

**Scheme of Teaching and Examination for
VI Semester DIPLOMA in MECHANICAL (AUTOMOBILE) ENGINEERING**

THEORY

Sr. No.	SUBJECTS	SUBJECT CODE	TEACHING SCHEME		EXAMINATION - SCHEME					
			Periods per Week	Periods in one Session (Year)	Hours of Exam.	Terminal Exam. (A) Marks	Final Exam. (B) Marks	Total Marks (A+B)	Pass Marks Final Exam.	Pass Marks in the Subject
1.	Professional Studies & Entrepreneurship	00601	06	60	03	20	80	100	26	36
2.	Manufacturing Technology – II	25602	06	60	03	20	80	100	26	36
3.	Industrial Management	25603	04	50	03	20	80	100	26	36
4.	Drawing, Design & Estimating	33604	12	150	04	20	80	100	26	36
5.	Elective*		06	60	03	20	80	100	26	36
	Non-Conventional Energy Sources	25605A								
	Refrigeration and Air-Conditioning	25605B								
	Heavy Earth Movers	33605C								
Total:-			32					500		

PRACTICAL

Sr. No.	SUBJECTS	SUBJECT CODE	TEACHING SCHEME		EXAMINATION – SCHEME					
			Periods per Week	Periods in one Session (Year)	Hours of Exam.	Marks Internal Exam (A)	Marks External Exam (B)	Total Marks (A+B)	Pass Marks Final Exam.	Pass Marks in the Subject
6.	Elective Lab.		04	60	04	10	40	50	16	21
	Non-Conventional Energy Sources Lab	25607A								
	Refrigeration & Air Conditioning Lab	25607B								
	Heavy Earth Movers Lab	33606C								
Total:-			06					50		

SESSIONAL

Sr. No.	SUBJECTS	SUBJECT CODE	TEACHING SCHEME		EXAMINATION - SCHEME			
			Periods per Week	Periods in One Session (Year)	Marks of Internal Examiner (X)	Marks of External Examiner (Y)	Total Marks (X+Y)	Pass Marks in the Subject
7.	Professional Studies & Entrepreneurship	00607	04	--	20	30	50	25
8.	Drawing, Design & Estimating	33608	--	--	20	30	50	25
9.	Project Work & Its Presentation in Seminar	33609	--	--	40	60	100	50
Total:-			04				200	

Total Periods per Week	42	Total Marks = 750
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PROFESSIONAL STUDIES & ENTREPRENEURSHIP

Subject Code 00601	Theory			No of Period in one session : 60		
	No. of Periods Per Week			Full Marks	:	100
	L	T	P/S	Annual Exam.	:	80
	06	-	-	Internal Exam.	:	20

Rationale:

The paper has been introduced to achieve dual purpose for the students. Firstly, this course provides the basics of Professional management and secondly it also prepares the student to develop self reliance by becoming an entrepreneur.

This makes them conversant with their duties and responsibility to make them successful in their career building by developing profession expertise.

Objectives:

With the input provided in this paper, the students will be able to:-

- Acquire basic knowledge of management.
- Understand the various area of management such as human resources, marketing, finance and commercial aspect, production & material management etc.
- Understand the benefit of becoming an entrepreneur.
- Handle a project efficiently and independently.
- To avail subsidies / grants / loan etc. from various of agencies.

PART-I: PROFESSIONAL STUDIES

TOPIC:

<u>01 – INTRODUCTION:</u>		[05]
01.01	Professional Ethics: Definition, Objective, Right & Wrong, Duty & Obligation	
01.02	Management: Definition, Function and Objectives.	[05]
01.03	Leadership: Definition, Types – Autocratic, Democratic and Laissez – faire, Functions and Characteristics of Leadership.	[05]
01.04	Motivation : Definition, Types and Importance / Benefits	[05]
01.05	Forms of Business organization: Sole proprietorship, Partnership, Joint Stock company and Co-operative Societies.	[05]
01.06	Supervisor’s/Technician’s role: Concept of supervisory management, career needs, Role of Technicians in an organization.	[05]

PART-II: ENTREPRENEURSHIP

TOPIC:

<u>02 – INTRODUCTION:</u>		
02.01	Entrepreneurship: Concept, Characteristics of a successful entrepreneurship, basic ingredients of entrepreneurship: 1. Finance 2. Technology 3. Sales and Marketing	[10]
02.02	Project Report: Meaning, Project Identification, Project Selection, Contents of a project Report, Techno- Economic Feasibility Report (TEFRR), Market Survey.	[10]

- 02.03 Sources of Finance: [05]
Government, Commercial Banks, Financial institutions:
SIDBI – Small Industries development Bank of India
SFC – State Financial Corporations
IDBI – Industrial Development Bank of India
IFCI – Industrial Finance Corporation of India
ICICI – Industrial Credit Investment Corporation of India

- 02.04 Acts : [05]
Indian factories Act 1948 (Main Provision Only)
Consumers Protection Act 1986 (Main Provision Only)

03 – PROJECT WORK:

As elaborated in Sessional Paper (00607).

Books Recommended :

1. Essential of Management, Tata McGraw Hill, Publishing Company Ltd., New Delhi. - Herald Koonz & Cyril O' Donnel.
2. Business Organization and Management, S. C. Chand and Company (Pvt.) Ltd., Ram Nagar, New Delhi - M. C. Shukla.
3. Managerial Economics, Sultan Chand & Sons, New Delhi - R. L. Vashney & K. L. Maheshwari
4. Project Appraisal and Follow up, Govind Prakashan, Mumbai. - D. P. Sharda
5. Modern Marketing Management, Progressive Corporation Pvt. Ltd., P51, Mahatma Gandhi Road, Bombay-400 001 - Dr. Rustam S. Davar
6. A hand book for new entrepreneurs (with special reference to science and technology target group) - Entrepreneurship Development Institute of India, 83-A, Swastic Society Navrangpura, Ahmedabad, PIN-380 009.

