

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 (SANDWITCH PATTERN)																	
COURSE CODE : FE																	
DURATION OF COURSE : EIGHT SEMESTERS									WITH EFFECT FROM 2009-10								
SEMESTER : SEVENTH									DURATION : 16 WEEKS								
FULL TIME / PART TIME : FULL TIME									SCHEME : C								
SR. NO.	SUBJECT TITLE	SUB CODE	TEACHING SCHEME			EXAMINATION SCHEME											
			TH	TU	PR	PAPER HRS	TH		TEST	TOTAL		PR		OR		TW	
							Max	Min		Max	Min	Max	Min	Max	Min		
1	Management Ø	9133	03	--	--	03	80	28	20	100	40	--	--	--	--	--	--
2	Production Technology \$	9152	04	--	--	03	80	28	20	100	40	--	--	--	--	--	--
3	Advanced Welding Technology.	9238	03	--	02	03	80	28	20	100	40	--	--	25#	10	25@	10
4	Process Equipment	9239	04	--	02	03	80	28	20	100	40	--	--	--	--	50@	20
5	Industrial Erection & Safety	9240	04	--	02	03	80	28	20	100	40	--	--	25#	10	25@	10
6	Industrial Project	--	--	--	06	--	--	--	--	--	--	--	--	50#	20	50@	20
7	Professional Practices - VI \$	--	--	--	05	--	--	--	--	--	--	--	--	--	--	50@	20
TOTAL			18	--	17	--	400	--	100	500	--	--	--	100	--	200	--

STUDENT CONTACT HOURS PER WEEK(FORMAL TEACHING) : **35 HRS.**

THEORY AND PRACTICAL PERIODS ARE OF 60 MINUTES EACH.

@ - INTERNAL ASSESSMENT, # - EXTERNAL ASSESSMENT, \$ - Common to ME / PT/MH /FE, Ø – Common to ME / PT / AE / MH / FE

TOTAL MARKS : 800

ABBREVIATIONS : TH – THEORY, TU – TUTORIAL , PR – PRACTICALS , OR –ORAL, TW – TERMWORK

All Practical, Oral and Term Work assessment are to be done as per the prevailing norms for implementation and assessment.

COURSE NAME : DIPLOMA IN PRODUCTION ENGINEERING / TECHNOLOGY
COURSE CODE : EJ/EN/ET/EX/EV/IC/IE/IS/MU/DE/ME/PG/PT/AE/CE/CS/CR/CO/CM/IF/EE/EP/CH/CT/PS/CD/EDEI/CV/FE/IU/MH/MI
SEMESTER : SIXTH for EJ/EN/ET/EX/EV/IC/IE/IS/MU/DE/ME/PG/PT/AE/CE/CS/CR/CO/CM/IF/EE/EP/CH/CT/PS/CD/ED/EI/CV/IU and SEVENTH for MH/MI/FE
SUBJECT TITLE : MANAGEMENT
SUBJECT CODE : 9133

Teaching and Examination Scheme:

Teaching Scheme			Examination Scheme						
TH	TU	PR	PAPER HR.	TH	TEST	PR	OR	TW	TOTAL
03	--	--	03	80	20	--	--	--	100

Rationale:

After completion of three years of technical training, Polytechnic students are expected to enter in to the World of Work. The business environment is altogether different and new to the students. A proper introduction and understanding of Business Processes is therefore essential for all Polytechnic students. Management is a subject which deals with basics of Managerial science required to understand the processes in Industrial & Commercial environment. This will enable the students of Polytechnics to become familiar and to understand various Business Organizational structures, their functioning and the Role these technicians will have to play in these setups with responsibilities.

Objective:

The students will able to:

1. Familiarize environment in the world of work
2. Explain the importance of management process in Business.
3. Identify various components of management.
4. Describe Role & Responsibilities of a Technician in an Organizational Structure.
5. Apply various rules and regulations concerned with Business & Social Responsibilities of the Technician.

Contents: Theory

Chapter No.	Name of the Topics	Hours	Marks
01	<p>Overview Of Business</p> <p>1.1. Types of Business</p> <ul style="list-style-type: none"> • Service • Manufacturing • Trade <p>1.2. Industrial sectors</p> <p>Introduction to</p> <ul style="list-style-type: none"> • Engineering industry • Process industry • Textile industry • Chemical industry • Agro industry <p>1.3 Globalization</p> <ul style="list-style-type: none"> • Introduction • Advantages & disadvantages w.r.t. India <p>1.4 Intellectual Property Rights (I.P.R.)</p>	02	---
02	<p>Management Process</p> <p>2.1 What is Management?</p> <ul style="list-style-type: none"> • Evolution • Various definitions • Concept of management • Levels of management • Administration & management • Scientific management by F.W.Taylor <p>2.2 Principles of Management (14 principles of Henry Fayol)</p> <p>2.3 Functions of Management</p> <ul style="list-style-type: none"> • Planning • Organizing • Directing • Controlling 	07	12
03	<p>Organizational Management</p> <p>3.1 Organization :-</p> <ul style="list-style-type: none"> • Definition • Steps in organization <p>3.2 Types of organization</p> <ul style="list-style-type: none"> • Line • Line & staff • Functional • Project <p>3.3 Departmentation</p> <ul style="list-style-type: none"> • Centralized & Decentralized • Authority & Responsibility • Span of Control <p>3.4 Forms of ownership</p> <ul style="list-style-type: none"> • Proprietorship • Partnership 	07	12

	<ul style="list-style-type: none"> • Joint stock • Co-operative Society • Govt. Sector 		
04	<p>Human Resource Management</p> <p>4.1 Personnel Management</p> <ul style="list-style-type: none"> • Introduction • Definition • Functions <p>4.2 Staffing</p> <ul style="list-style-type: none"> • Introduction to HR Planning • Recruitment Procedure <p>4.3 Personnel– Training & Development</p> <ul style="list-style-type: none"> • Types of training ➤ Induction ➤ Skill Enhancement <p>4.4 Leadership & Motivation</p> <ul style="list-style-type: none"> • Maslow’s Theory of Motivation <p>4.5 Safety Management</p> <ul style="list-style-type: none"> • Causes of accident • Safety precautions <p>4.6 Introduction to –</p> <ul style="list-style-type: none"> • Factory Act • ESI Act • Workmen Compensation Act • Industrial Dispute Act 	08	16
05	<p>Financial Management</p> <p>5.1. Financial Management- Objectives & Functions</p> <p>5.2. Capital Generation & Management</p> <ul style="list-style-type: none"> • Types of Capitals • Sources of raising Capital <p>5.3. Budgets and accounts</p> <ul style="list-style-type: none"> • Types of Budgets ➤ Production Budget (including Variance Report) ➤ Labour Budget • Introduction to Profit & Loss Account (only concepts) ; Balance Sheet <p>5.4 Introduction to –</p> <ul style="list-style-type: none"> • Excise Tax • Service Tax • Income Tax • VAT • Custom Duty 	08	16
06	<p>Materials Management</p> <p>6.1. Inventory Management (No Numericals)</p> <ul style="list-style-type: none"> • Meaning & Objectives <p>6.2 ABC Analysis</p> <p>6.3 Economic Order Quantity</p> <ul style="list-style-type: none"> • Introduction & Graphical Representation 	08	16

