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 for FG and 8 SEMESTERS for FE **WITH EFFECT FROM 2012-13**

SEMESTER : SIXTH **DURATION : 16 WEEKS**

PATTERN : FULL TIME - SEMESTER **SCHEME : G**

SR. NO	SUBJECT TITLE	Abbreviation	SUB CODE	TEACHING SCHEME			EXAMINATION SCHEME									SW (17600)
							PAPER HRS.	TH (1)		PR (4)		OR (8)		TW (9)		
				TH	TU	PR		Max	Min	Max	Min	Max	Min	Max	Min	
1	Management $	MAN	17601	03	--	--	1&½	50#*	20	--	--	--	--	--	--	**50**
2	Production Engineering & Robotics β	PER	17609	04	--	--	03	100	40	--	--	--	--	--	--	
3	Advanced Welding Technology	AWT	17621	03	--	03	03	100	40	50#	20	--	--	25@	10	
4	Advanced Fabrication Processes	AFP	17622	03	--	03	03	100	40	50#	20	--	--	25@	10	
5	Industrial Erection & Safety	IES	17623	03	--	02	03	100	40	--	--	--	--	25@	10	
6	Project β	PRO	17090	--	--	04	--	--	--	--	--	50#	20	50@	20	
7	Entrepreneurship Development β	EDE	17099	01	--	02	--	--	--	--	--	--	--	25@	10	
	TOTAL			**17**	**--**	**14**	**--**	**450**	**--**	**100**	**--**	**50**	**--**	**150**	**--**	**50**

Student Contact Hours Per Week: **31 Hrs.**

THEORY AND PRACTICAL PERIODS OF 60 MINUTES EACH.

Total Marks **: 800**

@ - Internal Assessment, # - External Assessment, [ ] No Theory Examination, $ - Common to all branches, β - Common to ME / PG / PT/ MH/MI/FG/FE

Abbreviations: TH-Theory, TU- Tutorial, PR-Practical, OR-Oral, TW- Term Work, SW- Sessional Work.

- 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.

Course Name : All Branches of Diploma in Engineering / Technology

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

Semester : Sixth for EJ/EN/ET/EX/EV/IC/IE/IS/MU/DE/ME/PG/PT/AE/CE/CS/CR/ CO/CM/IF/CW/EE/EP/EU/CH/CT/PS/TX/TC/FG and Seventh for MH/MI/CD/ED/EI/ CV/FE/IU

Subject Title : Management

Subject Code : 17601

Teaching and Examination Scheme:

Teaching Scheme			Examination Scheme					
TH	TU	PR	PAPER HRS	TH	PR	OR	TW	TOTAL
03	--	--	1&½	50#*	--	--	--	50

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:

Management concepts are universal and it is a multidisciplinary subject. They are equally applicable to different types industries like Manufacturing, Service and Trade as well as different kind of business activities like industry, army, school, hospital, retail shops etc. Also, at the end of diploma course polytechnic students are expected to enter in to the Industrial Environment. This environment is altogether different and new to the students. A proper introduction and understanding of management fundamentals is therefore essential for all these students.

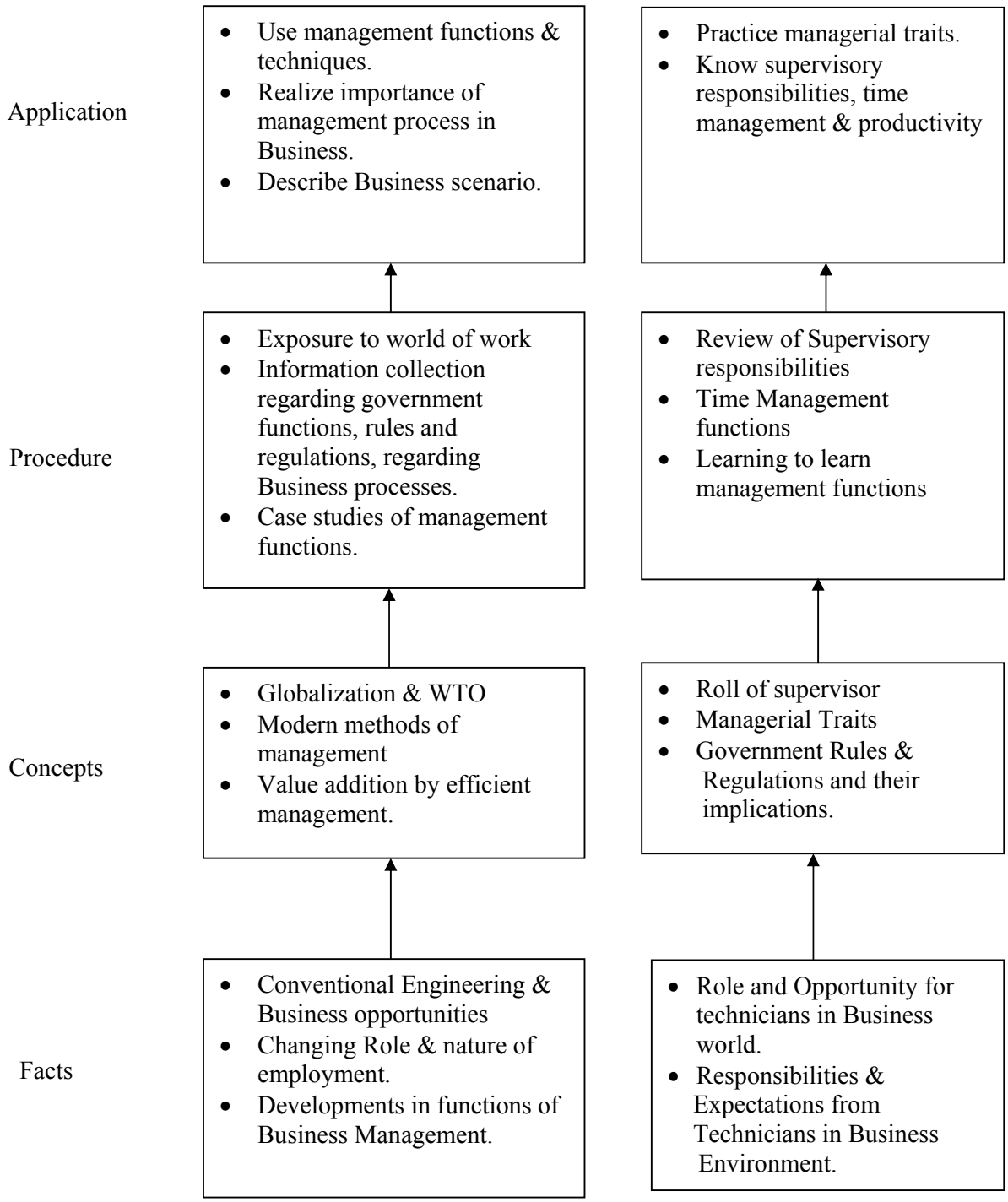
Contents of the this subject will enable the students to address various issues related to human resource, finance, materials, legislations etc. by use of basic principles of management. This will ensure that students will play their role effectively to enhance the quality of business output in total.

Objective:

The students will able to:

1. Get familiarized with environment related to business processes.
2. Know the management aspects of the organisations.
3. Understand Role & Responsibilities of a Diploma engineer.
4. Understand importance of quality improvement techniques.
5. Appreciate need and importance of safety in industries.
6. Understand process of Industrial finance and its management.
7. Know the latest trends in industrial management.