Reference Books:

1. Leadership in Organisation - Published by I.S.T.E. Mysore
2. Motivation - Published by I.S.T.E. Mysore
3. Motivation - I.I.T. Kanpur - Published by I.S.T.E. Mysore
4. A Hand book on Project Appraisal and follow up, Govind Prakashan, 204, Saraswati Kunj, 90, S. V. Road, Goregoan, Bombay-400 062. - D. P. Sarda
5. Bihar Industrial Policy - Government of Bihar, Department of Industries.
6. Entrepreneurship Guide - Bihar State Financial Corporation, Fraser Road, Patna-800 001.

MANUFACTURING TECHNOLOGY - II

Subject Code 25602	Theory			No of Period in one session : 60		
	No. of Periods Per Week			Full Marks	:	100
	L	T	P/S	Annual Exam.	:	80
	06	-	-	Internal Exam.	:	20

Rationale :

The modern trend in Engineering field i.e. in industrial production is very competitive owing to the new business policies being adopted by world traders. In a competitive marketing the product needs higher accuracy together with man production at lower price to suit the pocket of the consumers. This has resulted in need for adoptions of new machine tools, new processes and techniques automation and controls. The need of higher strength of materials being used in aero-space and other alike field, still requires advance technique of machining.

The Diploma holders being employed in supervisory capacity in different industrial concern must be conversant with essential traditional machine tools and processes and the modern technique & controls being adopted in developed and developing countries.

The introduction of this revised curriculum on subject named Manufacturing Technology-II is a very balanced effort to extend our technicians a comprehensive knowledge of traditional machine tools and techniques being adopted by modern industries.

Objective:

After completion of the course a student will be able to :-

- Classify Milling Machines and Milling operations.
- Select milling cutter.
- Give specification of milling machine.
- Know the different processes of gear manufacturing.
- Select best gear manufacturing method.
- Know the grinders.
- Select wheels for different grinding operations.
- Know the precision finishing operation.
- Develop knowledge in handling of broaches.
- Know the presses, classify, different press operation, dies and punches and their accessories.
- Develop design skill of jigs and fixtures and their applications.
- Know the different special purpose machines and operations carried on.
- Develop basic concept of C. N. C. machines and C. A. M.
- Understand the principle of modern machinery methods.

<u>S.No.</u>	<u>Topics</u>	<u>Periods</u>
01	Milling Process.	(08)
02	Gear Manufacturing.	(08)
03	Grinding.	(08)
04	Super Finishing Process.	(07)
05	Broaching.	(05)
06	Press Work.	(10)
07	Jigs & Fixtures.	(07)
08	Modern Machining Method.	(07)
Total :		(60)

CONTENTS:

<u>TOPIC: 01 – MILLING PROCESS:</u>	[08]
Introduction, Classification, Important parts and its functions, Mechanism, Work and cutter holding devices, Attachments, Types of Milling cutters, Different milling process.	
<u>TOPIC: 02 – GEAR MANUFACTURING:</u>	[08]
Introduction, Different methods, Indexing and dividing heads, Form cutters, Gear generating processes, Gear hobbing, Shaving, burnishing, grinding.	
<u>TOPIC: 03–GRINDING:</u>	[08]
Introduction, Classification, Grinding m/c, its parts and functions, Different types of grinding m/c centreless grinding, Work holding devices, Dry and wet grinding, Allowances and tolerances, Grinding Wheels, marking system, selection, binding glazing, loading, dressing & mounting of grinding wheels.	
<u>TOPIC: 04 – SUPER FINISHING PROCESS :</u>	[07]
Introduction, working Principle, application, advantages and limitations of Lapping, Honing, Polishing, Electroplating and Metal Spraying.	
<u>TOPIC: 05 – BROACHING:</u>	[05]
Introduction, broach and its types, Different broaching methods, broaching machines, fixtures for different operations, advantages and limitations.	
<u>TOPIC: 06 – PRESS WORK:</u>	[10]
Introduction, different operations, Press classification, selection, size, press tools-punch and die, die accessories, types of dies, clearance, feeding mechanism, Power press, main parts and working, driving mechanism.	
Operation performed on press :-	
<ul style="list-style-type: none">• Notching,• Piercing,• Blaming,• Shearing,• Nibbling,• Perforating etc.	
<u>TOPIC: 07 – JIGS & FIXTURES:</u>	[07]
Introduction, difference between jig and fixture, advantages and limitations, design principles, Elements of jigs and fixtures, principle of location, drilling jigs, milling fixtures.	
<u>TOPIC: 08 – MODERN MACHINING METHOD:</u>	[07]
Introduction, need, applications, advantages, limitation, working principles of electric discharge machining (EDM), Ultrasonic Machining (USM), Electrochemical Machining (ECM), Abrasive Jet Machining (AJM). Numerical Control (NC) and Computerized Numerical Control (CNC) Machines.	
Books Recommended:	
1. Workshop Technology	- Hazra & Choudhary
2. Workshop Technology	- Raghuvanshi
3. Workshop Technology, Vol.-II & III	- Chapman
4. Workshop Technology, HMT Publication	-
5. A Text Book of Production Engineering, S. Chand & Co. Ltd., Delhi	- P. C. Sharma
6. Modern Machining Methods	- M. Adittam
7. Modern Trend in Machine & Technology, I. S. T. E., Mysore.	-
8. N. C. & C. N. C. Machine Tools, I. S. T. E., Mysore.	-

INDUSTRIAL MANAGEMENT

Subject Code 25603	Theory			No of Period in one session : 50		
	No. of Periods Per Week			Full Marks		: 100
	L	T	P/S	Annual Exam.		: 80
	04	-	-	Internal Exam.		: 20

Rationale & Objective:

By studying industrial management paper, diploma students will become acquainted with skills of management, have knowledge about site selection, plant layout, purchasing, stores, material handling, safety management, maintenance and problem control.

