

# REVISED CURRICULUM

FOR

## DIPLOMA PROGRAMME

IN

# AUTOMOBILE ENGINEERING

FOR THE STATE OF HIMACHAL PRADESH



*Prepared by:-*

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## FOREWORD

*Globalization, liberalization and privatization have been sweeping the developing world over the last few decades. They have removed barriers of distances, state boundaries, culture, language etc. for trade and commerce, so that a person or a firm with superior quality product and services can reach any where in the world, trade and prosper. Emergence of Indian multinationals viz. Infosys, Tata etc. is evidence to this phenomenon. This has resulted into an era where the moto of “survival of the fittest” works. We as a country have been exposed to the competition of ever lasting nature, affecting our society, industry as well as individuals. Moreover it has broken monopolistic trade practices that industries use to enjoy before.*

*Coupled with globalization are advancements in science and technology affecting economical and socio-political systems at various levels viz. international, continental, national and regional. The emergence of new bodies of knowledge has been posing a great threat to existing manufacturing and related trade practices. There is a visible growth drift from manufacturing sector to service sector giving rise to knowledge economy.*

*The knowledge economy, a recently known term uses knowledge as a major resource for national growth in production and services, and in increasing its Gross Domestic Product. The economy where emphasis is laid on new ideas instead of exploiting labour, where life-long learning is preferred over traditional learning, where inter-disciplinary research is promoted resulting into short product development cycle.*

*Under such circumstances the importance and requirement of technical manpower that is well-qualified and equipped with higher order competencies has increased manifold. Such a manpower is being considered as “Human Capital” globally and the countries based on knowledge economy are treating it (Human Capital) as a prime resource to compete at international level and for keeping an edge over the others.*

*Under prevailing situation where India is emerging as a global economy, technical education of our country has a great role to play. The polytechnics in the country are supposed to cater to national need of human capital at middle level managers by way of developing diploma graduates having requisite technical as well as generic skill sets. This is the only way through which we can realize our dream of becoming knowledge society by 2020.*

*This curriculum document is the result of the judicious/exhaustive exercise undertaken by CCDC considering the prevailing context as stated above. In order to meet the present day need of our national human capital, a course on Generic Skill Development is appropriately introduced in this curriculum of diploma programme along with other requisite changes in various technical courses.*

*It is now upto the managers of the technical education system to transform this scheme into reality by planning, developing and implementing learning experiences at various levels.*

*The attention of all concerned educational managers is solicited to strive hard and convert this plan into reality. I wish them good luck.*

**S. S. Guleria HAS  
Director**

**Technical Education, Vocational & Industrial Training,  
Sundernagar, Himachal Pradesh.**

## PREFACE

*Curriculum Document is a comprehensive plan or a blue print for developing various curriculum materials and implementing given educational programme to achieve desired and formally pre-stated educational objectives. Moreover it (the document) is the output of exhaustive process of curriculum planning and design, undertaken by the implementers under the expert guidance of curriculum designer.*

*Technical Education Department of Himachal Pradesh has undertaken restructuring of the diploma programmes offered by the polytechnics in the State. Consequently H.P. State Board of Technical Education assigned the project for revision of six existing diploma programmes to this institute in the month of April 2007 with a view to update the courses and their contents as per employment needs of the world of work. A series of workshops were held in the months of April-May, 2007 and 1<sup>st</sup> Year curriculum of diploma programmes was handed over to the H.P. State Board of Technical Education for its implementation from July, 2007. Subsequently another series of workshops were held for the revision of 2<sup>nd</sup> and 3<sup>rd</sup> Year curriculum of all these courses during September – December 2007.*

*While working out the detailed contents and study and evaluation scheme, the following important elements have been kept in mind:*

- i) Major employment opportunities of the diploma holders*
- ii) Modified competency profile of the diploma holders with a view to meet the changing needs due to technological advancement and requirements of various employment sectors.*
- iii) Vertical and horizontal mobility of diploma passouts for their professional growth*
- iv) Pragmatic approach in implementing all the curricula of diploma programmes in engineering and technology in the state of H.P.*

*The document is an outcome of the feedback received from industry/field organizations of different categories viz. small, medium and large scale which offer wage employment for the diploma passouts. In every stage of planning and designing of this curriculum, suggestions and advice of experts representing industry, institutions of higher learning, research organizations etc. were sought. Moreover, the representative sample of polytechnic faculty from H.P. state, who are the actual implementors of these programmes were drawn for the revision to ensure seamless curriculum implementation. The document contains the study and evaluation scheme and detailed subject/course contents for all the three years to enable the H.P. Polytechnics to implement revised curriculum to achieve the desired objectives.*

*We have taken cognizance of recommendation of experts both from industry and academic institutions and have adequately incorporated segments of Entrepreneurship Development, Environment and Safety Awareness, Industry Oriented Practice Based Minor and Major Projects, Industrial Training etc. Time has specifically been allocated for undertaking extra-curricular activities. Emphasis has been laid on developing and improving communication skills in the students for which Communication Lab has been introduced during the first year itself.*

*We hope that this revision will prove useful in producing competent diploma holders in the state of Himachal Pradesh. The success of this curriculum depends upon its effective implementation and it is expected that the managers of polytechnic education system in Himachal Pradesh will make efforts to create better facilities, develop linkages with the world of work and foster conducive and requisite learning environment as prescribed in the curriculum document.*

**Er. P.P. Sharma**  
**Head**  
**Composite Curriculum Development Centre**  
**Directorate of Technical Education,**  
**Vocational & Industrial Training,**  
**Sundernagar, Himachal Pradesh.**

## DIPLOMA PROGRAMME IN AUTOMOBILE ENGINEERING

(For the State of Himachal Pradesh)

### 1. SALIENT FEATURES

- 1) Name of the Programme : Diploma Programme in  
**Automobile Engineering**
- 2) Duration of the Programme : Three years (Six Semesters)
- 3) Entry Qualification : 10 +
- 4) Intake : 30
- 5) Pattern of the Programme : Semester Pattern
- 6) Number of Semesters : Six
- 7) Ratio between theory and Practice : 40 : 60

### 8) Industrial Training:

Four weeks of industrial training is included after IV semester during summer vacation. Internal assessment out of 50 marks and external assessment out of another 50 marks are added in 5th semester. Total 100 marks are allotted to industrial training.

#### Distribution of Marks:

- Daily diary and reports of training - 50 Marks
- Viva Voce (External) - 50 Marks

### 9) Ecology and Environment :

As per Govt. of India directives, an awareness camp on Ecology and Environment has been incorporated during second semester.

### 10) Entrepreneurship Development:

An Entrepreneurial Awareness Camp and a full subject on Generic Skill and Entrepreneurship Development has been incorporated in the scheme.

### 11) Student Centred Activities:

A provision of 3-4 hrs per week has been made for organizing Student Centred Activities for overall personality development of students. These activities will comprise of co-curricular activities such as expert lectures, games, hobby classes like photography, painting, singing etc. seminars, declamation contests, educational field visits, NCC, NSS and cultural activities etc.

## 2. GUIDELINES

### 2.1 GUIDELINES FOR ASSESSMENT OF STUDENT CENTRED ACTIVITIES (SCA)

Distribution of 25 marks for SCA will be as follows:

- i. 5 Marks shall be given for general behaviour
- ii. 5 Marks for attendance shall be based on the following distribution:

1.	Less than 75%	Nil
2.	75-79.9%	3 Marks
3.	80-84.9%	4 Marks
4.	Above 85%	5 Marks
- iii. 15 Marks shall be given for the Sports/NCC/Cultural and Co-curricular activities/other activities after due consideration to the following points:
  1. For participation in sports/NCC/Cultural/Co-curricular activities at National or above level, shall be rewarded with minimum of 10 marks
  2. For participation in sports/NCC/Cultural/Co-curricular activities at Inter-polytechnic level, shall be rewarded with minimum of 08 marks
  3. For participation in two or more of the listed activities, 5 extra marks should be rewarded

### 2.2 GUIDELINES FOR INTERNAL ASSESSMENT

- The distribution of marks for Internal Assessment in theory subjects and drawing shall be made as per the following guidelines:
  - i. 60% of internal assessment shall be based on the performance in the house tests. At least three such tests shall be conducted during the semester out of which at least one house test should be conducted. 30% weight age will be given to house test and 30% to class test(One best out of two).
  - ii. 20% marks shall be given to home assignments, class assignments, seminars etc.
  - iii. 20% marks shall be given for attendance/punctuality in the subject concerned.
- The distribution of marks for Internal Assessment in practical subjects shall be made as per the following guidelines:

- i. 60% marks shall be awarded for performance in practical
- ii. 20% marks shall be given for Report/Practical book and punctuality in equal proportion.
- iii. 20% marks shall be for Viva-voce conducted during the practical.

### 3. **EMPLOYMENT OPPORTUNITIES FOR DIPLOMA HOLDERS IN AUTOMOBILE ENGINEERING**

After having detailed discussions with professionals of Automobile Industry (in public as well as private sector) following employment opportunities are identified for diploma holders in Automobile Engineering at his entry level in profession:

#### **Supervisor in Automobile Industry**

Junior Engineer/Charge man/Foreman in R&D, assembly, vehicle testing, quality control, marketing, sales and servicing in:-

- i) Automobile manufacturing and auto ancillary industry
- ii) Ordnance factory

#### **Supervisor in State Transport workshops/Service Department of Government as well as Private Sector and Garages**

Garage Supervisor/Foreman/Service Station In charge/Junior Engineer in following organizations:

- i) State transport authorities
- ii) Garages of municipal corporations and other public/private sector undertakings
- iii) Maintenance department of heavy earth moving equipments
- iv) Repair and maintenance of Tractor and Agriculture equipments service center
- v) Military Engineering Service

#### **Junior Engineer/Sectional Officer in Government departments like PWD/Electricity Boards/Railways/Dock yards/Para military forces.**

##### 1. **Inspector**

- Motor Vehicle Authority
- Pollution Level Testing
- Driving Test
- Driving Instructor

##### 2. **Surveyor in Insurance Companies:**

3. **Self Employment:** Some of diploma holders may start their own ventures like garages/Service Stations/Annual Maintenance Contractors.

4. **COMPETENCY PROFILE OF DIPLOMA HOLDERS IN AUTOMOBILE ENGINEERING**

Keeping in view the employment opportunities, a diploma holders in Automobile Engineering should have following competencies :

1.	Development of knowledge and skills in communication, interpersonal relations, appropriate attitudes and value system.
2.	Development of competencies in reading and interpreting drawings pertaining to different components, sub-assemblies and assembly of automobile and related equipment
3.	Knowledge and skills regarding basic concepts, principles, constructional details and working of an automobile.
4.	Understanding regarding specifications of materials and components used in the manufacture of an automobile.
5.	Development of skills in inspection and testing of an automobile as per laid standards.
6.	Development of skills in diagnosing and fault finding and rectifications of the same in an automobile.
7.	Knowledge and skill to manage routine, preventive and emergency maintenance.
8.	Development of competency to design simple components and mechanism of an automobile.
9.	Development of competency to manage the inventory and spare parts and waste in workshop.
10.	Development of competency to estimate material cost, manufacturing cost and repairing cost of material.
11.	Development of managerial skills to plan and execute shop floor operations for the manufacturing/production/servicing of automobile as per laid targets/schedule quality standards.
12.	Skill of data collection, analyzing the feedback and carrying out product development/improvement for customer satisfaction.
13.	Development of knowledge and skills of managing pollution control standards, fuel efficiency standards and safety standards.
14.	Competency to manage a garage
15.	Understanding of resource system helping in the financing and managing of small enterprise
16.	Development of basic understanding of the use of computer in automobile industry.
17.	Knowledge of Motor Vehicle Act, State Rules ad Labour Laws
18.	Knowledge of Applied Science and Engineering Science subjects which will serve as foundation for technology subjects.

## 5. DERIVING CURRICULUM AREAS FROM COMPETENCY PROFILE

1.	Development of knowledge and skills in communication, interpersonal relations, appropriate attitudes and value system.	- Communication Skills - Basics of Management
2.	Development of competencies in reading and interpreting drawings pertaining to different components, sub-assemblies and assembly of automobile and related equipment	- Engineering Drawing - Automobile - Engineering Drawing
3.	Knowledge and skills regarding basic concepts, principles, constructional details and working of an automobile.	- Auto Chassis, Transmission and Control System - Automobile Engines - Auto Electrical Equipment
4.	Understanding regarding specifications of materials and components used in the manufacture of an automobile.	- Automotive Materials
5.	Development of skills in inspection and testing of an automobile as per laid standards.	- Strength of Materials - Driving Practice
6.	Development of skills in diagnosing and fault finding and rectifications of the same in an automobile.	- Auto Repair and Maintenance Workshop - Auto Reconditioning - Auto Reconditioning Workshop - Mechanics of Vehicles
7.	Knowledge and skill to manage routine, preventive and emergency maintenance.	- Auto Repair and Maintenance
8.	Development of competency to design simple components and mechanism of an automobile.	- Elements of Design - Mechanics of Vehicles
9.	Development of competency to manage the inventory and spare parts and waste in workshop.	- Basics of Management
10.	Development of competency to estimate material cost, manufacturing cost and repairing cost of material.	- Production Planning and Costing
11.	Development of managerial skills to plan and execute shop floor operations for the manufacturing/production/servicing of automobile as per laid targets/schedule quality standards.	- Production Planning
12.	Skill of data collection, analyzing the feedback and carrying out product development/improvement for customer satisfaction.	- Marketing and Sales
13.	Development of knowledge and skills of managing pollution control standards, fuel efficiency standards and safety standards.	- Motor Vehicle Act
14.	Competency to manage a garage	- Garage Equipment

15.	Understanding of resource system helping in the financing and managing of small enterprise	- Entrepreneurial Awareness Camp
16.	Development of basic understanding of the use of computer in automobile industry.	- Fundamentals of Information Technology - CAD
17.	Knowledge of Motor Vehicle Act, State Rules and Labour Laws	- Motor Vehicle Act
18.	Knowledge of Applied Science and Engineering Science subjects which will serve as foundation for technology subjects.	- Applied Physics - Applied Chemistry - Applied Mathematics - Hydraulics - Principles of Thermal Engineering - Applied Mechanics

6. **ABSTRACT OF CURRICULUM AREAS**

**Following is the abstract of curriculum areas:**

- 6.1 Applied Science
- Applied Mathematics
  - Applied Physics
  - Applied Chemistry
  - Basics of Information Technology
- 6.2 Engineering Sciences
- Engineering Drawing
  - Applied Mechanics
  - Principles of Thermal Engineering
  - Electrical Technology
- 6.3 Automobile Engineering/Technology
- Auto Engineering Drawing
  - Automotive Materials
  - Auto Engines
  - Auto Chassis, Transmission and Control System
  - Garage Equipment
  - Auto Electrical and Electronic Equipment
  - Auto Repair and Maintenance
  - Autoshop Practice
  - MVA and Transport Management
  - Elements of Design
  - Mechanics of Vehicles
  - Driving Practice
  - Production Processes
  - Production Planning and Costing
  - Computer Aided Drafting
  - Auto Reconditioning
  - Auto Reconditioning Workshop
  - Elective-I & II
- 6.4 Workshop Practice
- General Workshop Practice
  - Industrial Training
  - Mechanical Workshop Practice
  - Project Work
- 6.5 Management Subjects
- Basics of Management
  - English and Communication Skills
  - Generic Skills and Entrepreneurship Development
- 6.6 Student Centred Activities
- It includes industrial visits, extension lectures, seminars, library studies, hobby clubs, sports and games and cultural activities.

## 7. HORIZONTAL AND VERTICAL ORGANISATION

Sr. No.	Subject	Distribution of time in various semesters					
		I	II	III	IV	V	VI
1.	English and Communication Skills	5	5	-	-	-	-
2.	Applied Mathematics	5	5	-	-	-	-
3.	Applied Physics	6	6	-	-	-	-
4.	Applied Chemistry	6	6	-	-	-	-
5.	Engineering Drawing	7	6	-	-	-	-
6.	General Workshop Practice	7	6	-	-	-	-
7.	Basics of Information Technology	-	4	-	-	-	-
8.	Applied Mechanics	-	-	6	-	-	-
9.	Elements of SOM and Hydraulics	-	-	-	7	-	-
10.	Electrical Technology	-	-	-	6	-	-
11.	Production Processes	-	-	3	-	-	-
12.	Auto Engineering Drawing	-	-	8	8	-	-
13.	Autoshop Practice	-	-	6	4	-	-
14.	Automobile Engines	-	-	-	6	-	-
15.	Automotive Materials	-	-	4	-	-	-
16.	Auto Chassis, Transmission and Control System	-	-	5	-	-	-
17.	Principles of Thermal Engineering	-	-	6	-	-	-
18.	Garage Equipment	-	-	-	3	-	-
19.	Mechanics of Vehicles	-	-	-	-	4	-
20.	Auto Electrical and Electronic Equipment	-	-	-	-	6	-
21.	Auto Repair and Maintenance Workshop	-	-	-	-	8	-
22.	Elements of Design	-	-	-	-	5	-
23.	Electives	-	-	-	-	4	4
24.	MVA and Transport Management					-	4
25.	Production Planning and Costing	-	-	-	-	-	4
26.	Mechanical Workshop Practice	-	-	-	4	-	-
27.	Computer Aided Drafting	-	-	-	-	4	-
28.	Driving Practice	-	-	-	-	4	4
29.	Auto Reconditioning	-	-	-	-	-	4
30.	Auto Reconditioning Workshop	-	-	-	-	-	6
31.	Generic Skills and Entrepreneurship Development	-	-	-	-	3	-
32.	Basics of Management	-	-	-	-	-	3
33.	Practice in Communication Skill	-	-	-	-	-	2
34.	Project Work	-	-	-	-	-	8
35.	Student Centered Activities	4	2	2	2	2	1
	Total	40	40	40	40	40	40

1. **STUDY AND EVALUATION SCHEME FOR DIPLOMA PROGRAMME AUTOMOBILE ENGINEERING, HIMACHAL PRADESH**

**FIRST SEMESTER AUTOMOBILE ENGINEERING**

SR. NO	SUBJECTS	STUDY SCHEME <i>Hrs/Week</i>		MARKS IN EVALUATION SCHEME								Total Marks of Int. & Ext.
				INTERNAL ASSESSMENT			EXTERNAL ASSESSMENT					
		Th	Pr	Th	Pr	Tot	Th	Hrs	Pr	Hrs	Tot	
1.1	*English and Communication Skills – I	3	2	30	20	50	100	3	50	3	150	<b>200</b>
1.2	*Applied Mathematics - I	5	-	50	-	50	100	3	-	-	100	<b>150</b>
1.3	*Applied Physics – I	4	2	30	20	50	100	3	50	3	150	<b>200</b>
1.4	*Applied Chemistry – I	4	2	30	20	50	100	3	50	3	150	<b>200</b>
1.5	*Engineering Drawing – I	-	7	-	50	50	100	4	-	-	100	<b>150</b>
1.6	*General Workshop Practice – I	-	7	-	100	100	-	-	50	4	50	<b>150</b>
#Student Centred Activities		-	4	-	-	-	-	-	-	-	-	-
<b>Total</b>		<b>16</b>	<b>24</b>	<b>140</b>	<b>210</b>	<b>350</b>	<b>500</b>	<b>16</b>	<b>200</b>	<b>-</b>	<b>700</b>	<b>1050</b>

\* Common with other diploma programmes

# Will comprise of co-curricular activities like games, hobby clubs, including photography, seminars, declamation contests, extension lectures, educational field visits, N.C.C., NSS, cultural activities etc.

## SECOND SEMESTER AUTOMOBILE ENGINEERING

SR. NO.	SUBJECTS	STUDY SCHEME		MARKS IN EVALUATION SCHEME								Total Marks of Int. & Ext.
		<i>Hrs/Week</i>		INTERNAL ASSESSMENT			EXTERNAL ASSESSMENT					
		Th	Pr	Th	Pr	Tot	Th	Hrs	Pr	Hrs	Tot	
2.1	*English and Communication Skills - II	3	2	30	20	50	100	3	50	3	150	<b>200</b>
2.2	*Applied Mathematics – II	5	-	50	-	50	100	3	-	-	100	<b>150</b>
2.3	* Applied Physics-II	3	2	30	20	50	100	3	50	3	150	<b>200</b>
2.4	* Applied Chemistry-II	3	2	30	20	50	100	3	50	3	150	<b>200</b>
2.5	*Basic of Information Technology	-	4	-	50	50	-	-	50	3	50	<b>100</b>
2.6	* Engineering Drawing-II	-	6	-	50	50	100	4	-	-	100	<b>150</b>
2.7	*General Workshop Practice – II	-	6	-	100	100	-	-	50	4	50	<b>150</b>
#Student Centred Activities		-	4	-	-	-	-	-	-	-	-	-
<b>Total</b>		<b>14</b>	<b>26</b>	<b>140</b>	<b>260</b>	<b>400</b>	<b>500</b>	<b>16</b>	<b>250</b>	<b>16</b>	<b>750</b>	<b>1150</b>

\* Common with other diploma programmes

# Will comprise of co-curricular activities like games, hobby clubs, including photography, seminars, declamation contests, extension lectures, educational field visits, N.C.C., NSS, cultural activities etc.

