MAHARASHTRA STATE BOARD OF TECHNICAL EDUCATION, MUMBAI

TEACHING AND EXAMINATION SCHEME FOR POST S.S.C. DIPLOMA COURSES

COURSE NAME : DIPLOMA IN PLASTIC ENGINEERING

COURSE CODE : PS

DURATION OF COURSE : 6 SEMESTERS **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	--	--	--	--	--	--	
2	Polymer Blends and Composites	PBC	17652	04	--	02	03	100	40	--	--	--	--	25@	10	
3	Elastomer Technology	ETE	17653	04	--	02	03	100	40	--	--	--	--	50@	20	
4	Packaging Technology	PTE	17654	03	--	02	03	100	40	--	--	--	--	25@	10	**50**
5	Plastic Waste Management	PWM	17655	03	--	--	03	100	40	--	--	--	--	--	--	
6	Maintenance of Plastic Processing Machines	MPM	17804	--	--	02	--	--	--	50#	20	--	--	25@	10	
7	Industrial Project	IPR	17805	--	--	06	--	--	--	--	--	50#	20	50@	20	
8	Entrepreneurship Development	EDP	17806	01	01	--	--	--	--	--	--	--	--	25@	10	
			TOTAL	**18**	**01**	**14**	**--**	**450**	**--**	**50**	**--**	**50**	**--**	**200**	**--**	**50**

Student Contact Hours Per Week: **33 Hrs.**

THEORY AND PRACTICAL PERIODS OF 60 MINUTES EACH.

Total Marks**: 800**

@ - Internal Assessment, # - External Assessment, [ ] No Theory Examination, $ - Common to all branches, #* - Online Examination,

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/1CH/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.

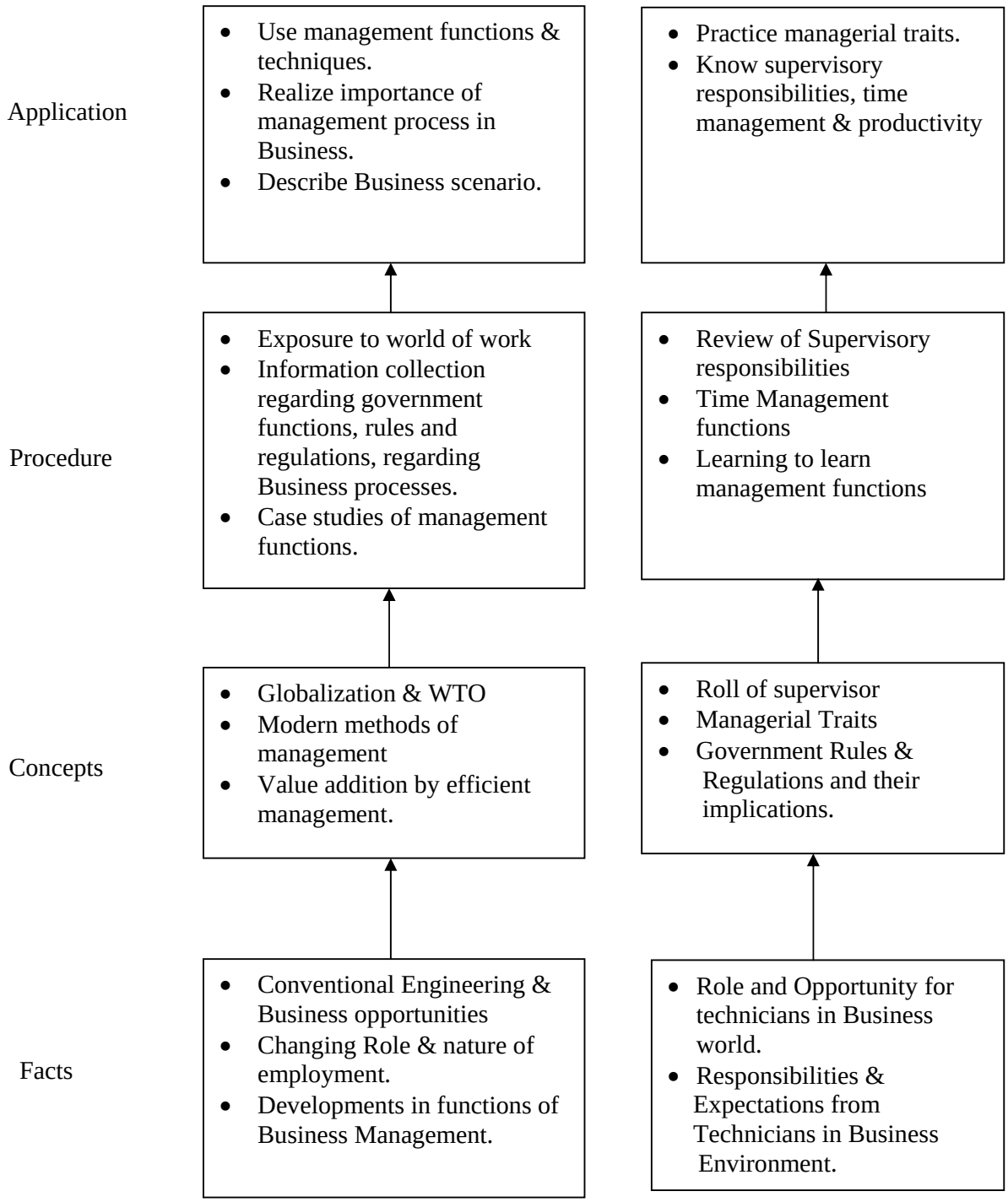
Contents of the this subject will enable the students to address various issues related to human resource, finance, materials, legislations etc. by use of basic principles of management. This will ensure that students will play their role effectively to enhance the quality of business output in total.

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 : Diploma in Plastic Engineering

Course code : PS

Semester : Sixth

Subject Title : Polymer Blends & Composites

Subject Code : 17652

Teaching and Examination Scheme:

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

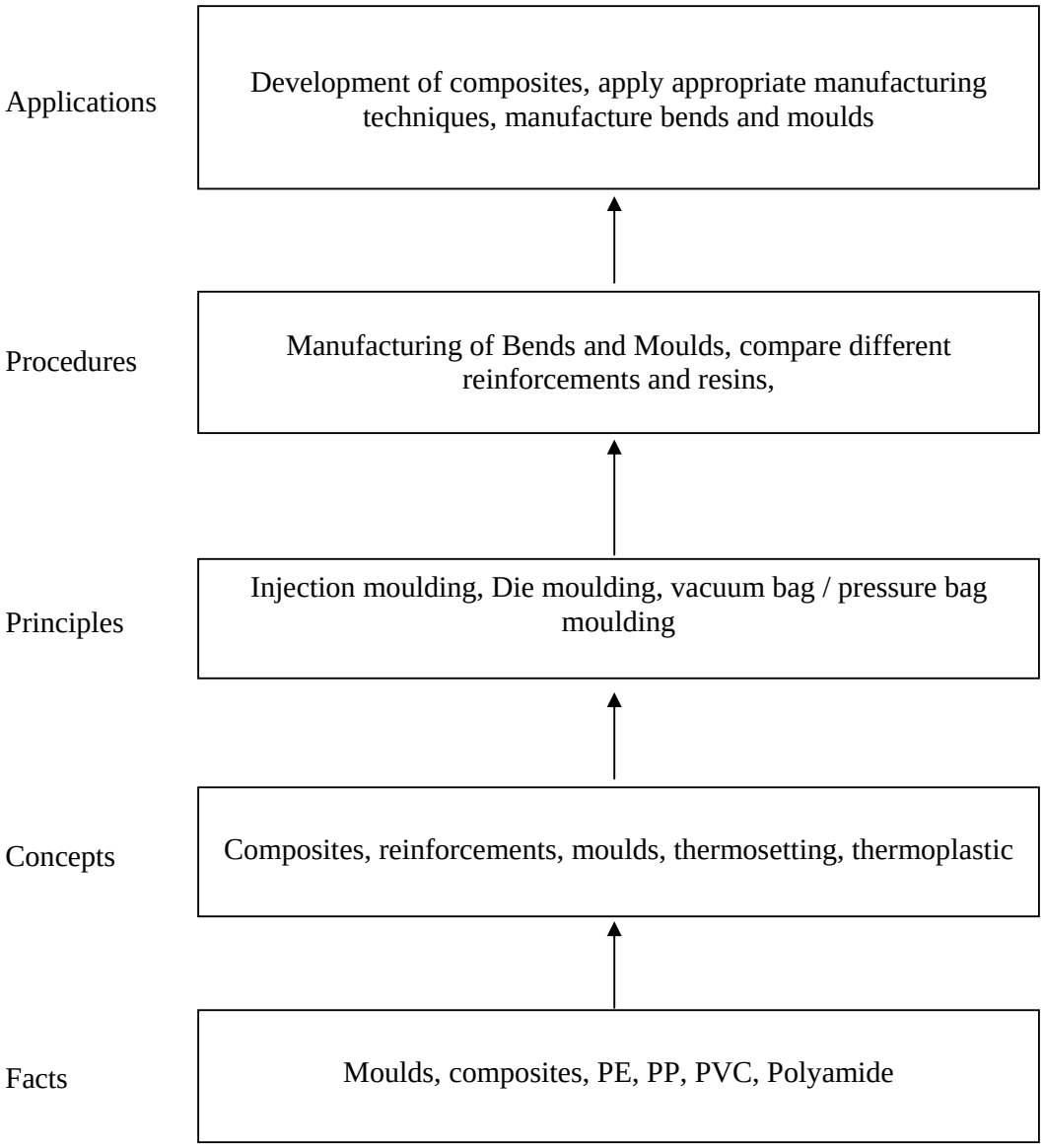
NOTE:

- **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:

Properties of plastic can be moulded as per suitability of application. The technique involve, mixing, blending of two or more different polymers and reinforcing the plastic with high modulus fibers. This courses gives the relevant knowledge of polymer blends and composites and suitable processing techniques.

Learning Structure:



Contents: Theory

Topic No.	Name of Topics	Hours	Marks
1	**Composites & Its Fundamentals:** **Specific Objectives:** Students should be able to ➢ Define the composites. ➢ Classify the composites. ➢ Classify the terminology such as matrix, reinforcement blend, and alloy. ➢ Prepare the prepregs 1.1 Introduction to composites: Composite and its elements with their roles, fundamentals of composites, classification of composites such as thermosetting and thermoplastic composites. 1.2 Resin systems (matrix) involved in composites: Thermosetting materials such as Epoxy, phenolics, polyester (unsaturated), vinyl ester. Polyamide, Thermoplastic materials like - PE, PP, PVC, Polyamide. 1.3 Moulding compounds, prepregs such as SMC, BMC, their preparation, properties and applications, curing system for resin & other additives such as coupling agent, release agent, pigment, curing agent, accelerator, inhibitor, flame retardant - their role and examples.	04 06 06	04 10 12
2	**Reinforcement :** **Specific Objectives:** Students should be able to ➢ Differentiate the glass fibre, carbon fibre & graphite fibres. ➢ Explain the manufacture techniques. 2.1 Preparation, properties and applications of reinforcing agents such as glass fibre, carbon fibre, graphite fibre, form of glass fibre and types of glass, polymeric fibers i.e. aramid, polyester, PE, boron and natural fibres. 2.2 Manufacture and application of hybrid composites, sandwich composites, core materials, honeycomb structure. Types of reinforcement orientation and their effect on strength of products.	06 06	12 12
3	**Processing of Composites:** **Specific Objectives:** Students should be able to ➢ Explain the different moulding techniques for composites. ➢ Observed the common fault in FRP, their causes & remedies. 3.1 Classification - Open & Close moulding, various processes for manufacturing composite products such as hand lay-up, spray-up, filament winding, pultrusion, vacuum bag. 3.2 Pressure bag moulding, matched die moulding, resin transfer moulding. 3.3 Common faults observed in FRP, their causes & remedies.	04 04 04	06 04 04
4	**Fundamentals of Polymer Blends:** **Specific Objectives:** Students should be able to ➢ Define polymer blends, miscible & immiscible polymers. ➢ Classify the polymer blends. 4.1 Introduction, definition, need, classification of polymer blend. criteria for determination of miscibility(gibbs free energy equation only) 4.2 Role of Compatibiliser of polymers &criteria for it, need of	06	08

	compatibility, impact modification by elastomers.	06	08
5	**Development of Polymer Blends:** **Specific Objectives:** Students should be able to ➢ How polymer blend is to be prepared. ➢ How blend performance determine on the basis of mechanical property. Economy of blending, developing commercial blends, **Blend performance** (Mechanical Properties & Electrically conductive blend), distinguish between polymer alloys & blend.	06	12
6	**Commercial Polymer Blends :** **Specific Objectives:** Students should be able to ➢ Elaborate the features of commercial blends. ➢ Describe processing of blends. Preparation, properties and applications of commercial polyblends based on **PE, PPO, PVC, ABS, PS, PP, EVA.**	06	08
	Total	**64**	**100**

List of Practicals:

1. Preparation of simple laminate by hand lay-up method.
2. To demonstrate Preparation of simple laminate by spray-up method.
3. Determination of density of the composite.
4. Determination of matrix and fiber content of composite.
5. Determination of water absorption of composite.
6. Demonstration of fabrication techniques involved in composites such as drilling, turning, jointing, shaping etc., use of fasteners.
7. To demonstrate manufacturing techniques such as filament winding.
8. To compare the properties of composites manufactured by various techniques. (case study)
9. To discuss applications of composites in automotive industry. (Case study)
10. To collect the data of various manufacturer of Thermoset resins used in composites. (Case study)
11. To collect the data of various manufacturer of Reinforcement (Glass fibre) used in composites. (Case study)

Reference Books:

1. Hand book of composites By Lubin
2. Polymer Blends and Alloys By J. M. Hopes & Utraki (Chapman & Hall)
3. SPI Plastic Engineering By Berino
4. Fibre Reinforced plastics By Weatherhead
5. Handbook of Reinforced Plastic By John Murphy (Elsevier)
6. Polymer blends By D. R. Paul & S. Newnan
7. Fiber reinforced plastics By S. Peters

Course Name : Diploma in Plastic Engineering

Course code : PS

Semester : Sixth

Subject Title : Elastomer Technology

Subject Code : 17653

Teaching and Examination Scheme:

Teaching Scheme			Examination Scheme					
TH	TU	PR	PAPER HRS.	TH	PR	OR	TW	TOTAL
04	--	02	03	100	--	--	50@	150