Learning Structure:



Contents: Theory

Topic and contents	Hours	Marks
Topic 1: Overview of Business **Specific Objectives** ➢ State various business types and sectors ➢ Describe importance of globalisation 1.1. Types of Business • Service • Manufacturing • Trade 1.2. Industrial sectors Introduction to • Engineering industry • Process industry • Textile industry • Chemical industry • Agro industry • IT industry • Banking, Insurance, Retail, Hospitality, Health Care 1.3 Globalization • Introduction • Advantages & disadvantages with respect to India	02	04
Topic 2: Management Process **Specific Objectives** ➢ State various management principles ➢ Describe different management functions 2.1 What is Management? • Evolution • Various definitions of management • Concept of management • Levels of management • Administration & management • Scientific management by F.W.Taylor 2.2 Principles of Management (14 Principles of Henry Fayol) 2.3 Functions of Management • Planning • Organizing • Directing • Controlling • Decision Making	08	08
Topic 3: Organisational Management **Specific Objectives** ➢ Compare different forms of organisation , ownership for a specific business ➢ Describe types of departmentation 3.1 Organization : • Definition	08	08

• Steps in organization 3.2 Types of organization • Line • Line & staff • Functional • Project 3.3 Departmentation • By product • By process • By function 3.4 Principles of Organisation • Authority & Responsibility • Span of Control • Effective Delegation • Balance, stability and flexibility • Communication 3.5 Forms of ownership • Proprietorship • Partnership • Joint stock • Co-operative Society • Govt. Sector		
Topic 4: Industrial Safety and Legislative Acts **Specific Objectives** ➢ Describe types of accidents & safety measures ➢ State provisions of industrial acts. 4.1 Safety Management • Causes of accidents • Types of Industrial Accidents • Preventive measures • Safety procedures 4.2 Industrial Legislation - Necessity of Acts Important Definitions & Main Provisions of following acts: • Indian Factory Act • Workman Compensation Act • Minimum Wages Act	08	06
Topic 5: Financial Management (No Numerical) **Specific Objectives** ➢ Explain functions of financial management ➢ State the sources of finance & types of budgets. ➢ Describe concepts of direct & indirect taxes. 5.1 Financial Management - Objectives & Functions 5.2 Capital Generation & Management • Types of Capitals - Fixed & Working • Sources of raising Capital - Features of Short term, Medium Term & Long Term Sources 5.3 Budgets and accounts • Types of Budgets	08	08

• Fixed & Variable Budget - Concept • Production Budget - Sample format • Labour Budget - Sample format • Profit & Loss Account & Balance Sheet - Meaning, sample format, meaning of different terms involved. 5.4 Meaning & Examples of - • Excise Tax • Service Tax • Income Tax • Value Added Tax • Custom Duty		
Topic 6: Materials Management (No Numerical) **Specific Objectives** ➢ Describe concept of inventory, ABC analysis & EOQ. ➢ Describe purchase functions & procedures ➢ State features of ERP & MRP 6.1 Inventory Concept, its classification, functions of inventory 6.2 ABC Analysis - Necessity & Steps 6.3 Economic Order Quantity Concept, graphical representation, determination of EOQ 6.4 Standard steps in Purchasing 6.5 Modern Techniques of Material Management • Material Resource Planning (MRP) - Functions of MRP, Input to MRP, Benefits of MRP • Enterprise Resource Planning (ERP) - Concept, list of modules, advantages & disadvantages of ERP	08	08
Topic 7: Quality Management **Specific Objectives** ➢ State Principles of Quality Management ➢ Describe Modern Technique & Systems of Quality Management 7.1 Meaning of Quality Quality Management System – Activities, Benefits Quality Control - Objectives, Functions, Advantages Quality Circle - Concept, Characteristics & Objectives Quality Assurance - Concept, Quality Assurance System 7.2 Meaning of Total Quality and TQM Components of TQM – Concept, Elements of TQM, Benefits 7.3 Modern Technique & Systems of Quality Management like Kaizen,5'S',6 Sigma 7.4 ISO 9001:2000 - Benefits, Main clauses.	06	08
TOTAL	**48**	**50**

Learning Resources:
Books:

Sr. No	Author	Name of Book	Publisher
01	Dr. O.P. Khanna	Industrial Engineering & Management	Dhanpat Rai & Sons New Delhi
02	Banga & Sharma	Industrial Engineering & Management	Khanna Publication
03	Dr. S.C. Saksena	Business Administration & Management	Sahitya Bhavan Agra
04	W.H. Newman E. Kirby Warren Andrew R. McGill	The process of Management	Prentice- Hall

E Source:

- nptel.iitm.ac.in
- http://iete-elan.ac.in/subjects/amIndustrialMgmt.htm

Course Name : Mechanical Engineering Group

Course code : ME/PG/PT/MH/MI/FE/FG

Semester : Sixth for ME/PG/PT/FG and Seventh for MH/MI/FE

Subject Title : Production Engineering & Robotics

Subject Code : 17609

Teaching and Examination Scheme:

Teaching Scheme			Examination Scheme					
TH	TU	PR	PAPER HRS.	TH	PR	OR	TW	TOTAL
04	--	--	03	100	--	--	--	100

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 is technology subject. A technician is required to work at the highest productivity level. His /her productivity depends on the productivity of two important resources i.e. human resource and equipment resource in the manufacturing system. Hence he/she should learn the techniques for improvement in productivity of these two resources.

A technician is required to plan the production schedule. He / She is required to organize material supply for the manufacturing activities. The total cost of goods produced contains expenditure incurred on material and human resources. The direct and indirect cost of scarce resources can be reduced by the technician by optimizing their use. Hence he / she should learn, process planning, production planning and control.

Modern manufacturing system employs latest techniques such as JIT, TPM, FMS, 5'S', Kaizen. To keep pace with time, the technician should know all these techniques.

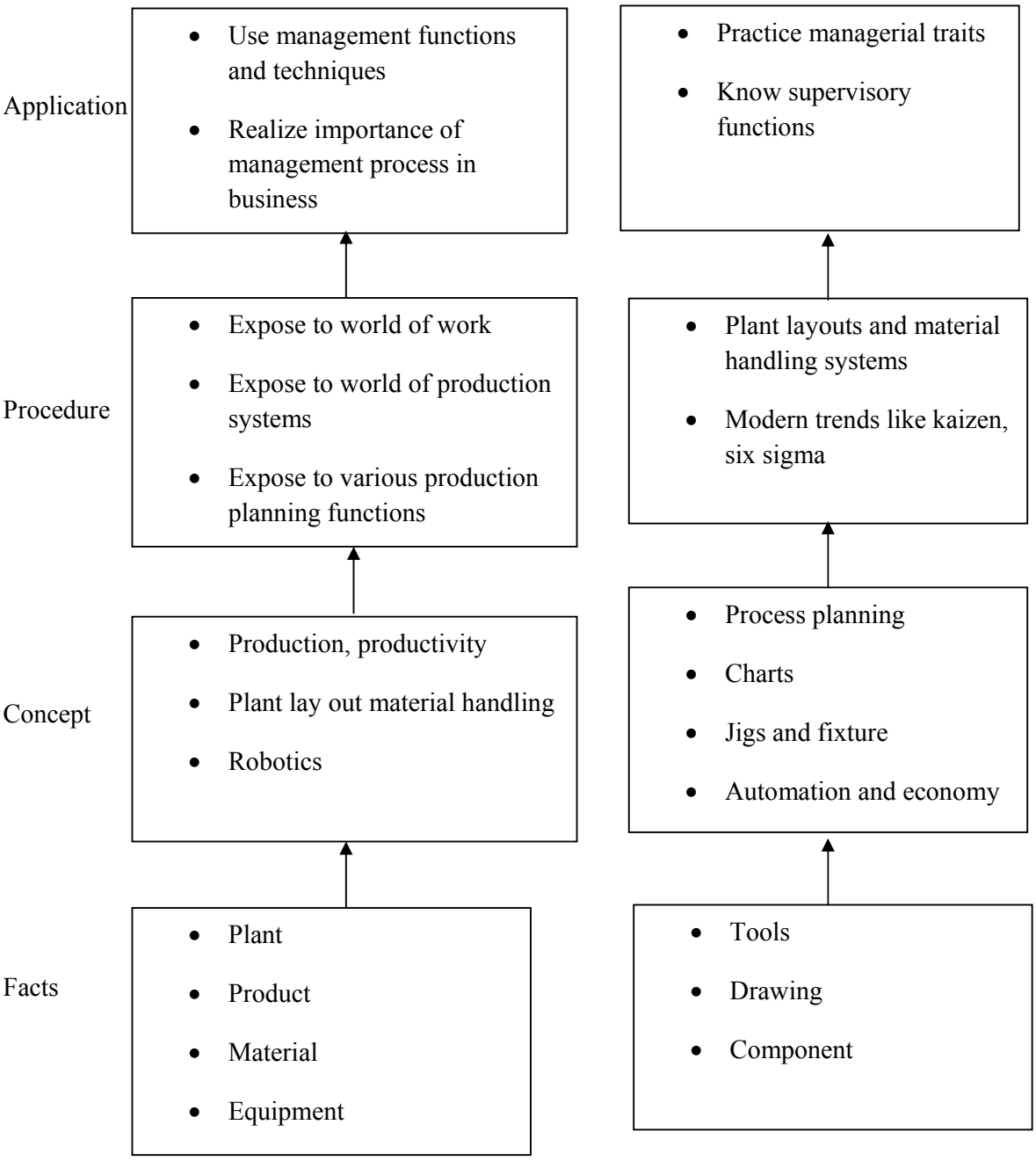
Industrial Robots are going to perform important and difficult functions in modern production system. A technician is expected to be aware of robots and their functioning.