<u>S.No.</u>	<u>Topics</u>	<u>Periods</u>
01	Functions of Management.	(05)
02	Business organisation.	(05)
03	Site Selection & Plant layout.	(06)
04	Purchase Management.	(05)
05	Inventory Control.	(06)
06	Material Management.	(05)
07	Safety Management.	(06)
08	Environmental Pollution Control.	(06)
09	Plant Maintenance.	(06)
Total :		(50)

CONTENTS:

TOPIC: 01 – FUNCTIONS OF MANAGEMENT: **[05]**

01.01 Definition, objective, importance, classification, functions of management planning, organising authority and responsibility communicating, directing, co-ordinating, control, motivation, decision-making.

TOPIC: 02 – BUSINESS ORGANISATION: **[05]**

02.01 Introduction, necessity, classification line, functional line and staff, organisation-advantages and disadvantages, organisation chart, Project organisation, public, private and joint sector enterprises.

TOPIC: 03– SITE SELECTION & PLANT LAYOUT: **[06]**

03.01 Importance of site selection, factors affecting plant location, Rural Vs. Urban location. Plant layout, objectives, advantages of good plant layout, classification, comparison between product layout and process layout.

TOPIC: 04 – PURCHASE MANAGEMENT : **[05]**

04.01 Purchasing, objective, function, classification of purchasing organisation, purchase procedure.

TOPIC: 05 – INVENTORY CONTROL: **[06]**

05.01 Introduction, importance, classification, advantage, economic order quantity (EOQ), A-B-C analysis, numericals. Function of Stores Management, Centralised and decentralized stores.

TOPIC: 06 – MATERIAL MANAGEMENT: [06]

06.01 Introduction, definition, principles and function, types, selection of material handling equipments, handling of hazardous materials, relation to plant layout.

TOPIC: 07 – SAFETY MANAGEMENT: [06]

07.01 Introduction, importance, steps for safety, functions, compensation for injury.

TOPIC: 08 – ENVIRONMENTAL POLLUTION CONTROL: [06]

08.01 Introduction, factors affecting environment, effects of pollution on ecology, air pollution control, water pollution control, solid waste management, noise pollution control.

TOPIC: 09 – PLANT MAINTENANCE: [06]

09.01 Objective, importance, duties, function and responsibilities of plant maintenance department, types and disadvantages, plant maintenance schedule.

Books Recommended:

1. Industrial Engineering & Management - O. P. Khanna
2. Industrial Engineering & Management - S. K. Sharma & S. Sharma
3. Organisation and Management - Banga & Sharma

DRAWING, DESIGN & ESTIMATING

Subject Code 33604	Theory			No of Period in one session : 150		
	No. of Periods Per Week			Full Marks	:	100
	L	T	P/S	Annual Exam.	:	80
	12	-	-	Internal Exam.	:	20

Rationale :

This course is aimed at further reinforcing and enhance the knowledge and skills acquired in the earlier courses. The exercise included in the course would provide the students such experiences which they would encounter in their professional career. The day to day functions carried out in the design & drawing department of an industry are multifarious. Some of their functions are planning, sketching, deciding specifications, determining design factors and providing dimensions.

Objective:

1. Students will be able to select suitable material for a component.
2. They will be able to provide proper shape while designing a component to suit the working and to be beautiful to look at.
3. They will be able to design a component such that the component will be strong enough as well as economical.
4. They will be able to sketch free hand the assembly of the components designed.
5. They will be able to prepare bill of material for the components designed.
6. They will be able to prepare an estimate for the materials for component designed.
7. They will be able to estimate for the materials required in manufacturing of the components.
8. They will be able to select a suitable alternative/substitute material for the component designed and estimate for the quantity of material.

<u>S.No.</u>	<u>Topics</u>	<u>Periods</u>
Topic A : Draw any Three of the following :		
01	Ball & Roller Bearing.	
02	Automisers.	
03	Carburetor.	
04	Spark Plug.	
05	Rotary Gear Pump.	
06	Gears in mesh/ Spur Gears/Bevel Gears/Worm and Worm Wheel.	
Topic B : Design any Six of the following :		
07	Connecting rod of an I. C. Engine.	
08	Piston rod of an I. C. Engine.	
09	Valves.	
10	Cylinder.	
11	Clutches.	
12	Brakes.	
13	Screw Jack.	
14	Protected type flange coupling.	
15	Bush pin type flexible coupling.	
16	Carriage Spring.	
17	Close Coiled Helical Spring.	
18	Cam Profile.	
Topic C : Give free hand sketches of the components designed. Also give bill of materials.		
Topic D : Estimate for the materials for any one of the components designed. Estimate also for the substitute material for any one.		

NON-CONVENTIONAL ENERGY SOURCES

Subject Code 25605A	Theory			No of Period in one session : 60		
	No. of Periods Per Week			Full Marks		:
	L	T	P/S	Annual Exam.		:
	6	-	-	Internal Exam.		:
						100
						80
						20

Rationale :

Non-conventional energy sources have become the most urgent sources for replacement of conventional energy source because of rising cost, decreasing availability and causing pollution to environment. Knowledge of new technologies will enrich the technical know how of students and the increase their employment opportunities in upcoming sector of renewable energy.