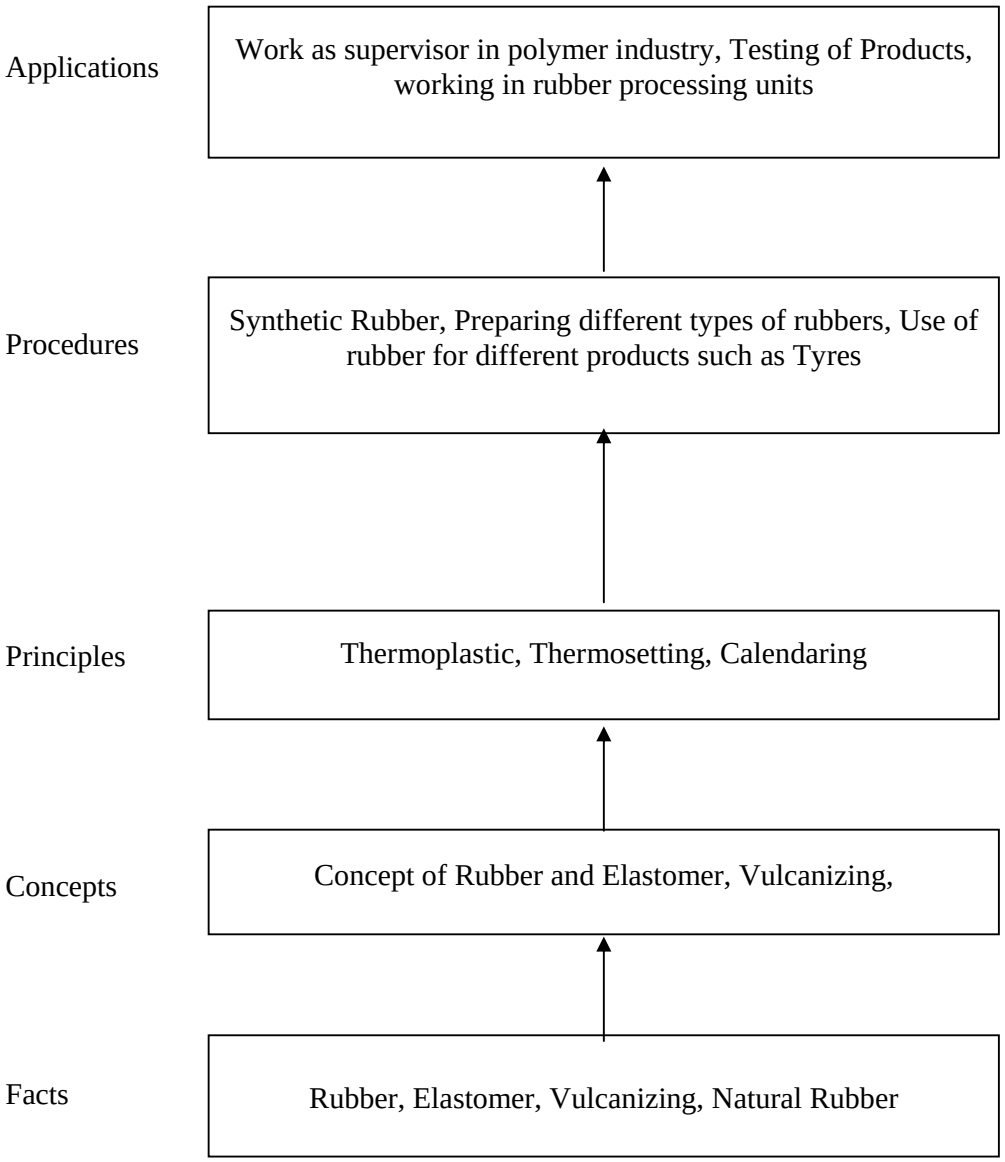
NOTE:

- **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:

An Elastomer is an integral part of our social life because of their tremendous & surprising properties; so it is necessary to study these materials in details. A whole curricula of this programme deals with synthesis of polymer, their processing and application. Elastomers mean a polymeric material which exhibit the elastic properties. In this course one can study their types, manufacturing, properties and applications and testing of products.

Learning Structure:



Contents: Theory

Chapter	Name of Topics	Hours	Marks
1	**Introduction:** **Specific Objectives:** Students should be able to ➢ Understand the basic concept of rubber & elastomers. ➢ Classify the rubbers and elastomers. Basic concept of Rubber and Elastomers, Natural and Synthetic rubber, Thermoplastic and thermosetting elastomers, Natural Rubber, sources of natural rubber, Special grades of Natural rubber (TSR & TCR), Advantages & application of reclaimed rubber, applications of natural rubber.	08	16
2	**Synthetic Rubber:** **Specific Objectives:** Students should be able to ➢ Acquire the skill of identifying the material. ➢ Select the proper material for particular end material. Preparation, properties & applications of Polybutadiene rubber, Styrene - Butadiene rubber, Acrylonitrile Butadiene rubber (NBR), Neoprene rubber, fluorocarbon (viton) rubber, EPDM rubber, Silicon rubber, polyurethane elastomers, polyacrylic rubber,	14	28
3	**Vulcanization:** **Specific Objectives:** Students should be able to ➢ Understand the concept of vulcanization. ➢ Classify the accelerators. Principle of mastication, concept of vulcanization. Sulfur vulcanization, non sulfur vulcanization, accelerators, classification of accelerators,	14	16
4	**Processing & Testing of Elastomers:** **Specific Objectives:** Students should be able to ➢ Develop the skill of processing of elastomers. ➢ Classify the elastomers according their chemical structure, properties & applications. Hot feed, cold feed & ram extrusion of rubber, calendaring of rubber - skimming, fractioning & topping, solubility & tack of elastomers, plasticity & viscosity test.	08	16
5	**Rubber Product Manufacturing:** **Specific Objectives:** Students should be able to ➢ Acquire the skill of rubber compounding. ➢ Manufacture the rubber products. Stages in raw rubber, latex compounding rubber product manufacturing like gloves, experimental, surgical foams, carpet packing seals, gasket, O - ring, their compound recipe.	12	10
6	**Tyre technology:** **Specific Objectives:** Students should be able to ➢ Construct the tyre. ➢ Understand the concept of green tyre. Introduction, materials, tyre components, tyre construction, standard diagonal, ply, belted, bias, radial ply, Tyre building,	08	14
	Total	**64**	**100**

List of Practicals:

1. To Identify the given materials (rubber) by flame test.
2. To calculate hardness of rubber.
3. To measure ash & moisture content.
4. To calculate melting point of rubber.
5. To demonstrate preparation of rubber compound by two roll mill.
6. To demonstrate extrusion of rubber.
7. To demonstrate compression molding of natural rubber.
8. To collect various rubber products used in daily use and predict type of rubber used in that product. (Case study)
9. To collect data of manufacture of rubber such as natural rubber, SBR, EPDM in India. (Case study)
10. To compare properties of rubber product manufactured by extrusion process and vulcanized by different method. (Case study)
11. Mini Project.