### THIRD SEMESTER AUTOMOBILE ENGINEERING

SR. NO.	SUBJECTS	STUDY SCHEME <i>Hrs/Week</i>		MARKS IN EVALUATION SCHEME								Total Marks
				INTERNAL ASSESSMENT			EXTERNAL ASSESSMENT					
		Th	Pr	Th	Pr	Tot	Th	Hrs	Pr	Hrs	Tot	Int. & Ext.
3.1	*Applied Mechanics	4	2	30	20	50	100	3	50	3	150	<b>200</b>
3.2	Principles of Thermal Engineering	4	2	30	20	50	100	3	50	3	150	<b>200</b>
3.3	Automotive Materials	4	-	50	-	50	100	3	-	-	100	<b>150</b>
3.4	Automobile Chassis, Transmission and Control	5	-	50	-	50	100	3	-	-	100	<b>150</b>
3.5	Production Processes	3	-	50	-	50	100	3	-	-	100	<b>150</b>
3.6	Auto Engineering Drawing - I	-	8	-	50	50	100	4	-	-	100	<b>150</b>
3.7	Auto shop Practices - I	-	6	-	50	50	-	-	100	3	50	<b>150</b>
# Student Centred Activities including Ecology and Environmental Awareness Camp		-	2	-	25	25	-	-	-	-	-	<b>25</b>
<b>Total</b>		<b>20</b>	<b>20</b>	<b>210</b>	<b>165</b>	<b>375</b>	<b>600</b>	<b>19</b>	<b>200</b>	<b>-</b>	<b>800</b>	<b>1175</b>

\* Common With other diploma programmes

# Will comprise of co-curricular activities like extension lectures on self employment, games, hobby clubs, including photography, seminars, declamation contests, educational field visits, N.C.C., NSS, Cultural Activities

## FOURTH SEMESTER AUTOMOBILE ENGINEERING

SR. NO.	SUBJECTS	STUDY SCHEME <i>Hrs/Week</i>		MARKS IN EVALUATION SCHEME								Total Marks
				INTERNAL ASSESSMENT			EXTERNAL ASSESSMENT					
		Th	Pr	Th	Pr	Tot	Th	Hrs	Pr	Hrs	Tot	Int. & Ext.
4.1	Elements of SOM and Hydraulics	5	2	30	20	50	100	3	50	3	150	<b>200</b>
4.2	**Electrical Technology	4	2	30	20	50	100	3	50	3	150	<b>200</b>
4.3	Garage Equipment	3	-	50	-	50	100	3	-	-	100	<b>150</b>
4.4	Automobile Engines	6	-	50	-	50	100	3	-	-	100	<b>150</b>
4.5	Auto Engineering Drawing	--	8	-	50	50	100	4	-	-	100	<b>150</b>
4.6	Autoshop Practices - II	-	4	-	50	50	-	-	100	3	100	<b>150</b>
4.7	Mechanical Workshop Practice	-	4	-	50	50	-	-	100	3	100	<b>150</b>
# Student Centred Activities including Entrepreneurial Awareness camp		-	2	-	25	25	-	-	-	-	-	<b>25</b>
<b>Total</b>		<b>18</b>	<b>22</b>	<b>160</b>	<b>215</b>	<b>375</b>	<b>500</b>	<b>16</b>	<b>300</b>	<b>-</b>	<b>800</b>	<b>1175</b>

\* Common With other diploma programmes

\*\* Common with diploma in Mechanical Engineering

# Will comprise of co-curricular activities like games, hobby clubs, including photography, seminars, declamation contests, educational field visits, N.C.C., NSS, Cultural Activities

**Industrial Training** - After examination of 4th Semester, the students shall go for training in a relevant industry/ In house training should be provided for a minimum period of 4 weeks and shall prepare a diary. It shall be evaluated during 5th semester by his/her teacher for 50 marks. The students shall also prepare a report at the end of training and shall present it in a seminar, which will be evaluated for another 50 marks. This evaluation will be done by HOD and lecturer incharge – training at the start of 5th Semester.

## FIFTH AUTOMOBILE ENGINEERING

SR. NO.	SUBJECTS	STUDY SCHEME Hrs/Week		MARKS IN EVALUATION SCHEME									Total Marks  Int. & Ext.
				INTERNAL ASSESSMENT			EXTERNAL ASSESSMENT						
		Th	Pr	Th	Pr	Tot	Th	Hrs	Pr	Hrs	Tot		
5.1	Elements of Design	5	-	50	-	50	100	3	-	-	100	<b>150</b>	
5.2	Mechanics of Vehicle	4	-	50	-	50	100	3	-	-	100	<b>150</b>	
5.3	Auto Electrical and Electronic Equipment	4	2	30	20	50	100	3	50	3	150	<b>200</b>	
5.4	Computer Aided Drafting	-	4	-	50	50	-	-	100	3	100	<b>150</b>	
5.5	*Generic Skills and Entrepreneurship Development	3	-	50	-	50	100	3	-	-	100	<b>150</b>	
5.6	Auto Repair and Maintenance	-	8	-	50	50	-	-	100	3	100	<b>150</b>	
5.7	Driving Practice - I	-	4	-	50	50	-	-	100	3	100	<b>150</b>	
5.8	Elective - I	4	-	50	-	50	100	3	-	-	100	<b>150</b>	
Industrial Training		-	-	-	50	50	-	-	50	-	50	<b>100</b>	
#Student Centred Activities		-	2	-	25	25	-	-	-	-	-	<b>25</b>	
Total		<b>20</b>	<b>20</b>	<b>230</b>	<b>245</b>	<b>475</b>	<b>500</b>	-	<b>400</b>	-	<b>900</b>	<b>1375</b>	

\* Common with other diploma programmes

# Will comprise of co-curricular activities like games, hobby clubs, including photography, seminars, declamation contests, educational field visits, N.C.C., NSS, Cultural Activities

## SIXTH SEMESTER AUTOMOBILE ENGINEERING

SR. NO.	SUBJECTS	STUDY SCHEME <i>Hrs/Week</i>		MARKS IN EVALUATION SCHEME								Total Marks of Int. & Ext.
				INTERNAL ASSESSMENT			EXTERNAL ASSESSMENT					
		Th	Pr	Th	Pr	Tot	Th	Hrs	Pr	Hrs	Tot	
6.1	*Basics of Management	3	-	50	-	50	100	3	-	-	100	<b>150</b>
6.2	Auto Reconditioning	4	-	50	-	50	100	3	-	-	100	<b>150</b>
6.3	Motor Vehicle Act and Transport Management	4	-	50	-	50	100	3	-	-	100	<b>150</b>
6.4	Auto Reconditioning Workshop	-	6	-	50	50	-	-	100	3	100	<b>150</b>
6.5	Production Planning and Costing	4	-	50	-	50	100	3	-	-	100	<b>150</b>
6.6	Driving Practice - II	-	4	-	50	50	-	-	100	3	100	<b>150</b>
6.7	Project Work	-	8	-	100	100	-	-	100	3	100	<b>200</b>
6.8	Elective - II	4	-	50	-	50	100	3	-	-	100	<b>150</b>
6.9	Practice in Communication Skills	-	2	-	50	50	-	-	50	3	50	<b>100</b>
#Student Centred Activities		-	1	-	25	25	-	-	-	-	-	<b>25</b>
Total		<b>19</b>	<b>21</b>	<b>250</b>	<b>275</b>	<b>525</b>	<b>500</b>	<b>-</b>	<b>350</b>	<b>-</b>	<b>850</b>	<b>1375</b>

\* Common with other diploma programmes

# Will comprise of co-curricular activities like writing of Detailed Project Report, games, hobby clubs, including photography, seminars, declamation contests, educational field visits, N.C.C., NSS, Cultural Activities

## 9. INDUSTRIAL TRAINING OF STUDENTS

It is needless to emphasize further the importance of Industrial Training of students during their 3 years of studies at Polytechnics. It is industrial training, which provides an opportunity to students to experience the environment and culture of industrial production units and commercial activities undertaken in field organizations. It prepares student for their future role as diploma engineers in the world of work and enables them to integrate theory with practice. Polytechnics have been arranging industrial training of students of various durations to meet the above objectives.

This document includes guided and supervised industrial training of a minimum of 4 weeks duration to be organised during the semester break starting after second year i.e. after IV Semester examinations. The concerned HODs along with other teachers will guide and help students in arranging appropriate training places relevant to their specific branch. It is suggested that a training schedule may be drawn for each student before starting of the training in consultation with the training providers. Students should also be briefed in advance about the organizational setup, product range, manufacturing process, important machines and materials used in the training organization.

Equally important with the guidance is supervision of students training in the industry/organization by the teachers. A minimum of one visit per week by the teacher is recommended. Students should be encouraged to write daily report in their diary to enable them to write final report and its presentation later on.

An internal assessment of 50 and external assessment of 50 marks have been provided in the study and evaluation scheme of V Semester. Evaluation of professional industrial training report through viva-voce/presentation aims at assessing students understanding of materials, industrial process, practices in industry/field organization and their ability to engage in activities related to problem solving in industrial setup as well as understanding of application of knowledge and skills learnt in real life situations. The formative and summative evaluation may comprise of weightage to performance in testing, general behaviour, quality of report and presentation during viva-voce examination. It is recommended that such evaluations may be carried out by a team comprising of concerned HOD, teachers and representative from industry.

Teachers and students are requested to see the footnote below the study and evaluation scheme of IV Semester for further details.

## **2. DETAILED CONTENTS OF SEMESTER WISE SUBJECTS**

## 1.1 ENGLISH AND COMMUNICATION SKILLS – I

L T P  
3 - 2

### RATIONALE

*Language is the most commonly used medium of self-expression in all spheres of human life – personal, social and professional. A student must have a fair knowledge of English language and skills to communicate effectively to handle the future jobs in industry. The objective of this course is to enable the diploma holders to acquire proficiency, both in spoken (oral) and written language. At the end of the course, the student will be able to develop comprehension skills, improve vocabulary, use proper grammar, acquire writing skills, correspond with others and enhance skills in spoken English. It is expected that each polytechnic will establish a **communication skill laboratory** for conducting practicals mentioned in the curriculum.*

### DETAILED CONTENTS

1. **Facets of Literature** (14 hrs)
  - 1.1 Short Stories
    - 1.1.1 Homecoming – R.N. Tagore
    - 1.1.2 The Selfish Giant - Oscar Wilde
    - 1.1.3 The Diamond Necklace- Guy- De Maupassant
  - 1.2 Prose
    - 1.2.1 I Have A Dream – Martin Luther King
    - 1.2.2 On Habits – A. G. Gardiner
    - 1.2.3 My struggle for An Education- Booker T Washington
  - 1.3 Poems
    - 1.3.1 Ozymandias – P.B. Shelley
    - 1.3.2 Daffodils – William Wordsworth
    - 1.3.3 Stopping by Woods on a Snowy Evening – Robert Frost
2. **Grammar and Usage** (10 hrs)
  - 2.1 Parts of speech
    - 2.1.1 Nouns
    - 2.1.2 Pronouns
    - 2.1.3 Adjectives
    - 2.1.4 Articles
    - 2.1.5 Verbs
    - 2.1.6 Adverbs
    - 2.1.7 Prepositions
    - 2.1.8 Conjunction
    - 2.1.9 Interjection
    - 2.1.10 Identifying parts of speech

- 2.2 Pair of words (Words commonly confused and misused)
  - 2.1 Tenses
  - 2.2 Correction of incorrect sentences
  - 2.3 One word Substitution
  
- 3. **Translation** (04 hrs)
  - 3.1 Glossary of Administrative Terms (English and Hindi)
  - 3.2 Translation from Hindi into English and English to Hindi.
  
- 4. Paragraph of 100-150 words from outlines (08 hrs)
  
- 5. **Comprehension** (04 hrs)  
Unseen passages of literacy, scientific, data/graph based for comprehension exercises
  
- 6. **Communication** (08 hrs)
  - 6.1 Definition, Introduction and Process of Communication
  - 6.2 Objectives of Communication

### LIST OF PRACTICALS

1. Locating a Book in Library
2. How to look up words in a Dictionary: meaning and pronunciation of words as given in the standard dictionary using symbols of phonetics,
3. How to Seek Information from an Encyclopedia
4. Listening pre-recorded English language learning programme
5. Paper Reading before an audience (reading unseen passages)
6. Study of spelling Rules
7. Study of essentials of a Good Speech to respond and comprehend visual, oral themes, situations or stimulus and practice before select gathering
8. Exercises on use of different abbreviations
9. Greetings for different occasions
10. Introducing oneself, others and leave taking
11. Exercises on writing sentences on a topic

### **Note:**

1. *The Text Book on “English and Communication Skills, Book-I By Kuldip Jaidka et. al. developed by NITTTTR, Chandigarh is recommended to be used for teaching and setting-up the question papers.*
2. *A communication laboratory may be set up consisting of appropriate audio-video system with facility of playing CDs/DVDs and a video camera for recording the performance of each student with play back facility. A set of CDs from any language training organization e.g. British Council etc. may be procured for use of students.*
3. *Elements of body language will be incorporated in all practicals*
4. *The practical exercises involving writing may also be included in Theory Examination.*

## RECOMMENDED BOOKS

1. English and Communication Skills, Book-I By Kuldip Jaidka, Alwainder Dhillon and Parmod Kumar Singla, Prescribed by NITTTR, Chandigarh Published By Abhishek Publication, 57-59, Sector-17, Chandigarh
2. Essentials of Business Communication by Pal and Rorualling; Sultan Chand and Sons
3. The Essence of Effective Communication, Ludlow and Panthon; Prentice Hall of India
4. New Design English Grammar, Reading and Writing Skills by AL Kohli (Course A and course B), Kohli Publishers, 34 Industrial Area Phase-II, Chandigarh,
5. New Design English Reading and Advanced Writing Skills for Class XI and XII by MK Kohli and AL Kohli; Kohli Publishers, 34 Industrial Area Phase-II, Chandigarh,
6. A Practical English Grammar by Thomson and Marlinet
7. Spoken English by V Sasikumar and PV Dhamija; Tata McGraw Hill
8. English Conversation Practice by Grount Taylor; Tata McGraw Hill
9. Developing Communication Skills by Krishna Mohan and Meera Banerji; MacMillan India Ltd., Delhi
10. Business Correspondence and Report Writing by RC Sharma and Krishna Mohan; Tata McGraw Hill Publishing Company Ltd. New Delhi
11. Communication Skills by Ms R Datta Roy and KK Dhir; Vishal Publication, Jalandhar

## SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Hrs)	Marks Allotted (%)
1	14	40
2	10	15
3	4	10
4	8	10
5	4	10
6	8	15
<b>Total</b>	<b>48</b>	<b>100</b>

## Glossary of Administrative Terms

1.	Senior	वरिष्ठ
2.	Cashier	खजांची
3.	Consent	सहमती
4.	Earned Leave	जमा छुट्टी
5.	Under Consideration	विचार अधीन
6.	Criterion	कसौटी
7.	Staff	कर्मचारी
8.	Tenure	कार्यकाल
9.	Working Committee	कार्य समिति
10.	Estate	सम्पदा
11.	Self-Sufficient	आत्मनिर्भर
12.	Emergency	आपात्तकाल
13.	General Body	आम सभा
14.	Exemption	छूट
15.	Daily wages	दिहाड़ीदार
16.	Death-Cum Retirement	मृत्यु और निवृत्ती
17.	Despatch Register	रवानगी रजिस्टर
18.	Despatch	रवानगी
19.	Stenography	आशुलिपिक
20.	Assurance	दिलासा
21.	Justify	सही साबित करना
22.	Superior	बढ़िया
23.	High Commission	उच्चायुक्त
24.	Simultaneous	साथ - साथ
25.	Precautionary	एहतियाती
26.	Commanding Office	कमांडिंग अफसर
27.	Negligence	लापरवाही
28.	Performance	पुरा करना
29.	Proof Reader	पुफ रीडर
30.	Take Over	काम सभालना
31.	Timely Compliance	समय दौरान पुरा करना
32.	Responsibility	जिमेदारी
33.	Chief Justice	मुख्य न्यायधिश
34.	Disciplinary Action	अनुशासनिक कार्रवाई
35.	Efficiency Bar	दक्षता रोक
36.	Flying Squad	उड़न दस्ता
37.	Regret	खेद
38.	Inconvenience	असुविधा
39.	Ambiguous	अस्पष्ट
40.	Part Time	अर्धकालीन
41.	Academy	अकादमी
42.	Disparity	असमानता
43.	Extraordinary	असाधारण
44.	Provisional	अस्थायी
45.	Income Tax	आयकर
46.	Bonafide	असली
47.	Acting in Official Capacity	बतौर अधिकारिक हैसियत
48.	Contractor	ठेकेदार
49.	On probation	परिवीक्षाधीन
50.	State	राज्य

51.	Administrator	प्रशासक
52.	Admission	प्रवेश
53.	Aforesaid	पूर्वोक्त, उपरोक्त
54.	Affidavit	शपथपत्र
55.	Agenda	कार्यसूची
56.	Alma Mater	विद्यालय जहां किसी व्यक्ति ने शिक्षा प्राप्त
57.	Appointing Authority	मनोनित अधिकारी
58.	Apprentice	शिल्पकार
59.	Additional	अतिरिक्त
60.	Advertisement	विज्ञापन
61.	Assistant	सहायक
62.	Assumption of Charge	अधिकार ग्रहण करना
63.	Attested Copy	सत्यापित प्रति
64.	Chief Minister	मुख्यमन्त्री
65.	Clerical Error	लेखन सम्बन्धी भ्रम
66.	Code	कानून की किताब, गुप्त भाषा
67.	Corruption	नैतिक भ्रष्टाचार, खोटापन
68.	Craftsman	कारीगर
69.	Compensation	हरजाना
70.	Compensatory Allowance	क्षतिपूरक भत्ता
71.	Compile	संकलन करना, संग्रह करना
72.	Confidential Letter	गुप्त पत्र
73.	Chief Engineer	मुख्य अभिन्यता
74.	Data	स्वीकृत तत्त्व (आंकड़े)
75.	Dearness Allowance	संहगाई भत्ता
76.	Department	विभाग
77.	Dictionary	शब्द कोष
78.	Director	निदेशक, संचालन
79.	Director of Tech. Edu.	तकनीकी शिक्षा निदेशक
80.	Executive Engineer	अधिशासी अभिन्यता
81.	Employment Exchange	व्यवसाय केन्द्र
82.	Head Office	मुख्य कार्यालय
83.	Head Clerk	प्रधान लिपिक
84.	Indian Admn. Service	भारतीय प्रशासनिक सेवा
85.	Legislative Assembly	विधान सभा
86.	Officiating	स्थानापन्न
87.	Office Record	कार्यालय रिकार्ड
88.	Office Discipline	कार्यालय अनुशासन
89.	Polytechnic	बहुतकनीकी
90.	Temporary	अस्थायी
91.	Qualified	योग्यता प्राप्त
92.	Under Investigation	जांच अधीन
93.	Sub-treasury	उप-खजाना
94.	Target Date	लक्ष्य तिथि
95.	Technical Approval	तकनीकी मान्यता
96.	Verification	जांच पड़ताल
97.	Viva-voca	मौखिक परीक्षा
98.	Write off	बटटेखाते डालना
99.	Warning	चेतावनी
100.	Yours faithfully	भवदीय

## 1.2 APPLIED MATHEMATICS - I

L T P  
5 - -

### RATIONALE

*Applied Mathematics forms the backbone of engineering students. Basic elements of algebra, trigonometry, coordinate geometry have been included in the curriculum as foundation course. This course will develop analytical abilities to make exact calculations and will provide continuing educational base to the students.*

### DETAILED CONTENTS

1. **Algebra** (30 hrs)
  - 1.1 Complex Numbers: Complex number, representation, modulus and amplitude. De-Moivre's theorem, its application in solving algebraic equation.
  - 1.2 Geometrical progression, its  $n$ th term and sum of  $n$  terms and to infinity. Application of Arithmetic progression and Geometrical progression to Engineering problem.
  - 1.3 Partial fractions (linear factors, repeated linear factors)
  - 1.4 Permutations and Combinations: Value of  ${}^n P_r$   ${}^n C_r$ . Simple problems
  - 1.5 Binomial theorem (without proof) for positive integral index (expansion and general form); binomial theorem for any index (expansion without proof) first and second binomial approximation with applications to engineering problems
2. **Trigonometry** (20 hrs)
  - 2.1 Concept of angles, measurement of angles in degrees, grades and radians and their conversions.
  - 2.2 T-Ratios of Allied angles (without proof), Sum, difference formulae and their applications (without proof). Product formulae (Transformation of product to sum, difference and vice versa). T-Ratios of multiple angles, sub-multiple angles ( $2A$ ,  $3A$ ,  $A/2$ ).
  - 2.3 Graphs of  $\sin x$ ,  $\cos x$ ,  $\tan x$  and  $e^x$

3. **Differential Calculus** (30 hrs)

3.1 Definition of function; Concept of limits.

$$\text{Lt } x \rightarrow a \frac{x^n - a^n}{x - a}$$

Four standard limits

$$\text{Lt } x \rightarrow 0 \frac{\sin x}{x}, \quad \text{Lt } x \rightarrow 0 \frac{a^x - 1}{x}, \quad \text{Lt } x \rightarrow 0 (1+x)^{1/x}$$

3.2 Differentiation by definition of  $x^n$ ,  $\sin x$ ,  $\cos x$ ,  $\tan x$ ,  $e^x$ ,  $\log_a x$

3.3 Differentiation of sum, product and quotient of functions. Differentiation of function of a function.

3.4 Differentiation of trigonometric inverse functions. Logarithmic differentiation. Exponential differentiation Successive differentiation (excluding nth order).