General 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. Apply modern tools in production engineering like six sigma, kaizen, poka yoke, etc.
4. Understand concept of robotics, limitations of human in difficult operation and applications of robots.

Learning Structure:



Theory:

Topic and Content	Hrs.	Marks
Topic 1: Production System **Specific Objectives:** ➢ Define productivity ➢ State methods to improve productivity **Content:** 1.1 Production – definition ,types of production systems **04 Marks** 1.2 Productivity – importance, measurement of productivity, techniques of improving productivity. **04 Marks**	06	08
Topic 2: Plant Location, Plant Layout and Material Handling **Specific Objectives:** ➢ Draw layouts for manufacturing unit. ➢ State principles of material handling. ➢ Correlate plant layout and material handling. **Content:** 2.1 Plant Location - Importance of site selection, factors affecting site selection, Government policies, relaxation for backward areas**. 04 Marks** 2.2 Plant Layout - objectives, types, design principles, characteristics of plant layout, symptoms of bad plant layout. **04 Mark**s 2.3 Material handling - need, principles and types of material handling devices - conveyor, hoist & crane, forklift truck, trolley, pipe, selection of material handling systems and devices**.** Automated Guided Vehicles **06 Marks**	10	14
Topic 3: Process Planning **Specific Objectives:** ➢ Prepare process sheet for any given component. ➢ Select machine tool for given manufacturing process. **Content:** 3.1 Planning of processes from raw material to finished product, factors affecting process planning, **08 Marks** 3.2 Deciding sequence of operations, operation sheet, combined operations, and determination of inspection stages. **08 Marks**	10	16
Topic 4: Production Planning and Control (PPC) **Specific Objectives:** ➢ State importance of PPC system in industry. ➢ Describe techniques of production control. **Content:** 4.1 Definition ,functions and importance of PPC, Meaning of Control, Progressive Control **06 Marks** 4.2 Gantt chart, Flow Process Sheet, Line balancing, **06 Marks**	06	12
Topic 5: Work Study **12 Marks** **Specific Objectives:** ➢ Calculate standard time for given activity ➢ Prepare process chart **Content:** 5.1 Method Study- Definition, Objectives, Procedure, Selection of work. **04 Marks** 5.2 Recording Techniques:- Process Charts - Outline process chart,	08	12

Flow process chart, Two Handed process chart, Multiple activity Chart, Flow diagram, String diagram, Travel chart. **04 Marks** 5.3 Work Measurement – Objectives, procedure, Time Study, Time Study Equipments. Stop Watch Time Study, Allowances, Calculation of Standard Time, **04 Marks**		
Topic 6: Jigs and Fixtures **Specific Objectives:** ➢ Understand importance and use of jigs and fixtures in industries ➢ Understand principles of jig and fixture design and design a jig/fixture for given component **Content:** 6.1 Introduction. Difference between jig and fixture, Different components of Jig/ fixture, Types of jigs and fixtures. **04 Marks** 6.2 Types of locators and clamping devices, 3-2-1 principle of location, Fool proofing of jigs and fixture, General principles of jig and fixture design. **08 Marks**	08	12
Topic 7: Modern Trends in Production Engineering **Specific Objectives:** ➢ Describe kaizen technique. **Content:** 7.1 Just In Time manufacturing – Pull and push types of manufacturing systems. Waste management technique, Concept of ERP. **06 Marks** 7.2 Basic concepts of ➢ Kaizen ➢ Concept and meaning of 5S ➢ Lean manufacturing **04 Mark**	06	10
Topic 8: Robotics **Specific Objectives:** ➢ State concept of robotics ➢ State limitations of human in difficult operation ➢ State applications of robots. **Contents:** 8.1 Robotics – Introduction, Robot anatomy and structure, specification, working and basic components, Various configuration, Degree of freedom and application**.** **04 Marks** 8.2 Sensors – Classification, Basic configuration. **04 Marks** 8.3 Power sources for robotics, Actuators - Mechanical, Electrical, Hydraulic, and Pneumatic. **04 Mark**s 8.4 Concept of grippers – Screw and vacuum actuated gripper, end effectors. **04 Marks**	10	16
Total	**64**	**100**

Learning Resources:
Books:

Sr. No.	Author	Name of Book	Publication
1	L.C. Jhamb	Industrial Management	Everest
2	James C. Rigs	Production System, Planning,	N.Y.Wiley & Sons

		Analysis & Control	
3	O.P. Khanna	Industrial Engineering and Management	Dhanpat Rai & Sons
4	P. H. Joshi	Jigs & Fixtures	Tata McGraw Hill
5	Taiichi Ohno	Toyota Production system	Productivity Press
6	Richard D.Klafter Michael Negin	Robotic Engineering	P.H.I
7	C.Ray Asfahl	Robots and Manufacturing Automation	John Wiley and Sons.
8	R.K. Rajput	Robotics & industrial Automation	S Chand.

Course Name : Diploma in Fabrication Technology & Erection Engineering

Course Code : FE/FG

Semester : Sixth for FG and Seventh for FE

Subject Title : Advanced Welding Technology

Subject Code : 17621

Teaching and Examination Scheme:

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

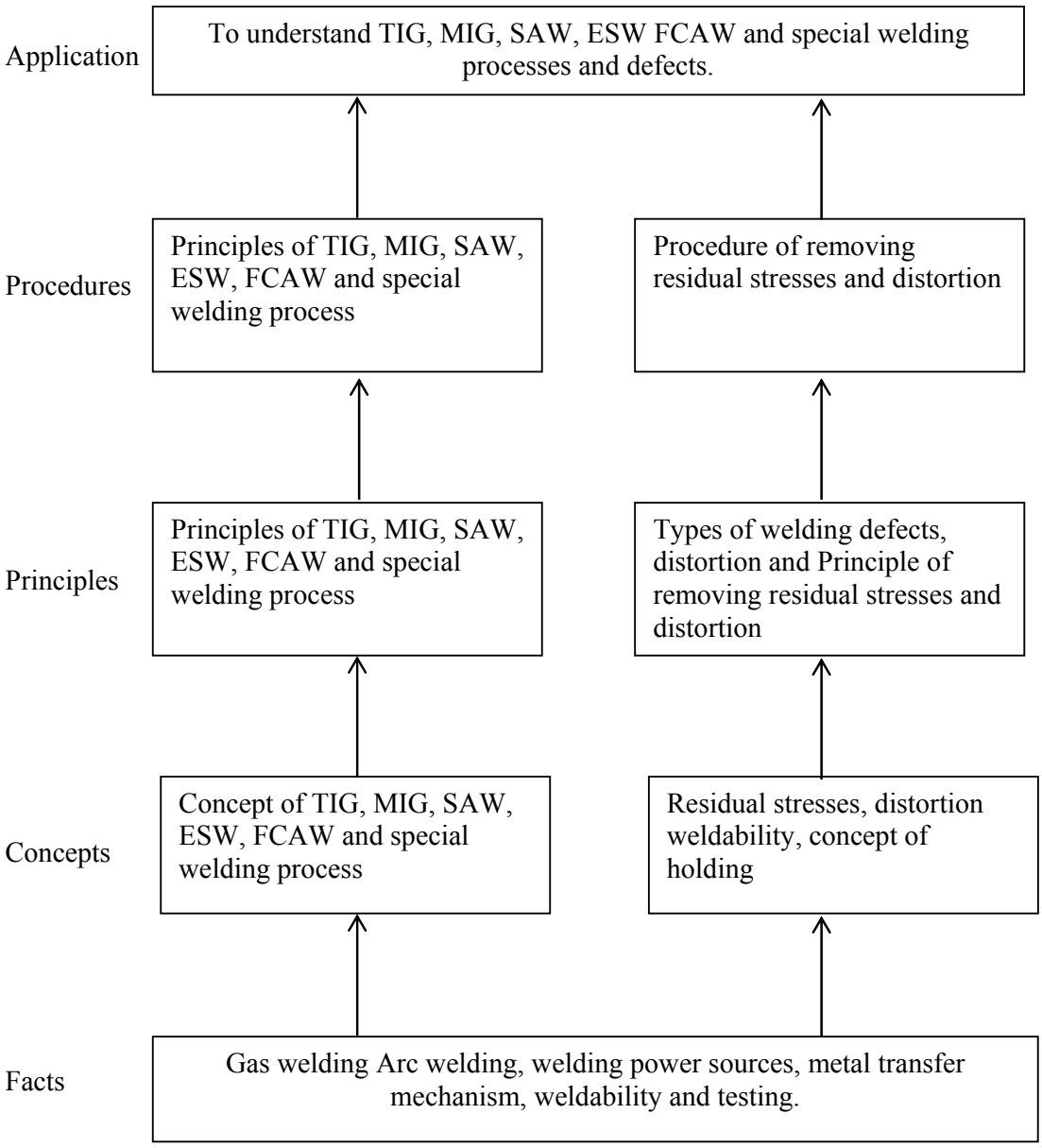
To make students understand different welding techniques, equipments, jigs and fixtures and maintenance. The students will be convers cent with the operations of the equipment and tools used in welding. They will be able to decide the use of equipment and tools as per requirements.

Objectives:

The student will be able to:

1. Understand basic welding processes.
2. Operate and control diff. welding machines & equipment.
3. Inspect the job for specified dimension & quality.
4. Know various welding codes.
5. Adopt safety practices during welding.

Learning Structure:



Contents: Theory

Topic and Contents	Marks	Hours
Topic 1. GAS TUNGSTON ARC WELDING (TIG) Definition, Principle of operation, Equipment, Base metals, welded joint design, shielding gases: • Comparison of shielding gases • Welding fixtures • Automatic welding • Longitudinal seamers • Pedestal boom manipulators	12	08
Topic 2. GAS METAL ARC WELDING (MIG) Definition, Principle of operation, Equipments, Metals welded, Shielding gases holding and handling equipment, joint design, Advantages and limitations, safety practices.	08	04
Topic 3. SUBMERGED ARC WELDING (SAW) 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.	08	04
Topic 4. FLUX CORED ARC WELDING Definition, application, principle of operation, fundamental and selection of electrodes comparison with other processes.	06	02
Topic 5. ELECTRO SLAG WELDING Definition, Principle of Operation, Advantages & disadvantages, application.	06	02
Topic 6. SPECIAL WELDING & CUTTING PROCESSES Plasma arc welding, laser cutting and welding, ultra sonic welding, diffusion welding, friction and inertia welding, thermit welding, atomic hydrogen welding.	16	08
Topic 7. RESISTANCE WELDING Definition, fundamentals of resistance welding, advantages and disadvantages, application.	08	04
Topic 8. DISTORTION AND RESIDUAL STRESSES IN WELDED FABRICATION. • 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. • Repair & Maintenance Welding • Factors influencing the choice of technique, Precautions in welding certain metals, examples of repair work.	08	03
Topic 9. LATEST TRENDS IN WELDING Precision Welding, Micro Welding, Welding of materials like plastics, ceramics, other composite materials. Wilding of alloyes. Advanced Welding Equipments needed for the latest methods of welding.	16	05
Topic 10. WELDING CODES & PROCEDURE Preparation of welding procedure specification(WPS) Welding codes, standards & specification. • Pipe line welding codes.- API 1104, BS 4515- 1 • Piping welding codes - ASME B 31.1, ASME B 31.3, ASME B	12	08

31.8 • Process equipment codes - ASME section 8. • Structural welding code - AWS D1.1		
Total	**100**	**48**

Practical:
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

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

Practicals:
1. Butt weld in overhead position.
2. Fillet weld in overhead position.
3. TIG welding of aluminum parts.
4. One job based on MIG Welding.
5. Welding of cast iron.
6. Seam welding.
7. Spot welding.
8. Distortion control in welding.

Assignments:
1. One assignment on case study of a product prepared by latest welding method.
2. One assignment on WPS.
3. One assignment on codes & standards.

Learning Resources:
Books:

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 Destortion in Welding & Fabrication	2nd	--	Welding Institute London

Welding Codes, Standards and Specification:
- 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

Course Name : Diploma in Fabrication Technology & Erection Engineering

Course Code : FE/FG

Semester : Sixth for FG and Seventh for FE

Subject Title : Advanced Fabrication Processes

Subject Code : 17622

Teaching and Examination Scheme:

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

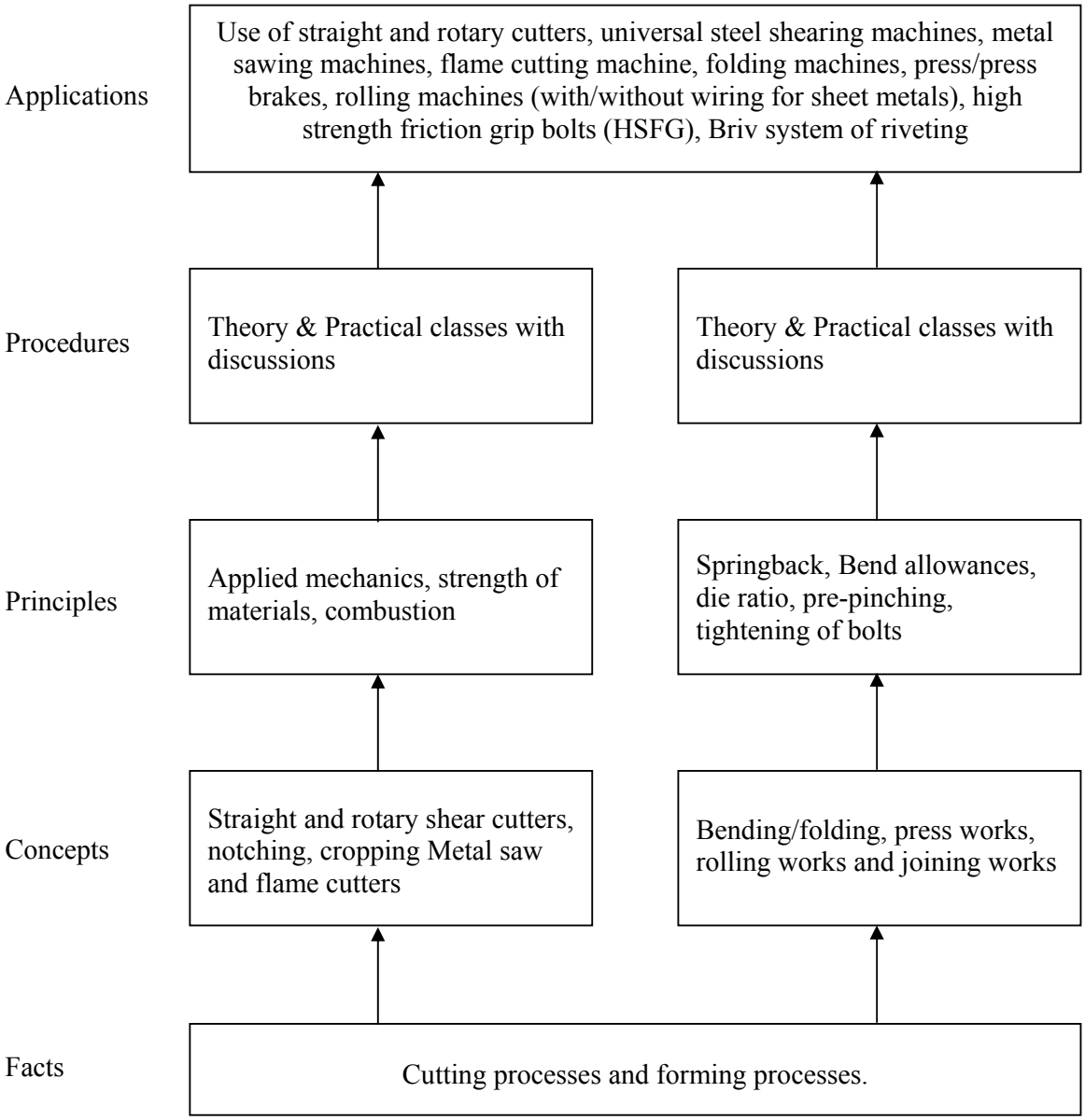
This subject will help the students to know how a well prepared/obtained job/blank is converted into as required product. This subject will also help the students to know as to what is basic sheet metal works & the recent trends in fabrication. They will understand the working of various machines used in fabrication processes and operate them.