	6.4 Purchase Procedure <ul style="list-style-type: none"> • Objects of Purchasing • Functions of Purchase Dept. • Steps in Purchasing 6.5 Modern Techniques of Material Management <ul style="list-style-type: none"> • Introductory treatment to JIT / SAP / ERP 		
07	Project Management (No Numericals) 7.1 Project Management <ul style="list-style-type: none"> • Introduction & Meaning • Introduction to CPM & PERT Technique • Concept of Break Even Analysis 7.2 Quality Management <ul style="list-style-type: none"> • Definition of Quality , concept of Quality , Quality Circle, Quality Assurance • Introduction to TQM, Kaizen, 5 'S', & 6 Sigma 	08	08
TOTAL		48	80

Learning Resources:

Books:

Sr. No	Author	Name of Book	Publisher
01	Dr. O.P. Khanna	Industrial Engg & Management	Dhanpal Rai & sons New Delhi
02	Dr. S.C. Saksena	Business Administration & Management	Sahitya Bhavan Agra
03	W.H. Newman E.Kirby Warren Andrew R. McGill	The process of Management	Prentice- Hall
04	Rustom S. Davar	Industrial Management	Khanna Publication
05	Banga & Sharma	Industrial Organisation & Management	Khanna Publication
06	Jhamb & Bokil	Industrial Management	Everest Publication , Pune

**COURSE NAME : DIPLOMA IN FABRICATION TECHNOLOGY & ERECTION
ENGINEERING**

COURSE CODE : ME/ PT/MH/FE

SEMESTER : SIXTH FOR ME/PT & SEVENTH FOR MH/FE

SUBJECT TITLE : PRODUCTION TECHNOLOGY

SUBJECT CODE : 9152

Teaching and Examination Scheme:

Teaching Scheme			Examination Scheme						
TH	TU	PR	PAPER HRS	TH	TEST	PR	OR	TW@	TOTAL
04	--	--	03	80	20	--	--	--	100

RATIONALE:

This subject is technology subject. A Technician is required to work at the highest productivity level. His productivity is dependent on the productivity of the machines and the people in the manufacturing system. Hence he should learn the techniques for improvement in productivity of the people and equipment.

A technician required to plan the production schedule accordingly organize material supply for the manufacturing activities. The total cost of goods produced contains large portion of overhead cost. Technician is required to minimize the direct and indirect cost by optimizing the use of resources available to him. Hence he should learn accounting process, inventory control and process planning.

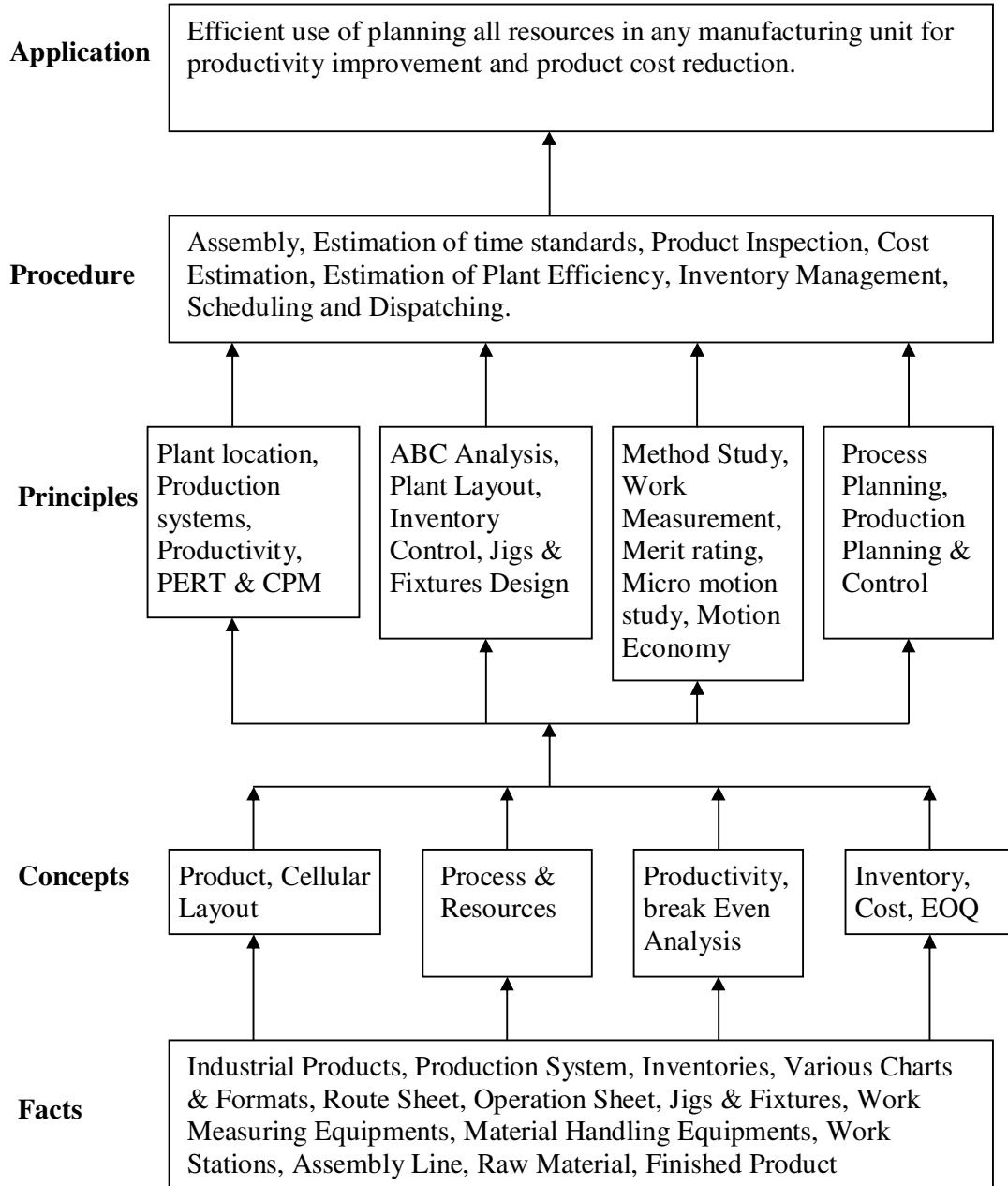
Modern manufacturing system employ techniques such as JIT, TPM , FMS, 5'S', kaizen which should be known to the technician.

OBJECTIVES:

Students will be able to :-

1. Understand importance of productivity and factors for improvement of productivity.
2. Know different production systems and modern trends in manufacturing systems.
3. Find the break-even point for manufacturing a product.
4. Prepare / modify layout of production system.
5. Select suitable material handling devices and plant facilities.
6. Prepare process plan and specify tooling for it.
7. Prepare process chart for analysis of existing process.
8. Use PERT & CPM techniques for scheduling and controlling the manufacturing activities.
9. Apply techniques of method study and work measurement for improvement of existing manufacturing methods.
10. Find the Economic Order Quantity (EOQ) for given situation.