Objective:

<u>S.No.</u>	<u>Topics</u>	<u>Periods</u>
01	Wind Energy.	(09)
02	Biomass Energy.	(10)
03	Geothermal Energy.	(10)
04	Energy from Ocean.	(07)
05	Fuel Cells.	(06)
06	Hydrogen Energy.	(06)
07	Energy Storage.	(06)
08	Energy Conservation.	(06)
Total :		(60)

CONTENTS:

TOPIC: 01 – WIND ENERGY: **[09]**

Introduction, Principle, wind energy conversion systems, types of wind machines, its performance, advantages and limitation.

TOPIC: 02 – BIOMASS ENERGY: **[10]**

Introduction, Bio-gas generation, composition, Bio-gas plants, site-selection, bio-mass gasifiers, applications, advantages and limitations.

TOPIC: 03 – GEOTHERMAL ENERGY: **[10]**

Introduction, geothermal sources, classification, compressed resources, exploration, environmental implications, applications, advantages and dis-advantages.

TOPIC: 04 – ENERGY FROM OCEANS: **[07]**

Introduction, Ocean thermal energy conversion, site-selection, utilization, tidal power energy conversion. Ocean waves, mini and micro hydel plants.

TOPIC: 05 – FUEL CELLS: **[06]**

Introduction, Classification, Principles, performance, application, advantages and limitations.

TOPIC: 06 – HYDROGEN ENERGY: **[06]**

Introduction, production, storage, transportation, safety, utility, comparison with other automobile fuels.

TOPIC: 07 – ENERGY STORAGE:

[06]

Introduction, classification, application, advantages, disadvantages of mechanical, electrical, chemical and thermal energy storage systems.

TOPIC: 08 –ENERGY CONSERVATION:

[06]

Introduction, Conservation of thermal and electrical energy in agriculture, industry, transport and home sector, Present energy scenario in India, Energy audit.

Books Recommended:

1. -
2. -
3. -
4. -
5. -
6. -
7. -

REFRIGERATION & AIR - CONDITIONING

Subject Code 25605B	Theory			No of Period in one session : 60		
	No. of Periods Per Week			Full Marks		: 100
	L	T	P/S	Annual Exam.		: 80
	6	-	-	Internal Exam.		: 20

Rationale and Objective:

Refrigeration and air-conditioning is essential for comfort of human being for increasing the efficiency of daily work. It is widely used in automotive Engg and medicine to maintain the refined temperature and humidity.

Diploma technicians need to know the knowledge of this subject to supply the suggestions about the above.

<u>S.No.</u>	<u>Topics</u>	<u>Periods</u>
01	Method of Refrigeration.	(04)
02	Air Refrigeration System.	(05)
03	Simple Vapour Compression Refrigeration System.	(08)
04	Vapour absorption and Electrolux Refrigeration System.	(05)
05	Refrigerant and its properties.	(03)
06	Refrigeration equipments and application of refrigeration.	(07)
07	Psychrometry.	(07)
08	Comfort air-conditioning.	(05)
09	Cooling Load Calculation.	(08)
10	Air Conditioning equipments and its application.	(05)
11	Maintenance of Refrigeration and air-conditioning system.	(03)
Total :		(60)

CONTENTS:

TOPIC: 01 – METHOD OF REFRIGERATION: [04]

- 01.01 Ice Refrigeration.
- 01.02 Evaporative Refrigeration.
- 01.03 Dry Ice Refrigeration.
- 01.04 Steam Jet Refrigeration.
- 01.05 Unit of Refrigeration, engine, Refrigeration and heat pump.

TOPIC: 02 – AIR REFRIGERATION SYSTEM: [05]

- 02.01 Reversed Carnot Cycle and most efficient refrigeration.
- 02.02 Bell Coleman Refrigeration, Calculation of C. O. P.
- 02.03 Advantages and disadvantages of air-refrigeration system.
- 02.04 Necessity of cooling the aeroplane.
- 02.05 Limitations, merit and compactions of air refrigeration system (Numerical problems).

<u>TOPIC: 03 – SIMPLE VAPOUR COMPRESSION REFRIGERATION SYSTEM:</u>	[08]
03.01 Vapour Compression Refrigerator.	
03.02 T- ϕ , H- ϕ and P-H diagram for Vapour Compressions Refrigeration System.	
03.03 Analysis of Vapour Compression System.	
03.04 Wet versus dry compression.	
03.05 Advantages of Vapour Compressions over air refrigeration System.	
03.06 C. O. P. Calculation by analytically and by the help of tables & numerical problems.	
<u>TOPIC: 04 – VAPOUR ABSORPTION AND ELECTROLUX REFRIGERATION SYSTEM:</u>	[05]
04.01 Basic absorption system.	
04.02 Actual ammonia absorption system with block diagram.	
04.03 Electrolux refrigeration System with block diagram & working principle.	
04.04 Comparison of compression and absorption refrigeration system.	
<u>TOPIC: 05 – REFRIGERANT AND ITS PROPERTIES:</u>	[03]
05.01 Classification of Refrigerants.	
05.02 Physical properties of CO ₂ , SO ₂ , F-12 & F-22.	
05.03 Antifreeze solutions.	
<u>TOPIC: 06 – REFRIGERATION EQUIPMENTS AND APPLICATION OF REFRIGERATION:</u>	[07]
06.01 Compressors, Condensers and Cooling towers.	
06.02 Evaporators, Electric motors.	
06.03 Industrial, medical and comfort air conditioning.	
<u>TOPIC: 07 – PSYCHROMETRY:</u>	[07]
07.01 Introduction.	
07.02 Meaning of air-conditioning.	
07.03 Psychrometer properties and relations.	
07.04 Psychrometer chart and processes.	
07.05 Summer, Winter and Year round air-conditioning –Numerical problem.	
<u>TOPIC: 08 – COMFORT AIR-CONDITIONING:</u>	[05]
08.01 Requirement of Comfort air-conditioning.	
08.02 Thermodynamics of human body.	
<u>TOPIC: 09 – COOLING LOAD CALCULATION:</u>	[09]
09.01 Different heat sources.	
09.02 Conduction heat, radiation heat of sun, occupant and equipment load.	
09.03 Infiltration air load.	
09.04 Fresh air load. (Numerical Problems)	