3.5 Applications:

(a) Errors and increments

(b) Maxima and minima

(c) Equation of tangent and normal to a curve (for explicit functions only)

**RECOMMENDED BOOKS**

1. Elementary Engineering Mathematics by BS Grewal, Khanna Publishers, New Delhi
2. Engineering Mathematics by Vol. I & II by S Kohli, IPH, Jalandhar
3. Applied Mathematics by Dr. RD Sharma
4. Applied Mathematics, Vol. I & II by SS Sabharwal & Sunita Jain, Eagle Parkashan, Jalandhar
5. Comprehensive Mathematics, Vol. I & II by Laxmi Publications
6. Engineering Mathematics by Dass Gupta
7. Engineering Mathematics by C Dass Chawla, Asian Publishers, New Delhi
8. Comprehensive Mathematics, Vol. I & II by Laxmi Publications
9. Engineering Mathematics, Vol I, II & III by V Sundaram et al, Vikas Publishing House (P) Ltd., New Delhi
10. Engineering Mathematics by N.Ch.S.N Iyengar et.al, Vikas Publishing House (P) Ltd., New Delhi
11. Engineering Mathematics, Vol I & II by SS Sastry, Prentice Hall of India Pvt. Ltd.,
12. Engineering Mathematics, Vol I & II by AK Gupta, MacMillan India Ltd., New Delhi

**SUGGESTED DISTRIBUTION OF MARKS**

Topic No.	Time Allotted (Hrs)	Marks Allotted (%)
1	30	30
2	20	30
3	30	40
<b>Total</b>	<b>80</b>	<b>100</b>

## 1.3 APPLIED PHYSICS– I

L T P  
4 - 2

### RATIONALE

*Applied physics includes the study of a large number of diverse topics all related to things that go on in the world around us. It aims to give an understanding of this world both by observation and by prediction of the way in which objects will behave. Concrete use of physical principles and analysis in various fields of engineering and technology are given prominence in the course content.*

### DETAILED CONTENTS

1. **Units and Dimensions** (08 hrs)
  - 1.1 Physical quantities
  - 1.2 Units - fundamental and derived units, systems of units (FPS, CGS, MKS and SI units)
  - 1.3 Dimensions and dimensional formulae of physical quantities
  - 1.4 Dimensional equations and principle of homogeneity, applications to conversion from one system of units to another, checking the correctness of physical relations and derivation of simple physical relations, limitations of dimensional analysis
  - 1.5 Significant figures and error analysis
  
2. **Force and Motion** (12 hrs)
  - 2.1 Scalar and vector quantities – examples, addition and multiplication (scalar product and vector product) of vectors
  - 2.2 Force, resolution and composition of forces – resultant, parallelogram law of forces, equilibrium of forces, Lami's theorem  
Force, type of forces, gravitational electromagnetic weak and strong force, conservative and non-conservative forces with simple examples.
  - 2.3 Newton's Laws of motion – concept of momentum, Newton's laws of motion and their applications, determination of force equation from Newton's second law of motion; Newton's third law of motion, conservation of momentum, impulse, simple numerical problems
  - 2.4 Circular motion – angular displacement, angular velocity and angular acceleration
  - 2.5 Relation between linear and angular variables (velocity and acceleration)
  - 2.6 Centripetal force (derivation) and centrifugal force
  - 2.7 Banking of roads
  
3. **Work, Power and Energy** (12 hrs)
  - 3.1 Work: definition and its SI units
  - 3.2 Work done in moving an object on horizontal and inclined plane (incorporating frictional forces)
  - 3.3 Power: definition and its SI units, calculation of power in simple cases

- 3.4 Energy: Definition and its SI units: Types: Kinetic energy and Potential energy with examples and their derivation
  - 3.5 Principle of conservation of mechanical energy (for freely falling bodies), transformation of energy from one form to another
  - 3.6 Relation between work, heat and energy
  - 3.7 Concept of friction, cause and types, applications of friction in daily life
4. **Rotational Motion** (06 hrs)
- 4.1 Definitions of torque, angular momentum, their relationship
  - 4.2 Conservation of angular momentum (qualitative) and its examples
  - 4.3 Moment of inertia and its physical significance, radius of gyration
  - 4.4 Theorems of parallel and perpendicular axes (statements)
  - 4.5 Moment of inertia of rod, disc, ring and sphere
5. **Properties of Matter** (10 hrs)
- 5.1 Elasticity, definition of stress and strain, different types of modulus of elasticity, stress – strain diagram, Hooke’s law
  - 5.2 Pressure – its units, gauge pressure, absolute pressure, atmospheric pressure, Pascal law and its applications.
  - 5.3 Surface tension – its units, measurement of surface tension by capillary tube method, applications of surface tension, effect of temperature and impurity on surface tension
6. **Thermometry** (10 hrs)
- 6.1 Principles of measurement of temperature and different scales of temperature
  - 6.2 Difference between heat and temperature on the basis of K.E. of molecules
  - 6.3 Types of thermometers, Physical properties on which they are based  
(No description of individual thermometer)
  - 6.4 Co-efficient of linear, surface and cubical expansions and relation amongst them
  - 6.5 Modes of transfer of heat (Conduction, convection and radiation with examples)
  - 6.6 Co-efficient of thermal conductivity, determination of thermal conductivity of good conductor (Searle’s method) and bad conductor (Lee’s disc method)

7. **Space Exploration and Radio-activity** (06 Hrs)  
 Concept of Natural, artificial satellite, equatorial orbit, Geo-Stationary orbit, Polar orbit, Apogee, Perigee, inclination, purpose of space research, space science in India, Indian satellite, Application of space science, Useful life of satellite, Natural radioactivity, units, concept of nuclear fission, fusion and nuclear reactor. Applications of Radioisotopes in Agriculture industry and medicine.

**LIST OF PRACTICALS (to perform minimum eight experiments)**

1. To find the diameter of wire using a screw gauge
2. To find volume of solid cylinder and hollow cylinder using a vernier caliper
3. To determine the thickness of glass strip and radius of curvature of a concave surface using a spherometer
4. To verify the parallelogram law of forces
5. To verify conservation of energy of a rolling solid sphere/cylinder
6. To find the diameter of a capillary tube using Travelling Microscop
7. To find the time period of a simple pendulum
8. To find the time period of cantilever
9. To determine the atmospheric pressure at a place using Fortin's Barometer
10. To find the coefficient of thermal conductivity of copper using Searle's conductivity apparatus

**RECOMMENDED BOOKS**

1. *Test Book of Physics for Class XI (Part-I, Part-II) N.C.E.R.T /C.B.S.E.*
2. *Test Book of Physics for Class XII (Part-I, Part-II) N.C.E.R.T /C.B.S.E.*
3. *Applied Physics, Vol. I and Vol. II, TTTI Publications, Tata McGraw Hill, Delhi*
4. *Concepts in Physics by HC Verma, Vol. I & II, Bharti Bhawan Ltd. New Delhi*
5. *Fundamentals of Physics by Resnick and Halliday & Walker, Asian Book Pvt. Ltd., New Delhi*
6. *Berkeley Physics Course, Vol. I, II & III, Tata McGraw Hill, Delhi*
7. *The Feynman Lectures on Physics by Feynman, Leighton and Sands, Vol. I & II, Narosa Publishing House, Delhi*
8. *Fundamentals of Optics by Francis A. Jenkins & Harvey E White, McGraw Hill International Editions, Physics Series*
9. *A Text Book of Optics by Subramanian and Brij Lal, S Chand & Co., New Delhi*
10. *Comprehensive Practical Physics, Vol, I & II, JN Jaiswal, Laxmi Publishers*
11. *Engineering Physics by PV Naik, Pearson Education Pvt. Ltd, New Delhi*
12. *Applied Physics I & II by RA Banwait & R Dogra, Eagle Parkashan, Jalandhar*

**SUGGESTED DISTRIBUTION OF MARKS**

Topic No.	Time Allotted (Hrs)	Marks Allotted (%)
1	08	10
2	12	20
3	14	25
4	06	10
5	10	15
6	10	15
7	04	05
<b>Total</b>	<b>64</b>	<b>100</b>

## 1.4 APPLIED CHEMISTRY - I

L T P  
4 - 2

### RATIONALE

*The role of chemistry and chemical products in every branch of engineering is expanding greatly. Now a days various products of chemical industries are playing important role in the field of engineering with increasing number of such products each successive years. The strength of materials, the chemical composition of substances, their behavior when subjected to different treatment and environment, and the laws of heat and dynamic energy have entered in almost every activity of modern life. Chemistry is considered as one of the core subjects for diploma students in engineering and technology for developing in them scientific temper and appreciation of chemical properties of materials, which they have to handle in their professional career. Effort should be made to teach this subject through demonstration and with the active involvement of students.*

### DETAILED CONTENTS

1. **Basic concepts of Chemistry** (10 hrs)
  - 1.1 Units and Dimensions, derived units (with special reference to pressure, volume, temperature, density, specific gravity, surface tension, viscosity and conductivity)
  - 1.2 Matter, element, compound and mixtures, atom, molecule, ion, symbols and formulae (recapitulation only)
  - 1.3 Atomic mass (A), molar mass, mole concept, molar volume of gases
  - 1.4 Solution, strength of solutions in grams per liter, molarity (M), molality (m), mass fraction and mole fraction (numerical problems)
  - 1.5 Chemical equations, thermo-chemical equations, balancing of chemical equations (using partial equation method)
  - 1.6 Numerical problems based on mole concept
  - 1.7 Brief introduction and concept of Volumetry Analysis
  
2. **Atomic structure and Chemical Bonding** (10 hrs)
  - 2.1 Fundamental particles i.e. electron, proton and neutron (their masses and charges)
  - 2.2 Postulates of Bohr model of atom, success and failures of Bohr model of atom
  - 2.3 Heisenberg's uncertainty principle
  - 2.4 Elementary idea of modern concept of atom, quantum numbers (significance only), definition of shells, sub shells and orbitals, concept of orbitals, shapes of s & p orbitals only. Electronic configuration of elements (atomic number 1 to 30 only) on the basis of Aufbau principle, Pauli's principle and Hund's rule
  - 2.5 Modern periodic law, introduction of periodic table, periods and groups,
  - 2.6 Division of the periodic table into s, p, d, and f blocks (details excluded)
  - 2.7 Chemical bond and cause of bonding

- 2.8 Ionic bond, covalent bond, orbital concept of covalent bonding, valence bond theory, sigma ( $\sigma$ ) and pi ( $\pi$ ) bonds.
- 2.9 Metallic bonding (electron sea model)
- 2.10 Coordinate bond with examples of ozone, ammonium chloride,  $\text{H}_3\text{N}-\text{BF}_3$  complex

3. **Water** (10 hrs)

- 3.1 Sources of water
- 3.2 Hard water, soft water, types of hardness, action of soap on hard water
- 3.3 Degree of hardness in terms of calcium carbonate, Units of hardness in Clark degree, French degree and ppm
- 3.4 Estimation of hardness by EDTA method,
- 3.5 Disadvantages of hard water in domestic and industrial uses
- 3.6 Boiler water: causes and prevention of scale and sludge formation, corrosion, priming & foaming and caustic embitterment
- 3.7 Softening of hard water by premitit and ion exchange processes
- 3.8 Qualities of drinking water and purification of available water for drinking purposes
- 3.9 Chemical analysis: Estimation of alkalinity, estimation of total dissolved solids (TDS), free chlorine, chloride, and dissolved oxygen
- 3.10 Numerical problems

4. **Equilibrium, Acids and Bases.** (10 hrs)

- 4.1 Equilibrium state, equilibrium constant and statement of Le-chatelier's principle with illustration
- 4.2 Ionization of electrolyte in aqueous solution, ionic equilibrium, degree of ionization, self-ionization of water and ionic product of water ( $K_w$ )
- 4.3 Concept of pH and pH scale
- 4.4 Arrhenius concept of acids/bases; strong acids/bases, weak acids/bases, dissociation constants of acids/bases. Neutralization, acid base titration, choice of indicators for acid base titration
- 4.5 Hydrolysis of salts, buffer solutions (acidic and basic), buffer action of a buffer solution, applications of buffer solution
- 4.6 Simple numerical problems

5. **Electrochemistry.** (10 hrs)

- 5.1 Electronic concept of oxidation and reduction, redox reactions
- 5.2 Electrolytes and non electrolytes
- 5.3 Electrolysis, Faradays laws of electrolysis
- 5.4 Applications of electrolysis in electrometallurgy, electro-refining and electroplating (numerical)
- 5.5 Galvanic cells (elementary idea) brief description of Daniel cell, Ni-Cd cell, dry cell and lithium iodide cell
- 5.6 Lead storage batteries and maintenance free batteries
- 5.7 Simple numerical problems related to Faraday's laws

6. **Organic Chemistry.** (08 hrs)  
6.1 Tetra covalency of carbon, catenation (definition only)  
6.2 Structural and condensed formulae of organic compounds  
6.3 Homologous series, functional groups and following organic families:  
(a) alkanes (b) alkenes (c) alkynes (d) alcohols (e) ethers (f) aldehydes and ketones (g) Carboxylic acids (h) esters (i) amides (with structure, IUPAC names and method of preparation of first member of the series)
7. **Environmental Pollution and its control.** (06 hrs)  
7.1 Introduction  
7.2 Causes and control of air, water, and soil pollutions  
7.3 Noise pollution  
7.4 Radio active pollution and its control  
7.5 Sewage and its treatment

### LIST OF PRACTICALS

1. Introduction to volumetric analysis, apparatus used and molarity based calculations
2. To determine strength of given solution of sodium hydroxide by titrating against standard solution of oxalic acid using phenolphthalein indicator.
3. To determine strength of given solution of sulphuric acid by titrating against standard solution of sodium carbonate using methyl orange indicator (or by conductometrically).
4. Estimation of hardness of water by EDTA method.
5. Estimation of total alkalinity in the given sample of water by titrating against standard solution of sulfuric acid.
6. Determination of the dosage of bleaching powder required for sterilization or disinfection of different samples of water, using standard sodium thiosulfate solution
7. Estimation of chloride ions in the given sample of water by titrating against standard solution of silver nitrate.
8. To determine %age purity of ferrous sulphate in given solution of known strength using potassium permanganate solution.
9. To distinguish between aldehyde and ketone by Tollen's reagent (benzaldehyde and acetone may be used)
10. To prepare iodoform from ethanol or acetone  
OR
11. To prepare the Mohr's salt from ferrous sulphate and ammonium sulphate.

### RECOMMENDED BOOKS

1. *Chemistry in Engineering* by J.C. Kuricose And J. Rajaram, Tata McGraw Hill, Publishing Company Limited, New Delhi.
2. *Engineering Chemistry* by P.C.Jain and Monika Jain, Dhanapat Rai Publishing Company New Delhi.
3. *Engineering Chemistry* by Shashi Chawla.
4. *Progressive Applied Chemistry – I* by Dr. G.H. Hugar Eagle Prakashan Jalandhar

### SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Hrs)	Marks Allotted (%)
1	10	15
2	10	15
3	10	10
4	10	20
5	10	20
6	08	10
7	06	10
<b>Total</b>	<b>64</b>	<b>100</b>

## 1.5 ENGINEERING DRAWING - I

L T P  
- - 7

### RATIONALE

*Drawing is the language of engineers and technicians. Reading and interpreting engineering drawing is their day to day responsibility. The subject is aimed at developing basic graphic skills in the students so as to enable them to use these skills in preparation of engineering drawings, their reading and interpretation. The emphasis, while imparting instructions, should be to develop conceptual skills in the students following BIS SP 46 – 1988.*

*Note:*

- i) First angle projection is to be followed*
- ii) Minimum of 14 sheets to be prepared*
- iii) Instructions relevant to various drawings may be given along with appropriate demonstrations, before assigning drawing practice to students*

### DETAILED CONTENTS

1. **Handling, Use and Care of Drawing Instruments and Materials**
  - 1.1 Drawing Instruments
  - 1.2 Materials
  - 1.3 Layout of drawing sheets
  
2. **Free Hand Sketching and Lettering** (01 sheets)
  - 2.1 Different types of lines in Engineering drawing as per BIS specifications
  - 2.2 Practice of free hand sketching of vertical, horizontal and inclined lines, geometrical figures such as triangles, rectangles, circles, ellipses and curves
  
3. **Lettering Technique and Practice** (02 sheets)
  - 3.1 Instrumental single stroke lettering of 35 mm and 70 mm height in the ratio of 7:4
  - 3.2 Free hand lettering (Alphabet and numerals )- lower case and upper case, single stroke, vertical and inclined at 75 degree in different standards, series of 3, 5, 8 and 12 mm heights in the ratio of 7:4
  
4. **Dimensioning Technique** (01 sheet)
  - 4.1 Necessity of dimensioning, method and principles of dimensioning (mainly theoretical instructions)
  - 4.2 Dimensioning of overall sizes, circles, threaded holes, chamfered surfaces, angles, tapered surfaces, holes, equally spaced on P.C.D., counter sink holes, counter bored holes, cylindrical parts, narrow spaces and gaps, radii, curves and arches

5. **Scales** (02 sheets)
  - 5.1 Scales - their need and importance (Theoretical instructions).
  - 5.2 Drawing of plain and diagonal scales
  
6. **Projection** (04 sheets)
  - 6.1 Theory of projections (Elaborate theoretical instructions)
  - 6.2 Drawing 3 views of given objects (Non-symmetrical objects may be selected for this exercise)
  - 6.3 Drawing 6 views of given objects (Non-symmetrical objects may be selected for this exercise)
  - 6.4 Identification of surfaces on drawn views and objects drawn
  - 6.5 Exercises on missing surfaces and views
  - 6.6 Introduction to third angle projections
  
7. **Sections** (02 sheets)
  - 7.1 Importance and salient features, Methods of representing sections, conventional sections of various materials, classification of sections, conventions in sectioning
  - 7.2 Drawing of full section, half section, partial or broken out sections, Offset sections, revolved sections and removed sections.
  - 7.3 Drawing of different conventions for materials in section, conventional breaks for shafts, pipes, rectangular, square, angle, channel, rolled sections
  - 7.4 Exercises on sectional views of different objects.
  
8. **Isometric Views** (02 sheets)
  - 8.1 Fundamentals of isometric projections (Theoretical instructions)
  - 8.2 Isometric views from 2 or 3 given orthographic views.
  
9. **Symbols and Conventions** (02 sheets)
  - 9.1 Civil engineering, sanitary fitting symbols
  - 9.2 Electrical fitting symbols for domestic interior installations
  - 9.3 Building plan drawing with electrical and civil engineering symbols, Material symbols and conventions.

#### **RECOMMENDED BOOKS**

1. *A Text Book of Engineering Drawing by Surjit Singh, Dhanpat Rai & Co., Delhi*
2. *Engineering Drawing by PS Gill, SK Kataria & Sons, New Delhi*
3. *Elementary Engineering Drawing in First Angle Projection by ND Bhatt, Charactar Publishing House*
4. *Engineering Drawing I & II by JS Layall, Eagle Parkashan, Jalandhar*

## 1.6 GENERAL WORKSHOP PRACTICE - I

L T P

- - 7

### RATIONALE

*In order to have a balanced overall development of diploma engineers, it is necessary to integrate theory with practice. General workshop practices are included in the curriculum in order to provide hand on experience about use of different tools and basic manufacturing practices.*

*This course aims at developing general manual and machining skills in the students. Besides above, the development of dignity of labour, precision, safety at work place, team working and development of right attitude are the other objectives.*

### DETAILED CONTENTS (PRACTICALS)

The following shops are included in the syllabus:

1. Carpentry and Painting Shop-I
2. Fitting Shop -I
3. Welding Shop-I
4. Electric Shop –I
5. Smithy Shop –I or Electronic Shop-I
6. Sheet Metal Shop-I

#### Note:

1. The branches e.g. Civil Engineering, Electrical Engineering, Mechanical Engineering, Automobile Engineering and Instrumentation & Control Engineering will do **Smithy Shop - I** instead of Electronic shop- I
2. The branches e.g. Electronics and Communication Engineering, will do **Electronic shop-I** instead of Smithy Shop-I.

#### 1. Carpentry and Painting Shop – I

- 1.1 Introduction to various types of wood such as Deodar, Kail, Partal, Teak, Hollack, Sheesham, Champ, etc. (Demonstration and their identification).
- 1.2 Demonstration, function and use of commonly used hand tools. Care, maintenance of tools and safety measures to be observed.  
Job I Marking, sawing and planing practice  
Job II Extensive planing practice on soft wood  
Job III Chiseling practice
- 1.3 Introduction to various types of wooden joints, their relative advantages and uses.  
Job IV Preparation of half lap joint  
Job V Preparation of Mortise and Tenon Joint

- 1.4 Demonstration of various methods of painting wooden items.  
 Job V Preparation of surface before painting.  
 Job VI Application of primer coat  
 Job VII Painting wooden items by brush/roller/spray

## 2. Fitting Shop – I

- 2.1 Introduction to fitting shop, common materials used in fitting shop, Identification of materials. (e.g. Steel, Brass, Copper, Aluminium etc.) Identification of various sections of steel such as Flat, Angle, Tee, Channel, Bar Girder, Square, Z-Section, etc.
- 2.2 Description and demonstration of various types of work benches. Holding devices and files, Precautions while filing. Different types of punches and their uses  
 Job I Filing practice (Production of flat surfaces) Checking by straight edge.  
 Job II Marking of jobs, use of marking tools and measuring instruments.  
 Job III Filing a dimensioned rectangular or Square piece of an accuracy of  $\pm 0.25\text{mm}$ .
- 2.3 Introduction to chipping, Demonstration on chipping and its applications. Demonstration and function of chipping tools.  
 Job IV Chipping practice
- 2.4 Care and maintenance of measuring tools like calipers, steel rule, try square, vernier calipers, micrometer, height gauge, combination set, surface plate, universal angle plate. Handling of measuring instruments, checking of zero error, finding of least count.  
 Job III Preparation of a job by filing on non-ferrous metal upto an accuracy of  $\pm 0.1\text{mm}$   
 Job IV Preparation of job involving thread on GI pipe/ PVC pipe and fixing of different types of elbow, tee union, socket, stopcock, taps, etc.
- 2.5 Description and demonstration of simple operation of hack-sawing, demonstration and description of various types of blades and their specifications, uses and method of fitting the blade.  
 Job V Making a cutout from a square piece of MS Flat using Hand hacksaw.