Learning Structure:



Contents: Theory

Chapter	Name of the Topic	Hours	Marks
01	<p>Production System Production - Definition , Types of production systems Productivity - Importance , Measurement of Productivity , Techniques of improving productivity Elements of cost- Fixed cost, Variable Cost. Break even analysis, Calculation of Break even point.</p>	06	08
02	<p>Plant location, Plant layout and Material Handling Plant Location - Importance of Site Selection, Factors affecting Site Selection , Government Policies , relaxation for Backward Areas. Plant Layout - Objectives , types , design principles, characteristics of Plant Layout, Symptoms of Bad Plant Layout. Group technology , Cellular layout, Material handling – Need, Principles and Types of material handling devices – conveyors , Hoist & cranes , forklift truck, trolleys, Pipes, Automated Guided Vehicles (AGV's) Selection of Material Handling systems and Devices.</p>	08	10
03	<p>Process Planning Planning of Processes from raw material to finished product, Factors affecting Process Planning, Deciding sequence of operations, Operation Sheet, Combined operations, Determination of Inspection Stages. * Selection of Machine Techniques of assembly planning, Types of assembly. * Plant Capacity, * Machine Capacity, Plant Efficiency. * Numerical not to be asked,</p>	08	10
04	<p>Production Planning and Control Routing, Sequencing [n job 2 machines], Scheduling, Dispatching, Meaning of Control, Progressive Control, Gantt chart. Concept of Line balancing.</p>	05	06
05	<p>Work Study Method Study- Objectives , Procedure , Selection of work. Recording Techniques - Process Charts – Outline process chart, Flow process chart, Two Hand process chart, Multiple activity chart, Flow diagram, String diagram, Travel chart. Micro motion study-Critical Examination, Principles of Motion Economy. Concept of ergonomics and workplace layout. Work Measurement - Objectives , procedure , Time Study, Time Study Equipments. Stop Watch Time Study, Standard Time, Work Sampling, Analytical Estimating, Predetermined Motion Time Study, Allowances, Calculation of Standard Time, Concept of Merit Rating.</p>	14	16

06	Inventory Control Methods of Inventory Management, Inventory Cost relationship, Deciding Economic Batch Quantity, EOQ Model, Calculation of EOQ, Concepts of discounts. Introduction of Material Requirement Planning, Stores Function – Storage systems – One bin, Two bin system, Material issue request (MIR), bin card.	09	12
7	Jigs and Fixtures Introduction. Difference between jig and fixture Different components of Jig/ fixture 3-2-1 principle of location. Types of locators and clamping devices. General principles of jig/fixture design. Types of jigs and fixtures.	06	08
8	Modern Trends Just In Time manufacturing – Pull and push types of manufacturing systems, Waste reduction, 5'S', inventory reduction, single piece production systems. Concept of continuous improvement (Kaizen) – DMIAC cycle, Brain storming. Poka Yoke. Concept of Rapid Prototyping Concept of Flexible manufacturing system	08	10
TOTAL		64	80

Professional Practices:

To find out production cycle time by visiting any manufacturing industry.
Method Study on any one manufactured job.

Learning Resources:

Books:

Sr. No.	Author	Name of Book	Publication
01	L.C. Jhamb	Industrial Management	Everest
02	James C. Rigs	Production System, Planning, Analysis & Control	N.Y.Wiley & Sons
03	O.P. Khanna	Industrial Engineering and Management	Dhanpat Rai & Sons
04	ILO	Work Study	ILO Geneva
05	P. H. Joshi	Jigs & Fixtures	--
06	P.C. Sharma	Production Engineering	--
07	Kempster	Introduction to Jigs and Fixtures Design	--
08	Baffa , Sarin	Modern Production and Operations Management	--
09	Terry Wireman	Total productive maintenance	Industrial press inc.
10	Taiichi ohno	Toyota production system	Productivity press

**COURSE NAME : DIPLOMA IN FABRICATION TECHNOLOGY & ERECTION
ENGINEERING**

COURSE CODE : FE

SEMESTER : SEVENTH

SUBJECT TITLE : ADVANCED WELDING TECHNOLOGY

SUBJECT CODE : 9238

Teaching & Examination Scheme

Teaching Scheme			Examination Scheme						
TH	TU	PR	PAPER HRS	TH	TEST	PR	OR	TW	TOTAL
03	--	02	03	80	20	--	25#	25@	150

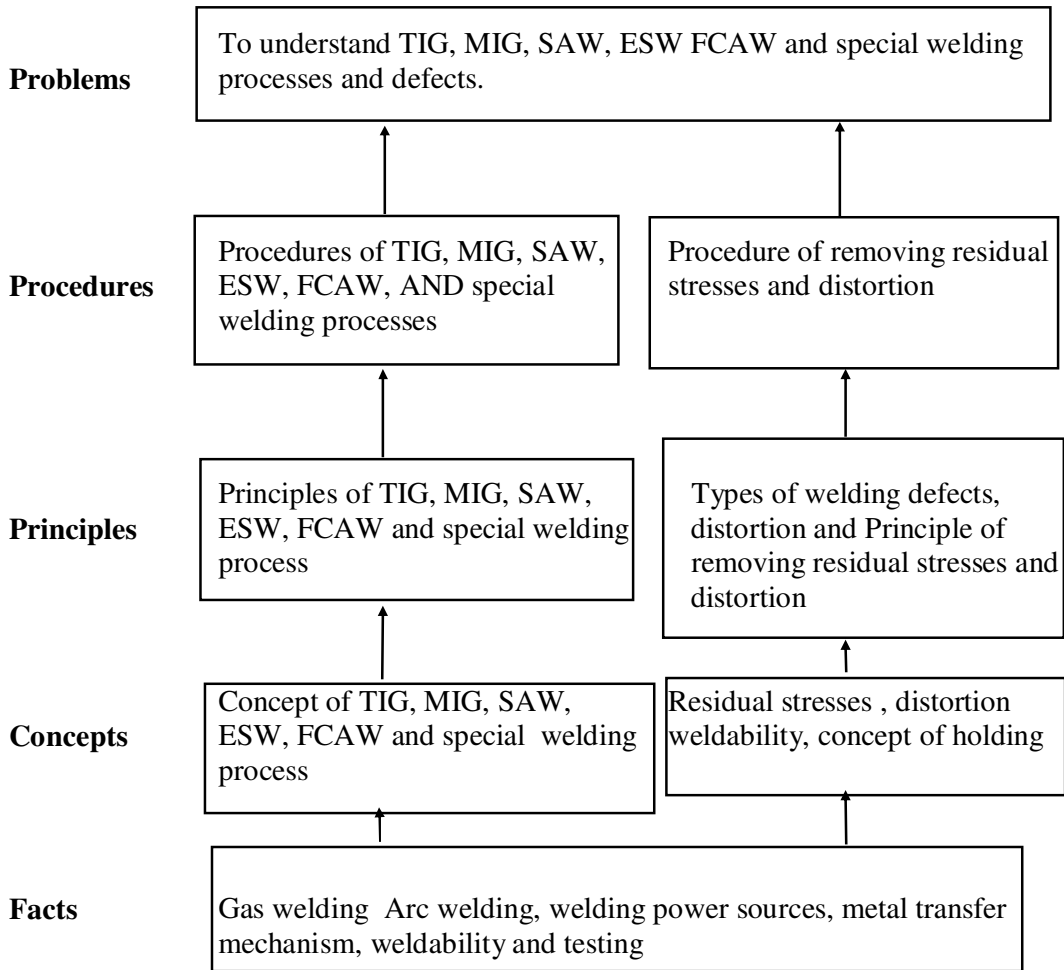
RATIONALE:

To make students understand different welding techniques, equipments, jigs and fixtures and maintenance.

OBJECTIVES:

1. To make student familiar with basic welding processes
2. Operate and control diff. welding machines & equipment
3. Inspect the job for specified dimension & quality
4. To make the students acquaint with welding codes.
5. Adopt safety practices during welding.