TOPIC: 10 – AIR CONDITIONING EQUIPMENTS AND ITS APPLICATION:

[05]

- 10.01 Air cleaning and air filters.
- 10.02 Humidifiers and dehumidifiers.
- 10.03 Fan and blowers.
- 10.04 Grills and registers.
- 10.05 Heating and cooling coil.

TOPIC: 11 – MAINTENANCE OF REFRIGERATION AND AIR-CONDITIONING SYSTEM:

[03]

- 11.01 Charging of refrigeration unit air conditioning system.
- 11.02 Causes of faults and their remedies.

Books Recommended:

- 1. Refrigeration and Air Conditioning, Dhanpat Rai Publishers. - S. Domkundman.
- 2. Refrigeration and Air Conditioning, Tata McGraw Hill, New Delhi. - C. P. Arora.
- 3. Refrigeration and Air Conditioning - R. S. Khurana.
- 4. Basic Refrigeration of Air Conditioning, Tata McGraw Hill, New Delhi. - P. N. Ananthanarayan.
- 5. A Text Book of Refrigeration Air Conditioning, Eurasia Publication House Pvt. Ltd., New Delhi - R. S. Khanna & J. K. Gupta.

Reference Books:

- 1. Refrigeration and Air Conditioning, Prentice Hall India. - R. C. Jordan & G. P. Priester.
- 2. Refrigeration and Air. - Manohar Prasad.
- 3. Refrigeration and Air Conditioning Principles of Refrigeration Conditioning, Tata McGraw Hill, New Delhi. - W. F. Stocker & R. N. Dossel.
- 4. Refrigeration and Air Conditioning, Khanna Publishers. - P. L. Ballany.
- 5. Principle of Refrigeration, Rajdhani Publication House Pvt. Ltd. - D. P. Gupta.
- 6. Basic Refrigeration of Air Conditioning, Dhanpat Rai Publishers. - B. Hazre and D. N. Chakravarty.
- 7. Modev Refrigeration Practice, McGraw Hill. - G. R. King.
- 8. Principle of Air Conditioning, Allied Publishers Pvt. Ltd. - P. M. Patel and A. K. Mehta.
- 9. Refrigeration and Air Conditioning, S. Prakashan, New Delhi. - A. S. Sarao and P. S. Gaabi.
- 10. Refrigeration and Air Conditioning in the light of latest development, I. S. T. E. -

HEAVY EARTH MOVERS

Subject Code 33605C	Theory			No of Period in one session : 60		
	No. of Periods Per Week			Full Marks	:	100
	L	T	P/S	Annual Exam.	:	80
	06	-	-	Internal Exam.	:	20

Rationale :

The extensive use of heavy earthmoving machinery in construction of dams, tunnels, roads and in coal and mineral mines calls for an indepth study of the subject. The students of 3 years diploma in automobile engineering must know the working principle, function of working parts and maintenance schedule of the heavy earthmovers in order to harness the optimum utility from these machineries. The study and knowledge required about the heavy earthmoving imaginaries will go a long way to serve the industry/organisation better where the automobile technicians are employed.

Objective:

1. Understand the working principle and function aspect of the various component parts.
2. Differentiate similarities and dissimilarity between the heavy earthmovers and the common automobile passenger and load carrying vehicles.

<u>S.No.</u>	<u>Topics</u>	<u>Periods</u>
01	Introduction.	(04)
02	Excavators.	(06)
03	Dragline.	(05)
04	Dumpers.	(04)
05	Graders.	(06)
06	Dozers.	(04)
07	Loaders.	(05)
08	Cranes.	(06)
09	Rollers.	(06)
10	Scrapers.	(04)
11	Maintenance.	(10)
Total :		(60)

CONTENTS:

TOPIC: 01 – INTRODUCTION:

[04]

- 01.01 Introduction to heavy Earthmoving Machines.
- 01.02 Commonly used heavy Earthmoving machines viz shovels, Draglines, Dozers, Graders, Dumpers, Tippers, their function.
- 01.03 Basic difference of common automobiles such as bus, trucks, cars, Jeeps & heavy earthmoving machines.
- 01.04 Types : Tyre mounted and crawler type, their description and functions.
- 01.05 Primovers, Diesel Engines, Power operated Engine.

TOPIC: 02 – EXCAVATORS:

[06]

- 02.01 Shovels-types, operation, functions.
- 02.02 Electric shovels, diesel shovels, Digging arrangements, hydraulic and electric system. Function, Turn table, Counter weight, Hoist.
- 02.03 Maintenance and lubrication. Operational instructions and safety instructions.

TOPIC: 03 – DRAGLINE:

[05]

- 03.01 Introduction, function and uses.
- 03.02 Description, constructional features, fair lead, boom, buckets, turn table.
- 03.03 Lubrication Maintenance.
- 03.04 Operational and safety instructions.