## 3. Welding Shop – I

- 3.1 Introduction to welding and its importance in engineering practice; types of welding; common materials that can be welded, introduction to welding equipment e.g. a.c. welding set, d.c. rectifier, Electrode holder, electrodes and their specifications, welding screens and other welding related equipment and accessories.
- 3.2 Electric arc welding, (ac. and dc.) precautions while using electric arc welding, Practice in setting current and voltage for striking proper arc.  
 Job I Practice of striking arc while using electric arc welding set.

Job II Welding practice job on arc welding for making uniform and straight weld beads.

3.3 Various types of joints and end preparation.

Job III Preparation of butt joint by arc welding.

Job IV Preparation of lap joint by arc welding.

Job V Preparation of corner joint by using electric arc welding.

Job VI Preparation of Tee joint by arc welding.

#### **4. Electric Shop – I**

4.1 Study, demonstration and identification of common electrical materials such as wires, cables, switches, fuses, ceiling roses, battens, cleats and allied items, tools and accessories.

4.2 Study of electrical safety measures and demonstration about use of protective devices.

Job I Identification of phase, neutral and earth of domestic appliances and their connection to two pin/three pin, plugs.

Job II Lay out of complete wiring of a house (i) batten wiring (ii) plastic casing and capping.

4.3 Study of common electrical appliances such as electric iron, electric kettle, ceiling fan/ table fan, electric mixer, electric Geyser, desert cooler etc.

Job III Testing and rectification of simulated faults in above said electrical appliances.

4.4 Introduction to a Lead-acid battery and its working.

Job IV Installation of a battery and to connect in series and parallel

Job V Charging a battery and testing it with the help of hydrometer and cell tester.

#### **5. Smithy Shop – I**

5.1 Demonstration and detailed explanation of tools and equipment used. Forging operations in Smithy shop. Safety measures to be observed in the smithy shop.

5.2 Demonstration and description of bending operation, upsetting operation, description and specification of anvils, swage blocks, hammers, etc.

5.3 Demonstration and description of tongs, fullers, swages

Job I To forge a L-Hook.

Job II To prepare a job involving upsetting process

Job III To forge a chisel

Job IV To prepare a cube from a M.S. round by forging method.

**OR**

#### **5. Electronic Shop – I**

5.1 Identification and familiarization with the following electronic instruments:

a) Multimeter digital (Three and half digit)

b) Single beam simple CRO, function of every knob on the front panel

- c) Audio-oscillator sine and square wave output
- d) Power supply fixed voltage and variable voltage, single output as well as dual output.

Job I - Practice in the use of above mentioned equipment through a small experiment

- 5.2 Identification and familiarization with commonly used tools: statement of their uses. Identification and familiarisation with active and passive components; colour code and types of resistor and potentiometers (including VDR, LDR, and thermistor). Identification of components including LED, LCD, UJT, FET, Coils, relays, switches (SPDT, DPDT, etc.) connectors, micro switches, reed relays, transformers (mains, audio and RF, etc) Linear and Digital ICs, Thyristors, etc.

**NOTE: Demonstration Boards for the above components should be made.**

Job II Cut, strip, join and insulate two length of wires/ cables (repeat with different types of cables/wires)

Job III Cut, strip, connect/solder/crimp different kinds of wires/ cables (including shielded cable) to different types of power/general purpose/Audio Video/Telephone plugs, sockets, jacks, terminals, binding posts, terminal strips, connectors. The tasks should include making complete recording/ playback/ antenna/ speaker leads for common electronic products such as Radio, TV, VCR, Cassette Recorder, Hi-Fi equipment, Head set, microphone

Job IV Cut, bend, tin component, Leads, inserts and solder components (resistor, capacitor, diodes, transistors, IFT type coils, DIL, ICs etc) on a PCB

Job V Wiring of a small circuit on a PCB/tag strip involving latching, sleeving and use of identifier tags

## 6. Sheet Metal Shop –I

Introduction to sheet metal shop, use of hand tools and accessories e.g. different types of hammers, hard and soft mallet, sheet and wire gauge, necessary allowance required during job fabrication, selection of material.

- 6.1 Introduction and demonstration of hand tools used in sheet metal shop.
- 6.2 Introduction and demonstration of various machines and equipment used in sheet metal shop e.g. Shearing Machine, Bar Folder, Burring Machine, Nibbling machine, Turning Machine, Wiring Machine, Setting Down Machine, Forming Machine, Punching Machine, Brake, Bending Machine etc.
- 6.3 Introduction to various raw materials used in sheet metal shop e.g. black-plain sheet, galvanized-iron plain sheet, galvanised corrugated sheet, aluminium sheets etc.
- 6.4 Study of various types of Nuts, Bolts, Rivets, Steel Screws etc.

- Job I Shearing practice on a sheet using hand shears.
- a) Single rivetted lap joint/Double rivetted lap joint
  - b) Single cover plate chain type/zig-zag type single rivetted Butt Joint

### **RECOMMENDED BOOKS**

1. *Workshop Technology I,II,III, by S K Hajra, Choudhary and A K Chaoudhary. Media Promoters and Publishers Pvt. Ltd., Bombay*
2. *Workshop Technology by Manchanda Vol. I,II,III India Publishing House, Jalandhar.*
3. *Manual on Workshop Practice by K Venkata Reddy, KL Narayana et al; MacMillan India Ltd. New Delhi*
4. *Basic Workshop Practice Manual by T Jeyapoovan; Vikas Publishing House (P) Ltd., New Delhi*

## 2.1 ENGLISH AND COMMUNICATION SKILLS - II

L T P  
3 - 2

### RATIONALE

*Language is the most commonly used medium of self-expression in all spheres of human life – personal, social and professional. A student must have a fair knowledge of English language and skills to communicate effectively to handle the future jobs in industry. The objective of this course is to enable the diploma holders to acquire proficiency, both in spoken (oral) and written language. At the end of the course, the student will be able to develop comprehension skills, improve vocabulary, use proper grammar, acquire writing skills, correspond with others and enhance skills in spoken English. It is expected that each polytechnic will establish a **communication skill laboratory** for conducting practicals mentioned in the curriculum.*

### DETAILED CONTENTS

1. **Facets of Literature** (12 hrs)
  - 1.1 Short stories
    - 1.1.1 The Portrait of a Lady - Khushwant Singh
    - 1.1.2 The Refugees – Pearl S. Buck
  - 1.2 Prose
    - 1.2.1 Forgetting- Robert Lynd.
    - 1.2.2 Walking Tours- Robert Louis Stevenson
  - 1.3 Poems
    - 1.3.1 All The World's A Stage – W. Shakespeare
    - 1.3.2 No Men are Foreign- James Kirkup
2. **The Art of Précis Writing** (04 hrs)
3. **Grammar and Usage** (08 hrs)
  - 3.1 Narration
  - 3.2 Voice
  - 3.3 Idioms and Phrases
4. **Correspondence** (06 hrs)
  - 4.1 Business Letters
  - 4.2 Personal letters
  - 4.3 Application for Job
5. **Drafting** (08 hrs)
  - 5.1 Report Writing
  - 5.2 Inspection Notes
  - 5.3 Memos, Circulars
  - 5.4 Telegrams
  - 5.5 Press Release
  - 5.6 Agenda and Minutes of Meetings

6. **Glossary of Technical & Scientific Terms** (02 hrs)
7. **Communication** (08 hrs)
- 7.1 Media and Modes of Communication
  - 7.2 Channels of Communication
  - 7.3 Barriers to Communication
  - 7.4 Listening Skills- Types of Listening
  - 7.5 Body language

### **LIST OF PRACTICALS**

1. Practice on browsing information from Internet
2. Group Discussions
3. Mock Interviews
4. Telephone Etiquette – demonstration and practice
5. Situational Conversation with feedback through video recording
6. Presentation on a given theme (using PowerPoint)
7. Exercises leading to personality development like mannerism, etiquettes, body language etc.
8. Reading unseen passages
9. Writing (developing) a paragraph
10. Exercises on writing notices and telephonic messages

### **Note:**

1. *The Text Book on “English and Communication Skills, Book-II By Kuldip Jaidka et. al. developed by NITTTR, Chandigarh is recommended to be used for teaching & setting-up the question papers.*
2. *A communication laboratory may be set up consisting of appropriate audio-video system with facility of playing CDs/DVDS and a video camera for recording the performance of each student with play back facility. A set of CDs from any language training organization e.g. British Council etc. may be procured for use of students.*
3. *Elements of body language will be incorporated in all practicals*
4. *The practical exercises involving writing may also be included in Theory Examination.*

## RECOMMENDED BOOKS

1. English and Communication Skills, Book-II By Kuldip Jaidka, Alwinder Dhillon and Parmod Kumar Singla, Prescribed by NITTTTR, Chandigarh & Published By Abhishek Publication, 57-59, Sector-17, Chandigarh
2. Essentials of Business Communication by Pal and Rorualing; Sultan Chand and Sons
3. The Essence of Effective Communication, Ludlow and Panthon; Prentice Hall of India
4. New Design English Grammar, Reading and Writing Skills by AL Kohli (Course A and course B), Kohli Publishers, 34 Industrial Area Phase-II, Chandigarh,
5. New Design English Reading and Advanced Writing Skills for Class XI and XII by MK Kohli and AL Kohli; Kohli Publishers, 34 Industrial Area Phase-II, Chandigarh,
6. A Practical English Grammar by Thomson and Marlinet
7. Spoken English by V Sasikumar and PV Dhamija; Tata McGraw Hill
8. English Conversation Practice by Grount Taylor; Tata McGraw Hill
9. Developing Communication Skills by Krishna Mohan and Meera Banerji; MacMillan India Ltd., Delhi
10. Business Correspondence and Report Writing by RC Sharma and Krishna Mohan; Tata McGraw Hill Publishing Company Ltd. New Delhi
11. Communication Skills by Ms R Datta Roy and KK Dhir; Vishal Publication, Jalandhar

## SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Hrs)	Marks Allotted (%)
1	12	40
2	4	10
3	8	15
4	6	10
5	8	10
6	2	5
7	8	10
<b>Total</b>	<b>48</b>	<b>100</b>

## GLOSSARY OF TECHNICAL & SCIENTIFIC TERMS

1. Absolute	परम, अचर, पूर्ण, स्थिर
2. Acceleration	त्वरण, प्रवेग
3. Acid	अम्ल
4. Alkaline	क्षारीय, स्वारा
5. Air Compressor	वायु - संपीडक
6. Air Conditioning	वातानुकूलन
7. Alignment	सरेखन
8. Alternating Current	प्रत्यावर्ती धारा
9. Altimeter	ऊंचाई मापने का यंत्र
10. Alum	फिटकरी
11. Ammeter	अम्मीटर
12. Ampere	ऐम्पियर
13. Amplification	प्रवर्धन
14. Amplitude	आयाम
15. Angle	कोण
16. Angular Velocity	कोणीय वेग
17. Angular Momentum	कोणीय संवेग
18. Annealing	तापानुशीतन
19. Anode	अनोड
20. Apex	शीर्ष, शिखर, शिखाग्र
21. Apparent	स्पष्ट
22. Applied Mechanics	अनुप्रयुक्त यंत्रिकी
23. Applied Science	अनुप्रयुक्त विज्ञान
24. Archimedes's Principle	आर्किमिडीज़ का सिद्धांत
25. Architecture	वास्तुकला, स्थापत्यकला
26. Armature	आर्मेचर
27. Atom	परमाणु
28. Automatic	स्वचलित
29. Axis	अक्ष
30. Axle	धुरी
31. Balance (Scale)	तुला, तराजू
32. Ball Bearing	बाल - बेयरिंग
33. Bar magnet	छड़ - चुम्बक
34. Barometer	वायुदाबमापी
35. Base	आधार
36. Base Plate	आधार पट्टिका
37. Battery	बैटरी
38. Beaker	बीकर
39. Bending Moment	वक्रण आघूर्ण
40. Blast Furnace	झोका भट्टी
41. Bleach	विरंजक
42. Boiler	उबालक
43. Bridge	पुल
44. Burette	ब्यूरेट
45. Callipers	कैलिपर्स
46. Calorie	कैलोरी
47. Canal	नहर
48. Capacitance	धारिता
49. Carburettor	कार्बुरेटर
50. Cast Iron	ढलवा लोहा

51.	Catalyst	उत्प्रेरक
52.	Cathode	कैथोड
53.	Centre of Gravity	गुरुत्वाकर्षण - केन्द्र
54.	Centrifugal	उपकेन्द्रीय
55.	Centripetal	अभिकेन्द्रीय
56.	Centroid	केन्द्रीय
57.	C.G.S. System	सी.जी.एस. पद्धति
58.	Chemical Action	रासायनिक क्रिया
59.	Chai	श्रृंखला, माला
60.	Change of State	अवस्था परिवर्तन
61.	Characteristics	लक्षण
62.	Charge (n)	आवेश
63.	Choke	चोक
64.	Chord, Major	गुरु स्वर - संघात
65.	Chord, Minor	लघु स्वर - संघात
66.	Circular	वृत्ताकार, वर्तुल
67.	Clock-wise	दक्षिणा वर्त
68.	Coagulation	स्कंदन
69.	Coefficient of Expansion	प्रसार गुणांक
70.	Coil	कुंडली
71.	Combustion	दहन
72.	Compass	दिशासूचक
73.	Compound	यौगिक
74.	Concave	अवतल
75.	Convex	उत्तल
76.	Concentrated (Solution)	गाढ़ा, सांद्रित (घोल)
77.	Concrete	कंकरीट
78.	Conduction	चालन
79.	Conductor	चालक
80.	Cone	शंकु
81.	Connection	सम्बंध, जोड़
82.	Constant (Adj.)	स्थिर, अचल, एकसमान
83.	Convection	संवहन
84.	Coulomb	कूलोम (विद्युत शक्ति की इकाई)
85.	Couple	बल युग्म
86.	Crane	क्रेन
87.	Crystalline	रवेदार
88.	Dehydrate	निर्जल करना
89.	Distil	आसहन करना
90.	Effervescence	बुदबुदाहट
91.	Element	तत्त्व, मूलतत्त्व
92.	Empirical Formula	मूलअनुपाती सूत्र
93.	Equivalent Weight	तुल्यांकी - भार
94.	Flame Test	ज्वाला - परीक्षण
95.	Flash Point	प्रज्वलन - ताप
96.	Flask	फ्लास्क
97.	Spring Balance	कमानी तुला
98.	Soluble	विलयशील
99.	Viscosity	गाढ़ापन
100.	Volumetric Analysis	आयतनी विश्लेषण

## 2.2 APPLIED MATHEMATICS - II

L T P  
5 - -

### RATIONALE

*Applied mathematics forms the backbone of engineering students. Basic elements of Differential calculus and integral calculus and statistics have been included in this course. This will develop analytical abilities to apply in engineering field and will provide continuing educational base to the students.*

### DETAILED CONTENTS

1. **Algebra** (12 hrs)
  - 1.1 Determinants: Elementary properties of determinants up to 3<sup>rd</sup> order, consistency of equations, Cramer's rule.
  - 1.2 Matrix: Algebra of matrices, Inverse of a matrix, matrix inverse method to solve a system of linear equations in 3 variables.
  
2. **Co-Ordinate Geometry** (20 hrs)
  - 2.1 Cartesian and Polar coordinates (two dimensional), conversion from cartesian to polar coordinates and vice-versa, distance between two points (cartesian co-ordinates), section formulae
  - 2.2 Area of triangle when its vertices are given, co-ordinates of centroid, in center of a triangle when the vertices are given, simple problems on locus.
  - 2.3 Equation of straight line in various standard forms (without proof), inter section of two straight lines, angle between two lines. Parallel and perpendicular lines, perpendicular distance formula
  - 2.4 General equation of a circle and its characteristics. To find the equation of a circle, given:
    - \* Centre and radius
    - \* Three points lying on it
    - \* Coordinates of end points of a diameter;
  
3. **Integral Calculus** (30 hrs)
  - 3.1 Integration as inverse operation of differentiation
  - 3.2 Simple integration by substitution, by parts and by partial fractions (for linear factors only)
  - 3.3 Applications of integration for :
    - (a) Simple problem on evaluation of area bounded by a curve and axes.
    - (b) Calculation of Volume of a solid formed by revolution of an area about axes. (Simple problems).
    - (c) To calculate average and root mean square value of a function

4. **Vector Algebra** (12 hrs)  
 a) Definition notation and rectangular resolution of a vector.  
 b) Addition and subtraction of vectors.  
 c) Scalar and vector products of 2 vectors.  
 d) Simple problems related to work, moment and angular velocity
5. **Differential Equations** (06 hrs)  
 Solution of first order and first degree differential equation by variable separation method (simple problems)

#### RECOMMENDED BOOKS

1. Elementary Engineering Mathematics by BS Grewal, Khanna Publishers, New Delhi.
2. Engineering Mathematics by Vol. I & II by S Kohli, IPH, Jalandhar
3. Applied Mathematics by Dr. RD Sharma
4. Applied Mathematics, Vol. I & II by SS Sabharwal & Sunita Jain/ M.L. Moudgil & P.C. Chopra, Eagle Parkashan, Jalandhar
5. Comprehensive Mathematics, Vol. I & II by Laxmi Publications
6. Engineering Mathematics by Dass Gupta
7. Engineering Mathematics by C Dass Chawla, Asian Publishers, New Delhi
8. Comprehensive Mathematics, Vol. I & II by Laxmi Publications
9. Engineering Mathematics, Vol I, II & III by V Sundaram et.al, Vikas Publishing House (P) Ltd., New Delhi
10. Engineering Mathematics by N.Ch.S.N Iyengar et.al, Vikas Publishing House (P) Ltd., New Delhi
11. Engineering Mathematics, Vol I & II by SS Sastry, Prentice Hall of India Pvt. Ltd.,
12. Engineering Mathematics, Vol I & II by AK Gupta, Macmillan India Ltd., New Delhi

#### SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Hrs)	Marks Allotted (%)
1	12	20
2	20	20
3	30	40
4	12	10
5	06	10
<b>Total</b>	<b>80</b>	<b>100</b>

## 2.3 APPLIED PHYSICS – II

L T P  
3 - 2

### RATIONALE

*Applied physics includes the study of a large number of diverse topics related to things that go in the world around us. It aims to give an understanding of this world both by observation and prediction of the way in which objects behave. Concrete use of physical principles and analysis in various fields of engineering and technology*

### DETAILED CONTENTS

#### Section – A : Waves and Applications

1. **Waves and vibrations** (10 hrs)
  - 1.1 Wave motion with examples, generation of waves by vibrating particles
  - 1.2 Types of wave motion - transverse and longitudinal wave motion with examples, sound and light waves, velocity, frequency and wave length of a wave. Relationship between wave velocity, frequency and wave length.
  - 1.3 Simple harmonic motion: definition, expression for displacement, velocity, acceleration, time period, frequency in S.H.M.
  - 1.4 Vibration of cantilever and beam, determination of time period of a cantilever
  - 1.5 Free, forced and resonant vibrations with examples
2. **Applications of sound waves** (05 hrs)
  - 2.1 Acoustics of buildings – reverberation, reverberation time, echo, noise, coefficient of absorption of sound, methods to control reverberation time
  - 2.2 Ultrasonics – production (magnetostriction and piezoelectric methods) and their engineering applications
3. **Light** (10 hrs)

Electromagnetic Waves, properties of Electromagnetic waves, Electromagnetic Spectrum interference of light, types of interference, young's double slit experimentm Coherent source of Light, Diffraction of light, Difference between diffraction and interference.