GRAPHICAL STRUCTURE:



DETAILED CONTENTS

Chapter	Description	Marks	Hrs
1.	<p>GAS TUNGSTON ARC WELDING (TIG) Theory: -</p> <p>Definition, Principle of operation, Equipment, Base metals welded, joint design, shielding gases:</p> <ul style="list-style-type: none"> ◦ Comparison of shielding gases ◦ Welding fixtures ◦ Automatic welding ◦ Longitudinal seamers ◦ Pedestal boom manipulators <p>Practice : -</p> <ul style="list-style-type: none"> • Butt weld in overhead position • Fillet weld in overhead position • TIG welding of aluminum parts 	12	08
2.	<p>GAS METAL ARC WELDING (MIG) Theory: -</p> <p>Definition, Principle of operation, Equipments, Metals welded, Shielding gases holding and handling equipment, joint design, Advantages and limitations, safety practices.</p> <p>Practice : -</p> <ul style="list-style-type: none"> • One job based on MIG Welding 	08	04
3.	<p>SUBMERGED ARC WELDING (SAW) Theory: -</p> <p>Definition, Principle of operation. Limitation and advantages, suitable work metals, equipments, joint design, weld design, jigs and fixtures, holding techniques, comparison of SAW with other arc welding processes, safety practices.</p>	08	04
4.	<p>FLUX CORED ARC WELDING Theory :-</p> <p>Definition, application, principle of operation, fundamental and selection of electrodes comparison with other processes.</p>	04	02
5.	<p>ELECTRO SLAG WELDING Theory :-</p> <p>Definition, Principle of Operation, Advantages & disadvantages, application.</p> <p>Practice : -</p> <ul style="list-style-type: none"> • Welding of cast iron 	04	02

	SPECIAL WELDING & CUTTING PROCESSES Theory :-		
6.	Plasma arc welding, laser cutting and welding, ultra sonic welding, diffusion welding, friction and inertia welding, thermit welding, atomic hydrogen welding.	16	10
	RESISTANCE WELDING Theory :-		
7.	Definition, fundamentals of resistance welding, advantages and disadvantages, application. Practice :- <ul style="list-style-type: none"> • Seam welding • Spot welding 	08	05
	DISTORTION AND RESIDUAL STRESSES IN WELDED FABRICATION. Theory :-		
8.	Concept of distortion, types of distortion, causes of distortion, control of distortion, correction of distortion, residual stresses and methods of stress relieving, control of distortion in structural work. Practice :- <ul style="list-style-type: none"> • Distortion control in welding 	04	03
	REPAIR & MAINTENANCE WELDING Theory :-		
9.	Factors influencing the choice of technique, Precautions in welding certain metals, examples of repair work.	04	02
	WELDING CODES & PROCEDURE Theory :-		
10.	Preparation of welding procedure specification(WPS) <u>Welding codes, standards & specification.</u> <ul style="list-style-type: none"> • Pipe line welding codes.- API 1104, BS 4515- 1 • Piping welding codes – ASME B 31.1, ASME B 31.3, ASME B 31.8 • Process equipment codes- ASME section 8. • Structural welding code- AWS D1.1 Practice :- <ul style="list-style-type: none"> • One assignment on WPS • One assignment on codes & standards 	12	08
TOTAL		80	48

Skill to be developed**Intellectual skill:**

1. Understand the diff. welding methods.
2. Understand & interpret the welding codes & standards..
3. Understand welding parameters in various processes
4. Understand weld mechanics.

Motor skill:

1. Edge preparation for making the welding joint
2. Use welding machine & equipment.
3. Set the tool, job & decide parameter of machines.
4. Evaluation of weld quality.

IMPLEMENTATION STRATEGIES:

The subject matter will be taught as per the teaching scheme for Theory and practical. The identified list of practical may be conducted along with Theory session. The subject teacher will prepare and provide learning material/handout for supplementing/ complementing classroom instructions.

REFERENCES:

Author	Title	Edition	Year of Publication	Publisher & Address
O.P. Khanna	A Text Book of Welding Tech.	--	1994	Dhanpat Rai & Sons, New Delhi
A.C. Davis,	The Science & Practice of Welding	8th	1941	Cambridge University Press
--	Control of Distortion in Welding & Fabrication	2nd	--	Welding Institute London

**COURSE NAME : DIPLOMA IN FABRICATION TECHNOLOGY & ERECTION
ENGINEERING**

COURSE CODE : FE

SEMESTER : SEVENTH

SUBJECT TITLE : PROCESS EQUIPMENT

SUBJECT CODE : 9239

Teaching & Examination Scheme

Teaching Scheme			Examination Scheme						
TH	TU	PR	PAPER HRS	TH	TEST	PR	OR	TW	TOTAL
04	--	02	03	80	20	--	--	50@	150

RATIONALE:

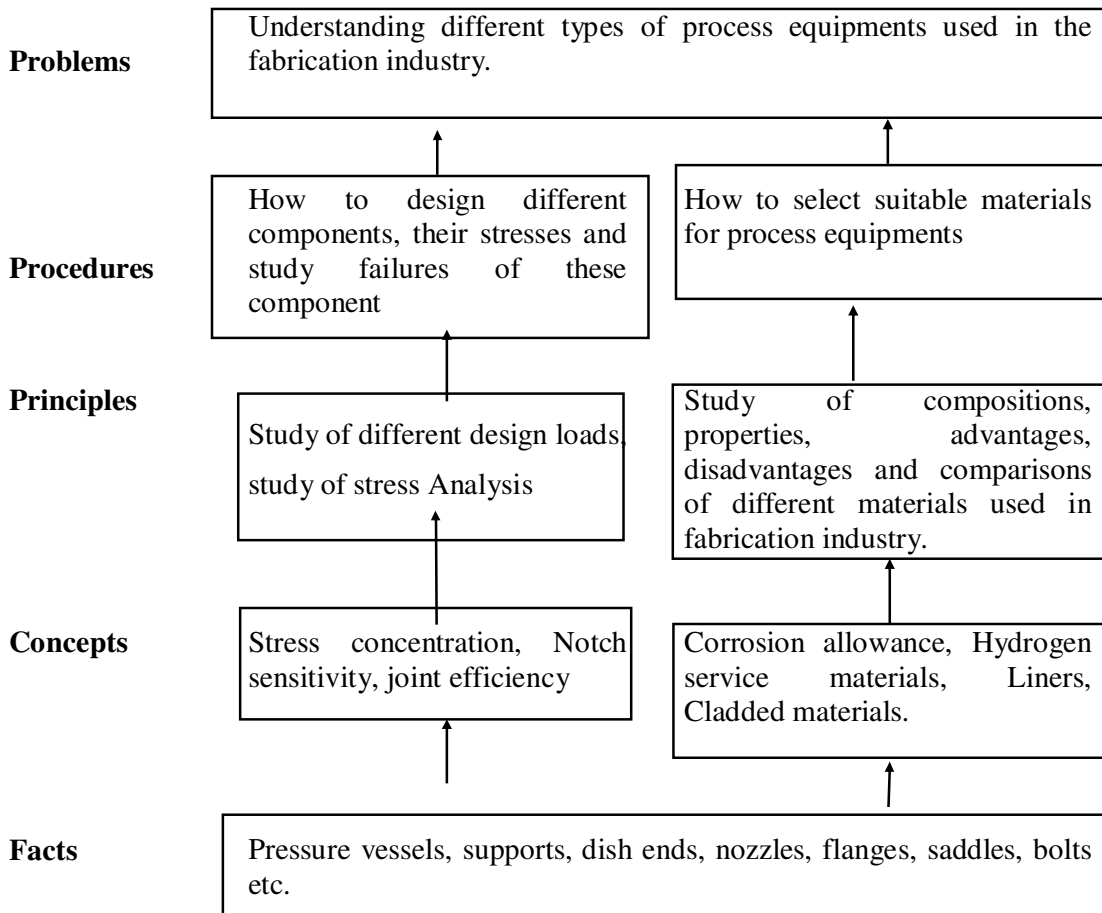
It is intended to teach the students to understand the facts, concepts, construction and working of different process equipments used in the fabrication industry.