<u>TOPIC: 04 – DUMPERS:</u>		[04]
04.01	Introduction & function.	
04.02	Construction features and working.	
04.03	Unloading mechanism-Hydraulic pump & its function, Hydraulic jack, Tilting mechanism.	
04.04	Side Dumping, Back dumping & bottom dumping.	
04.05	Maintenance of Hydraulic pump, Ram & Tilting mechanism and Engine.	
<u>TOPIC: 05 – GRADERS:</u>		[06]
05.01	Functions and uses.	
05.02	Constructional features.	
<u>TOPIC: 06 – DOZERS:</u>		[04]
06.01	Functions and uses.	
06.02	Description of constructional features. Blades, Push Arm, Hydraulic lift, Pitch arm mechanism tilting mechanism.	
<u>TOPIC: 07 – LOADERS:</u>		[05]
07.01	Description of constructional feature, function and uses.	
<u>TOPIC: 08 – CRANES:</u>		[06]
08.01	Description of constructional feature, function and uses.	
08.02	Types : wheel and truck mounted cranes.	
<u>TOPIC: 09 – ROLLERS:</u>		[06]
09.01	Description of constructional features.	
09.02	Functions and uses.	
<u>TOPIC: 10 – SCRAPERS:</u>		[04]
10.01	Function and uses.	
10.02	Descriptive features, workings and applications.	
<u>TOPIC: 11 – MAINTENANCE:</u>		[10]
11.01	Reasons for emphasis on maintenance of heavy Earthmoving machineries.	
11.02	Importance of lubrication and maintenance; and lubrication schedule.	
11.03	Maintenance of Crawler claim and heavy duty tyre wheels.	
11.04	Operational and safety instructions.	

Books Recommended:

1. Earthmoving construction equipment, function and care, M/s - Sri S. Gurumukh
Khanna Publisher, New Delhi
2. Winning Coal and Iron ore Vol. I, Printed by D. P. Mitra, E. - R. T. Deshmukh &
L. M. Press, 63, Beadon Street, Calcutta D. J. Deshmukh

Reference Books:

3. Earthmoving and Heavy Equipment, A. S. C. Publisher. - G. D. Oberlender

NON – CONVENTIONAL ENERGY SOURCES

Subject Code 25607A	Practical			No of Period in one session : 60		
	No. of Periods Per Week			Full Marks	:	50
	L	T	P/S	Annual Exam.	:	30
	-	-	04	Internal Exam.	:	20

Rationale:

Non-Conventional Energy Sources have become the most important sources for replacement of conventional energy sources because of latter rising cost, decreasing availability and causing pollution to environment. Knowledge of new technologies will enrich the technical know how of the students and increase their employment opportunities in upcoming sector of renewable energy.

Objective:

After performing the following experiments, the students will be able to :-

- Utilise solar energy for various purposes.
- Utilise wind energy for running chakki, water pump etc.
- Make use of Bio-gas in energies, stoves, Petromax etc.
- Save conventional energy whose sources are limited in many cases.

CONTENTS:

Study / Observation of following Systems:-

<u>S.No.</u>	<u>Topics</u>
01	Solar concentrating type cooker.
02	Wind mill pump.
03	Wind turbine electric generator.
04	Bio-gas plant fixed dome type.
05	Bio-gas plant floating dome type.
06	Bio-gasifier.
07	12 V Battery Charging and maintenance.
08	Performance rating of Solar lantern during different weather conditions.

REFRIGERATION & AIR-CONDITIONING

Subject Code 25607B	Practical			No of Period in one session : 60		
	No. of Periods Per Week			Full Marks	:	50
	L	T	P/S	Annual Exam.	:	30
	-	-	04	Internal Exam.	:	20

Rationale & Objective:

A diploma holder technician should be able to handle the refrigerator and air-conditioning machines to operate successfully. Fault should be detected and the better use of modification of the machines.

CONTENTS:

Perform at least five:-

<u>S.No.</u>	<u>Topics</u>
01	Determination of C. O. P. Of a refrigeration.
02	Study of evaporator and cooling towers.
03	Study of house hold refrigeration.
04	Study of vapour absorption refrigeration system.
05	Determination of dry and wet bulb temperature.
06	Study of Spray ponds.

Books Recommended:

1. Refrigeration Air Conditioning - P. L. Ballancy
2. Refrigeration Air Conditioning - R. S. Khurana

HEAVY EARTHMOVERS

Subject Code 33606C	Practical			No of Period in one session : 60		
	No. of Periods Per Week			Full Marks	:	50
	L	T	P/S	Annual Exam.	:	30
	-	-	04	Internal Exam.	:	20

Rationale:

Uses of heavy earthmovers are increasing day by day in mines excavation, material handling, lifting heavy materials, clearing roads of snowfalls, land sliding debris, making new roads in jungle and hilly areas, removing unauthorised structures.

Thus the student of Automobile Engineering Diploma must know operation and maintenance of the heavy earthmovers.

Objective:

After doing practical with heavy earthmovers the students will be able to:

- (a) Operate each and every heavy earthmovers.
- (b) Perform periodic and break-down maintenance of the heavy earthmovers.
- (c) Suggest means to improve the working of heavy earth movers.
- (d) Suggest appropriate use of heavy earthmovers for a problem which cannot be tackled manually or otherwise.

<u>S.No.</u>	<u>Topics</u>	<u>Periods</u>
01	Tools used for Maintenance.	(12)
02	Hydraulic System.	(18)
03	Clutch & Transmission.	(15)
04	Visit Of Operating Site Of Machine.	(15)
Total :		(60)

CONTENTS:

TOPIC: 01 – TOOLS USED FOR MAINTENANCE: [12]

- 01.01 Identification of various tools, working stands for repair of heavy Earthmovers.
- 01.02 Uses of various tools, instruments and equipments.