Learning Recourses:
Reference Books:

Sr. No	Author	Title	Publisher
1	W.J.S.Norton	Applied Science of Rubber	--
2	Jotmann	Rubber Technology Handbook	--
3	C.M. Blow	Rubber Manufacturing And Technology	--
4	D.C. Blackley	Chemistry And Technology of Synthetic Rubber	Applied science
5	Bhowmick , hall, benarey	Rubber Product Mfg. Tech.	Marcell Decker
6	Levy, carley	Plastics extrusion tech. H/b	--
7	Mark Erman, Eircirch	Science & tech of rubber – III rd edition	Reinhold
8	Harmansed	H/B of Plastics & Elastomers	--
9	J.Y.Bridson	Rubber materials & their compounds	--

Course Name : Diploma in Plastic Engineering

Course code : PS

Semester : Sixth

Subject Title : Packaging Technology

Subject Code : 17654

Teaching and Examination Scheme:

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

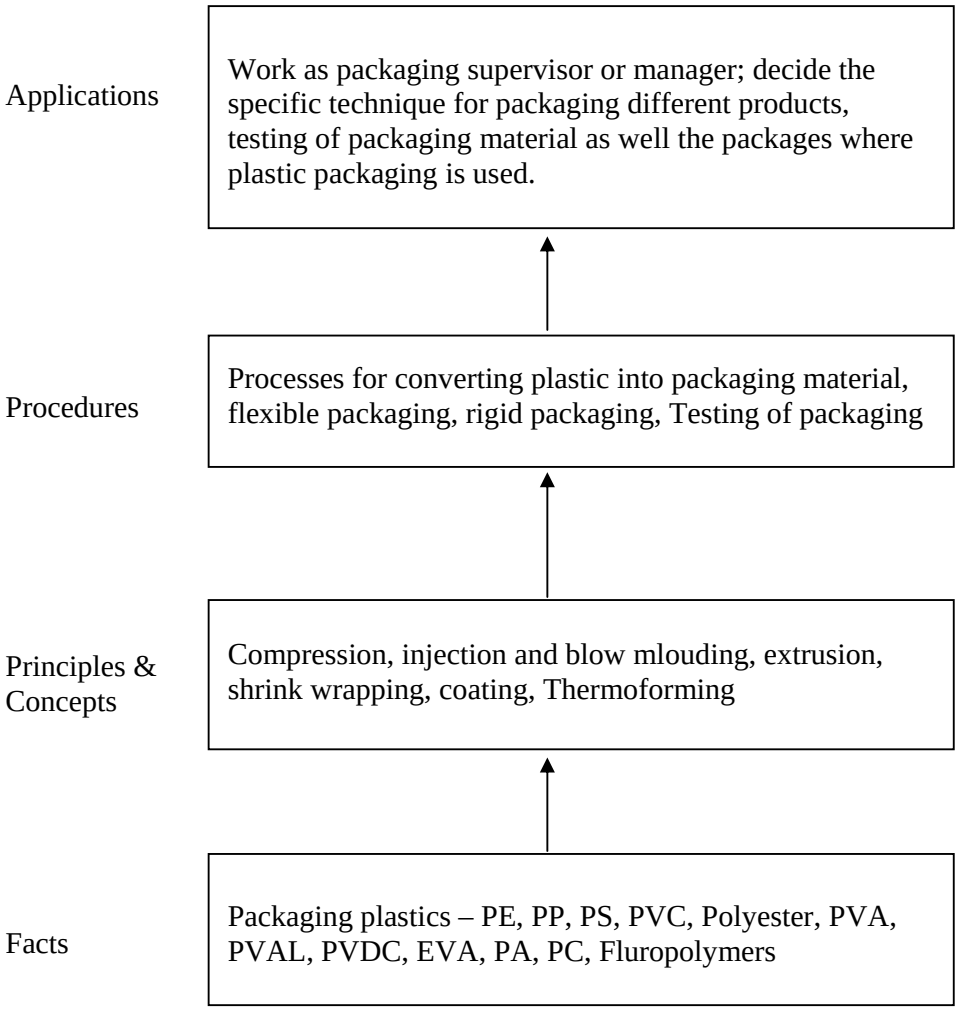
Note:

- **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 0 and to be entered in mark sheet under the head Sessional Work (SW).**

Rationale:

Day to day there is a vast increase in application of plastic in packaging .One can start a packaging plant if having a prerequisite knowledge of it. Hence this course is intending to create awareness among the students about packaging materials, methods & technologies.

Learning Structure:



Contents: Theory

Name of the Topic	Hrs.	Marks
Topic 1: The students will be able of ➢ Know the advantages of plastics packaging ➢ Know the regulations on packaging of plastics ➢ Properties, applications of various plastics materials in packaging of plastics. **Introduction to plastics packaging** - Definition of package, advantages of plastics packaging, distribution hazards, Role of plastics in packaging, regulations of food & medical packaging, --- Medical packaging regulations (Drug packaging, medical device packaging) ---Food packaging regulations (Food additive, acceptable amount of migration, threshold of regulations, food processing equipment and housewares exclusions, determining the conditions of use, multilayer food packaging, use of recycled plastics for food packaging)	08	16
Topic 2: Introduction to Packaging Plastics The student should be able to ➢ Know properties of various plastics materials in packaging of plastics. ➢ Know the applications of various plastics materials in packaging of plastics. Introduction to various plastics for packaging :- Properties and applications related to packaging of following plastics • LLDPE (By Athalay) • HDPE (By Athalay) • HMW-HDPE (By Athalay) • PP-PP random copolymers (By Athalay) • PET (By Athalay) • PS (By Selke and AthalaY) • Nylons or polyamides (By Athalay) • PC (By Athalays and Selke) • Nitrile (by A. S. Athalay) • EVA (By Selke and by A. S. Athalay) • Ethylene vinyl alcohole copolymers (By Selke and Athalay) • PVDC (By Selke) • Fluoropolymers (By Athalay)	06	14
Topic 3: Flexible Packaging The student will be able to ➢ Know the applications in flexible packaging ➢ Acquire skill of identifying advantages of flexible packaging ➢ Use the various techniques of flexible packaging for various products. Flexible packaging:- Characteristics of flexible packaging, pouch styles- - pillow pouches, three side seals pouches, four side seal pouches, stand up pouches, shrink wrap, Forming pouches, retort pouches, Bulk and heavy duty bags, bag-in-box. Evaluation of seals in flexible packages.	08	16

Topic 4: The students will be able to ➢ Know the applications in rigid packaging ➢ Acquire skill of identifying advantages of rigid packaging ➢ Use various techniques of rigid packaging for various products. **Rigid packaging:-**skin packaging, Blister packaging, Thermoforming fill-seal, cushioning, plastic pallets, drums & container.	04	10
Topic 5: Environmental Issues The students will be able to ➢ Know the environmental issues of plastics packaging ➢ Know the applications of plastics packaging ➢ Know the recycling of plastics packaging materials. Name of the topic: Environmental Issues Source reduction and reuse, recycling of plastic packaging: collection of packaging materials for recycling, recycling rates for plastics packaging, processing of collected plastics. Feedstock recycling, PET recycling, LDPE recycling, HDPE recycling, biodegradable plastics. Other environmental concerns: resource depletion and energy efficiency, pollution, climate change.	08	14
Topic 6: Plastics Packaging with Respect to Process The student should be able to ➢ Know the various processing methods on plastics ➢ Applications of various plastics 1) Injection moulding process i) Lids and caps a) Friction clousers, b) snap fit clousers, c) threaded clousers, d) speciality clousers, e) filament and overlap clousers ii) Blow moulding and bottles a) Hot fill bottles b) coinjection blow moulded bottles c) foam blow moulding d) in-mould labeling e) aseptic blow moulding 2) Vacuum and gas packaging (By A. S. Athalay) 3) Pallet wrapping (By A. S. Athalay)	08	16
Topic 7: Conversion processes and testing methods The student should be able to ➢ Know the various converting processes ➢ Know the applications of various plastics. ➢ Evaluate the packaging by conducting various tests. ➢ Acquire skill of identifying advantages of plastics packaging over other. Conversion processes:- Extrusion coating and lamination, hot melt lamination, adhesive lamination, thermal lamination, metallised film, silicon oxide film. Testing - Stack loads test, vibration test, product loss, gloss.	06	14
Total	**48**	**100**

List of Tutorials:

1) To understand different types of packaging method with example.
2) Discuss the flexible packed plastic product (Case study)

3) Discuss the rigid packed plastic product (Case study)
4) To determine Coefficient of friction of film.
5) To determine the Dielectric strength of film.
6) To perform the Permeability test of film.
7) Demonstration of box strapping.
8) Demonstration of Shrink packaging.
9) To perform the drop test of the container
10) Demonstration of film recycling using agglomerator.