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 used in pressure vessel construction.

Learning Structure:



DETAILED CONTENTS

Chapter	Description	Marks	Hrs.
1	PRESSURE VESSELS Theory: - Introduction, Design approach, Terminology, Ligament efficiency	04	06
2	DESIGN LOADS Theory: - Introduction, Design pressure, Design temperature, Dead load, wind load, piping load, earthquake loads, and combination of design loads.	08	08
3	STRESSES IN PRESSURE VESSELS Theory: - Introduction, Allowable stress range, General Design Criterion, stresses in ring, cylinder, sphere, Poisson ratio, Dilation of pressure vessels, membrane stress, thick cylinder, thick sphere, thermal stresses, ultra high pressure vessel , discontinuity stresses in vessels, stresses in Bi-metallic joints, Deformation and stresses in flanges, reinforced circular plates, stacked plates and built up plates.	12	12
4	STRESS ANALYSIS IN VARIOUS PARTS OF VESSELS Theory: - Cylindrical shell, spherical shell, hemispherical heads, semi ellipsoidal heads, torispherical heads, conical heads, supports skirts, support legs, support lugs, anchor bolts, saddles, stiffeners.	16	12
5	DESIGN CONSTRUCTION FEATURES Theory : - Stress concentrations, Nozzle reinforcement, placement and shape, fatigue concentration, stresses concentration in circular and elliptical opening.	16	08
6	WELD DESIGN Theory: - 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	08
7	CONSTRUCTION MATERIALS Theory : - General considerations, Non corrosive service, corrosive service, bolting material, selection of material for hydrogen service, aluminum alloys, stainless steels etc. Note: Derivation / Proof of any formula is not expected.	12	10
--	Practice: - Eight assignments based on above theory content	--	--
Total		80	64

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

1. Calculate the thickness of process equipments.
2. Decide the material of construction
3. Decide FOS & life of vessel.

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:

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 INFABRICATION TECHNOLOGY & ERECTION
ENGINEERING**

COURSE CODE : FE

SEMESTER : SEVENTH

SUBJECT TITLE : INDUSTRIAL ERECTION & SAFETY

SUBJECT CODE : 9240

Teaching & Examination Scheme

Teaching Scheme			Examination Scheme						
TH	TU	PR	PAPER HRS	TH	TEST	PR	OR	TW	TOTAL
04	--	02	03	80	20	--	25#	25@	150

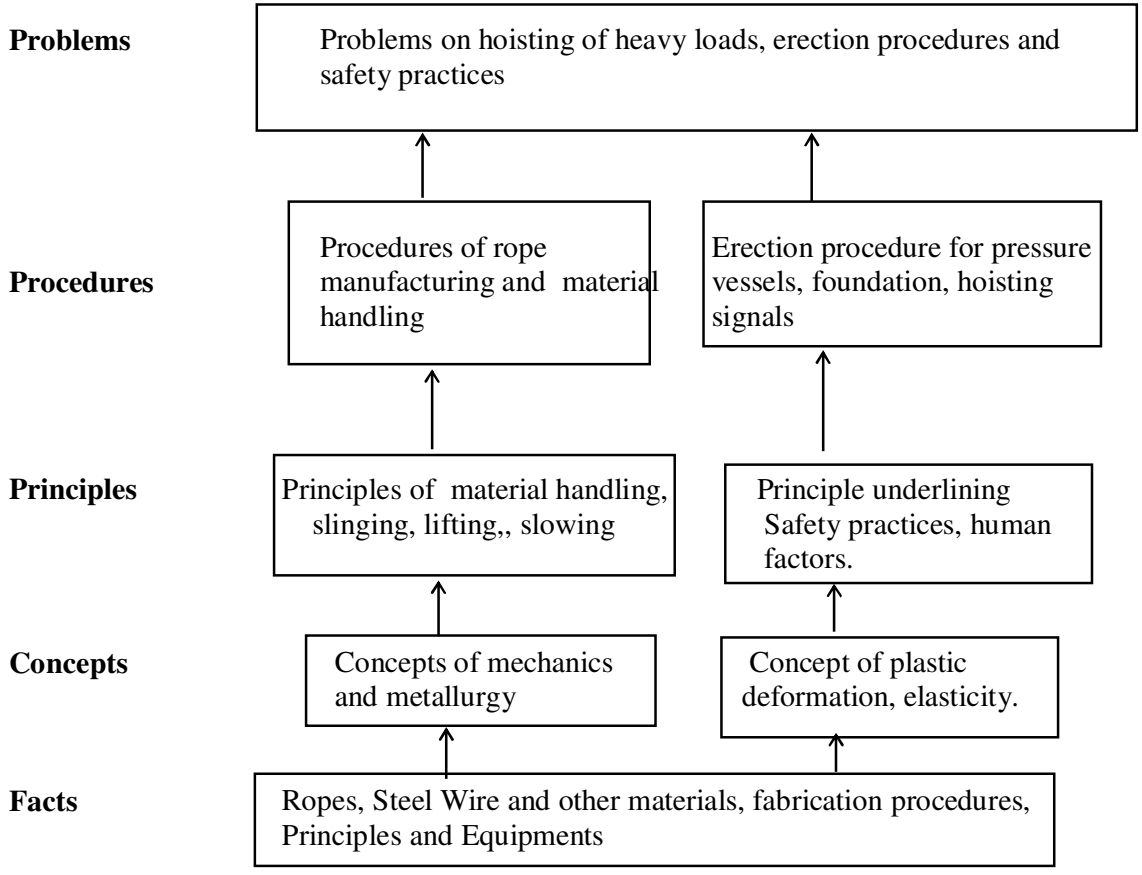
RATIONALE:

To make understand students with the different equipments and tools used for erection, material handling and safety norms.

OBJECTIVES:

- To make students realize the profile of an erection engineer.
- To give better understanding of erection materials & tools.
- To create awareness of the need for industrial safety.
- To impart understanding about hoisting equipments, cranes etc.

Learning Structure:



DETAILED CONTENTS

Chapter	Description	Marks	Hrs
1	<p>INTRODUCYION & ERECTION MATERIALS AND TOOLS</p> <p>Theory :-</p> <ul style="list-style-type: none"> • <u>Profile of an erection engineer</u> • <u>Natural Fibre ropes - Characteristics features</u> <ul style="list-style-type: none"> ◦ Manila rope ◦ Sisal rope ◦ Hemp rope ◦ Coir rope. ◦ Construction of Natural fibre ropes <ul style="list-style-type: none"> ◦ directions of lay, right and left hand lay ◦ Hard laid and soft laid ropes ◦ plain lay rope (three stranded rope) shrewd lay rope (four stranded rope) Cable lay rope • Whipping and seizing of ropes • Precautions in handling and storing of natural fibre ropes • <u>Synthetic fibre ropes - Characteristics and uses,</u> <ul style="list-style-type: none"> ◦ Polyamides (nylon) rope ◦ Polyster (terylene) rope ◦ Polypropylene rope ◦ Polyethylene rope • Construction of synthetic fibre ropes <ul style="list-style-type: none"> ◦ Plain laid or house laid construction ◦ braided rope construction ◦ Plaited rope construction ◦ parafil construction • Precautions in handling and storing synthetic fibre ropes • Inspection of synthetic fibre ropes • <u>Steel wire ropes (SWR)</u> <ul style="list-style-type: none"> ◦ Construction and their application ◦ Functions of heart ◦ Specification of wire ropes ◦ Kinking, cause, effect and method of possible removal in case of ropes of small diameters ◦ Precaution in handling and storage of wire ropes ◦ Lubrication of wire ropes ◦ Inspection of steel wire ropes ◦ Requirements of selection of SWR ◦ wire rope attachment <ul style="list-style-type: none"> – shackles, thimbles, hooks, Cross by clips – aluminum sleeve attachment - Wedge sockets 	16	14
	<p>Practice :-</p> <p>Four assignments based on the theory</p>		