## Section – B : Electrical Circuits and Electromagnetism

4. **Electrostatics** (08 hrs)
- 4.1 Coulombs law, unit charge
  - 4.2 Electric flux and Gauss's Law, Electric field intensity and electric potential
  - 4.3 Electric field of point charge, charged sphere (conducting and non-conducting), straight charged conductor, plane charged sheet
  - 4.4 Capacitance, types of capacitors, capacitance of parallel plate capacitor, series and parallel combination of capacitors, charging and discharging of capacitor, their behaviour under AC and DC
  - 4.5 Dielectric and its effect on capacitors, dielectric constant and dielectric break down
5. **DC Circuits** (08 hrs)
- 5.1 Concept of electricity, various applications of electricity
  - 5.2 Current, voltage and resistance, potential difference, power, electrical energy and their units, advantages of electrical energy over other forms of energy
  - 5.3 Ohm's law
  - 5.4 Series and parallel combination of resistors, specific resistance, effect of temperature on resistance, co-efficient of resistance
  - 5.5 Kirchhoff's laws, wheatstone bridge principle and its applications
  - 5.6 Heating effect of current and concept of electric power
6. **Electromagnetism** (08 hrs)
- 6.1. Magnetic field and its units
  - 6.2. Biot-Savart Law, magnetic field around a current carrying straight conductor, circular loop and solenoid
  - 6.3. Force on a moving charge and current in a magnetic field, force between two current carrying parallel conductors
  - 6.4. Moving coil galvanometer, conversion of galvanometer into ammeter and voltmeter
  - 6.5. Permeability, dia, para and ferro-magnetic materials

## Section – C : Advanced Physics

7. **Semiconductor physics** (05 hrs)
- 7.1 Energy bands, intrinsic and extrinsic semiconductors, p-n junction diode and its characteristics
  - 7.2 Diode as rectifier – half wave and full wave rectifier
8. **Modern Physics** (10 hrs)
- 8.1 Lasers: concept of energy levels, ionization and excitation potentials; spontaneous and stimulated emission; lasers and its characteristics, population inversion, types of lasers, helium – neon and ruby lasers and applications
  - 8.2 Fibre optics: introduction, optical fiber materials, types, light propagation and applications
  - 8.3 Superconductivity: phenomenon of superconductivity, effect of magnetic field, critical field, type I and type II superconductors and their applications

### LIST OF PRACTICALS (To perform minimum eight experiments)

1. To determine and verify the time period of cantilever by drawing graph between load ( $w$ ) and depression ( $d$ )
2. To verify Ohm's law
3. Determination of voltage-current relationship in a dc circuit under specific physical conditions and to draw conclusions
4. To verify laws of resistances in series and in parallel
5. To convert a galvanometer into an ammeter of a given range
6. To convert a galvanometer into a voltmeter of a given range
7. To study the capacitance of a parallel plate capacitor
8. To study characteristics of a pn junction diode
9. To find the wavelength of a He-Ne laser
10. To compare capacitance using DeSauty bridge
11. To determine ionization potential of Mercury
12. To determine high resistance by substitution method
13. To plot sine wave, square wave on CRO and to determine wavelength and velocity of waves

### RECOMMENDED BOOKS

1. *Test Book of Physics for Class XI (Part-I, Part-II) N.C.E.R.T*
2. *Test Book of Physics for Class XII (Part-I, Part-II) N.C.E.R.T*
3. *Applied Physics, Vol. I and Vol. II, TTTI Publications, Tata McGraw Hill, Delhi*
4. *Concepts in Physics by HC Verma, Vol. I & II, Bharti Bhawan Ltd. New Delhi*

5. *Fundamentals of Physics by Resnick, Halliday and Walker, Asian Book Pvt. Ltd., New Delhi*
6. *Berkeley Physics Course, Vol. I, II & III, Tata McGraw Hill, Delhi*
7. *The Feynman Lectures on Physics by Feynman, Leighton and Sands, Vol. I & II, Narosa Publishing House, Delhi*
8. *Fundamentals of Optics by Francis A. Jenkins & Harvey E White, McGraw Hill International Editions, Physics Series*
9. *A Text Book of Optics, Subramanian and Brij Lal, S Chand & Co., New Delhi*
10. *Comprehensive Practical Physics, Vol, I & II, JN Jaiswal, Laxmi Publishers*
11. *Engineering Physics by PV Naik, Pearson Education Pvt. Ltd, New Delhi*
12. *Applied Physics I & II by RA Banwait & R Dogra, Eagle Parkashan, Jalandhar*

### SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Hrs)	Marks Allotted (%)
1	10	15
2	05	10
3	10	15
4	08	10
5	08	10
6	08	15
7	05	10
8	10	15
<b>Total</b>	<b>64</b>	<b>100</b>

## 2.4 APPLIED CHEMISTRY - II

L T P  
3 - 2

### RATIONALE

*The role of chemistry and chemical products in every branch of engineering is expanding greatly. Now a day various products of chemical industries are playing important role in the field of engineering with increasing number of such products each successive years. The strength of materials, the chemical composition of substances, their behavior when subjected to different treatment and environment, and the laws of heat and dynamic energy have entered in almost every activity of modern life. Chemistry is considered as one of the core subjects for diploma students in engineering and technology for developing in them scientific temper and appreciation of chemical properties of materials, which they have to handle in their professional career. Effort should be made to teach this subject through demonstration and with the active involvement of students.*

### DETAILED CONTENTS

1. **Metallurgy** (10 hrs)
  - 1.1 General metallurgical terms/operations
  - 1.2 Extraction of pure iron, copper and aluminium from their chief ores
  - 1.3 Manufacture of wrought iron from pig iron, manufacture of steel by open hearth process and L.D. process
  - 1.4 Alloys: Types of alloys (ferrous and non ferrous) purposes of alloying, composition, properties and uses of – invar steel, nichrome, stain less steel, brass, bronze, gun metal, duralumin, alnico, germen silver, magnalium
2. **Corrosion.** (06 hrs)
  - 2.1 Definition and electro chemical theory of corrosion, passivity of metals (e.g. Ti, Cr, Fe and Al)
  - 2.2 Preventions and control measures: (i) Internal measures (purification of metals, alloying with corrosion resistant elements, heat treatment) (ii) External measures (application of inhibitors, alteration of corrosion environments, protective coatings – (a) Metallic (b) Non-metallic coating and sacrificial anode)
3. **Fuels.** (12 hrs)
  - 3.1 Introduction, combustion, classification of fuels, characteristics of good fuel
  - 3.2 Calorific value, determination of calorific value by Bomb calorimeter, and Dulong's formula (equation to be assumed, numerical problems)
  - 3.3 Proximate and Ultimate analysis of coal
  - 3.4 Fuel rating: Octane number, cetane number, influence of chemical composition and structure on fuel rating
  - 3.5 Gaseous fuels : Natural gas, LPG, CNG, Hydrogen, Composition, manufacture and uses of water gas, producer gas, biogas,
  - 3.6 Merits and demerits of gaseous fuels over solid and liquid fuels
  - 3.7 Numerical problems (of section 3.1 (only on combustion), 3.2 and 3.3)

4. **Lubricants.** (04hrs)
  - 4.1 Definition and classification of lubricants
  - 4.2 Mechanism of lubrication
  - 4.3 Characteristics of good lubricants
  - 4.4 Properties of lubricants: such as oiliness, emulsification, flash and fire point, volatility, viscosity and viscosity index, cloud and pour point, acidity value, soapification value, coke number.
  
5. **Paints and Varnishes.** (04hrs)
  - 5.1 Constituent of paints, characteristics of good paint
  - 5.2 Constituent and characteristics of varnishes
  - 5.3 Constituent of enamels
  - 5.4 Uses of paints varnishes and enamels
  
6. **Refractories** (04 hrs)
  - 6.1 Introduction and characteristics of good refractory materials
  - 6.2 Types and chemical composition of acidic, basic and neutral refractories
  - 6.3 Applications of refractories
  
7. **Polymers, Plastics and Adhesives.** (08 hrs)
  - 7.1 Polymerization, degree of polymerization (DP). Addition and condensation polymers with suitable examples
  - 7.2 Definition, structure and applications of thermoplastics and thermosetting plastics with examples of each type
  - 7.3 Plasticizer, fillers and binders
  - 7.4 Definition and examples of fibers and elastomers (natural and synthetic rubber)
  - 7.5 Adhesives, synthetic resins (both thermosetting and thermoplastic)

#### **LIST OF PRACTICALS**

1. Estimation of copper in the given copper ore solution by titrating against standard solution of sodium thiosulfate/ or spectrophotometrically.
2. Estimation of total dissolved salts in the given sample of water gravimetrically.
3. Estimation of moisture in the given coal sample gravimetrically
4. Estimation of ash in the given coal sample gravimetrically
5. Determination of viscosity of given liquid by Red Wood viscometer
6. Determination of flash / fire point of the given lubricant using Able' s flash point apparatus
7. Determination of total acid value (Total acid number TAN) of a lubricating oil

## RECOMMENDED BOOKS

1. *Chemistry in Engineering* by J.C. Kuricose and J. Rajaram, Tata McGraw Hill, Publishing Company Limited, New Delhi.
2. *Engineering Chemistry* by P.C.Jain and Monika Jain, Dhanapat Rai Publishing Company New Delhi.
3. *Engineering Chemistry* by Shashi Chawla/A.D. Sharma
4. *Progressive Applied Chemistry – II* by Dr. G.H. Hugar, Eagle Prakashan Jalandhar.

## SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Hrs)	Marks Allotted (%)
1	10	17
2	06	10
3	12	25
4	04	10
5	04	10
6	04	10
7	08	18
<b>Total</b>	<b>48</b>	<b>100</b>

## 2.5 BASICS OF INFORMATION TECHNOLOGY

L T P  
- - 4

### RATIONALE

*Information technology has great influence on all aspects of life. Almost all work places and living environment are being computerized. In order to prepare diploma holders to work in these environments, it is essential that they are exposed to various aspects of information technology such as understanding the concept of information technology and its scope; operating a computer; use of various tools of MS office; using internet etc. form the broad competency profile of diploma holders. This exposure will enable the students to enter their professions with confidence, live in a harmonious way and contribute to the productivity.*

### Note:

1. There will be no theory examination.
2. Explanation of Introductory part should be dovetailed with practical work so that following topics may be explained in the laboratory along with the practical exercises.

### DETAILED CONTENTS

- (1) Information Technology – its concept and scope
- (2) Computers for information storage, information seeking, information processing and information transmission
- (3) Elements of computer system, computer hardware and software; data – numeric data, alpha numeric data; contents of a program, processing
- (4) Computer organization, block diagram of a computer, CPU, memory
- (5) Input devices; keyboard, Scanner, mouse etc; output devices; VDU and Printer, Plotter
- (6) Electrical requirements, inter-connections between units, connectors and cables
- (7) Secondary storage; magnetic disks – tracks and sectors, optical disk (CD, CD-RW and DVD Memory), primary and secondary memory: RAM, ROM, PROM etc., Capacity; device controllers, serial port, parallel port, system bus
- (8) Installation concept and precautions to be observed while installing the system and software
- (9) Introduction about Operating Systems such as Windows, Windows NT etc.
- (10) About the internet – server types, connectivity (TCP/IP, shell); applications of internet like: e-mail and browsing
- (11) Various Browsers like WWW (World wide web); hyperlinks; HTTP (Hyper Text Transfer Protocol); FTP (File Transfer Protocol)
- (12) Basics of Networking – LAN,WAN, Topologies

## LIST OF PRACTICALS

1. Given a PC, name its various components and list their functions
2. Identification of various parts of a computer and peripherals
3. Practice in installing a computer system by giving connection and loading the system software and application software
4. Installation of DOS and simple exercises on TYPE, REN, DEL, CD, MD, COPY, TREE, BACKUP commands
5. Exercises on entering text and data (Typing Practice)
6. **Installation of Windows 98 or 2000 or NT or XP.**
  - (1) Features of Windows as an operating system
    - Start
    - Shutdown and restore
    - Creating and operating on the icons
    - Opening closing and sizing the windows
    - Using elementary job commands like – creating, saving, modifying, renaming, finding and deleting a file
    - Creating and operating on a folder
    - Changing setting like, date, time color (back ground and fore ground)
    - Using short cuts
    - Using on line help
7. **MS-Word**
  - File Management:  
Opening, creating and saving a document, locating files, copying contents in some different file(s), protecting files, Giving password protection for a file
  - Page Set up:  
Setting margins, tab setting, ruler, indenting
  - Editing a document:  
Entering text, Cut, copy, paste using tool- bars
  - Formatting a document:  
Using different fonts, changing font size and colour, changing the appearance through bold/ italic/ underlined, highlighting a text, changing case, using subscript and superscript, using different underline methods
  - Aligning of text in a document, justification of document ,Inserting bullets and numbering
  - Formatting paragraph, inserting page breaks and column breaks, line spacing
  - Use of headers, footers: Inserting footnote, end note, use of comments
  - Inserting date, time, special symbols, importing graphic images, drawing tools
  - Tables and Borders:  
Creating a table, formatting cells, use of different border styles, shading in tables, merging of cells, partition of cells, inserting and deleting a row in a table

- Print preview, zoom, page set up, printing options
- Using Find, Replace options
- Using Tools like:  
Spell checker, help, use of macros, mail merge, thesaurus word content and statistics, printing envelopes and labels
- Using shapes and drawing toolbar,
- Working with more than one window in MS Word,
- How to change the version of the document from one window OS to another
- Conversion between different text editors, software and MS word

## 8. **MS-Excel**

- Starting excel, open worksheet, enter, edit, data, formulae to calculate values, format data, create chart, printing chart, save worksheet, switching between different spread sheets
- Menu commands:  
Create, format charts, organise, manage data, solving problem by analyzing data, exchange with other applications. Programming with MS-Excel, getting information while working
- Work books:  
Managing workbooks (create, open, close, save), working in work books, selecting the cells, choosing commands, data entry techniques, formula creation and links, controlling calculations, working with arrays
- Editing a worksheet, copying, moving cells, pasting, inserting, deletion cells, rows, columns, find and replace text, numbers of cells, formatting worksheet
- Creating a chart:  
Working with chart types, changing data in chart, formatting a chart, use chart to analyze data
- Using a list to organize data, sorting and filtering data in list
- Retrieve data with MS – query: Create a pivot table, customising a pivot table. Statistical analysis of data
- Exchange data with other application: embedding objects, linking to other applications, import, export document.

## 9. **MS PowerPoint**

- a) Introduction to Powerpoint
  - How to start Powerpoint
  - Working environment: concept of toolbars, slide layout, templates etc.
  - Opening a new/existing presentation
  - Different views for viewing slides in a presentation: normal, slide sorter etc.
- b) Addition, deletion and saving of slides
- c) Insertion of multimedia elements
  - Adding text boxes
  - Adding/importing pictures
  - Adding movies and sound

- Adding tables and charts etc.
  - Adding organisational chart
  - d) Formatting slides
    - Using slide master
    - Text formatting
    - Changing slide layout
    - Changing slide colour scheme
    - Changing background
    - Applying design template
  - e) How to view the slide show?
    - Viewing the presentation using slide navigator
    - Slide transition
    - Animation effects etc.
10. **Internet and its Applications**
- a) Log-in to internet
  - b) Navigation for information seeking on internet
  - c) Browsing and down loading of information from internet
  - d) Sending and receiving e-mail
    - Creating a message
    - Creating an address book
    - Attaching a file with e-mail message
    - Receiving a message
    - Deleting a message

## RECOMMENDED BOOKS

1. *Fundamentals of Computer by V Rajaraman; Prentice Hall of India Pvt. Ltd., New Delhi*
2. *Computers Today by SK Basandara, Galgotia publication Pvt ltd. Daryaganj, New Delhi.*
3. *MS-Office 2000 for Everyone by Sanjay Saxena; Vikas Publishing House Pvt. Ltd., New Delhi*
4. *Internet for Every One by Alexis Leon and Mathews Leon; Vikas Publishing House Pvt. Ltd., Jungpura, New Delhi*
5. *A First Course in Computer by Sanjay Saxena; Vikas Publishing House Pvt. Ltd., Jungpura, New Delhi*
6. *Mastering Windows 95, BPB Publication, New Delhi*
7. *Computer Fundamentals by PK Sinha; BPB Publication, New Delhi*
8. *Fundamentals of Information Technology by Leon and Leon; Vikas Publishing House Pvt. Ltd., Jungpura, New Delhi*
9. *On Your Marks - Net...Set...Go... Surviving in an e-world by Anushka Wirasinha, Prentice Hall of India Pvt. Ltd., New Delhi*
10. *Learning MS Office XP by Ramesh Bangia, Khanna Book Publishing Co. (P) Ltd., New Delhi.*
11. *Fundamentals of Information Technology by Vipin Arora, Eagle Parkashan, Jalandhar*

## 2.6 ENGINEERING DRAWING - II

L T P  
- - 6

### RATIONALE

*Drawing is the language of engineers and technicians. Reading and interpreting engineering drawing is their day to day responsibility. The subject is aimed at developing basic graphic skills in the students so as to enable them to use these skills in preparation of engineering drawings, their reading and interpretation . The emphasis, while imparting instructions, should be to develop conceptual skills in the students following BIS SP 46 – 1988.*

### Note:

1. First angle projection is to be followed
2. Minimum 15 sheets to be prepared
3. SP 46 -1988 should be followed
4. Instructions relevant to various drawings may be given along with appropriate demonstration, before assigning drawing practice to the students
5. 20 percent of drawing sheets to be prepared on the third angle projection

### DETAILED CONTENTS

1. **Detail and Assembly Drawing** (02 sheets)
  - 1.1 Principle and utility of detail and assembly drawings
  - 1.2 Practical exercise on drawing from detail to assembly or vice versa using wooden joints as example
2. **Threads** (Min.02 sheets)
  - 2.1 Nomenclature of threads, types of threads (metric). Single and multiple start threads
  - 2.2 Forms of various external thread sections such as V, Square, Acme, Knuckle, Metric, Seller and Buttress thread
  - 2.3 Simplified conventions of left hand and right hand threads, both external and internal threads
3. **Nuts and Bolts** (Min.02 sheets)
  - 3.1 Different views of hexagonal and square headed bolts and nuts
  - 3.2 Assembly of nuts and bolts with washers
4. **Locking Devices** (01 sheet)
  - 4.1 Lock nuts, Castle nuts, Sawn nuts, Split pin lock nut
  - 4.2 Spring washers, Locking plates.

5. **Screws, Studs and Washers** (01 sheet)
  - 5.1 Drawing various types of machine screws
  - 5.2 Drawing various types of studs
  - 5.3 Drawing various types of washers
  
6. **Keys and Cotters** (Min.03 sheets)
 

Various types of keys and their application. Preparation of drawings of various keys and cotters

  - 6.1 Various types of joints (a) Sleeve and Cotter joint (b) Kunckle joint (c) Spigot and Socket joint
  
7. **Coupling** (02 sheets)
 

Flange coupling (protected and unprotected coupling)

  - 7.1 Pin type flexible coupling
  
8. **Rivets and Rivetted Joints** (02 sheets)
  - 8.1 Types of general purpose rivet heads
  - 8.2 Types of rivetted joints - lap, butt (single cover plate and double cover plate), chain and zig-zag riveting.
  - 8.3 Caulking and fullering of rivetted joints.
  
9. **Welded Joints** (01 sheet)
  - 9.1 Various conventions and symbols of welded joints (IS 696)
  - 9.2 Practical application of welded joints say joints of steel frames, windows, doors and furniture.
  
10. Introduction to AutoCAD (not to be included in examination)

### RECOMMENDED BOOKS

1. *A Text Book of Engineering Drawing by Surjit Singh, Dhanpat Rai & Co., Delhi*
2. *Engineering Drawing by PS Gill, SK Kataria & Sons, New Delhi*
3. *Elementary Engineering Drawing in First Angle Projection by ND Bhatt, Charotar Publishing House*
4. *Engineering Drawing I & II by JS Layall, Eagle Parkashan, Jalandhar*

## 2.7 GENERAL WORKSHOP PRACTICE - II

L T P  
- - 6

### RATIONALE

*As we know that, the psychomotor skills are mastered through practice, an opportunity therefore, has been extended to students through this course to refine their skills in different trades. The basic skills developed during first semester will be refined during this course by doing higher order skills jobs. In addition to developing general manual and machining skills in the students, the objective of development of sense of dignity of labour, precision, safety at work places, team working and right attitude among the students will also be met.*

### DETAILED CONTENTS (PRACTICALS)

The following shops are included in the syllabus. Student can opt relevant shops depending upon the need of his/her branch of diploma programme :

1. Carpentry and painting shop-II
2. Fitting shop -II
3. Welding shop -II
4. Electric shop -II
5. Smithy shop –II or Electronic shop-II
6. Sheet Metal Shop –II

#### Note:

1. *The branches e.g. Civil Engineering, Electrical Engineering, Mechanical Engineering, Automobile Engineering will do **Smithy Shop -II** instead of Electronic shop- II*

#### *And*

2. *The branches e.g. Electronics and Communication Engineering, Instrumentation and Control will do **Electronic shop- II** instead of Smithy Shop- II*

#### 1. **Carpentry and Painting Shop - II**

- 1.1 Introduction to joints, their relative advantages and uses.  
Job I Preparation of Dovetail joint and glued joint.  
Job II Preparation of Mitre Joint  
Job III Preparation of a lengthening Joint  
Job IV Preparation of atleast one utility job with and without lamination.
- 1.2 Demonstration of job showing use of Rip Saw, Bow saw and Tenon saw, method of sharpening various saws.
- 1.3 Demonstration of job on Band Saw and Circular Saw, Jig Saw, Chain and Chisel, Universal wood working machine, Saw re-sharpening machine, Saw Brazing unit.
- 1.4 Importance and need of polishing wooden items, Introduction to polishing materials.  
Job V Preparation of surface before polishing.  
Job VI Application of primer coat.  
Job VII Polishing on wooden items

## **2. Fitting Shop – II**

- 2.1 Introduction to various types of threads (internal, external)-single start, multi-start, left hand and right hand threads.
- 2.2 Description and demonstration of various types of drills, taps and dies Selection of dies for threading, selection of drills and taps for tapping operations.  
Job I Making internal and external threads on a job by tapping and dieing operations manually)
- 2.3 Precautions while drilling soft metals, e.g. copper, Brass, Aluminium etc.  
Job II Drilling practice on soft metals (Aluminum, Brass and copper)
- 2.4 Introduction and demonstration of dial type indicator, sine bar and U block with clamps

## **3. Welding Shop – II**

- 3.1 Introduction to gas welding, spot welding and seam welding and machinery and equipment used. Adjustments of different types of flames in gas welding demonstration and precautions about handling welding equipment.  
Job I Practice in handling gas welding equipment (Low pressure and High pressure) and welding practice.
- 3.2 Common welding joints generally made by gas welding.  
Job II Preparation Butt joint by gas welding.  
Job III Preparation of small cot frame from conduit pipe by electric arc welding/gas welding.  
Job IV Preparation of square pyramid from MS rods by welding (type of welding to be decided by students themselves).  
Job V Exercise job on spot/seam welding machine.