Learning Recourses:
Books:

Sr. No.	Title	Author	Publisher
1	Modern Packaging Industries	---	NIIR
2	Plastics in Flexible Packaging	A. S. Athaley	Multitech
3	Plastic Films	John Bristoll	Longman scientific & technology
4	Plastics in Food Technology	W. E. Brown	Marcell Dekker
5	Plastics Packaging	S. Selke, R. J. Hernandez, John Culter.	Hanser Publications.
6	Handbook of Package Engineering	Joseph Hanlon, Robert Kelsey	CRC Press, Boca Raton
7.	Technology o Plastics Packaging for the consumer Market	Giles and Bain	CRC Press

Course Name : Diploma in Plastic Engineering

Course code : PS

Semester : Sixth

Subject Title : Plastics Waste Management

Subject Code : 17655

Teaching and Examination Scheme:

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

Note:

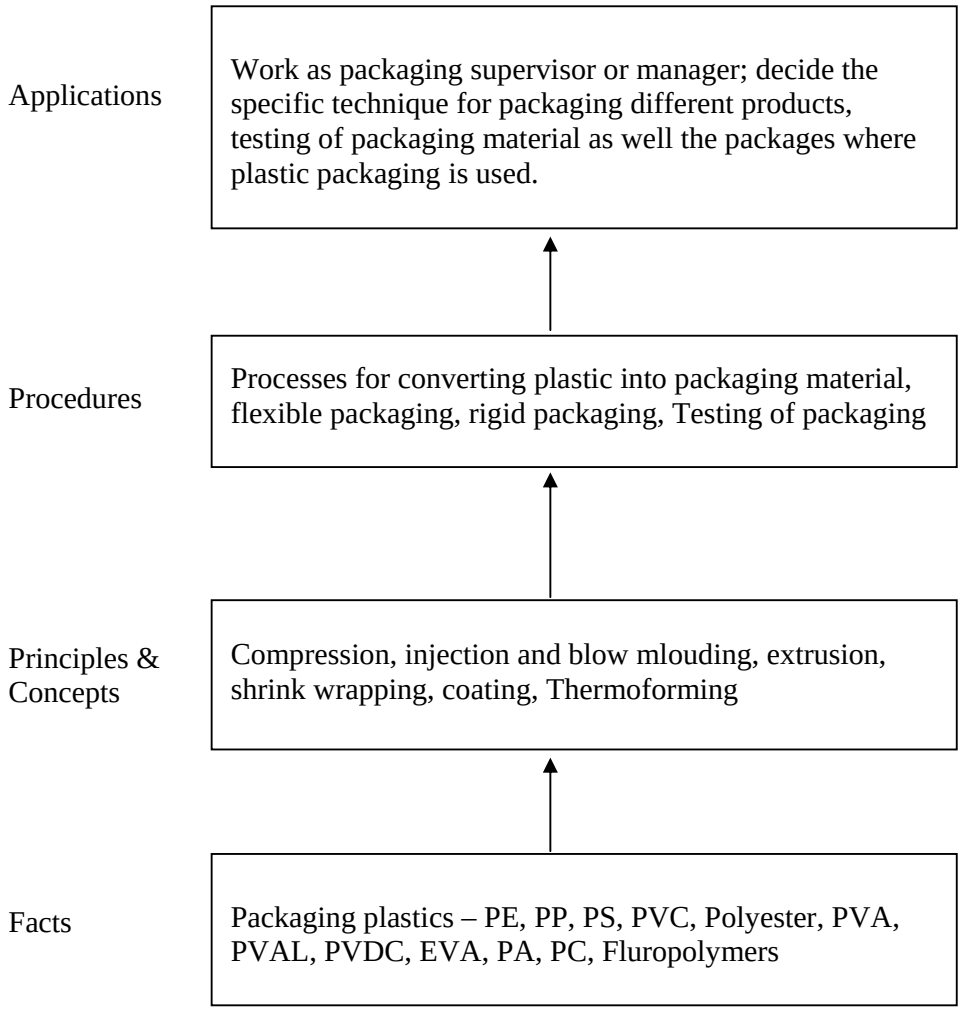
- **Two tests each of 25 marks to be conducted as per the schedule given by MSBTE.**
- **Total of tests marks for all theory subjects are to be converted out of 0 and to be entered in mark sheet under the head Sessional Work (SW).**

Rationale:

- Plastics due to their advantages and wider applications are becoming more and more popular and their productions are used almost all everywhere.
- Plastics are replacing the materials being used todays.
- On the other side the plastic wastes are imposing other problems of environmental pollution, as they are not biodegradable.
- The quality requirements of different applications are different.
- This indeed gives rise to another idea of recycling the plastic wastes and use for suitable applications. This has also a wider scope

  Hence this course is introduced to impart knowledge of plastic waste management to the technician.

Learning Structure:



Contents: Theory

Topic No.	Topic & Subtopic	Hours	Marks
1	**Introduction:** 1.1 Introduction, Definition of Waste, Waste Management. Hazards to Environment due to accumulation of Waste. 1.2 Pollution – Types of Pollutants. Ways to control the Pollution. 1.3 Sources of waste- Domestic, Industrial, Commercial, Medical etc. 1.4 Need of Plastic Waste Management.	06	14
2	**Ways of Management:** 2.1 Land filling. 2.2 Incineration. 2.3 Recycling- type of recycling such as primary, secondary & tertiary recycling(Physical, Chemical) 2.4 Melt Processing, Solvolysis (Nylon, PET), Pyrolysis, Gasification.	14	26
3	**Collection, Recovery, Sorting:** Collection, Recovery, Sorting & Separation of Plastic Waste – Various Techniques, Methods and Equipments used for Sorting, Separation.	08	16
4	**Additives/** Additives used for improving the properties of plastics waste **impact modifier, processing aids, stabilizers** Advantages, Limitations and Applications of i) Recycled Materials ii) Biodegradable Materials	06	14
5	**Topic 5: Biodegradation** Mechanism of Biodegradation, Enzymes for biodegradation, Additives for biodegradation. Degree of Biodegradability, Tests to measure resistance of Plastics to Biodegradation (Resistance to Fungi, Bacteria).	06	14
6	**Topic 7: Recycling of Various Plastics** The student will be able to i) Know the Process of recycling of plastic waste ii) Know the types of chemical recycling of plastic waste. Commodity plastic waste (Polyolefins, PVC), Elastomer waste	08	16
	Total	**48**	**100**

Learning Recourses:
Books:

Sr. No.	Author	Title
1	Hanser Publication.	How to Manage Plastic Waste
2	Ratan Sarpotdar. & Lalita Chaudhary.	Degradable Plastic: Project Report 1999