2	<p>HOISTING TOOLS & EQUIPMENTS Theory: -</p> <ul style="list-style-type: none"> • Knots, bends, hitches & splices • Hoisting Chain - Inspection • <u>Slings - Description, merits and demerits</u> <ul style="list-style-type: none"> ◦ Manila rope sling ◦ Steel chain slings ◦ Wire rope slings • <u>Types of slings</u> <ul style="list-style-type: none"> ◦ Endless sling or gourmet ◦ Choker sling, double choker sling, basket sling ◦ Double basket sling, bridle sling, turnbuckle sling. • <u>Connecting tools</u> <ul style="list-style-type: none"> ◦ Connecting bar, Maul, Bull pin, fork wrench, drift pin <p><u>Practice: -</u> Two assignments based on the theory</p>	08	07
3	<p>HANDLING OF LOADS Theory: -</p> <ul style="list-style-type: none"> • Handling of loads on slings • Consideration for correct handling <ul style="list-style-type: none"> ◦ Estimation of centre of gravity ◦ Hook position ◦ Adjusting sling lengths between hook and lifting lugs • Use of pads at sharp edges while placing Slings • Use of spreader bar 	04	06
	<p>Practice :- One assignment based on the theory</p>	--	--
4	<p>CHAIN HOISTS Theory : -</p> <p>Brief description of uses of the following hoists</p> <ul style="list-style-type: none"> • Pull lift hoist • Differential hoist • Screw geared hoist • Spur geared hoist 	08	04
	<p>Practice :- One assignment based on the theory</p>	--	--
5	<p>ERECTION EQUIPMENTS Theory : -</p> <ul style="list-style-type: none"> • <u>Basic motions of cranes</u> <ul style="list-style-type: none"> ◦ Hoisting ◦ Luffing ◦ Slewing • Types of power plant in crane body and Hydraulic torque 	24	16

	converter transmission, fluid coupling		
	<ul style="list-style-type: none"> • <u>Classification of cranes</u> <ul style="list-style-type: none"> ◦ Mobile ◦ Stationary • <u>Types of mobile cranes</u> <ul style="list-style-type: none"> ◦ Conventional truck cranes ◦ Crawler crane ◦ Self propelled wheel type crane ◦ rail mounted crane • Truck Cranes <ul style="list-style-type: none"> ◦ Brief description of main parts ◦ Salient features of working ◦ necessity for outriggers ◦ uses • Crawler Cranes <ul style="list-style-type: none"> ◦ Brief description & salient features ◦ Disadvantages when compared to truck cranes ◦ Uses • Rail mounted cranes <ul style="list-style-type: none"> ◦ Brief description of salient fatures ◦ Uses • Tipping (Stability) & structural (strength) failure of mobile crane <ul style="list-style-type: none"> • Specification of mobile cranes • Factors influencing selection of mobile cranes <ul style="list-style-type: none"> ◦ Size and weight of the load to be handled ◦ Suitability of site conditions approachability Uniformity in type & make of crane availability of spare parts ◦ Utilization of crane ◦ Speed of load handling ◦ Variety of load handling ◦ Economics - initial costs and other costs • Guy Derricks <ul style="list-style-type: none"> ◦ brief description of construction ◦ Situation where it is preferred ◦ working elements • Stiff leg Derrick <ul style="list-style-type: none"> ◦ Description of main parts ◦ Situation where used. <p>Safety precautions during working of cranes</p> <ul style="list-style-type: none"> • Other Erecting units (description and use) <ul style="list-style-type: none"> ◦ Gin Poles ◦ Basket Pole ◦ Shear legs <p>Practice :- Three assignments based on the theory</p>		
6	ACCIDENT PREVENTION AND SAFETY Theory : <ul style="list-style-type: none"> • Definition of accident prevention 	08	08

	<ul style="list-style-type: none"> ● Personal injury accidents and property damage accidents. ● Causes of accidents <ul style="list-style-type: none"> ○ Human failures ○ Unsafe working conditions ○ failure of machinery and equipments ● Benefits of accident prevention ◆ Accident prevention measures <ul style="list-style-type: none"> ○ Good house keeping and layout ○ Proper illumination and safe working conditions ○ Care for environmental factors ○ Care in handing loads by lifting machines ○ Human factors ○ Use of protective equipments <p><u>HOIST SIGNALS</u></p> <ul style="list-style-type: none"> ● Objectives for devising hoist signals ● Hoist Signals for crane operation <ul style="list-style-type: none"> ○ Hoist Load ○ Lower Load ○ Back trolley ○ Travel crane bridge ○ Boom up ○ Boom down ○ Stop ○ Emergency stop ○ Slew boom ○ Whistle signals & electronic devices for Derrick Operation <p>Practice: - One assignment based on the theory.</p>		
7	<p>ERECTION AND INSTALLATION OF PROCESS EQUIPMENTS</p> <p>Theory : -</p> <ul style="list-style-type: none"> ● <u>Advance planning</u> <ul style="list-style-type: none"> ○ Availability of all drawings ○ Good housekeeping at site for easy identification of materials and accident prevention. ○ Schedule for shipping men, materials and equipments. ○ Erection procedure with time schedule ○ Men, materials and equipments. ○ Proper lighting ventilation and other facilities. ○ Safety Instructions. ● <u>Site Operations</u> <ul style="list-style-type: none"> ○ Physical checking of the dimensions of the process equipments. ○ Physical checking of the dimensions of the foundation ○ Suitable method for material handing by lifting devices. ○ Selection of proper tools and tackles ○ Hoisting and position the vessel on the foundation. 	08	06

	<ul style="list-style-type: none"> ◦ Aligning and leveling the vessel. ◦ Final tightening by pneumatic torque wrench ◦ Pressure testing 		
	Practice :- One assignment based on the theory.	--	--
8	ERECTION COSTING Theory :- <ul style="list-style-type: none"> ◦ Need for erection costing ◦ Steps in erection costing ◦ Site labour cost ◦ Site plant/Facility usage cost Other overheads. 	04	03
	Practice :- <ul style="list-style-type: none"> • One assignment based on the theory. • One industrial visit based on the syllabus 	--	--
Total		80	64

Skill to be developed:

Intellectual skills

1. Ability to understand erection procedures.
2. Capability to identify & select proper material, tools & equipments for hoisting.
3. Ability to select appropriate knots & hitches, slings ect.
4. Acquiring better safety consciousness.

Motor Skills:

1. Ability to set the correct considerations for handling of load.
2. Ability to use safety equipments and follow general safety procedures.
3. Capability to handle erection procedures in sites.

IMPLEMENTATION STRATEGIES :

The subject matter will be taught as per the teaching scheme for Theory and practical. The identified list of practical may be conducted along with Theory session. The subject teacher will prepare and provide learning material/handout for supplementing/ complementing classroom instructions.

References:

Author	Title	Edition	Year of Publication	Publisher & Address
Havers & Stubbs	Hand book of Heavy Construction	--	--	McGraw Hill
W.E. Rossangal	Handbook of Rigging	--	--	McGraw Hill

**COURSE NAME : DIPLOMA IN FABRICATION TECHNOLOGY & ERECTION
ENGINEERING**

COURSE CODE : FE

SEMESTER : SEVENTH

SUBJECT TITLE : INDUSTRIAL PROJECT

SUBJECT CODE : --

Teaching and Examination Scheme:

Teaching Scheme			Examination Scheme						
TH	TU	PR	PAPER HRS	TH	TEST	PR	OR	TW	TOTAL
--	--	06	--	--	--	--	50#	50@	100

NOTE: 04 practical hours are for industrial project to be completed by visiting industry.