TOPIC: 02 – HYDRAULIC SYSTEM: [18]

- 02.01 To open the hydraulic system and study the function of system.
- 02.02 To dismantle, Inspection and assemble the control unit.
- 02.03 Dismantle Piston and hydraulic pump-units and assemble them.

TOPIC: 03 – CLUTCH & TRANSMISSION: [15]

- 03.01 To dismantle the clutch unit, Transmission unit; study the function and Re-assemble them.
- 03.02 Study of different type of clutches.
- 03.03 Study the line diagram hydraulic system and short out their possible problem.

TOPIC: 04 – VISIT OF OPERATING SITE OF MACHINE:

- 04.01 Visit of operating site of Excavator, Dumpers, CRANES, Loader and Scraper.
Prepare the Visit Report by explaining the functions of machines.
- 04.02 Study the Maintenance schedule of each machine.
- 04.03 Study the important reconditioning and maintenance of machines.
- 04.04 Prepare a Project Report for the reconditioning and maintenance of above machines.

PROFESSIONAL STUDIES & ENTREPRENEURSHIP

Subject Code 00607	Sessional			No of Period in one session : 50		
	No. of Periods Per Week			Full Marks	:	50
	L	T	P/S	Annual Exam.	:	30
	-	-	04	Internal Exam.	:	20

Rationale:

The paper has been introduced to achieve dual purpose for the students.

Firstly, this course provides the basics of Professional management and secondly it also prepares the student to undertake independent venture by becoming an entrepreneur.

This makes them conversant with their duties and responsibility to make them successful in their career building.

Objectives:

With the input provided in this paper, the students will be able to :-

- Acquire basic knowledge of management.
- Understand the area of management such as human resources, marketing, finance and commercial aspect.
- Understand the benefit of becoming an entrepreneur.
- Handle a project efficiently and in dependently.

To prepare a Project Report on any of the followings:

<u>S.No.</u>	<u>Topics</u>
01	Project Identification and formulation Report.
02	Project Profile/Pre-feasibility Report.
03	Techno-economical Feasibility Report (TEFR).
04	Market Survey Report.

CONTENTS

S.NO. TOPICS

TOPIC – 01 : PROJECT IDENTIFICATION AND FORMULATION REPORT:

- ◆ Introduction.
- ◆ Collection of Data.
- ◆ Compilation of Data.
- ◆ Analysis and Assimilation of Data.
- ◆ Product Selection.
- ◆ Report Finalisation and Report Writing.

TOPIC - 02 : PROJECT PROFILE/PRE-FEASIBILITY REPORT :

- ◆ Introduction of the product.
- ◆ Market.
- ◆ Man Power (Personnel Required).
- ◆ Manufacturing Process.
- ◆ Plant and Machinery.
- ◆ Cost of Project.

- ◆ Means of Finance.
- ◆ Cost of Production.
- ◆ Annual Turnover.
- ◆ Profit.
- ◆ Profit on Investment.

TOPIC – 03: TECHNO-ECONOMICAL FEASIBILITY REPORT (TEFR).

- ◆ Introduction on product.
- ◆ Market Prospects and Marketing.
- ◆ Location.
- ◆ Manufacturing Programme and Annual Turnover.
- ◆ Manufacturing Process.
- ◆ Cost of Project.
- ◆ Means of Finance.
- ◆ Requirement of Raw materials, Consumables, Utilities and Working Capital.
- ◆ Organisational Structure, Management and Man Power.
- ◆ Project Implementation Schedule.
- ◆ Profitability and Cash Flow.

TOPIC - 04 : MARKET SURVEY REPORT:

- ◆ Data Collection & Processing through Primary & Secondary Sources- Questionnaire method, e-mail, by post, by phone.
- ◆ Present Status.
- ◆ Growth of the Industry.
- ◆ Import and Export.
- ◆ Present market Demand.
- ◆ Forecast.
- ◆ Future Prospect/Scope.
- ◆ Market Segmentation.

Books Recommended:

1. Essential of Management, Tata McGraw Hill, - Herald Koonz & Cyril O' Donnel.
Publishing Company Ltd., New Delhi.
2. Business Organisation and Management, S. C. Chand - M. C. Shukla
and Company (Pvt.) Ltd., Ram Nagar, New Delhi
3. Managerial Economics, Sultan Chand & Sons, New - R. L. Vashney & K. L. Maheshwari
Delhi
4. Project Appraisal and Follow up, Govind Prakashan, - D. P. Sharda
Mumbai.
5. Modern Marketing Management, Progressive - Dr. Rustam S. Davar
Corporation Pvt. Ltd., P51, Mahatma Gandhi Road,
Bombay-400 001