## **4 Electric Shop – II**

- 4.1 Importance of three-phase wiring and its effectiveness.  
Job I Laying out 3 phase wiring for an electric motor or any other 3 phase machine.
- 4.2 Estimating and costing of power consumption.  
Job II Connecting single-phase energy meter and testing it. Reading and working out the power consumption and the cost of energy.  
Job III Checking continuity of connection (with tester and lamp) location of faults with a multimeter) and their rectification in simple machines and/or other electric circuits fitted with earthing.
- 4.3 Demonstration of dismantling, servicing and reassembling a table fan/ceiling fan/air cooler/mixer/electric iron, Electric heater, geyser, electric oven, air conditioner etc.  
Job IV Dismantling, servicing serving and reassembling of any of the above electrical appliances.

- Job V Testing Single phase/three phase electrical motor by using voltmeters, ammeter, clip on meter, tachometer etc.
- Job VI Reversing the rotation of a motor.

## 5. Smithy Shop – II

- 5.1 Introduction to various heat treatment processes e.g annealing, hardening, tempering, normalizing etc.
- 5.2 Description of various types of power hammers and their usage (Demonstration only).

Job I To forge a ring to acquaint the students with forge welding

Job II To forge a chisel and acquaint the students with simple idea of hardening and tempering.

Job III To forge squares on both ends of a circular rod

Job IV To forge a single/double ended spanner.

Job V To prepare a job involving drawing down process

OR

## 5. Electronic Shop- II

- 5.1 Demonstrate the jointing methods of mounting and dismantling as well as uses of the items mentioned below:

a) Various types of single, multi-cored insulated screened power, audio video, co-axial, general purpose wires/cables

b) Various types of plugs, sockets connectors suitable for general purpose audio and video use, 2 and 3 pin mains plug and sockets.

Banana-plugs, and sockets, BNG, RCA, DIN, UHF, Ear phone speaker connector, telephone jacks and similar male and female connectors and terminal strips.

c) Various types of switches such as: normal/ miniature toggle, slide, push button piano key, rotary, micro switches, SPST, SPDT, DPST, DPDT, band selector, multi way Master Mains Switch.

d) Various types of protective devices such as : Wire fuse, cartridge fuse, slow acting/fast acting fuse, HRC fuse, thermal fuse, single/multiple circuit breakers, over and under current relays.

- 5.2 Identification and familiarisation with active and passive components; colour code and types of resistor, capacitors and potentiometers (including VDR, LDR, and thermistor). Identification of components including LED, LCD, UJT, FET, Coils, relays, switches (SPDT, DPDT, etc.) connectors, micro switches, read relays, transformers (mains, audio and RF, etc) Linear and Digital ICs, Thyristors, etc.

- 5.3 Demonstrate the following:
1. To make faultless solder joints and soldering on PCBs
  2. To remove components/wires by unsoldering.
  3. To assemble components on boards, chassis, tape strips.
  4. Various laying methods of cables
  5. Exposure to modern soldering and de-soldering processes
  6. Field visits to relevant work-places

Job I De-solder, remove and clean all the components, wires from a given equipment, a PCB or a tap strip using the following

Job II Soldering Iron

Job III Temperature Control soldering Iron

Job IV De-soldering pump

Job V De-soldering strip

Job VI Wiring of a small circuit on a PCB/tag strip involving lacking, sleeving and use of identifier tags

## 6. Sheet Metal Shop-II

- 6.1 Introduction to various metal forming processes e.g. Spinning, Punching, Blanking, cup drawing
- 6.2 Introduction to soldering and brazing.
- 6.3 Introduction to metal spinning process.
  - Job I Preparation of job involving shearing, circular shearing, rolling, folding, beading and soldering process e.g. Funnel or any other job involving above operations.
  - Job II Exercise on job involving brazing process
  - Job III Spinning a bowl/cup/saucer
  - Job IV Visit to an sheet metal industry e.g. coach builders etc.

## RECOMMENDED BOOKS

1. *Workshop Technology I,II,III, by S K Hajra, Choudhary and A K Chaoudhary. Media Promoters and Publishers Pvt. Ltd., Bombay*
2. *Workshop Technology by Manchanda Vol. I,II,III India Publishing House, Jalandhar.*
3. *Manual on Workshop Practice by K Venkata Reddy, KL Narayana et al; MacMillan India Ltd. New Delhi*
4. *Basic Workshop Practice Manual by T Jeyapoovan; Vikas Publishing House (P) Ltd., New Delhi.*

### 3.1 APPLIED MECHANICS

L T P  
3 - 2

#### RATIONALE

*The subject Applied Mechanics deals with basic concepts of mechanics like laws of forces, moments, friction, centre of gravity, laws of motion and simple machines which are required by the students for further understanding of other allied subjects. The subject enhances the analytical ability of the students.*

#### DETAILED CONTENTS

1. **Introduction** (06 hrs)
  - 1.1 Concept of engineering mechanics (Applied Mechanics), definition of mechanics, statics, dynamics, application of engineering mechanics in practical fields.
  - 1.2 Definition of mass and weight basic quantities and derived quantities of basic units and derived units
  - 1.3 Concept of rigid body, scalar and vector quantities
  
2. **Laws of forces** (10 hrs)
  - 2.1 Definition of force, measurement of force in SI units, its representation, types of force: Point force/concentrated force & Uniformly distributed force, effects of force, characteristics of a force
  - 2.2 Different force systems (coplanar and non-coplanar), principle of transmissibility of forces, law of super-position
  - 2.3 Composition and resolution of coplanar concurrent forces, resultant force, method of composition of forces, laws of forces, triangle law of forces, polygon law of forces - graphically, analytically, resolution of forces, resolving a force into two rectangular components
  - 2.4 Free body diagram
  - 2.5 Equilibrant force and its determination
  - 2.6 Lami's theorem (concept only)  
*[Simple problems on above topics]*
  
3. **Moment** (08 hrs)
  - 3.1 Concept of moment
  - 3.2 Moment of a force and units of moment
  - 3.3 Varignon's theorem (definition only)
  - 3.4 Principle of moment and its applications (Levers – simple and compound, balance steel yard, safety valve, reaction at support)
  - 3.5 Parallel forces (like and unlike parallel force), calculating their resultant
  - 3.6 Concept of couple, its properties and effects
  - 3.7 General conditions of equilibrium of bodies under coplanar forces
  - 3.8 Position of resultant force by moment  
*[Simple problems on the above topics]*

4. **Friction** (08 hrs)
- 4.1 Definition and concept of friction, types of friction, force of friction
  - 4.2 Laws of static friction, coefficient of friction, angle of friction, angle of repose, cone of friction
  - 4.3 Equilibrium of a body lying on a horizontal plane, equilibrium of a body lying on a rough inclined plane, friction in simple screw jack
  - 4.4 Calculation of least force required to maintain equilibrium of a body on a rough inclined plane subjected to a force:
    - a) Acting along the inclined plane Horizontally
    - b) At some angle with the inclined plane
5. **Centre of Gravity** (06 hrs)
- 5.1 Concept, definition of centroid of plain figures and centre of gravity of symmetrical solid bodies
  - 5.2 Determination of centroid of plain and composite lamina using moment method only, centroid of bodies with removed portion
  - 5.3 Determination of center of gravity of solid bodies - cone, cylinder, hemisphere and sphere; composite bodies and bodies with portion removed  
*[Simple problems on the above topics]*
6. **Simple Lifting Machines** (10 hrs)
- 6.1. Definition of effort, velocity ratio, mechanical advantage and efficiency of a machine and their relationship, law of machines
  - 6.2. Simple and compound machine (Examples)
  - 6.3. Definition of ideal machine, reversible and self locking machine
  - 6.4. Effort lost in friction, Load lost in friction, determination of maximum mechanical advantage and maximum efficiency
  - 6.5. System of pulleys (first, second, third system of pulleys), determination of velocity ratio, mechanical advantage and efficiency
  - 6.6. Working principle and application of inclined plane, wheel and axle, different pulley blocks, simple screw jack, worm and worm wheel, single and double winch crab. Expression for their velocity ratio and field of their application  
*[Simple problems on the above topics]*

### **LIST OF PRACTICALS**

1. Verification of the following laws:
  - a) Parallelogram law of forces
  - b) Triangle law of forces
  - c) Polygon law of forces
2. To verify the forces in different members of jib crane.
3. To verify the reaction at the supports of a simply supported beam.
4. To find the mechanical advantage, velocity ratio and efficiency in case of an inclined plane.
5. To find the mechanical advantage (M.A), velocity ratio (V.R) and efficiency ( $\eta$ ) of a screw jack.

6. To find the mechanical advantage, velocity ratio and efficiency of worm and worm wheel.
7. To find mechanical advantage, velocity ratio and efficiency of single purchase crab.
8. To find M.A, V.R, and  $\eta$  of :
  - (i) First system of pulleys
  - (ii) Second system of pulleys
9. To find out center of gravity of regular lamina and irregular lamina.
10. To determine coefficient of friction between three pairs of given surface.

### RECOMMENDED BOOKS

1. *A Text Book of Applied Mechanics by S Ramamurtham, Dhanpat Rai Publishing Co. Ltd.*
2. *Applied Mechanics By, Col. Harbhajan Singh, TL Singla and Parmod Kumar Singla Published By Abhishek Publication, 57-59, Sector-17, Chandigarh*
3. *A Text Book of Engineering Mechanics (Applied Mechanics) by RK Khurmi; S Chand and Co. Ltd., New Delhi.*
4. *Text Book of Applied Mechanics by Birinder Singh, Kaption Publishing House, New Delhi.*
5. *Engineering Mechanics by Parsad, Standard Publications, New Delhi.*

### SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Hrs)	Marks Allotted (%)
1	6	10
2	10	22
3	8	18
4	8	18
5	6	10
6	10	22
<b>Total</b>	<b>48</b>	<b>100</b>

## 3.2 PRINCIPLES OF THERMAL ENGINEERING

L T P  
4 - 2

### RATIONALE

*A diploma holder in Automobile Engineering is supposed to look after the I.C engines, air compressors and fuel used in IC engines and air conditioning of automobiles. Therefore, it is essential to teach him concepts, principles, applications and practices covering laws of thermodynamics, basic air cycles, types of fuel used and their properties and components of air conditioners. Hence this subject has been included in this course. It is expected that effort will be made by the teacher to provide enough learning experience to the students for developing necessary competencies related to this subject area.*

### DETAILED CONTENTS

1. **Principles of Thermal Engineering** (08 hrs)
  - Introduction
  - Property, system, surroundings
  - Heat and work
  - Enthalpy and internal energy
  
2. **Gas Laws** (08 hrs)

Boyle's law, charle's law, joule's law, characteristics equation, gas constant, universal gas constant.
  
3. **Law of Thermodynamics** (12 hrs)
  - Zeroth, first and second law of thermodynamics(concept only).
  - Concept of entropy
  - Constant volume, constant pressure, isothermal, hyperbolic, adiabatic and polytropic, throttling and free expansion processes.
  
4. **Air Cycles** (08 hrs)
  - Carnot cycle
  - Otto cycle
  - Diesel cycle
  - Dual combustion cycle
  
5. **Fuels and Combustion** (05 hrs)
  - Properties of fuel.
  - Fuel combustion
  - Air requirement for complete combustion of fuel, Analysis of exhaust gases with the help of electronic analysers.
  
6. **Air Compressor** (09 hrs)
  - Reciprocating air compressor.
  - Working of single stage and double stage compressor and applications.
  - Rotary air compressor.

- Working of fan, blower, booster and super charger.
  - Principle of turbo charger.
7. Testing of I.C. engine and determination of IHP, BHP and FHP. Heat balance sheets, mechanical efficiency, specific fuel consumption. (07 hrs)
  8. Introduction to air conditioning system. Refrigeration cycle, components of air conditioning system and their function and trouble shooting. (07 hrs)

### LIST OF PRACTICALS

1. To find flash point and fire point of given fuel.
2. To find viscosity of given fuel.
3. To study air compressor.
4. To analyse exhaust gases by electronic gas analyzer.
5. To conduct Morse test of multicylinder petrol engines.
6. To prepare heat balance sheet of an IC engine.
7. Identification of components in air conditioning system.

### INSTRUCTIONAL STRATEGY

*Teachers should provide simple exercises to students involving applications of various concepts and principles being covered in the subject. Tutorial sheets on various topics should be prepared and students should be asked to solve them. In practical work, students should independently perform practicals.*

### RECOMMENDED BOOKS

1. *Thermal Engineering by Mathur and Mehta.*
2. *Thermal Engineering by R.S Khurmi.*
3. *Thermal Engineering by R.K. Rajput, Luxmi Publications, New Delhi.*
4. *Thermal Engineering by A.S. Sarao, Satya Prakashan, New Delhi.*
5. *Thermal Engineering by P.L Ballaney, Khanna Publishers, Delhi.*
6. *Thermal Engineering by P.K. Nag.*

### SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Hrs)	Marks Allotted (%)
1	08	12
2	08	12
3	12	16
4	08	12
5	05	08
6	09	14
7	07	13
8	07	13
<b>Total</b>	<b>64</b>	<b>100</b>

## 3.3 AUTOMOTIVE MATERIALS

L T P  
4 - -

### RATIONALE

*Materials play an important role in the construction and manufacture of automobiles and the equipments/tools used in service, maintenance and repair of automobiles/vehicles. Right selection of materials adds to the economy, working and life of machinery. An automobile engineer must be conversant with the properties, uses, availability and costs of materials used in construction/fabrication of different types of vehicles; normal running, service and maintenance (routine, preventive and breakdown) as well as repairs to enable him to perform his functions confidently. The subject of Automobile Engineering materials has been designed to cover the above aspects.*

### DETAILED CONTENTS

1. **Importance of materials in Automobile Engineering** (04 hrs)
  - Classification: Metals and non-metals, Ferrous and non-ferrous metals and their alloys.
  - Names of common metals and their alloys and non metals used in Automobile Industry.
  - Properties of metals and alloys.
  - Physical properties-Appearance, lustre, colour, density and melting point.
  - Mechanical Properties: Strength, stiffness, elasticity, plasticity, toughness, ductility, malleability, brittleness, hardness, fatigue and creep.
  - Thermal and electrical conductivity and corrosion resistance.
  
2. **Ferrous Metals and Alloys** (12 hrs)
  - Classification, composition and uses of cast iron and plain carbon steels.
  - Effect of alloying elements (in brief) such as Aluminium, chromium, Nickel, Cobalt, Manganese, Molybdenum, tungsten, Vanadium, Silicon, Sulphur and Phosphorous.
  - Composition, properties and uses of alloy steels e.g. High speed steel, Stainless steels, Silicon steels, Heat resistant steels, spring steels, ultra high strength steel.
  - Heat Treatment: Definition, objectives and practical aspects, Brief description and uses of principle heat treatment processes, Annealing, Normalizing, Tempering, Hardening, Carburising, Nitriding and Cyaniding.
  
3. **Non-ferrous Metals and Alloys** (12 hrs)
  - Copper: Properties and uses thereof.
  - Composition, properties and uses of copper alloys.
  - Brasses: Cartridge brass, Nickel silver.
  - Bronzes: Phosphor bronze, Al-bronze, Mn-bronze, and Gun metal.

- Properties and uses of Aluminum.
  - Composition, properties and uses of Al-alloys e.g. Duralmin, Yellow metal, Magnalium and Hindalium.
  - Properties and uses of alloys of lead, tin and magnesium.
  - Bearing Metals: Requisite qualities. Composition, properties and uses of white bearing metals. Copper based bearing metals. Aluminium based bearing metals.
4. **Identification and examination of Metals and alloys** (03 hrs)
- Identification tests - Appearance, sound, filing, weight, magnetic, spark, bend and microstructure.
5. **Other Important Materials** (12 hrs)
- Plastics: Definition, classification of plastics, fibre reinforced plastics. Major application of engineering plastics in automobiles.
  - Heat insulating materials: Properties and uses of asbestos, glass wool, thermocole, cork, mica.
  - Sound insulating materials: Cork, fibre boards.
  - Fabrication materials: Wood, plywood, Rubber -natural and synthetic, glasses - plateglass, toughened glass, safety glass.
  - Abrasive materials: silicon carbide, aluminum oxide, diamond, corborandum.
  - Refractory materials: General characteristics and uses of dolomite, ceramics.
  - Protective coating materials: Paints, varnishes, enamels, putti, electroplating materials.
6. **Fuels, Lubricants, Oils and Additives** (15 hrs)
- Fuels: Types, properties, use and suitability of various fuels in automotive engines including compression ignition and spark ignition engines.
  - Lubricants: Classification (SAE and API), Types of lubricants, specifications, properties, uses, commercial names and availability of various types of lubricants. Both oils and greases.
  - Oils: used for cleaning, flushing and protective coatings.
  - Additives: Fuel additives, cleaning additives, antifreeze additives, sealing additives and additives used in lubricating oils.
7. **Selection, specifications and commercial availability of Materials** (06 hrs)
- Practical considerations for selection of material for different Automobile Components.
  - B.I.S: ISO Bureau of Indian standard specifications for metals, non-metals, auto components and other materials (brief discussion)

#### **INSTRUCTIONAL STATREGY**

*The teacher should show various types of materials used in manufacture of Auto parts. Visits to some industry making the components may be arranged. The students should be encouraged to collect samples of different materials.*

### RECOMMENDED BOOKS

1. *Materials and Processes by Y.F. Young*
2. *Materials and Metallurgy by D.S. Nut*
3. *Engineering Materials by Roy Chowdhry*
4. *Engineering Materials by R.S. Deshpande*
5. *Material Science by R.K. Rajput*
6. *Automobile Engineering Vol-I by Dr. Kirpal Singh, Standard Publishers.*

### SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Hrs)	Marks Allotted (%)
1	04	10
2	12	15
3	12	15
4	03	10
5	12	20
6	15	20
7	06	10
<b>Total</b>	<b>64</b>	<b>100</b>

## 3.4 PRODUCTION PROCESSES

L T P

3 - -

### RATIONALE

*Mechanical Workshop Practice contains only practicals in various workshops. There is need felt regarding general idea about various production processes. Also requires is basic knowledge about CNC Machine.*

### DETAILED CONTENTS

1. **Manufacturing Processes** (12 hrs)  
General machine Tools, Description and functions of main parts, Cutting Parameters, Principles of Turning, Drilling, Boring, Shaping, Planing, Slotting and Grinding, Milling and Superfinishing.
  - (a) Foundry Practice (14 hrs)
    - Pattern Making
    - Types of Pattern
    - Pattern Materials
    - Pattern Allowances
    - Introduction to Core Moulding
    - Introduction to Moulding
    - Types of Moulding Sand and their properties
    - Melting and pouring
    - Defect in castings
  - (b) Simple Arc & Gas Welding, Metal forming processes- Die stamping, Metal Drawing, Spinning, Rolling, Extruding, Forging, Tube Drawing.
2. **Modern Machining Processes** (06 hrs)  
Processes, Procedures, Advantages, Limitations and Applications of Electro discharge machining, Electro chemical Machining, USM, AJM and LBM.
3. **Numerical Control of Machine Tools** (08 hrs)  
Introduction to Numerical control of machine tools, NC Machines, CNC machines, Direct numerical control, Advantages and disadvantages of CNC machines, Fundamentals of Part Programming, Manual part Programming, Computer aided part programming.
5. **Powder Metallurgy** (08 hrs)  
Introduction, Production of Metal Powder-Atomization, Milling and grinding, Shooting. Main Characteristics of metal powder - particle shape, Size and Distribution, Apparent Density, Flowability, Compressibility, Purity and Sintering ability, Chemical Composition. Advantages and disadvantages of Power Metallurgy, Applications.

### INSTRUCTIONAL STATREGY

*The teaching of the subject should be in the form of Lecture Cum demonstration so that the students are able to see the processes practically.*

## RECOMMENDED BOOKS

1. *Workshop Technology Vol-I & II by Hazara & Chowdery – Asia Publishing House.*
2. *Workshop Technology by B.K. Manchanda, H. Tata Publications, Delhi.*
3. *Production Technology by R.K. Jain*
4. *Manufacturing Technology by M Adithan and Gupta, New Age International Private Limited, Delhi.*

## SUGGESTED DISTRIBUTION OF MARKS

<b>Topic No.</b>	<b>Time Allotted (Hrs)</b>	<b>Marks Allotted (%)</b>
1	12	26
2	14	28
3	06	12
4	08	18
5	08	16
<b>Total</b>	<b>48</b>	<b>100</b>

### 3.5 AUTOMOBILE CHASSIS, TRANSMISSION & CONTROL SYSTEM

L T P  
5 - -

#### RATIONALE

*Chassis, body, and transmission forms the core of automobile engineering. The subject aims at imparting knowledge and skills in chassis, frames, clutch system, transmission system, drive system, steering mechanism, suspension system, braking system, wheel and tyres and stability of vehicles.*

#### DETAILED CONTENTS

1. **Chassis and Body** (06 hrs)  
Classification of vehicles, layout of conventional type of chassis, function and arrangements of major assemblies, alternative arrangement used such as engine position, types of drive such as front wheel drive, rear wheel drive and four wheel drive.
2. **Automotive Safety Systems** (04 hrs)  
Preventive design, designing for minimum injury in accident, seat belts, air bags, electronic vehicle stability and occupants protection system, pedestrian protection.
3. **Chassis Frames** (03 hrs)  
Types of frame and body stream lining cross members, brackets, and materials of frame and body upholstery.
4. **Clutch** (07 hrs)  
Necessity, function and requirement of clutch, types of clutches: single plate, multi-plate, Hydraulic Power Assisted and wet and dry plate. Constructional details and working of centrifugal, semi centrifugal, diaphragm clutch and fluid coupling, friction disc and lining material.
5. **Transmission** (09 hrs)  
Necessity, function, types of transmission - sliding, constant mesh, synchromesh, epicyclic gear box and automatic transmission, free wheeling mechanism, principle of overdrives and torque converter, description and operation of transfer gear box, common faults and remedies, Continuously Variable Transmission (C.V.T), Automated Manual Transmission (A.M.T).
6. **Final Drive** (07 hrs)  
Propeller shaft - function and constructional details, universal joints - functions and types. Types of final drive-hotchkiss drive, torque tube, differential - principle, function and its working, rear axles-semi- floating, 3/4 floating and fully floating, common faults and remedies.
7. **Front Axle** (04 hrs)  
Types - stub double drop, fully dropped, load distribution, effect of braking of axle shape, steering head, elliot and reverse elliot, steering knuckle.