Rationale:

In practice the diploma technicians come across problems of varied nature. He/she will have to solve the problems involving drawings, designs, manufacturing, installation, testing of process equipments. In order to cultivate the systematic methodology for problem solving using acquired technical knowledge & skills, this particular subject is introduced.

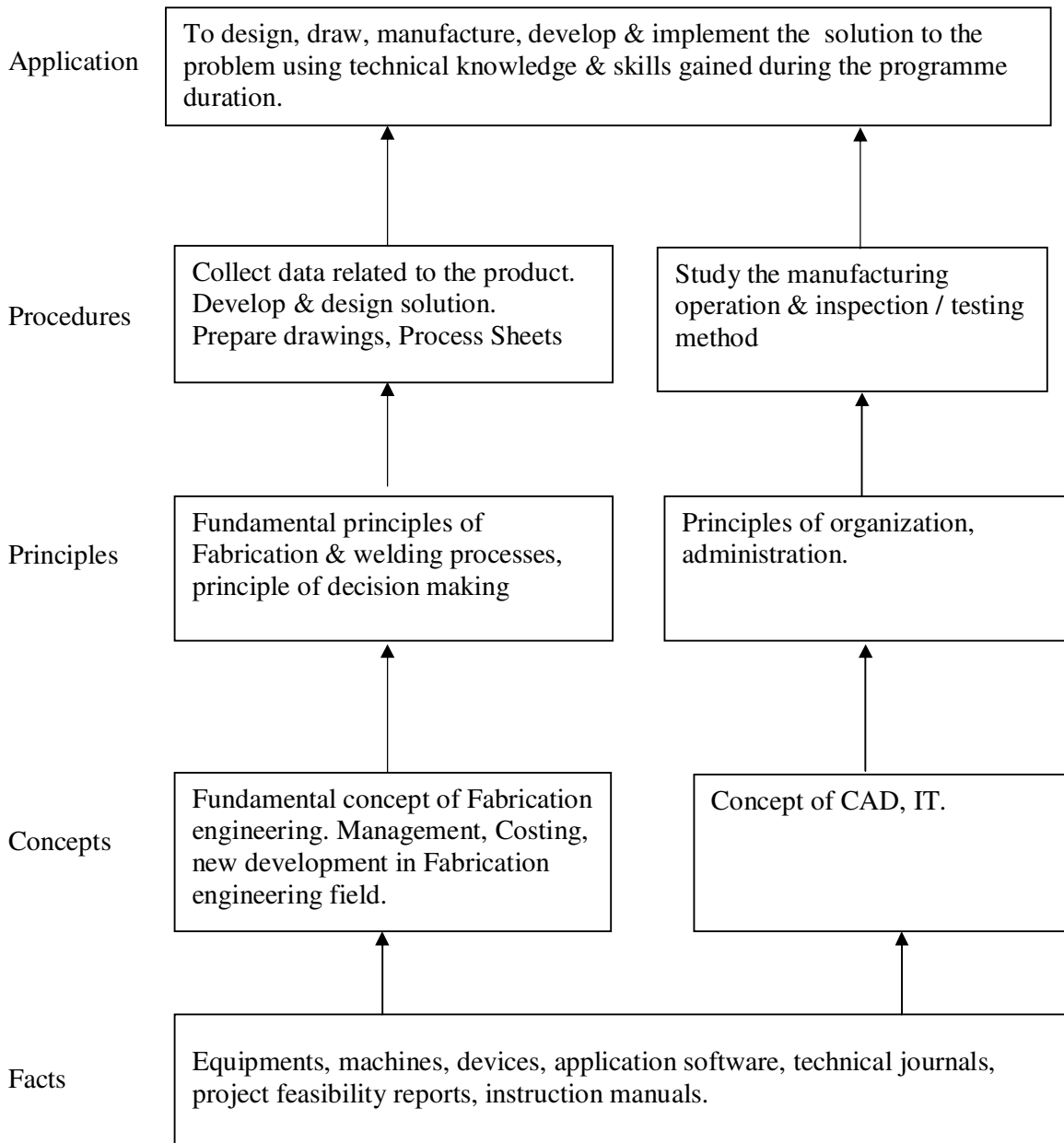
This subject will also help to enhance the generic skills & professional skills.

Objectives:

The student will be able to-

1. Identify, analyze & define the process equipment product.
2. Design, develop, manufacture & operate equipment/Program.
3. acquire higher-level technical knowledge by studying recent development in mechanical engineering field.
4. Work effectively in team.

Learning Structure:



Contents:

Skills To Be Developed:

Intellectual Skills

1. Design the process equipment component.
2. Convert innovative or creative idea into reality.
3. Understand & interpret drawings & processes
4. Select the viable, feasible & optimum alternative from different alternatives.

Motors skills

1. Use of skills learnt in workshop practical.
2. Assemble parts or components to form the product.
3. Classify & analyze the information collected.

- Notes:** 1) Project group size : 4-5 students per group.
2) Project report will be of minimum 80-100 pages unless otherwise specified.
3) Project diary should be maintained by each student.

Project details: Student can work in one area of the following

A batch of maximum 4-5 student will select a problem and then plan, organize & execute the project work of solving the problem in a specified duration. Student is expected to apply the knowledge & skills acquired. Batch may select any one problem/project work from following categories.

- a) Study of process equipment / devices, models, fabricated product, columns etc. Report involving aspects of drawing, process sheets, inspection, costing & testing should be prepared and submitted.
- b) Development of computer program for designing and / or drawing of components, Simulation of movement & operation, 3D modeling, pick & place robots etc.
- c) Industry sponsored projects- project related with solving the problems identified by industry should be selected. One person / engineer from industry is expected to work as co- guide along with guide from institution.
- d) Literature survey based projects:- Project related with collection tabulation, classification, analysis & presentation of the information. Topic selected must be related with latest technological developments in fabrication field. Report should be of min 80 pages.
- e) Investigative projects- Project related with investigations of causes for change in performance or structure of machine or component under different constraints through experimentation and data analysis.
- f) Industrial Engg. based project: Project based on work study , method study, methods improvement, leading to productivity improvement, data collection, data analysis and data interpretation be undertaken .

- g) Market research/ survey based projects: Projected related with identification of extent of demand, sales forecasting, Comparative study of marketing strategies, Comparative study of channels of distribution, Impact of variables on sales volume, etc. The project involves extensive survey & market research activities information to be collected through various mechanisms/tools & report be prepared.
- h) Project based on use of appropriate technology particularly benefiting rural society or economically weaker section.
- i) Project can be selected other than the area specified above. Project should provide viable and feasible solution to the problem identified. Report should be of min 80 pages.

COURSE NAME : MECHANICAL ENGINEERING GROUP
COURSE CODE : ME/MH/MI/PG/PT/FE
SEMESTER : SIXTH FOR ME/PG/PT AND SEVENTH FOR MH/MI/FE
SUBJECT TITLE : PROFESSIONAL PRACTICES - VI
SUBJECT CODE : --

Teaching and Examination Scheme:

Teaching Scheme			Examination Scheme						
TH	TU	PR	PAPER HRS	TH	TEST	PR	OR	TW	TOTAL
--	--	05	--	--	--	--	--	50@	50

Rationale:

Most of the diploma holders join industries. Due to globalization and competition in the industrial and service sectors the selection for the job is based on campus interviews or competitive tests.