Objectives:

The student will be able to:

1. Understand the difference in marking on drawing paper and on a job.
2. Know basic fabrication processes & recent trends in fabrication.
3. Read & interpret job drawings.
4. Identify, select & use various cutting tools in fabrication shop and know their advantages and limitations.
5. Understand the various forming operations in fabrication and the pre-requirements for the same.
6. Operate, control different devices/instruments, machines & equipments.
7. Inspect the job for specified dimensions.
8. Produce the job as per specified dimensions.
9. Adopt safety practices in fabrication shop.

Learning Structure:



Theory:

Topic and Contents	Marks	Hours
Topic 1. Straight Shearing Machines **Basic principles of shearing** 1. Shearing angle 2. Rake angle of blades 3. Clearance between cutting edges **Straight Cutting Machines** Construction and working of; 1. Bench shearing machine 2. Treadle guillotine machine 3. Power guillotine machine **Setting the guillotine** **Operation on guillotine** **Safety precaution during operation**	10	08
Topic 2. Rotary Shearing Machines **Shearing: Essential Features** **Types of rotary shears** Construction and working of; 1. Parallel shaft machine 2. Incline shaft machine **Advantages of rotary shearing machine**	04	02
Topic 3. Other Shearing Machines **Nibblers (portable)** Construction and working of; 1. Shear type 2. Punch type **Cropping and notching operations** **Operations on Universal steel shearing machine**	10	02
Topic 4. Metal Sawing **Brief description of** • Reciprocating power hacksaw • Circular metal saw • Hand sawing **Advantages & disadvantages of each method Safety precaution during operation.**	08	04
Topic 5. Flame Cutting • Basic Principle of flame cutting, • Flame cutting equipments • Fuel gases used **Flame Adjustment** • Procedure for lightening the cutting torch • Adjustment for flame • Procedure to extinguish the flame, **Factors influencing quality of cut** **Applications of flame cutting by hand** • Technique of cutting thick plates • Technique of cutting away from edge • Technique of cutting a round bar • Use of attachments in hand cutting to ensure steady rate and to cut along	16	08

desired lines, such as cutting along straight lines, small circles, large circles and other shapes **Rivet removal** Removal of defective weld by gouging Comparison of flame cutting and shearing		
Topic 6. Bending • Definition • Distinction between folding and bending • Mechanics of bending • Spring back • Methods of compensating for spring back • Basic bending methods • Bend Allowances for bending sheet metal • Importance of Neutral line • Neutral line data for bending sheet metal • Applications of bending allowances • Folding machines • Specifications • Steps in folding • Types of folding machines • Examples of work produced in a folding machine • Use of an angle clamping blade in a folding machine • Use of a narrow bending bar • Pipe and conduit bending	16	08
Topic 7. Press Work & Operations in Press Brakes **Press work** • Introduction to types of press viz. fly & power press. • Advantages and limitations of fly and power press • Blanking and piercing operations • Blanking pressures **Press Brakes** • Die ratio • Dimensional specification of a press brake • Comparison between Mechanical & Hydraulic press brakes • Bending operations on press brake.	12	06
Topic 8. Rolling **Types of Rolling Machine** • Pinch Type • Pyramid type, ➢ **Basic arrangement of rolls** ➢ **Vertical plate bending machine** ➢ **Angle ring bending rolls** ➢ **Slip rolls** ➢ **Cone rolling attachment**	08	02
Topic 9. Joining (Bolting & Riveting) ➢ **Bolting** **Use of bolts and nuts** • Black bolts and I.S. specifications • Turned barrel bolt • High strength Friction grip bolts (HSFG)	16	08

• Assembly of bolted joint **Methods of tensioning HSFG bolts** • Part turn method • Torque control method (manual operated torque wrench or power driven wrench) • Load indicating bolt heads and washers **I.S. Specification of HSFG bolts** **Gauge line for bolts.** **Riveting** **Common forms of rivets** • Solid • Semi tubular • Tubular • Bifurcated • Blind • Pop rivet • Briv System **Equipments for riveting** **Methods of riveting** • Hand riveting • Power riveting **Allowances for riveting** **Site riveting** **Hot and cold driven rivets**		
Total	**100**	**48**

Practical:
Skill to be developed:

Intellectual Skills:

1. Ability to read job drawings.
2. Ability to estimate, identify & select proper material, tools / equipments / machines.
3. Ability to select proper cutting parameters on machines.

Motor Skills:

1. Ability to set tools, work piece, and machines for desired operations.
2. Ability to complete job as per job drawing in allotted time.
3. Ability to use safety equipments and follow general safety procedures.
4. Ability to inspect the job for confirming desired dimensions and shape.
5. Ability to acquire hands-on experience.

Practical:-

One group job covering all the various fabrication processes;

1. Interpret the drawings given

2. Determine/evaluate material and size of blank
3. Marking/measuring, straightening, stiffening, surface cleaning, cutting, forming, etc.

Notes:

1. **Prepare a report of all the activities carried out to prepare the job. Submit a spiral bound copy of the report**
2. **Practical Examination will be conducted for 3Hours and students will be given job to use one or two processes.**

Learning Resources:
Books:

Author	Title	Edition	Year of Publication	Publisher & Address
Kenyon Pitman	Basic Fabrication & Welding	1st	1979	Pitman Pub. Ltd.
F. J. M. Smith	Basic Fabrication & Welding	1st	1975	Longman Group Ltd.
Arora B.D.	Sheet Metal Fabrication.	--	--	CEPAICTE
Hazra & Choudhari	Workshop Technology Vol 1/ 2	11th	1997	Media Promoters & Publishers
Elenev S.A.	Press Working	--	---	Mir Publishers
Prasad R.C.	Composites Science & Technology	--	--	New Age International (P) Ltd.
Bhargava A.K.	Engineering Material Polymer	--	--	Printice Hall of India.