Course Name : Diploma in Plastic Engineering

Course code : PS

Semester : Sixth

Subject Title : Maintenance of Plastic Processing Machines

Subject Code : 17804

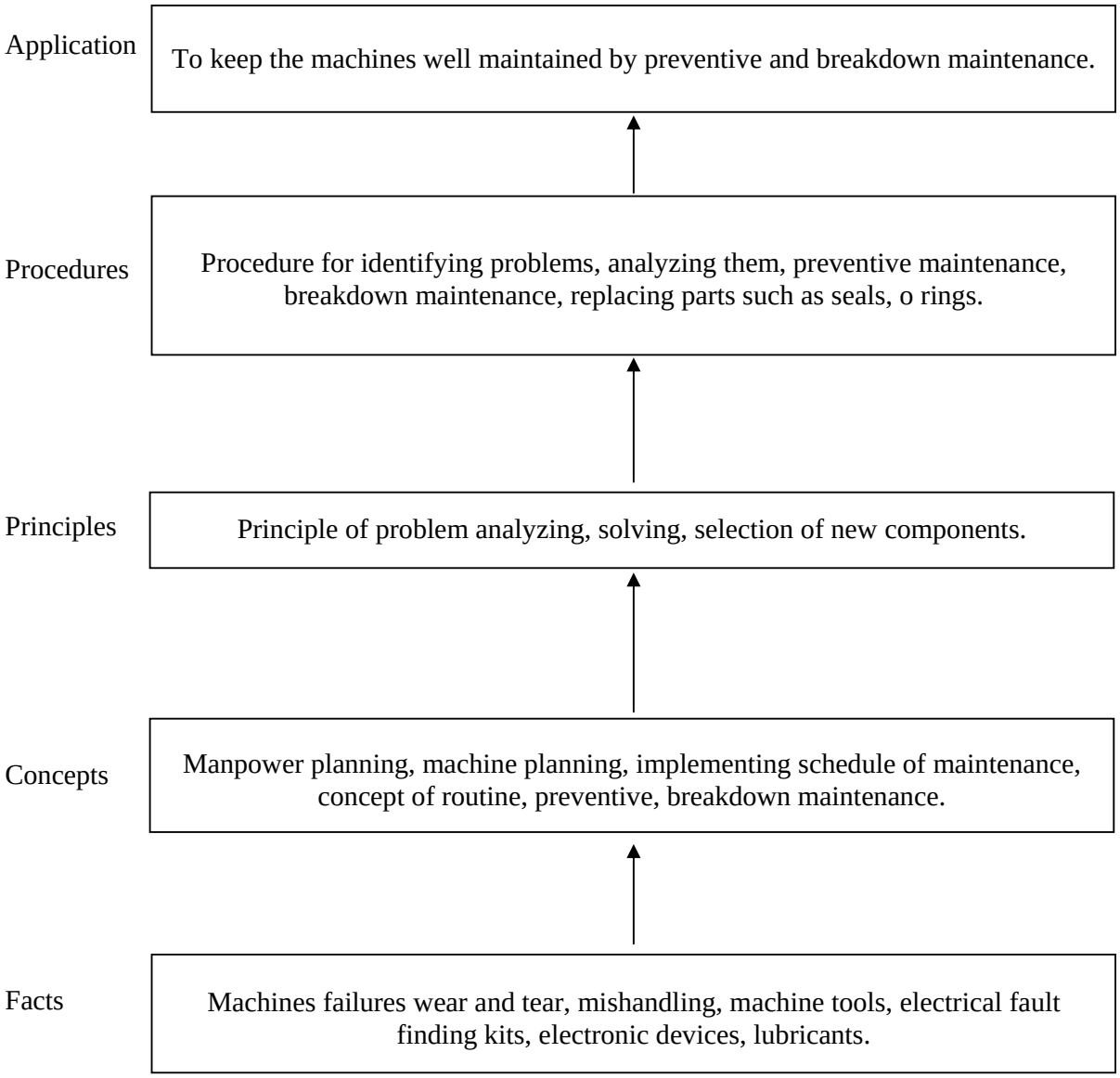
Teaching and Examination Scheme:

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

Rationale:

Plastic engineers are supposed to work on various plastic processing machines. These machines must be maintained properly by routine, preventing and breakdown maintenance in order to achieve steady and long life performance. Particularly in small scale industries where more work is done by less manpower, job of maintenance of machines is assigned to production technicians. This subject is intending to create awareness about routine, preventive, online and breakdown maintenance of various plastics processing machines

Learning Structure:



CONTENTS: (To be taught during Practical)

Chapter 1: The student will be able to i) Help to keep machine in working condition by preventive and breakdown maintenance ii) Identify the types of maintenance and their significance in processing machinery iii) Maintain the record of maintenance. Types of maintenance, routine, preventive, breakdown & their significance for all plastic processing machinery.
Chapter 2: The student will be able to i) Carry out minor repair work ii) Find out faults related to processing machine iii) Maintain record of maintenance Routine maintenance, Oiling, lubrication, types of lubrications, lubrication system, cleaning, calibration.
Chapter 3: Preventive Maintenance The student will be able to i) Carry out the minor repair work ii) Maintain scheduling of preventive maintenance Its importance, repair cycle, systematic recording preventive maintenance scheduling, types of schedules.
Chapter 4: The student will be able to i) Identify problems related to machine functioning ii) Maintain record of maintenance. Manpower of machine planning, economy with preventive maintenance case studies safety aspects, spare part inventories, equipments required. Expected life of valves, heaters, a ring seals.
Chapter 5: The student will be able to i) Carry out repair work ii) Help to keep the machine in working condition by breakdown maintenance Breakdown maintenance of major equipments, pumps, compressors, valve
Chapter 6: Records The student will be able to i) Maintain record of maintenance ii) Help to keep machine will maintained. Attending Joints, valves, pumps & other equipments, leakages, electrical, hydraulic, pneumatic circuits.
Chapter 7: The student will be able to i) Find out the faults related to processing machine ii) Maintain record of maintenance Organization of Maintenance department, control & co-ordination of various depts., related functions such as stores, equipment record, and maintenance & repair records.

Practicals:
Skills to be Developed:

A. Intellectual Skill

1. Understand different Parts of the various plastic processing machines.
2. Selection of different types of maintenance.
3. Maintenance of Different types Hydraulic and pneumatic circuits in processing machine.
4. Co-ordination of various activities in maintenance department.

B. Motor Skills

1. To develop the ability of Calibration of different parts.
2. To develop ability of routine maintenance.
3. To develop skill of maintaining the compressor and pumps in plastic Processing machines.
4. To maintain the record of maintenance.

List of Praticals

1. Constructional detail & function of injection moulding machine its parts.
2. To collect technical specification /parameters of injection moulding machine.
3. To study safety features and controls provided in injection moulding machine & its maintenance schedule from service manual.
4. To identify tools & accessories used for maintenance.
5. To study hydraulic system, lubrication system of plastic processing machine.
6. Dismantling & refitting the plasticizing screw
7. Identifying various aspects of precautionary measure of preventive maintenance for injection moulding machine.
8. Identifying various aspects of breakdown maintenance or general faults seen in injection moulding machine.
9. To conduct trial on machine.
10. To demonstrate electrical control assembly of plastic processing machine from service manual & actual practice.

