report up to 10 pages and deliver the seminar. batch size - 2-3 students. Source of information - books, magazine, Journals, Website ,surveys,</p> <p>Topics suggested for guidance-</p> <ol style="list-style-type: none"> 1. Clutches - Types, Principles, working, & applications. 2. High pressure boilers. 3. Heat exchangers - Types, working applications. 4. Hydraulic turbines -Types, working & applications. 5. Hydraulic pumps - Types, working & applications. 6. Sensors -Types, principle & applications. 7. Super conductor technology - Types, principle & applications. 8. Semi conductors- Types, materials & applications. 9. Industrial brakes- Types, construction, working & applications. 	
<p>4. Industrial visits Structured industrial visits be arranged and report of the same shall be submitted by each student to form a part of the term work. No of visits- At least one Scale of industry- medium scale unit, large scale unit. Group size- practical batch Report-not exceeding 7 to 10 pages. Purpose :</p> <ul style="list-style-type: none"> ➤ To study the profile of industry ➤ To see the advanced manufacturing processes & machinery. ➤ To observe working of CNC machines, work centres, flexible manufacturing systems ➤ To observe working in foundry, forging shop, press shop, heat treatment shop etc. ➤ To observe chip less manufacturing machines & processes. ➤ To study process sheets , quality control charts & production drawings, metallurgical testing laboratory ➤ To observe Tool room, standards room etc. <p>Following types of industries may be visited in & around the institute.</p> <ol style="list-style-type: none"> 1. Foundry 2. Forging units 3. Sheet metal processing unit 4. Machine/ Automobile component manufacturing unit 5. Fabrication unit/ powder metallurgy component manufacturing unit. 6. Machine tool manufacturing unit. 7. Any processing industry like chemical, textile, sugar, agriculture, fertilizer industries. 8. Auto workshop / four wheeler garage. 9. City water supply pumping station 10. Hydro electric power plant, 11. Wind mills, Solar Park 	08

<p>5. Socially Relevant Activities Conduct any one activity through active participation of students and write the report. Group of students- maximum 4 Report- Not more than 6 pages List of suggested activities- (activities may be thought in terms of campus improvement)</p> <ol style="list-style-type: none"> 1. Awareness about carbon credit 2. Anticorruption movement 3. Awareness about cyber crimes. 4. Developing good citizens. 5. Management of E- WASTE 6. Recycling of waste materials. 7. Accident prevention & enforcement of safely rules. 8. Awareness about pollution and pollution control. 9. (Any other relevant activity may be performed) 	06
<p>6. Mini Projects Students, in a group of 4, shall perform any one activity listed below.</p> <ol style="list-style-type: none"> 1. Model making out of card board paper, wood, thermocol, plastics, metal, clay etc <ol style="list-style-type: none"> a) Any new idea/principle converted into model b) Mechanisms c) Jigs/fixtures d) Material handling device, etc. 2. Toy making with simple operating mechanisms 3. Layout of workshop/department/college 4. Experimental set up/testing of a parameter 5. Display board indicating different type of machine components like bearing, fasteners, couplings, pipe fitting, valves, cams & followers, exploded views of assemblies, type of welding equipment, welding rods (drawings, photo graphs) 6. Any relevant project which will make students to collect information & work with their own hands. 7. Students shall arrange exhibition of all mini projects in the class/hall and present the task to the audience/ experts/examiners. The student shall submit a brief report (Max. 5 pages) of the mini project. <p style="text-align: center;">OR</p> <p>Modular course: Modular courses on any one of the suggested or equivalent topic be undertaken by a group of 15 to 20 students.</p> <ol style="list-style-type: none"> 1. Advance features in CAD 2. Meshing of solid model using any suitable software 3. Developing Unfold Sheet or Hyperblank by using Blanking Software 4. CAM Software 5. Basics of PLC programming 6. Applications of mechatronics 7. Piping Technology 8. Modern packaging technology 9. Enterprise Resource Planning 10. Bio-pneumatic Robots 11. Bio-mimicry 	12

Learning Resources:**1. Books:**

Sr. No.	Author	Title	Publisher
01	NRDC, Publication Bi Monthly Journal	Invention Intelligence Journal	National Research Development Corporation, GOI.
02	DK Publishing	How things works encyclopedia	DK Publishing
03	Trott	Innovation mgmt.& new product development	Pearson Education
04	E.H. McGrath, S.J.	Basic Managerial Skills for All – Ninth Edition	PHI
05	Apprenticeship Training Scheme:- Compiled By – BOAT (Western Region), Mumbai, Available on MSBTE Web Site.		

2. Web sites

www.engineeringforchange.org

www.wikipedia.com

www.slideshare.com

www.teachertube.com

Course Name : All Branches of Diploma in Engineering & Technology

**Course Code : AE/CE/CH/CM/CO/CR/CS/CW/DE/EE/EP/IF/EJ/EN/ET/EV/EX/IC/IE/IS/
ME/MU/PG/PT/PS/CD/CV/ED/EI/FE/IU/MH/MI/DC/TC/TX/FG**

Industrial Training (Optional) after 4th semester examination.

Note:- Examination in Professional Practices of 5th Semester.

INDUSTRIAL TRAINING (OPTIONAL)

Rational:-

There was a common suggestion from the industry as well as other stakeholders that curriculum of Engineering and Technology courses should have Industrial training as part of the curriculum. When this issue of industrial training was discussed it was found that it will be difficult to make industrial training compulsory for all students of all courses as it will be difficult to find placement for all the students. It is therefore now proposed that this training can be included in the curriculum as optional training for student who is willing to undertake such training on their own. The institutes will help them in getting placement or also providing them requisite documents which the student may need to get the placement.

Details:- Student can undergo training in related industries as guided by subject teachers / HOD.

- The training will be for four weeks duration in the summer vacation after the fourth semester examination is over.
- The student undergoing such training will have to submit a report of the training duly certified by the competent authority from the industry clearly indicating the achievements of the student during training. This submission is to be made after joining the institute for Fifth semester.
- The student completing this training will have to deliver a seminar on the training activities based on the report in the subject Professional Practices at Fifth Semester.
- The student undergoing this training will be exempted from attending activities under Professional Practices at Fifth semester except the seminar.
- The students who will not undergo such training will have to attend Professional Practices Classes/activities of fifth semester and will have to complete the tasks given during the semester under this head.
- Their work will be evaluated on their submissions as per requirement and will be given marks out of 50. Or student may have to give seminar on training in Industry he attended.
- Institute shall encourage and guide students for Industry training.
- Evaluation:- Report of Training attended and delivery of seminar and actual experience in Industry will be evaluated in fifth semester under Professional Practices-III and marks will be given accordingly out of 50.