Course Name : Diploma in Fabrication Technology & Erection Engineering

Course Code : FE/FG

Semester : Sixth for FG and Seventh for FE

Subject Title : Industrial Erection & Safety

Subject Code : 17623

Teaching and Examination Scheme:

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

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).**

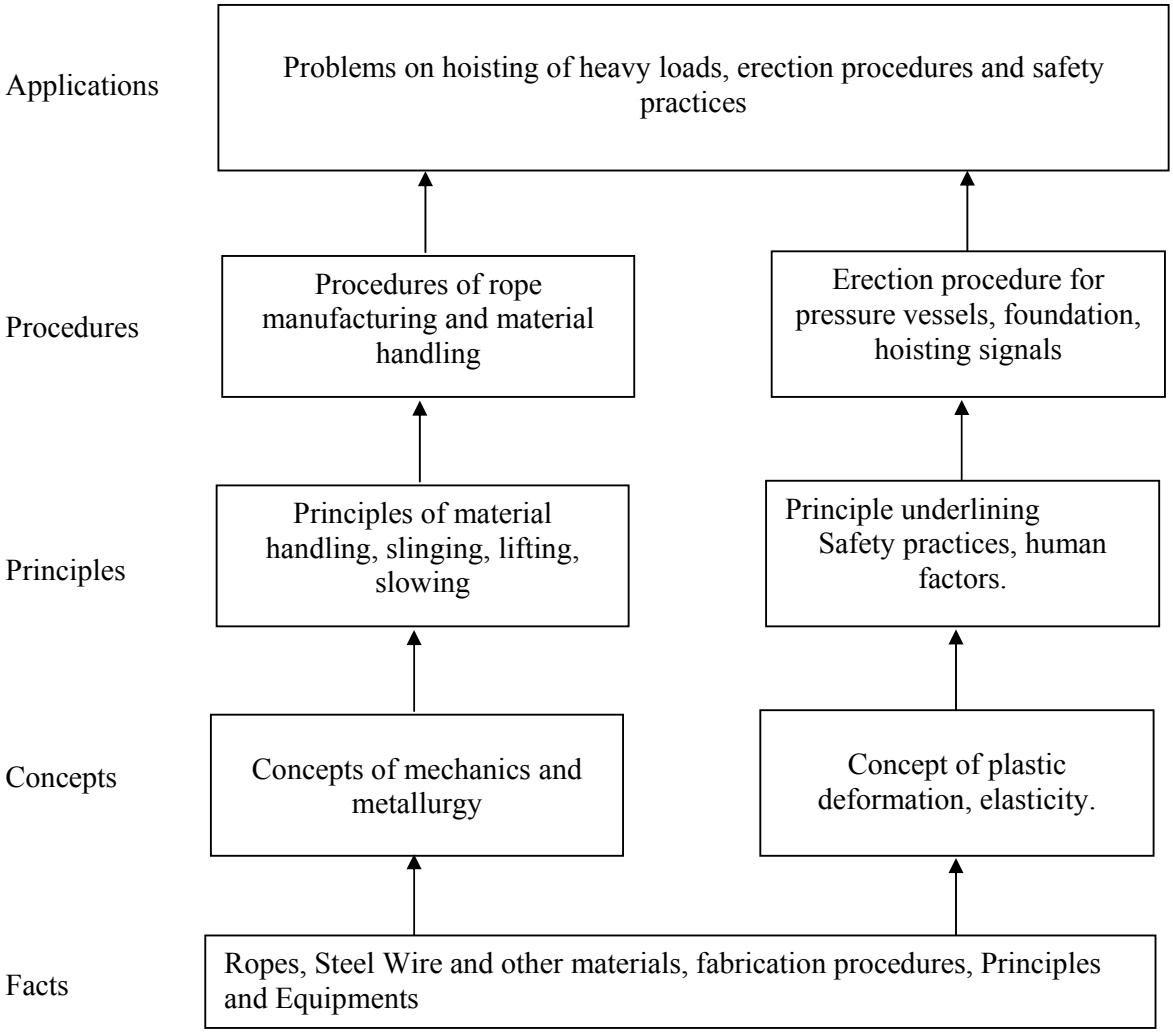
Rationale:

Understand functioning of different equipments and tools used for erection, material handling and safety norms. Know safety rules and regulation and implement them during the working. Operate various equipment and machines such as Hoists, Cranes, Ropes, Know safety precautions and use them in erection of Boilers, Turbines etc.

Objectives:

1. Make students realize the profile of an erection engineer.
2. Give better understanding of erection materials & tools.
3. Create awareness of the need for industrial safety.
4. Impart understanding about hoisting equipments, cranes etc.

Learning Structure:



Theory:

Topic & Content	Hours	Marks
Topic 1. ERECTION MATERIALS AND TOOLS • Profile of an Erection Engineer • Natural Fibre Ropes – Characteristics and Features ° Manila rope ° Sisal rope ° Hemp rope ° Coir rope. Construction of Natural fibre ropes ° 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 • Synthetic Fibre Ropes - Characteristics and Uses, ° Polyamides (nylon) rope ° Polyster (terylene) rope ° Polypropylene rope ° Polyethylene rope • Construction of Synthetic Fibre Ropes ° 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 • Steel Wire Ropes (SWR) ° 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 – shackles, thimbles, hooks, Cross by clips – aluminum sleeve attachment - Wedge sockets	12	24
Topic 2. HOISTING TOOLS & EQUIPMENTS • Knots, bends, hitches & splices • Hoisting Chain - Inspection • Slings - Description, merits and demerits ° Manila rope sling ° Steel chain slings	06	12

° Wire rope slings • Types of slings ° Endless sling or gourmet ° Choker sling, double choker sling, basket sling ° Double basket sling, bridle sling, turnbuckle sling. • Connecting tools ° Connecting bar, Maul, Bull pin, fork wrench, drift pin		
Topic 3. HANDLING OF LOADS • Handling of loads on slings • Consideration for correct handling ° 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	12
Topic 4. CHAIN HOISTS Description of operation and uses of the following hoists • Pull lift hoist • Differential hoist • Screw geared hoist • Spur geared hoist	04	08
Topic 6. ACCIDENT PREVENTION AND SAFETY • Definition of accident prevention • Personal injury accidents and property damage accidents. • Causes of accidents ° Human failures ° Unsafe working conditions ° failure of machinery and equipments • Benefits of accident prevention ♦ Accident prevention measures ° 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 HOIST SIGNALS • Objectives for devicing hoist signals • Hoist Signals for crane operation ° 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	10	20

Topic 7. ERECTION AND INSTALLATION OF PROCESS EQUIPMENTS • Importance of Erection of Pressure Vessels. Mounting of heavy pressure vessels like Boilers, Heat exchangers, • Meaning of the terms erection and installation, Difference between the two terms .Installation of boiler mountings & accessories. • Procedure of performing various tests before & during installation like leak tests, alignment testing, • **Advance planning** ° 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. • **Site Operations** ° 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. ° Aligning and leveling the vessel. ° Final tightening by pneumatic torque wrench ° Pressure testing	10	20
Topic 8. ERECTION COSTING ° Need for erection costing ° Steps in erection costing ° Site Labour Cost ° Site plant/Facility usage cost Other overheads.	02	04
Total	**48**	**100**

Assignments:

1. Four assignments based on Erection Material and tools.
2. Two assignments based on the theory of Hoisting tools and equipments.
3. One assignment based on handling of Loads.
4. One assignment based on Chain Hoist.
5. Three assignments based on erection equipments.
6. One assignment based on accident prevention and safety.
7. One assignment based on erection and installation of Process equipment
8. One assignment based on erection costing.
9. One industrial visit based on the curriculum.