8. **Steering** (08 hrs)  
Steering mechanism, function, Devis and ackermann requirements of steering gears, working and constructional details of steering gear, steering linkages – sector arm, centre arm, drag link and tie-rod steering stops. Front end geometry – camber, caster Steering Axes inclination, toe in and toe out, Cornering force, cornering power and self righting torque, over steering and under steering, power steering, necessity, salient features of construction and its working. Four wheel steering, common troubles and remedies of steering system of a vehicle.
9. **Suspension System** (08 hrs)  
Function type - independent, rigid axle. Springs, functions, and types (coil, leaf and torsion bar), sprung and un-sprung weight, Characteristics of springs, material, spring eye, bushes, variable rate spring, helper leafs, leaf sections. Camber grading and nippling spring seats, rubber pads, pressure blocks, spring covers, interleaf inserters, pneumatic suspension system. Function and construction of hydraulic dampers (shock absorbers), diagnosis of common faults and their rectifications.
10. **Braking System** (08 hrs)  
- Purpose of brakes, lay out of braking system, components.  
- Types of brakes- mechanical, hydraulic, power.  
- Principle of hydraulic brakes, braking action, master cylinder, wheel cylinder, leading and trailing shoes, self adjusting brakes, self applying and self releasing action, anti-skid devices, pedal travel, brake enclosures, heat generation and operating temperature. Drum brakes - construction and working details. Disc brakes - constructional and working details.
11. **Power Brakes** (08 hrs)  
Air, air hydraulic, hydraulic vacuum their construction and working details. Brake fluid and characteristics, brake liner, hand brake, engine exhaust brake system and its importance, brake tests, common faults and their rectification.
12. **Wheel and Tyres** (06 hrs)  
Wheels, types, hub attachment, wheel specification, tyres classification and purpose, types and construction of pneumatic tyre, composition of covers, tread breaker, bead and casing, causes of excessive tyre wear, effects of different condition of vehicles stability. Care and maintenance of tyres, tubes, static and dynamic balance, retreading of tyres, tubeless tyres, Run flat tyres.
13. **Miscellaneous** (02 hrs)  
History, leading manufacturers of automobiles, their market share, recent developments in automobile industry and automotive component industry in India. Specification of various 2-wheelers and 4-wheelers, milestones in the development of automobiles.

## LIST OF PRACTICALS

1. Study and sketches of heavy and light vehicle chassis.
2. Study and sketches of motor cycle and scooter chassis.
3. Study and sketches of single plate clutch(coil pressure spring and diaphragm type).
4. Study and sketches of multi plate clutch.
5. Study and sketches of sliding mesh gear box.
6. Study and sketches of constant mesh gear box.
7. Study and sketches of synchromesh gear box.
8. Study and sketches of universal joint, slip joint and propeller shaft.
9. Study and sketches of real axle- and differential.
10. Study and sketches of mechanical and hydraulic brake system and its parts.
11. Study and sketches of suspension system-coil, leaf spring, torsion box, shock absorber.
12. Study and sketches of power brake system.
13. Study and sketches of different floating axles (hub -mountings).

## INSTRUCTIONAL STATREGY

*Chassis is the base of an automobile. Use of video films, and LRs be emphasized. Parts, their placement and functions on an open chassis be explained. Practical demonstrations may be given as far as possible.*

## RECOMMENDED BOOKS

1. *Automobile Engineering - I* by Kirpal Singh; Standard Publishers, Delhi.
2. *Automobile Engineering - I* by G.B.S. Narang, C.B.S. Publisher and Distributor, Delhi.
3. *Automotive Chassis & Body* by P.L. Kohli, Tata McGraw Hill, Delhi.
4. *Automotive Chassis and Body* by W.H. Crouse, McGraw Hill Book Company, New Delhi.

## SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Hrs)	Marks Allotted (%)
1	06	08
2	04	04
3	03	04
4	07	08
5	09	12
6	07	10
7	04	04
8	08	10
9	08	10
10	08	10
11	08	10
12	06	08
13	02	02
<b>Total</b>	<b>80</b>	<b>100</b>

## 3.6 AUTOMOBILE ENGINEERING DRAWING - I

L T P

- - 8

### RATIONALE

*The Automobile Engineering Technician irrespective of his field of operation in an industry of transport undertaking, is expected to possess a thorough understanding of engineering drawing which includes clear spatial visualization of the subject and the proficiency in reading and interpreting a wide variety of production drawing and maintenance drawing. Besides this, he is also expected to possess a certain degree of drafting skill depending upon his job functions to perform his day to day activities e.g. communication and discussing the ideas with his superior and passing on instructions to his subordinates in a unambiguous way. The teachers are recommended to give more emphasis to the students by showing them automobile components.*

### DETAILED CONTENTS

#### Drawing of the following components

1. **Joints and Pulleys**
  - Universal joint, slip joint
  - Stepped or cone pulley, V-Belt pulley (1 sheet)
2. **Engine Bearings**
  - Bush bearing
  - Split bearing
  - Thrust bearing
  - Ball bearing
  - Roller bearing - straight and needle (1 sheet)
3. **Engine Components**
  - Four stroke petrol engine piston
  - Two stroke petrol engine piston
  - Four stroke diesel engine piston
  - Connecting rod
  - Crank shaft of 4 cylinder engines
  - Crank shaft of single cylinder engine
  - Spark plug (7 sheets)
4. **Screw jack** (1 sheet)
5. **Transmission** (2 sheets)
  - Single plate clutch
  - Gear box (free hand sketch)
  - Rear axle

### INSTRUCTIONAL STATREGY

*Teachers should demonstrate various components models or cut sections in the class so that the students can comprehend the subject.*

### RECOMMENDED BOOKS

1. *Automobile Engineering Drawing by R.B. Gupta; Satya Parkashan, New Delhi.*
2. *Machine Drawing by P.S. Gill; B.D Kataria and Sons, Ludhiana.*
3. *Machine Drawing by Laxmi Naraynan and Mathur; Jain Brothers, New Delhi.*

## 3.7 AUTOSHOP PRACTICE-I

L T P  
- - 6

### RATIONALE

*Automobile Technician/Foreman/Manager requires a thorough knowledge of Automobile Engineering theoretically as well as practically. Before the students of automobile engineering understand the theoretical aspects of automobile engineering chassis, body and transmission, it is essential to expose the student with the work study. This subject develops in the students, the skill and practical knowledge of automobile and also facilitates them to carry out the overhauling of different systems of automobile in the fifth and sixth semester of shop practice.*

### DETAILED CONTENTS

1. Identification and sketching of general tools of automobile workshop and practice to use them.
2. Identification and sketching of special tools and gauges of automobile workshop and practice to use them.
3. Observe and identify the components of single plate clutch and multiplate clutch.
4. Servicing of clutch: removal of worn out parts, adjustment of clutch, pedal free play and release lever adjustment.
5. Servicing and overhauling of gear boxes: sliding mesh, constant mesh and synchromesh gear box.
6. Servicing and overhauling of differential units and adjustment of backlash.
7. Servicing and overhauling of brakes - mechanical, hydraulic brakes and power brakes adjustments - bleeding of brakes.
8. Servicing of steering system - steering gear boxes correction, adjustment of free play.
9. Checking and adjustment of camber, caster, toe in and toe out, king pin inclination in steering geometry.
10. Servicing of suspension system - leaf springs, independent suspension - coil spring - torsion bar, telescopic shock absorber.
11. Removing dents on body and minor body repairs - body trimming and painting.
12. Painting practice on wood, metal and simple letter writing.
13. Wheel balancing - static and dynamic.
14. Practice in brake shoe riveting and derivetting, aligning the shoes and adjustment of brakes.
15. Overhauling of wheel and exles.

### INSTRUCTIONAL STATREGY

- *Students should be given practical demonstrations.*
- *The working of automobiles may be explained through audio, video films and learning resources.*
- *Repetitive practice is important.*

### RECOMMENDED BOOKS

1. *Car maintenance and Repair by W.Judge*
2. *Carburetors and fuel Injection System by Arthur W.Judge,*

## **ECOLOGY AND ENVIRONMENTAL AWARENESS CAMP**

A diploma holder must have knowledge of different types of pollution caused due to industries and constructional activities so that he may help in balancing the eco system and controlling pollution by pollution control measures. He should also be aware of environmental laws related to the control of pollution.

This is to be organized at a stretch for 3 to 4 days. Lectures will be delivered on following broad topics. There will be no examination for this subject.

1. Basics of ecology, eco system and sustainable development
2. Conservation of land reforms, preservation of species, prevention of advancement of deserts and lowering of water table
3. Sources of pollution - natural and man made, their effects on living and non-living organisms
4. Pollution of water - causes, effects of domestic wastes and industrial effluent on living and non-living organisms
5. Pollution of air-causes and effects of man, animal, vegetation and non-living organisms
6. Sources of noise pollution and its effects
7. Solid waste management; classification of refuse material, types, sources and properties of solid wastes, abatement methods
8. Mining, blasting, deforestation and their effects
9. Legislation to control environment
10. Environmental Impact Assessment (EIA), Elements for preparing EIA statements
11. Current issues in environmental pollution and its control
12. Role of non-conventional sources of energy in environmental protection

## 4.1 ELEMENTS OF STRENGTH OF MATERIALS AND HYDRAULICS

L T P  
5 - 2

### RATIONALE

*A diploma holder in automobile engineering is supposed to select and analyze the reasons for failure of different components and select the required material for different applications. He is also required to select and maintain hydraulics equipments. Therefore, it is essential to teach him concepts, principles, applications and practices covering stresses and strains, beams, bending moment and shear force, springs, shaft etc. and basics of hydraulic including pressure and discharge measurement, pumps and flow through pipes. Hence this subject has been included in this course. It is expected that efforts will be made by the teacher to provide appropriate learning experience to the students for developing necessary competencies related to this subject area.*

### DETAILED CONTENTS

- A. **Strength of Materials:**
1. **Stresses and strains:** (14 hrs)
- Introduction to stress and strain.
  - Mechanical properties of materials.
  - Tensile and compressive stress.
  - Shear stress and strain.
  - Hook's law and Young's Modulus of elasticity.
  - Modulus of Rigidity.
  - Poisson's ratio.
  - Bulk Modulus.
  - Deformation and stress in uniform bar.
  - Deformation and stress in non uniform bar.
  - Temperature stresses.
  - Longitudinal and hoop stress in thin and thick cylinders.
2. **Beam and Bending:** (08 hrs)
- Concept of Beam and their types (simply supported, overhanging, cantilever)
  - Different types of supports.
  - Concept of bending moments and shear force.
  - B.M and S.F. diagram for Beams; for uniformly distributed and concentrated loads.
  - Determination of position of maximum B.M and S.F. in beam. Point of contraflexure.
3. **Bending and Shear Stresses:** (12 hrs)
- Concept of simple bending, assumptions made in it and derivation of bending equation
  - Flexural formulae.
  - Concept of Second Moment of Area and Section Modulus for simple sections:
  - Rectangle cross section.

- Circular cross section.
- Triangular cross section.
- Hollow circular cross section.
- Calculation of bending stresses for the above section with given loading and span.
- Average shear stress in Rectangular and I section.

4. **Springs:** (08hrs)

- Leaf Springs.
- Maximum deflection in leaf springs.
- Maximum stress in leaf springs.
- Close coiled and open coiled springs subjected to axial load and axial twist.
- Stiffness of a spring.
- Strain energy and proof resistance

5. **Shafts:** (08hrs)

- Concept of torque and angle of twist.
- Derivation of Torsion equation.
- Calculation of Torque transmitted by hollow and solid shafts of round sections.

6. **Columns and Struts** (06 hrs)

- Long and short columns
- Buckling of columns
- Euler, Rankine and Gordon formulae

## B. Hydraulics

7. **Basics:** (02 hrs)

- Properties of fluids.

8. **Static Pressure:** (04 hrs)

- Pascal's law
- Concept of static pressure
- pressure head

9. **Measurement of Pressure:** (04 hrs)

- Introduction to absolute pressure, gauge pressure vacuum
- Working of simple manometer differential manometer, bourdon gauge.

10. **Flow of Liquid:** (06 hrs)

- Laminar and turbulent flow.
- Law of continuity.
- Velocity head, datum head, pressure Head, Total head.
- Bernoulli's Theorem.
- Discharge measurement

11. **Flow Through Pipes:** (04 hrs)  
 - Friction losses in pipes.  
 - Darcy's equation.  
 - Head loss due to sudden enlargement, contraction, obstruction and bend.
12. **Hydraulic Machinery** (04 hrs)  
 Description and application of :  
 - Reciprocating pump  
 - Centrifugal pump  
 - Jack  
 - Coupling

### **PRACTICAL EXERCISES FOR SOM**

1. To study tensile behavior of three different metals.
2. To calculate shear strength of two different metal under single and double shear.
3. Test on a spring to study comparative effect of gradual, sudden and falling loads.
4. Calculation of impact strength of metals by
  - Charpy test
  - Izod test
5. To calculate bending strength by performing bending test of
  - A steel box and wooden beams
  - A steel flat
6. To calculate torsion strength of 3 different metals by torsion test.
7. To calculate hardness of metals by
  - Rockwell hardness test
  - Vickers hardness test
  - Visco hardness test

### **PRACTICAL EXERCISES OF HYDRAULICS**

1. Measurement of pressure head with the help of following instruments:
  - Manometer- U tube and inclined tube
  - Piezometer, Bourdon type pressure gauge
2. Study of a reciprocating pump.
3. Study of centrifugal pump.
4. Measurement of flow with
  - Venturi meter
  - Orifice meter
5. Performance characteristics of centrifugal pump
6. Verification of Bernoulli's theorem

**Note:** Study means constructional details, inter-relation of parts working and their identification.

## INSTRUCTIONAL STATREGY

1. Students should be taken to SOM Lab and shown the working.
2. Students may be shown the cut models.

## RECOMMENDED BOOKS

1. *Mechanics of Materials* by Kirpal Singh
2. *Strength of Material* by R.S Khurmi, S Chand & Co., Delhi
3. *Elements of Strength of Materials* by D.R Malhotra and H.C Gupta, Satya Parkashan, New Delhi.
4. *Fluid Mechanics and Machine* by Jagdish Lal.
5. *Fluid Mechanics and Machines* by R.S Khurmi
6. *Mechanics of Solids* by Virender Singh

## SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Hrs)	Marks Allotted (%)
1	14	20
2	8	12
3	12	16
4	08	12
5	08	10
6	06	08
<b>B</b>		
7	02	02
8	04	04
9	04	04
10	06	04
11	04	04
12	04	04
<b>Total</b>	<b>80</b>	<b>100</b>

## 4.2 ELECTRICAL TECHNOLOGY

L T P  
4 - 2

### RATIONALE

*Basic knowledge of Electrical and Electronics Engineering is essential for diploma holders in Mechanical Engineering for the purpose of understanding applications of these subject areas on the shop floor and in handling machines and equipment. This subject imparts basic concepts, principles and applications to enable students to apply these principles in real live situations, may it be production, quality control or repair and maintenance.*

### DETAILED CONTENTS

1. **General Introduction:-** (05 hrs)
  - 1.1 Types of elect. Engg. materials; conducting semi-conducting & insulating materials and their application.
  - 1.2 Applications for electricity and Advantages of Elect. Energy over other types of energy.
  - 1.3 Concept of voltage current power and energy and their units
  
2. **DC Circuits:-** (05 hrs)
  - 2.1 Resistance factors affecting the resistance of conducting metals resistivity and their units.
  - 2.2 Resistances in series & parallel.
  - 2.3 Ohm's Law,
  - 2.4 Faraday's Laws,
  - 2.5 Len's Law.
  
3. **Principles of AC Circuits:-** (12 hrs)
  - 3.1 Concept of voltage generation advantages of three phase generation over single phase generation. Three phase star & delta connections voltage & current relationship (no derivation)
  - 3.2 Def of cycle, frequency time period instantaneous value rms & max value of sinusoidal wave (relation between rms & max value), form factor & peak factor.
  - 3.3 Concept of phase & phase difference.
  - 3.4 Concept of resistance, inductance, capacitance and impedance in ac circuits.
  - 3.5 Power factor(concept of lead, lag & unity p.f.),its importance and improvement.
  - 3.6 Measurement of three phase power using two voltmeter method.
  - 3.7 Determination of true power, current & p. f. in simple ac series circuits (simple problems)
  
4. **DC Machines:-** (08 hrs)
  - 4.1 Construction & principle of working of dc motor & generator.
  - 4.2 Fleming's Rules
  - 4.3 Starting of dc motors ( three-point starter) & speed control.
  - 4.4 Reversing the direction of rotation of dc motors.

5. **AC Machines:-** (10 hrs)  
 5.1 Types of AC motors and their applications  
 5.2 Construction of three phase induction motors, comparison of sq. cage and slip-ring induction motors  
 5.3 Working principle of single phase & three-phase induction motors.  
 5.4 Reversing the direction of rotation of single phase & three phase induction motors.  
 5.5 Starting of three phase induction motors using star/delta & DOI, starters, starting single phase split phase motors.
6. **Transformer:-** (06 hrs)  
 6.1 Construction & working principle.  
 6.2 Transformation ratio, emf equation, losses & efficiency.  
 6.3 Auto transformer,  
 6.4 Cooling of transformers.
7. **Basic Electronics:-** (10 hrs)  
 7.1 Basic idea of semiconductor products, diode, Zener diode, Transistor, SCR and their applications.

#### LIST OF PRACTICALS

1. Verification of Ohm's Law.
2. Series & parallel connection of resistances
3. Measurement of voltage, current & power and p.f. at various loads.
4. Measurement of transformation ratio of a single phase transformer.
5. Measurement of a cu & iron losses of transformer and to determine its efficiency by direct loading method .
6. Starting of three-phase sq. cage induction motor using star/delta starter and DOL starter.
7. Reversing the direction of three phase induction motor & single phase induction motors.
8. Measurement of terminal voltage of dc shunt generator as a function of load current and to plot the load-characteristic curve.
9. Use of multimeter for measurement of voltage & current (ac & dc both).

#### INSTRUCTIONAL STATREGY

- *Students may be given an assignment to prepare a chart of various electrical gadgets, their specification, rates and applications including the motors.*
- *Arrange visit to some Electrical distribution/control room.*

#### RECOMMENDED BOOKS

1. *Electrical Technology by B.L Theraja, S Chand and Co. New Delhi.*
2. *Basic Electrical and Electrical Engineering by S.K Sahadev, Dhanpat Rai and Sons.*
3. *Principles of Electrical Engineering by B.R Gupta, S Chand and Co.*
4. *Basic Electrical Engineering by JB Gupta, SK Kataria and Sons.*
5. *Basic Electricity by B.R. Sharma, Satya Prakashan, New Delhi.*

### SUGGESTED DISTRIBUTION OF MARKS

<b>Topic No.</b>	<b>Time Allotted (hrs)</b>	<b>Marks Allotted (%)</b>
1.	06	10
2.	06	10
3.	15	20
4.	08	15
5.	12	18
6.	07	12
7.	10	15
<b>Total</b>	<b>64</b>	<b>100</b>

## 4.3 GARAGE EQUIPMENTS

L T P  
3 - -

### RATIONALE

*Management of garages forms an important function of automobile technicians. To perform such functions, knowledge of service station equipment, tune up equipment, engine repair tools, electrical repair equipment and reconditioning and fabrication of equipment is very essential. Hence the subject.*

### DETAILED CONTENTS

1. **Service Station Equipment** (06 hrs)  
Specification and application of:
  - Air Compressor
  - Hydraulic Hoist
  - Car washer
  - Oil sprayers
  - Grease dispensers - manual and bucket type
  - Tyre inflation Gauge
  - Tyre Changer
  - Leaf Spring recambering machine
  
2. **Tune up Equipment** (08 hrs)
  - Use of vacuum Performance Gauge
  - Compression Gauge
  - Distribution Tester- cam(dwelling) angle tester(r.p.m.)tester.
  - Battery Tester
  - Spark plug cleaner and tester
  - Ignition timing light
  - Fuel injector tester
  - Fuel consumption tester
  
3. **Engine Repair Tools/Measuring and Tester:** (07 hrs)
  - Specification and use of
  - Torque wrench, pneumatic wrench
  - Piston ring compressor and expander
  - Valve lifter and valve spring tester
  - Piston ring file, groove cleaner
  - Scrappers
  - Use of
  - Inside micrometer
  - Outside micrometer
  - Special micrometer for cylinder bore and crank pin
  - Cylinder Dial gauge
  - Wheel aligning instruments

4. **Electrical Repair Equipment:** (06 hrs)  
 Specifications and use of
- Electrical Test Bench
  - Battery Charger
  - Head Lights Beam Aligner
  - Growler
5. **Chassis Body and Other Reconditioning Testing Equipment**(06 hrs)
- Brake Efficiency Tester
  - Clutch Fixture and Brake Line Rivetters
  - Crane and Chain Pulley Block
  - Jacks
  - Surface Protection Methods
  - Paint Spray Gun
  - Paint Drying Equipment
  - Wheel Balancer- Static and Dynamic
6. **Engine Reconditioning, Testing and Fabrication Equipment**(15 hrs)  
 Specification and use of
- Lathe Machine
  - Drilling Machine
  - Bench Grinder
  - Cylinder Boring Machine and Honing Machine
  - Crankshaft Grinding Machine and Camshaft Grinding Machine
  - Connecting Rod Aligner
  - Line Boring Machine and Arbor Press
  - Nozzle Grinding and Lapping Machine
  - Fuel Injection Pump Calibration Machine
  - Valve Refacer, Valve Seat Cutter and Grinder
  - Radiator Tester
  - Shaping Machine
  - Milling Machine

#### **INSTRUCIONAL STATREGY**

1. *Practical demonstration of use of various equipments will be useful.*
2. *Visit to workshop may he organized.*

#### **SUGGESTED DISTRIBUTION OF MARKS**

<b>Topic No.</b>	<b>Time Allotted (Hrs)</b>	<b>Marks Allotted (%)</b>
1	06	12
2	08	16
3	07	16
4	06	10
5	06	14
6	15	32
7	48	100

# 4.4 AUTOMOBILE ENGINES

L T P  
6 - -

## RATIONALE

*Automotive Engines forms the base of Automobile Engineering. The subject deals with basic concept of 2 stroke and 4 stroke petrol and diesel engine, classification of engines, constructional details, combustion phenomenon fuel system, cooling system, lubrication system, ignition system and effects of environment on engine and emission control have been included in this subject.*

## DETAILED CONTENTS

1. **Introduction** (09 hrs)
  - Basic of tractive power sources viz Mechanical (reciprocating and rotary engine, gas turbines), Electrical, hybrid, fuel cell, solar energy
  - Concept of two stroke and 4 stroke petrol and diesel engines, their application to automobiles, various terms and specifications of auto-engines.
  