While selecting candidates a normal practice adopted is to see general confidence, ability to communicate and attitude, in addition to basic technological concepts.

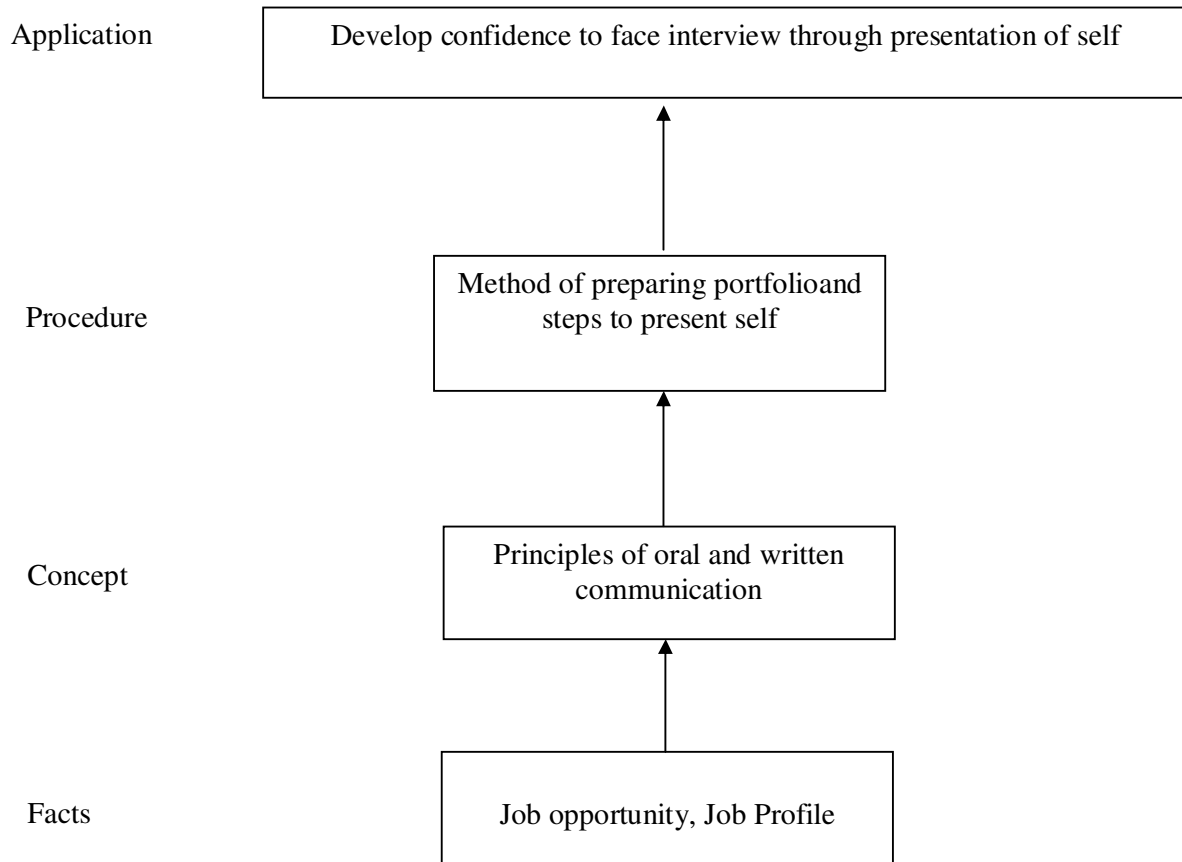
The purpose of introducing professional practices is to provide opportunity to students to undergo activities which will enable them to develop confidence. Industrial visits, expert lectures, seminars on technical topics and group discussion are planned in a semester so that there will be increased participation of students in learning process.

Objectives:

Student will be able to:

1. Acquire information from different sources.
2. Prepare notes for given topic.
3. Present given topic in a seminar.
4. Interact with peers to share thoughts.
5. Prepare a report on industrial visit, expert lecture.

Learning Structure:



Serial No.	Activities	Hours
01	<p>Industrial Visits Structured industrial visits be arranged and report of the same should be submitted by the individual student, to form a part of the term work. Two industrial visits may be arranged in the following areas / industries to observe - Material Handling System, quality control charts / production record / layout flow systems / Facilities / Hydraulic & pneumatic systems / Working of Boilers and steam engineering applications.</p> <ul style="list-style-type: none"> i) Auto / Electronic equipment manufacturing industry. ii) Cement / Sugar / Chemical / Textile / Steel rolling mills / extrusion industries. iii) Material handling in mines or ports. iv) Earth Moving Equipment Maintenance Shop. 	21
02	<p>Lectures by Professional / Industrial Expert be organized from any of the following areas (four lectures of two hour duration) student shall submit the report on each lecture:</p> <ul style="list-style-type: none"> a) Battery and its charging system b) Electronic ignition system c) micro processor based instrumentation in Automobiles d) Earth moving machines. e) Tractors f) Excavators. g) Fork lift truck. h) Road-roller. i) Automated Guided Vehicles (AGV) j) Career opportunities in Service stations, Marketing, Surveyor, Insurance, R&D, call centers, CAD, NDT, Railways, Defense, Aeronautics, Marine, Software development, Information Technology k) Continuing education / Open universities Programmes, l) Air compressor technology m) Tribological Aspects in automobiles / machine tools 	16
03	<p>Group Discussion : (Two topics) The students shall discuss in group of six to eight students and write a brief report on the same as a part of term work. The topic for group discussions may be selected by the faculty members. Some of the suggested topics are</p> <ul style="list-style-type: none"> i) Solar Vehicles / Electric Vehicles. ii) Auto Vehicles – Comparison. iii) Two stroke versus four stroke engines iv) Recycling of plastics and other waste material v) Attributes of product design vi) Creativity and innovativeness vii) Energy conservation in institutes viii) Value engineering ix) Revolution in communication technology x) Pneumatic tools and equipments xi) Wear mechanisms 	12

	<p>Student Activities : The students in a group of 3 to 4 will perform ANY THREE of the following activities (other similar activities to be considered), and write a report as a part of term work.</p> <p>Activity :</p> <ul style="list-style-type: none"> i) Collecting internal communication forms. ii) Collecting Failure data for automobile / machines / equipments. iii) Study of Hydraulic system for any one application like – dumpers, Earth moving equipment, Auto service station. iv) Survey of oils used for hydraulic circuits – specifications, properties, costs, manufacturers names etc. v) Study any one type of CNC machining center and prepare report on tooling and tool holding devices vi) Using finite element method analyse stresses in a cantilever beam. Write all the steps involved with brief description. vii) For a given job write a sequence of operations performed by automated manufacturing system. Draw a block diagram of control system to perform above operations viii) Survey of types of bearings involving information about construction working principles, mounting, lubrication, materials, advantages, limitations and cost. ix) Prepare a trouble shooting chart for any refrigeration system and suggest remedial measures to avoid failures x) For a drilling or milling operations on a simple machine component, draw a jig or fixtures showing various features like locating clamping, fool proofing etc. xi) Compare non traditional methods on the basis of working principles, accuracy , MRR, Applications and limitations <ul style="list-style-type: none"> a) EBM b) PAM C)AJM d)WJM Xii) For a given job involving 3 to 4 operations suggest to prepare a report 	18
05	<p>Seminar :- Seminar on any advanced technical topic to be presented by individual student in a batch of 20 students. A separate topic be selected by an individual student</p>	13
Total		80