Learning Resources:
Books:

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 : Mechanical Engineering Group

Course Code : AE/ME/PG/PT/MH/MI/FG/FE

Semester : Sixth for AE/ME/PG/PT/FG and Seventh for MH/MI/FE

Subject Title : Project

Subject Code : 17090

Teaching and Examination Scheme:

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

Rational:

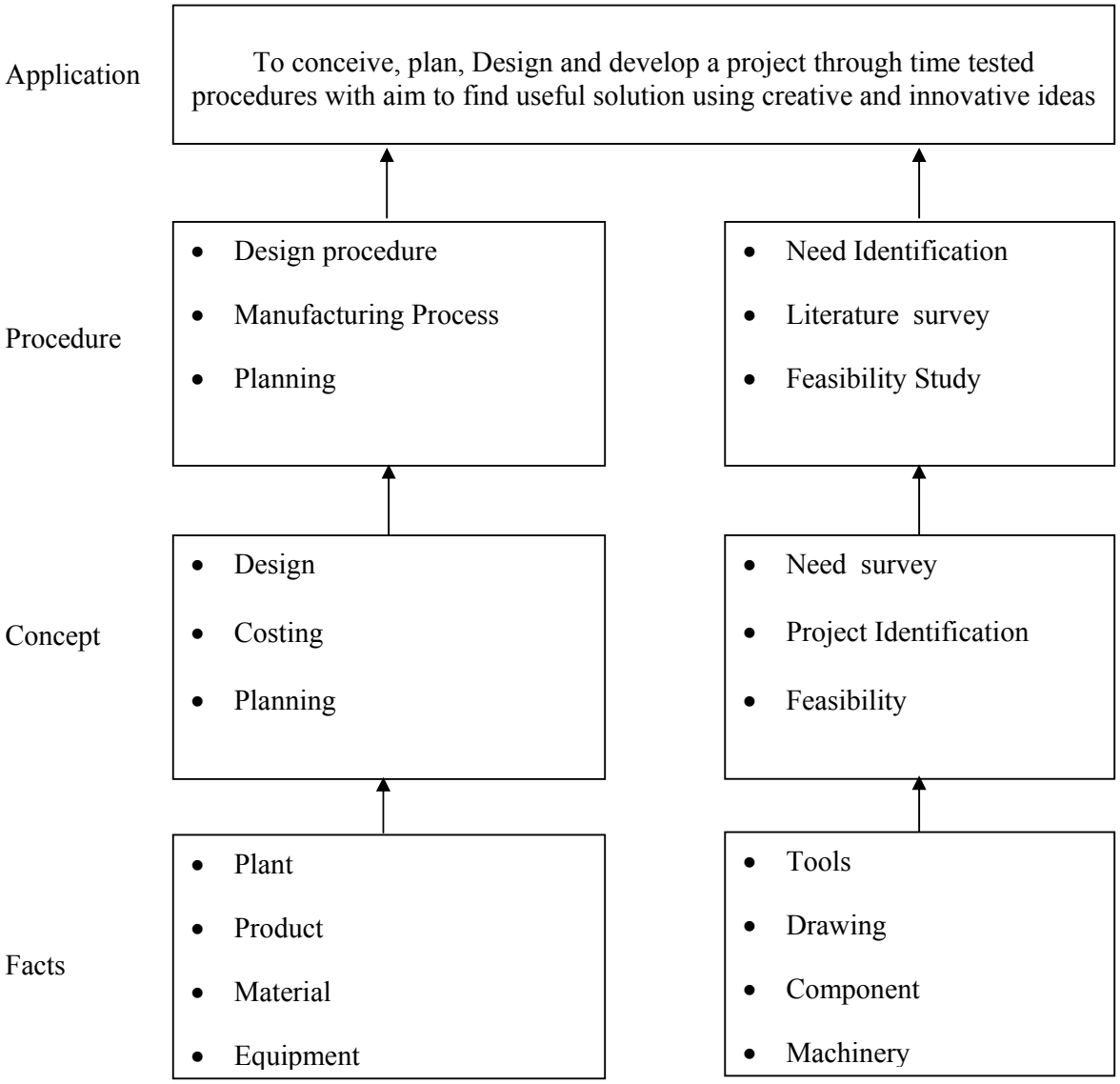
Project work allows students to use their creative and innovative ideas translating in working model, prototypes, and equipments and developing necessary hands on skills. This will allow the students to apply the previous knowledge and skills acquired during the course.

General Objectives:

The student will be able to-

1. Analyze the given problem.
2. Generate alternative solutions to the problem.
3. Compare & select feasible solutions amongst alternative generated.
4. Develop and manufacture new/modified equipments.
5. Acquire technical knowledge beyond curriculum.

Learning Structure:



CONTENT:

Following activities related to project are required to be dealt with, during this semester

1. The Selection and preliminary work regarding Project to be done as per directives given in **PROFESSIONAL PRACTICES – V** Curriculum.
2. The identified projects be executed during the semester as per the Guidance from the project Guide by the group of students (Group size max. 4 students).
3. Maintain the project diary individually for the activities performed in the format specified below.

Project Diary format:

Sr. No.	Date	Activity Carried Out	Remarks	Signature of Guide

SUGGESTED PROJECT WORK AREAS

1. Fabrication of small machine / devices/ test rigs/ material handling devices/ jig & fixtures/ demonstration models, etc.
2. Design & fabrication of mechanisms, machines, Devices, etc.
3. Development of computer program for designing and / or drawing of machine components, Simulation of movement & operation, 3D modeling, pick & place robots
4. Industry sponsored projects- project related with solving the problems identified by Industry should be selected. (One person from industry is expected to work as co- guide along with guide from institution).
5. 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 mechanical field, and preferably beyond curriculum.
6. Modification in the existing machinery / equipment for improved performance.
7. Maintenance based projects.
8. Industrial engineering based project: Project based on work study, method study, methods improvement, leading to productivity improvement.
9. Low cost automation projects.
10. Innovative/ Creative projects involving generation of new ideas and converting it into a model, gadget.
11. Market survey based projects.
12. Project based on use of appropriate technology particularly benefiting rural society or economically weaker section.
13. Equivalent level project can be selected from other than the area specified above.

Note:

Project should provide viable and feasible solution to the problem identified.
Report should be of 40TO 50 pages.
Font size of project report contents be as follows:

1. Main title: 16 bold Times new roman
2. Sub titles: 14 bold Times new roman
3. Running matter: 12 Times new roman, paragraph 1.5 line spacing,
4. Margin spacing 1.5 inch from left and 1 inch from other sides.

Preferably actual photographs / video clips showing progress of project work at different stages be added to project report).
Suggested framework for the project report:

The topics/ contents of the project report should be as follows

- Abstract
- Topic introduction/ Philosophy
- Literature Survey/ Methodology adopted
- Principle (aim objectives of the Project work)
- Data collection/ Design consideration/Basic Framework/Design / Drawing
- Manufacturing Processes and Process Sheets (if relevant)
- Assembly (if relevant)
- Performance / Calculations etc (If relevant)
- Costing
- Results and Discussion
- Conclusion
- Future Scope
- Bibliography/ References

Learning Resources:
Reference Books:

Sr. No.	Name of Book	Author	Publisher
1	Project Management	Maylor	Pearson Education
2	Project Management And Appraisal	Khatua	Oxford University Press
3	Project Management/2/e	Bhavesh patel	Vikas Publishing house
4	Project Management 3/e	Vasant Desai	Himalaya publishing House
5	Project Management The Managerial Approach	Gray	TMH

Course Name : Mechanical Engineering Group

Course Code : AE/ME/PG/PT/MH/MI/FG/FE

Semester : Sixth for AE/ME/PG/PT/FG and Seventh for MH/MI/FE

Subject Title : Entrepreneurship Development

Subject Code : 17099

Teaching and Examination Scheme:

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

Rational:

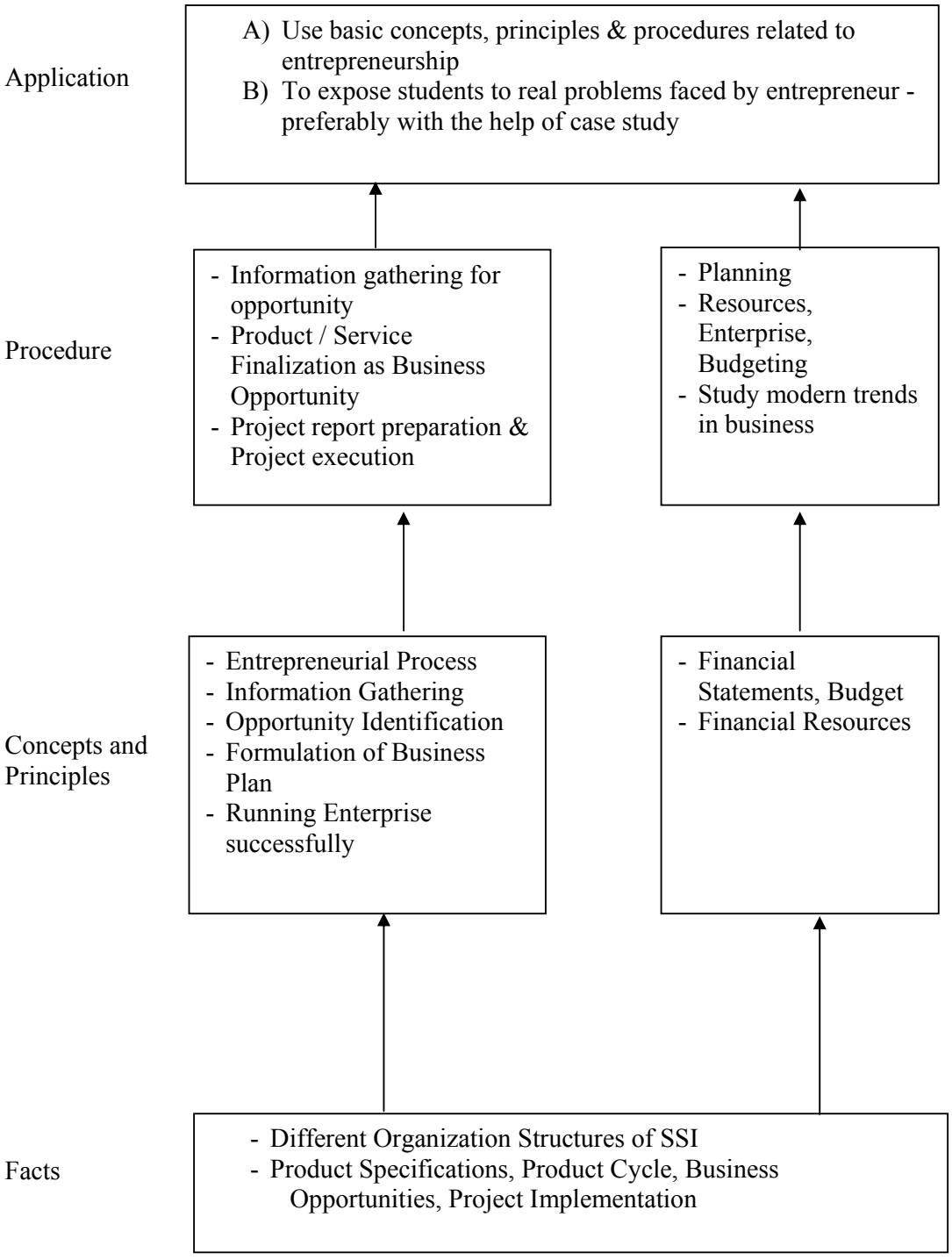
Globalization, liberalization & privatization along with revolution in Information Technology, have thrown up new opportunities that are transforming lives of the masses. Talented and enterprising personalities are exploring such opportunities & translating opportunities into business ventures such as- BPO, Contract Manufacturing, Trading, Service sectors etc. The student community also needs to explore the emerging opportunities. It is therefore necessary to inculcate the entrepreneurial values during their educational tenure. This will help the younger generation in changing their attitude and take the challenging growth oriented tasks instead of waiting for white-collar jobs. This subject will help in developing the awareness and interest in entrepreneurship and create employment for others.

General Objectives:

The students will be able to

1) Appreciate the concept of Entrepreneurship
2) Identify entrepreneurship opportunity.
3) Develop entrepreneurial values and attitude.
4) Collect and use the information to prepare project report for business venture.
5) Develop awareness about enterprise management.

Learning Structure:



Content:

Topic and Contents	Hours
Topic 1. Entrepreneurship, Creativity & Opportunities **Specific objectives:** ➢ Know the characteristics of entrepreneur and business **Contents:** 1.1 Concept, Classification & Characteristics of Entrepreneur 1.2 Creativity and Risk taking. 1.3 Business types and Reforms 1.4 SWOT Analysis	03
Topic 2. **Information and Support Systems for Development of Entrepreneurship** **Specific objectives:** ➢ Know the various information sources and support systems **Contents:** 2.1 **Information Sources:** Information related to project, procedures and formalities 2.2 **Support Systems** 1) Business Planning & Requirements for setting up an SSI 2) Govt. & Institutional Agencies (Like MSFC, DIC, MSME, MCED, MSSIDC, MIDC, LEAD BANKS) Statutory Requirements and Agencies.	03
Topic 3. **Market Assessment and feasibility** **Specific objectives:** ➢ Know the market requirement and customer needs through survey and feasibility analysis **Contents:** 3.1 Marketing -Concept and Importance, Market Identification. 3.2 Customer need assessment, Market Survey, Product feasibility analysis	02
Topic 4. Business Finance & Accounts **Specific objectives:** ➢ Know the basics of elements of costing, financial resources and business accounting procedure **Contents:** 4.1 **Business Finance:** Costing basics, Sources of Finance, Break Even Analysis. 4.2 **Business Accounts:** Book Keeping**,** Financial Statements, Financial Ratios and its importance, Concept of Audit.	03
Topic 5. **Project Report Preparation** **Specific objectives:** ➢ Understand and plan the steps in starting the business ➢ Prepare project report and carry out project feasibility study **Contents:** 5.1 Business plan: Steps involved from concept to commissioning 5.2 **Project Report** 1) Meaning and Importance 2) Components of project report/profile 5.3 **Project Feasibility Study:** 1) Meaning and definition 2) Technical, Market, Financial feasibility	03
Topic 6. **Enterprise Management and Modern Trends** **Specific objectives:** ➢ Know the role of entrepreneur in management of enterprise ➢ Understand the concept of E-Commerce **Contents:**	02

6.1 **Enterprise Management** 1) Essential roles of Entrepreneur in managing enterprise 2) Probable causes of sickness 6.2 E-Commerce: Concept and process 6.3 Global Entrepreneur	
Total	**16**

Tutorial:

Sr. No	Assignments
1	Assess yourself-are you an entrepreneur?
2	An Interview with an Entrepreneur.
3	Feasibility study of a product.
4	Prepare a Project Report for starting a small scale business.

Note - A teacher shall guide the students during tutorial periods for writing the above assignments**.**

Learning Resources:

1) Reference Books:

Sr. No.	Name of Book	Author	Publisher
1	Entrepreneurship	Trehan	Dream Tech Press
2	Entrepreneurship 2/e	Rajeev Roy	Oxford University Press
3	Entrepreneurship and Small Business	Schaper	Wiley India Publication
4	Entrepreneurship Development	Colombo plan staff college for Technical education.	Tata McGraw Hill Publishing co. ltd. New Delhi.
5	Poornima M. Charantimath	Entrepreneurship Development of Small Business Enterprises	Pearson Education
6	Entrepreneurship Development	E. Gorden K.Natrajan	Himalaya Publishing. Mumbai

2) Video Cassettes:

Sr. No.	SUBJECT	SOURCE
1	Five success Stories of First Generation Entrepreneurs	EDI STUDY MATERIAL Ahmedabad (Near Village Bhat , Via Ahmadabad Airport & Indira Bridge), P.O. Bhat 382428 , Gujrat,India P.H. (079) 3969163, 3969153 E-mail: ediindia@sancharnet.in/olpe@ediindia.org Website : http://www.ediindia.org
2	Assessing Entrepreneurial Competencies	
3	Business Opportunity Selection and Guidance	
4	Planning for completion & Growth	
5	Problem solving-An Entrepreneur Skill	