6. A hand book for new entrepreneurs (with special reference to science and technology target group) - Entrepreneurship Development Institute of India, 83-A, Swastic Society Navrangpura, Ahmedabad, PIN-380 009.
7. Student discipline - Published by I.S.T.E. Mysore
8. Communication Skill - Published by I.S.T.E. Mysore
9. Decision Making - Published by I.S.T.E. Mysore
10. Pollution Control in Industry - Published by I.S.T.E. Mysore
11. S.S.M. in Environmental Engineering - Published by I.S.T.E. Mysore
12. Leadership in Organisation - Published by I.S.T.E. Mysore
13. Small Enterprise Management - Published by I.S.T.E. Mysore
14. Motivation - Published by I.S.T.E. Mysore
15. Fundamentals of Environmental Pollution - Krishnan and Kannan
16. Enviromental Engineering, T.T.T.I., Madras - Tata Mcgraw Hill
17. Motivation I.I.T. Kanpur - Published by I.S.T.E. Mysore
18. Mine Management - V.N. Singh, Bangle Prining Press Ranchi
19. Hand book on Project Appraisal and follow up, Govind Prakashan, 204, Saraswati Kunj, 90, S. V. Road, Goregoan, Bombay-400 062. - D. P. Sarda
20. Bihar Industrial Policy - Government of Bihar, Department of Industries.
21. Entrepreneurship Guide - Bihar State Financial Corporation, Fraser Road, Patna-800 001.
22. Management Economics, S. Chand & Sons, 4792/23, Dariaganj, New Delhi-110 002. - R. L. Varshney & G. L. Maheshwari
23. Management Principles & Practices, S. Chand & Sons, 4792/23, Dariaganj, New Delhi-110002. - L. Prasad & S. S. Gulshan

DRAWING, DESIGN & ESTIMATING

Subject Code 33608	Sessional			No of Period in one session :		
	No. of Periods Per Week			Full Marks		: 50
	L	T	P/S	Annual Exam.		: 30
	-	-	-	Internal Exam.		: 20

Rationale :

This course is aimed at further reinforcing and enhance the knowledge and skills acquired in the earlier courses. The exercise included in the course would provide the students such experiences which they would encounter in their professional career. The day to day functions carried out in the design & drawing department of an industry are multifarious. Some of their functions are planning, sketching, deciding specifications, determining design factors and providing dimensions.

Objective:

1. Students will be able to select suitable material for a component.
2. They will be able to provide proper shape while designing a component to suit the working and to be beautiful to look at.
3. They will be able to design a components such that the component will be strong enough as well as economical.
4. They will be able to sketch free hand the assembly of the components designed.
5. They will be able to prepare bill of material for the components designed.
6. They will be able to prepare an estimate for the materials for component designed.
7. They will be able to estimate for the materials required in manufacturing of the components.
8. They will be able to select a suitable alternative/substitute material for the component designed and estimate for the quantity of material.

<u>S.No.</u>	<u>Topics</u>	<u>Periods</u>
Topic A : Draw any Three of the following : (15 × 03 = 45)		
01	Ball & Roller Bearing.	
02	Automisers.	
03	Carburetor.	
04	Spark Plug.	
05	Rotary Gear Pump.	
06	Gears in mesh/ Spur Gears/Bevel Gears/Worm and Worm Wheel.	
Topic B : Design any Six of the following : (09 × 06 = 54)		
07	Connecting rod of an I. C. Engine.	
08	Piston rod of an I. C. Engine.	
09	Valves.	
10	Cylinder.	
11	Clutches.	
12	Brakes.	
13	Screw Jack.	
14	Protected type flange coupling.	
15	Bush pin type flexible coupling.	
16	Carriage Spring.	
17	Close Coiled Helical Spring.	
18	Cam Profile.	
Topic C :	Give free hand sketches of the components designed. Also give bill of materials.	(06 × 06 = 36)
Topic D :	Estimate for the materials for any one of the components designed. Estimate also for the substitute material for any one.	(15)
Total :		(150)

PROJECT WORK AND ITS PRESENTATION IN SEMINAR

Subject Code 33609	Sessional			No of Period in one session :		
	No. of Periods Per Week			Full Marks	:	100
	L	T	P/S	Annual Exam.	:	60
	-	-	-	Internal Exam.	:	40

Rationale :

After Completing Diploma in Automobile Engineering, the technician are poised to get a job in a factory or to start a small Auto Component production or repairing unit and as such they should have the knowledge of preparing project report.

Secondly the industries generally face a lot of problems in their day-to-day working and hence the technician should have ability to solve such problems.

Objective:

The student will be able to:

- Make market survey together informations regarding availability of similar items in the market and further demand of such items.
- Collect information regarding availability of raw materials & skilled labours required for the proposed industry.
- Manage space, building, machines, manpower and finance required for the proposed industries.
- Calculate the required fixed capital and working capital.
- Calculate the unit cost of production & selling price and to compare the price with the selling price of such item available in the market.
- Find out the break even point (B. E. P.) for the product.
- Prepare technically feasible and economically viable scheme.
- Finally prepare a project report on the basis of above mentioned data.
- Explain Project Report in a Seminar.
- Make amendment in Project Report on the basis of suggestion received in the seminar.
- Develop creative thinking.
- Identify technical and managerial problems of industry.
- Solve such problems on his own or with the help of specialists.
- Design a job on the basis of Project Report.
- Make the job himself or with the help of skilled worker.

CONTENTS

Topics:

(A) Prepare a detailed Project Report on any one of the following :-

- 01 Arc Welding.
- 02 Gas Welding.
- 03 Casting Cylinder Liner.
- 04 Grinding Cylinder Liner.
- 05 Re-boring Cylinder.
- 06 Grinding Cam Shaft.
- 07 Fabrication of leaf spring.

OR

Prepare a Project Report giving solution to a problem actually observed during visit or in plant training.

Problem related to :-

- 01 **Technical :**
 - (i) Machine Breakdown.
 - (ii) Process (Identification of bottle necks if any).
 - (iii) Material Handling.
 - (iv) Plant-lay-out.
 - (v) Quality and input.
 - (vi) Any other.
- 02 **Managerial Problems :**
 - (i) Related to workers welfare.
 - (ii) Safety.
 - (iii) Ergonomics.
 - (iv) Any other.

(C) Explain the Project Report in a seminar and revise it after hearing the views of audience (class mates, teachers and expert from field).

(D) Make one job on the basis of Project Report Prepared under (A)