Reference books:

Sr. No.	Title	Author	Publisher
1	Hand book of Blow moulding	Rosato	Hanser
2	Hand book of injection moulding	Rosato	Hanser

3	SPI Plastic Engineering Handbook	Michael L. Berino	Chapman & hall
4	Plastics extrusion tech. Handbook	Sidney Levy ,P.E.	Hanser
5	Theory & Practice of Injection Moulding	Lubin	--
6	Oil Hydraulic Systems –Principles & Maintenance	S.R.Mujumdar	Tata McGraw Hill
7	Injection moulding machine manual	--	--

References:

(A) Books :

Author	**Title**
--	Injection Moulding machine manuals
--	Extruder manual
Lubin	Theory & Practice of Injection Moulding

(B) Technical Journals & Magazines:

Sr. No	**Title**	**Publication**
1	Chemical Weekly	Sevak Publication
2	Modern Plastic International	Mc-Graw Hill
3	Rubber India	AIRIA
4	Popular plastics & packaging	Colour Publications
5	IPI Transactions/journal	IPI
6	Plastic News	AIPMA
7	Plastic & Rubber Asia	PRA
8	Plastic Technology	Bill Communications

Course Name : Diploma in Plastic Engineering

Course Code : PS

Semester : Sixth

Subject Title : Industrial Project

Subject Code : 17805

Teaching and Examination Scheme:

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

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 and maintenance of machines. In order to cultivate the systematic methodology for problem solving using acquired technical knowledge & skills, this particular subject is introduced.

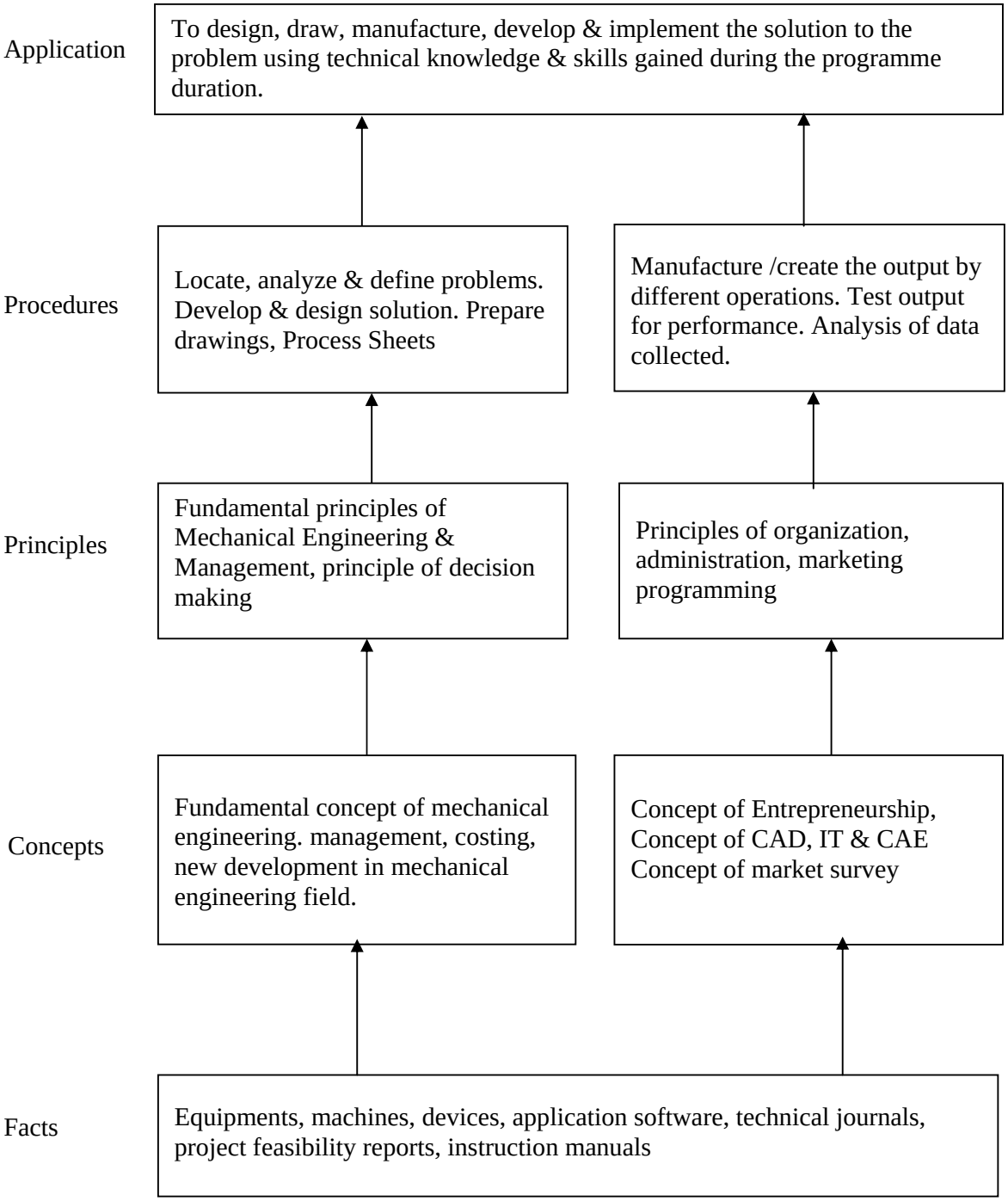
This subject will also help to enhance the generic skills & professional skills.

Objectives:

The student will be able to-

1. Identify, analyse & define the problem.
2. Generate alternative solutions to the problem identified.
3. Compare & select feasible solutions from alternatives generated.
4. Design, develop, manufacture & operate equipment/program.
5. Acquire higher-level technical knowledge by studying recent development in mechanical engineering field.
6. Compare machines/devices/apparatus for performance practices.
7. Work effectively in team.

Learning Structure:



Contents:
Skills To Be Developed:

Intellectual Skills

1. Design the related machine components & mechanism.
2. Convert innovative or creative idea into reality.
3. Understand & interpret drawings & mechanisms.
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 machine or mechanisms.
3. Classify & analyze the information collected.
4. Implement the solution of problem effectively.

Notes: 1. Project group size: Maximum 4 students
2. Project report will be of minimum 40 pages unless otherwise specified.
3. Project diary should be maintained by each student.

Part A-Project

A batch of maximum 4 students 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:

1. Processing of a product by any operation
   - Material selection.
   - Process selection.
   - Machinery selection.
2. Mould / Die design : Fabrication.
3. Small machine preparation. (finishing)

4. 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.

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 or mechatronics field, and should not be a part of diploma curriculum. Report should be of min 60 pages.

6. Market research/ survey based projects: Projected related with identification of extent of demand, sales forecasting, Comparative study of marketing strategies, Compararative 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.

Part B- Seminar

Every student will prepare & deliver the seminar. Evaluation of seminar will be carried out by panel of at least three teaching staff from mechanical/ production /automobile department.

1. Selection of topic for the seminar should be finalized in consultation with teacher guide allotted for the batch to which student belongs.
2. Seminar report should be of min.10 & max. 20 pages & it should be certified by guide teacher and head of the department
3. for presentation of seminar, following guide lines are expected to be followed:-
   a) Time for presentation of seminar: 7 to 10 minutes /student.
   b) Time for question/answer : 2 to 3 minutes /student
   c) Evaluation of seminar should be as follows:-
      Presentation : 15 marks
      Use of A. V. aids: 05 marks
      Question /answer : 05 marks
      Total : 25marks
   d) Use of audio visual aids or power point presentation is desirable.
4. Topic of the seminar should not be from diploma curriculum
5. Seminar can be on project selected by batch.

Learning Resources:

1. Magazines: Related to Plastic Industries

Course Name : Diploma in Plastic Engineering

Course Code : PS

Semester : Sixth

Subject Title : Entrepreneurship Development

Subject Code : 17806

Teaching and Examination Scheme:

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

Rationale:

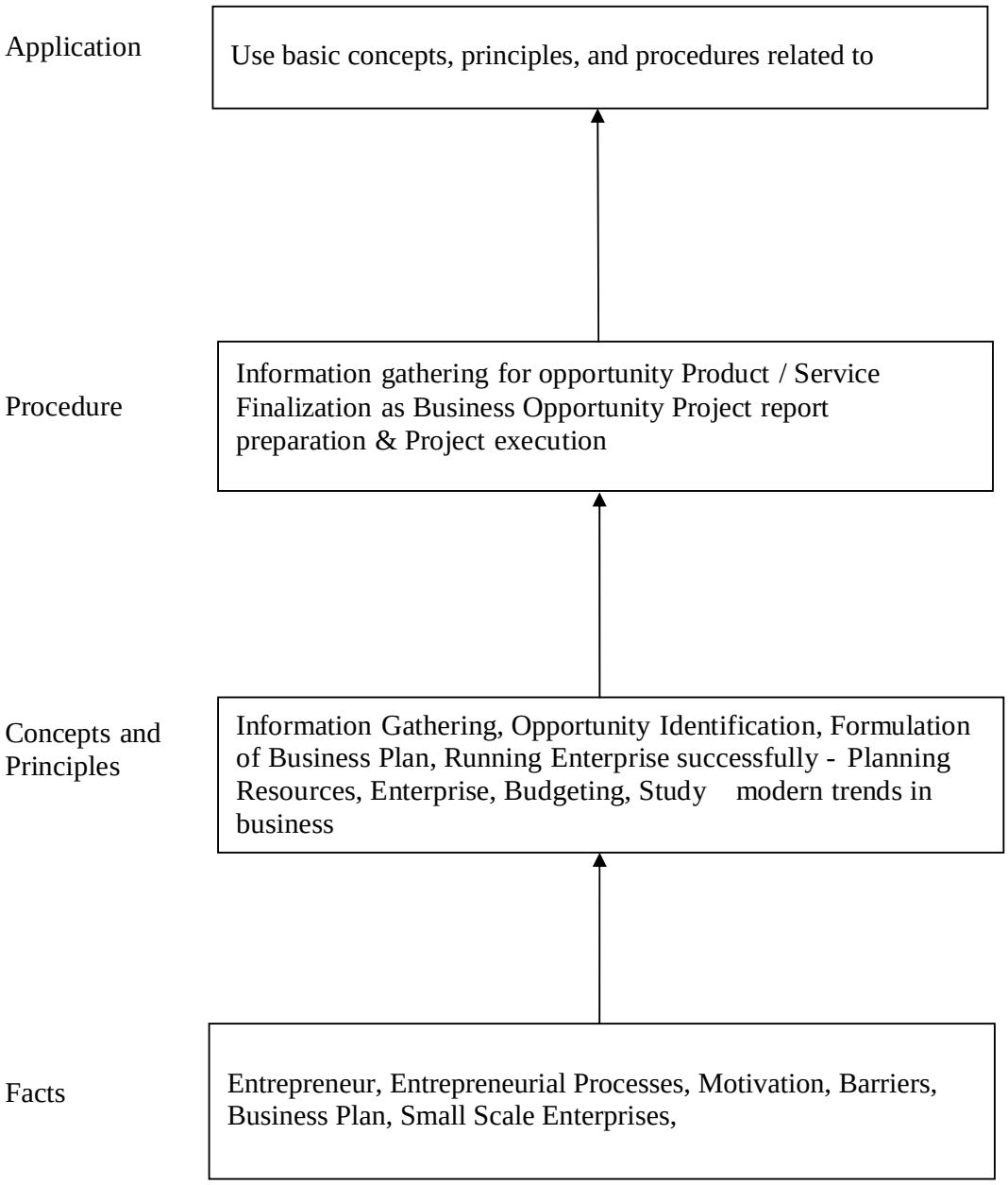
Globalization, liberalization & privatization along with revolution in Information Technology, have thrown up new opportunities that are transforming lives of the masses. Talented and enterprising personalities are exploring such opportunities & translating opportunities into business ventures such as- 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.

Objectives:

Students will be able to

1) Identify entrepreneurship opportunity.
2) Acquire entrepreneurial values and attitude.
3) Use the information to prepare project report for business venture.
4) Develop awareness about enterprise management.

Learning Structure:



Topic	Name of Topic	Hours
01	**Entrepreneurship, Creativity & Opportunities** • Concept, Classification & Characteristics of Entrepreneur • Creativity and Risk taking, Risk Situation, Types of risk & risk takers. • Business Reforms. • Process of Liberalization. • Reform Policies. • Impact of Liberalization. • Emerging high growth areas. • Business Idea Methods and techniques to generate business idea. • Transforming Ideas in to opportunities transformation involves • Assessment of idea &Feasibility of opportunity • SWOT Analysis	03
02	**Information and Support Systems** • Information Needed and Their Sources: • Information related to project, Information related to support system, Information related to procedures and formalities • Support Systems • Small Scale Business Planning, Requirements. • Govt. & Institutional Agencies, Formalities • Statutory Requirements and Agencies.	02
03	**Market Assessment** • Marketing - Concept and Importance • Market Identification, Survey Key components • Market Assessment	02
04	**Business Finance & Accounts** ➢ Business Finance • Cost of Project • Sources of Finance • Assessment of working capital • Product costing • Profitability • Break Even Analysis • Financial Ratios and Significance ➢ Business Account • Accounting Principles, Methodology • Book Keeping • Financial Statements • Concept of Audit	03

05	**Business Plan & Project Report** • Business plan steps involved from concept to commissioning Activity Recourses, Time, Cost • Project Report • Meaning and Importance • Components of project report/profile (Give list) 5.1) **Project Appraisal** 1) Meaning and definition 2) Technical, Economic feasibility 3) Cost benefit Analysis	03
06	**Enterprise Management And Modern Trends** ➢ Enterprise Management: • Essential roles of Entrepreneur in managing enterprise • Product Cycle: Concept and importance • Probable Causes Of Sickness • Quality Assurance: Importance of Quality, Importance of testing • E-Commerce: Concept and Process ➢ **Global Entrepreneur** • Assess yourself-are you an entrepreneur? • Prepare project report and study its feasibility.	03
	Total	**16**

List of Assignments:

1. Write the SWOT Analysis required for an successful entrepreneur.
2. Collect the required information, formalities and supporting systems for starting a small scale business.
3. Collect information regarding key parameters required for market analysis of an electrical industry.
4. Search for current available sources of finance to start a new business and write a report.
5. Write a report on different accounting methods, financial statements and audit.
6. Write a report on preparing a good business plan.
7. Collect information on E-commerce system and write a report on how it is useful for entrepreneurs.
8. Prepare a report on how to become a successful entrepreneur?

Learning Resources:

1) Books:

Sr. No.	Author	Title	Publisher
1	J. S. Saini B. S. Rathore	Entrepreneurship Theory and Practice	Wheeler Publisher, New Delhi
2	Prepared by Colombo plan staff college for Technician Education.	Entrepreneurship Development	Tata Mc Graw Hill Publishing co. ltd. New Delhi.
3	J. B. Patel D. G. Allampally	A Manual on How to Prepare a Project Report	EDI STUDY MATERIAL Near Village Bhat , Via Ahmadabad Airport & Indira Bridge, P.O. Bhat

4	Gautam Jain Debmuni Gupta	New Initiatives in Entrepreneurship Education & Training	382428 , Gujrat,IndiaP.H. (079) 3969163, 3969153 E-mail : ediindia@sancharnet.in/olpe@ediindia.org Website : http://www.ediindia.org
5	Schaper, Michael Volery	Entrepreneurship-Small Business	Wiley India,2011
6	Alpana, Trehan	Entrepreneurship	Dreamtech, 2011