2. **Classification of Engines** (08 hrs)

Classification of engines as per stroke, cycle, fuel, ignition, cooling, speed, location, placement, number, arrangement and position of cylinders, governing, cam placement, function, type of valve placement, reciprocating and rotary, Internal and external combustion, parts and scavenging.
  
3. **Engines Components** (10 hrs)

Construction details, specification, function and working of components, cylinder block, head, cylinder liner, piston, piston rings, wrist pin, connecting rod, crankshaft bearing, camshafts, valves and valves mechanisms. flywheel and dampers.
  
4. **Fuel Combustion and Combustion Chambers** (10 hrs)

Combustion phenomenon: Phases of normal combustion, delay period, flame propagation, detonation, pre-ignition, diesel knock, turbulence and combustion chamber types.
  
5. **Fuel System in spark Ignition Engine** (16 hrs)

Fuel System: types of fuel feed system, gravity and pump feed. STE Fuel tank, fuel lines, fuel filters, theory and types of carburetion.

  - Circuits of carburettor: Float circuit, starting and choke circuit, idling, low speed, high speed part load and full load circuits. Construction and working of solex, and amal carburettors. Dual carburettor and multi-barrel carburettor system and gaseous fuels, adoption of gaseous fuels, dry and wet air cleaners. Intake and exhaust manifold, exhaust pipes and mufflers, turbocharges and Air filters.

- Petrol Injection: Introduction to petrol injection, comparison with carburetor method, Types of petrol injection, Multi-point fuel injection system(MPFI) and its types and control. Conservation of fuel and oils.
6. **Fuel System in Compression ignition engine** (12 hrs)  
components, fuel tank, fuel lines, fuel filters, priming pump, fuel injection pump plunger and distributor types, injectors, single orifice, multiple orifice, pintle nozzle, governing and governors (pneumatic, mechanical). Calibration and phasing of fuel injection pump.
  7. **Cooling Systems** (08 hrs)  
Cooling system, necessity, types(air, water) thermo syphon and pump cooling. Viscous fan, Cooling fans, blowers, jackets, water pump, and its devices, hoses, thermostats pressure cap, PVRV cap, anti-freeze solution, scales and corrosion, anti-corrosion treatment, radiator shutters, trouble shooting and remedies.
  8. **Lubrication Systems:-** (06 hrs)  
Necessity and types of lubrication systems (splash and pressure) wet and dry sump. Components used, oil pumps, oil lines, filters, coolers, crank case ventilation. Characteristics, classification, service rating of lubricating oil.
  9. **Ignition system:-** (08 hrs)  
Concept of ignition system, types of ignition systems, coil and magneto. Function and working of coil, distributors, condenser, advance mechanisms, C.B. Point and gap, spark plugs and gaps pertaining to Indian vehicles.
  10. **Effect of Environment on engine:-** (04 hrs)  
Effects on performance of engine due to temperature, pressure, and working conditions like dirt, desert running and their remedial measures.
  11. **Emission Control:-** (06 hrs)  
Effects of pollutants from petrol and diesel engines on human beings and other materials, exhaust pollutants, sources of automotive emission, methods of emission control (by improvement in engine design and by exhaust gas treatment, positive crankcase ventilation, exhaust gas recirculation, catalytic converter for petrol and diesel engines, particulate filter).

#### **LIST OF TASKS/DEMONSTRATION**

Study, sketching and working of:

1. Basic components of an Automobile engine such as cylinder block, cylinder head, piston, connecting rod, crankshaft, fuel pump, Carburettor, fuel injection pump, fuel injectors.
2. Petrol engine fuel system tank, fuel pump.

3. Fuel system of diesel engine.
4. Water cooling system, Radiator, fan, pump
5. Exhaust system of multi-cylinder engine.
6. Fuel pump, identification of its parts with working.
7. Electrical fuel pump.
8. Identification of each part and working of solex carburettor circuits, idling, high speed, acceleration.
9. Maruti carburettor and circuits.
10. Scooter Carburettor.
11. Fuel injection pump 4 and 6 cylinder engine.
12. Fuel injectors

### **INSTRUCTIONAL STRATEGY**

*The students should be exposed to working of automobile engine through visits to industry.*

### **RECOMMENDED BOOKS**

1. *Automobile Engineering - II* by Karpal Singh
2. *Automobile Engineering* by R.B. Gupta
3. *Diesel Engine Mechanics* by N.K. Mangal
4. *Automobile Engineering* by Arthur W. Judge
5. *I.C. Engines* by M.L. Mathur and R.P. Singh
6. *Automobile Engineering* by G.B.S. Narang
7. *Automobile Engineering* by K.M. Gupta Vol. I & II.
8. *Automobile Engineering* by Anil Chhitkara.

### **SUGGESTED DISTRIBUTION OF MARKS**

<b>Topic No.</b>	<b>Time Allotted (Hrs)</b>	<b>Marks Allotted (%)</b>
1	08	09
2	08	08
3	10	08
4	10	08
5	16	15
6	12	15
7	08	08
8	06	08
9	08	10
10	04	05
11	06	06
<b>Total</b>	<b>96</b>	<b>100</b>

## 4.5 AUTOMOBILE ENGINEERING DRAWING - II

L T P  
- - 8

### RATIONALE

*The automobile engineering irrespective of his field of operation in an industry of transport undertaking, is expected to possess a thorough understanding of engineering drawing which includes clear spatial visualization of the subject and the proficiency in reading and interpreting a wide variety of production drawing and maintenance drawing. Besides this he is also expected to possess certain degree of draughting skill depending upon his job functions to perform his day today activities e.g. communication and discussing the ideas with his superiors and passing on instructions to his subordinates in a unambiguous way. The teachers are recommended to give more emphasis to the students by showing term automobile components.*

### DETAILED CONTENTS

1. **Gears** (1 sheet)  
Drawing of gear tooth profile for spur gear, nomenclatures and profiles by approximate and base circle as basis of construction
2. **Cam Profiles** (3 sheets)
  - Different types of cams and followers
  - Types of motion of follower
  - Uniform velocity motion
  - Simple harmonic motion
  - Uniformly accelerated and retarded motion
  - Drawing of cam profiles for the above motions
3. **Engine Components** (3 sheets)
  - Fuel injection pump (Jerk type)
  - Fuel injector
  - Overhead and side valve mechanism
4. **Chassis Components** (4 sheets)
  - Leaf spring suspension
  - Shock absorber
  - Internal expanding shoe brake assembly
  - Master cylinder
  - Wheel cylinder
5. **Auto Electrical Circuits** 1 sheet)
  - Automobile gauges and meters circuit diagram
  - Automobile lighting and signaling circuits
6. Reading and interpretation of an automobile drawing, maintenance drawing.

### RECOMMENDED BOOKS

1. *Automobile Engineering Drawing* by R.B. Gupta, Satya Parkashan, New Delhi
2. *Machine Drawing* by P.S. Gill, BD Katatia & Sons, Ludhiana
3. *Machine Drawing* by Laxi Naraynan and Mathur, Jain Brothers, New Delhi

### INSTRUCTIONAL STRATEGY

*Teachers should demonstrate various components modeler or cut sections in the class so that the students can comprehend the subject.*

## 4.6 AUTOSHOP PRACTICE - II

L T P  
- - 4

### RATIONALE

*Automobile workshop practice inducts practical attitude amongst the automobile engineering technician. A supervision /manager in transport undertaking/private sector have to deal with fabrication, repair and maintenance of vehicle such as patching, painting etc. Therefore, for an automobile technician it is necessary to develop the skill of handling and use of tools and maintenance of the vehicles. As a proprietor of a service station the knowledge of car washer, hydraulic hoist is most essential as lot of repair work of light commercial vehicles has to be carried out on hydraulic hoist.*

### DETAILED CONTENTS

1. Identification and function of each component of air compressor, car washer and hydraulic hoist.
2. Identification dismantling and assembling of AC fuel pump.
3. Identification and sketching of major components in the layout of chassis of a scooter/motor cycle/3 wheeler.
4. Identification and sketching of major components in the layout of chassis of a Car/Jeep, Truck/Bus.
5. Removal and fitting of wheels and tyre's of car/jeep and rotation of tyres, tyre pressure, use of gauges.
6. Removal and fitting of wheels and tyres of a two wheelers and repairing of punctures.
7. Soldering of defective radiator and brazing of a fuel tank.
8. Cleaning, greasing, checking as per maintenance schedule, washing, wiping and polishing of two wheelers.
9. Cleaning, greasing, checking as per maintenance schedule, washing, wiping and polishing of jeep/car.
10. Flushing out water jackets, cleaning of radiator and refitting in vehicle, adjustment of fan belt tension by self adjusting and automatic adjusting.
11. Dismantling and assembly of a carburetors.
12. Dismantling and assembly of water pump.
13. Dismantling and assembly of injectors.
14. Dismantling and assembly of oil pumps.
15. Dismantling and assembly of distributor.
16. Engine tune up.
17. Dismantling and assembly of fuel injection pump.
18. Study of MPFI System used in modern vehicle

### INSTRUCTIONAL STRATEGY

*Emphasis may be given on practical applications and practice on fitting of wheels and rotation of tyres.*

### RECOMMENDED BOOKS

1. *Car Maintenance and Repair* by W. Judge
2. *Carburetors and fuel Injection system* by Arthur W. Judge

## 4.7 MECHANICAL WORKSHOP PRACTICE

L T P  
- - 4

### RATIONALE

*Development of manual and machining skills are important aspects of technician training development. Skills in turning welding machining and fabrication are very essential for an automobile technician. Hence this mechanical workshop is introduced in the syllabus.*

### DETAILED CONTENTS

#### 1. Turning Shop:

- Demonstration of functioning of lathe machine. Names of different parts of machine. Lathe operations, safety measure and practice of starting and stopping of the machine.
- Practical demonstration by instructor: Holding the round bar, facing at one end, centring and rough turning.
- Simple exercise of plain and step turning.
- Taper turning by various methods.
- Cutting simple threads and knurling.

#### 2. Welding Shop:

- One exercise on lap and butt joint each with arc welding.
- One exercise of vertical and overhead arc welding.
- One exercise of welding and cutting.
- One exercise of spot welding.
- One exercise of TIG welding.
- One utility article.

#### 3. Machine Shop:

- Shaping machine: simple exercise of shaping machine.
- Milling machine: simple exercise as gear cutting and rack cutting.
- Drilling: Simple exercise of drilling machine.
- Grinding: Face grinding and surface grinding.

#### 4. Fabrication Shop:

- Practice job in riveting single lap joint.
- Practice job in rivetting double lap joint.
- Extensive practice in soldering and brazing.
- Practice job in joining of auto body parts.

### RECOMMENDED BOOKS

1. *Elements of Workshop Technology* by S.K Chandwary and Hazre, Asia Publishing House, New Delhi
2. *Workshop Technology* by B.S Ragubanshi, Dhanpat Rai & Sons, New Delhi.

## **ENTREPRENEURIAL AWARENESS CAMP**

This is to be organized at a stretch for two to three days during fourth semester. Lectures will be delivered on the following broad topics. There will be no examination for this subject

1. Who is an entrepreneur?
2. Need for entrepreneurship, entrepreneurial career and wage employment
3. Scenario of development of small scale industries in India
4. Entrepreneurial history in India, Indian values and entrepreneurship
5. Assistance from District Industries Centres, Commercial Banks. State Financial Corporations, Small industries Service Institutes, Research and Development Laboratories and other financial and development corporations
6. Considerations for product selection
7. Opportunities for business, service and industrial ventures
8. Learning from Indian experiences in entrepreneurship (Interaction with successful entrepreneurs)
9. Legal aspects of small business
10. Managerial aspects of small business

## 5.1 ELEMENTS OF DESIGN

L T P  
5 - -

### RATIONALE

*Understanding of basic principles of designing of components like cylinder liner, piston, crank shaft, connecting rod, simple mechanism. This subject clears many concepts of quality and standardizations.*

### DETAILED CONTENTS

1. **Introduction** (15 hrs)
  - Design considerations, design procedure
  - Basic requirements, classifications of design and principles of good economic design.
  - Standardization, interchangeability of Automobile parts with reference to IS-specifications.
  - Limits, fits and tolerances.
  - Material selection and economics.
  - Designing for strength
  
2. **Shaft Design** (15 hrs)
  - Stresses in shaft
  - Shaft coupling and various types
  - Design of shafts(Solid and hollow)
  - Design of axles
  - Shaft under torsion
  - Combined bending and torsion
  - Keys & flanged coupling.
  
3. **Design of Auto Parts** (50 hrs)
  - Cylinder liner and cylinder head
  - Piston
  - Connecting Rod
  - Crank Shaft
  - Design of Cam and Cam Shaft
  - Clutch: Single plate clutch and Multiplate clutch
  - Springs: closed coil, bound wire type, helical spring and leaf spring
  - Brakes-Internal expanding shoe brake used in an Automobile
  - Flywheel used in Automotive engines
  - Gears and Bearing
    - (i) Design of spur gear
    - (ii) Design of Bush bearing

### INSTRUCTIONAL STATREGY

*Use of learning resource, CDs and models can help in the understanding the subject.*

### RECOMMENDED BOOKS

1. *Machine Design by P.C. Sharma & Aggarwal*
2. *Machine Design by Pandya & Shah*
3. *Machine Design by R.S. Khurmi*
4. *Machine Design by A.P. Verma*

### SUGGESTED DISTRIBUTION OF MARKS

<b>Topic No.</b>	<b>Time Allotted (Hrs)</b>	<b>Marks Allotted (%)</b>
1	15	20
2	15	20
3	50	60
<b>Total</b>	<b>80</b>	<b>100</b>

## 5.2 MECHANICS OF VEHICLES

L T P  
4 - -

### RATIONALE

*Various types of motions, power transmission, forces acting on moving vehicle, vehicle braking, balancing and vibration in rotating body are some of the concepts which are essential for diploma holders in Automobile Engineering. Hence the subject is introduced in the syllabus.*

### DETAILED CONTENTS

1. **Simple Mechanism** (10 hrs)
  - Definition of link, kinematic pair, kinematic chain, Mechanism, inversions and machines.
  - Simple examples of mechanism with:-
  - Lower pairs, Four bar chain, Slider crank chain, Double slider crank chain, Higher pairs
  
2. **Motion and Turning Moment** (10 hrs)
  - Displacement, velocity and acceleration of piston.
  - Angular velocity and angular acceleration of connecting rod.
  - Calculations of piston effort and crank effort at different angles.
  - Fly wheel - its types, weight and moment of inertia.
  - Fluctuation of energy for fly wheel.
  - Turning moment diagrams with reference to internal combustion engines.
  - Analysis of Hooke's Joint.
  
3. **Power Transmission** (08 hrs)
  - Flat belt, V-belt and chain drives.
  - Ratio of tension of two sides of the belt with and without centrifugal tension.
  - Horse power transmitted and condition for maximum horse power transmitted.
  - Velocity ratios transmitted by
  - Belts
  - Simple, compound and epicyclic gear box.
  
4. **Vehicle in Motion** (10 hrs)
  - Air, grade, and rolling resistances.
  - Tractive effort, traction, Inertia load, Draw bar pull and power required to proper a vehicle.
  - Calculations of acceleration and tractive effort required in case of front wheel drive, rear wheel drive and four wheel drive.
  - Centrifugal force and its effect on vehicle stability on banked and unbanked road.

5. **Vehicle Control** (08 hrs)
- Braking friction and limits of braking.
  - Retardation and Braking force, calculations in case of front wheel, rear wheel and all wheel braking.
  - Weight transfer during braking.
  - Stopping distance and stopping time.
  - Davis and Ackermann Steering Mechanism, Correct Steering angle.
6. **Balancing** (10 hrs)
- Concepts of static and dynamic balancing, working of static and dynamic machine.
  - Balancing of rotating masses-single rotating mass by a single mass rotating in the same plane and by two masses rotating in different planes, balancing of several masses rotating in the same plane. Balancing of several masses rotating in different planes.
7. **Vibration** (08 hrs)
- Introduction, Types of vibrating motion, Types of free vibrations, Natural Frequency of Free longitudinal Vibrations, Natural frequency of free, Transverse vibrations.
  - Causes of vibration in rotating bodies, damping of vibrations, Free damped vibrations (Vacuum Damping)

#### INSTRUCTIONAL STATREGY

1. *Models should be shown.*
2. *Practical demonstrations should be organized.*

#### RECOMMENDED BOOKS

1. *Theory of Machines by R.S. Khurmi*
2. *Automobile Engineering Vol-I, II, Dr. Kirpal Singh, Standard Publishers and Distributor, New Delhi*
3. *Theory of Machines by D.R. Malhotra; Satya Parkashion*
4. *Theory of Machines by PL Balaney; Khanna Publishers, Delhi.*
5. *Mechanics of Vehicles by W. Steed; Kafe books Limited, London.*

#### SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Hrs)	Marks Allotted (%)
1	10	15
2	10	18
3	08	12
4	10	15
5	08	12
6	10	16
7	08	12
<b>Total</b>	<b>64</b>	<b>100</b>

## 5.3 AUTO ELECTRICAL AND ELECTRONIC EQUIPMENT

L T P

4 - 2

### RATIONALE

*Diploma holders in Automobile Engineering have to deal with different types of batteries, their charging and testing, regulators, ignition system, lighting system and various other electrical accessories used in Automobile Engineering. Hence the subject of automotive electric equipment is very essential for these technicians.*

### DETAILED CONTENTS

1. **Introduction** (04 hrs)  
Various Electrical components/systems in Automobile. Their functions and demands, earth return system, types of earthing, 6V, 12V system.
2. **Lead Acid Batteries** (15 hrs)
  - Construction, working, elements, types, materials used, electrolyte and its strength, effect of added plate area and temperature, rating, capacity, efficiency, temperature characteristics, terminal voltages, charging and discharging.
  - Battery Testing: Electrolyte testing by hydrometer, voltage test, high discharge and cadmium test. (voltage)
  - Battery Charging: Constant potential and constant current, initial charging, normal charging, trickle charging, intermittent charging, boost charging.
  - Battery Defects: Sulphation, plates decay, working, erosion, cracking, sedimentation, separator defects, shortcircuits, overcharging.
  - Alkaline Batteries: Construction, working, merits and demerits of Ni-Fe, Ni-Cd, Ag-Zn cells
3. **Charging System** (07 hrs)
  - Circuits, function and various components, dynamo and alternator, types, construction, working, advantages and disadvantages of dynamo and alternators, drives, cut out relay.
  - Regulation: Functions of various components of two unit, three unit and heavy duty Regulators, Regulator adjustments, Regulators for alternators.
4. **Starting System** (10 hrs)
  - Function of various components, torque terms, principle and constructional details of starter motor, switches, types, starter to engine drive and their types, Starter-alternators.
5. **Ignition System** (08 hrs)
  - Constructional details of coil, distribution, condenser, meaning of cam angle, ignition timing, ignition advancing mechanisms,

centrifugal and vacuum type, transistorized ignition system, construction and working details of magneto ignition system.

- Spark Plugs: Constructional details of spark plugs, classification as per reach, heat range, diameter, and effect of leaded fuels, care and maintenance of spark plug.

6. **Lighting System** (06 hrs)

- Various lighting circuits, head lamp, type and constructional details, sealed beam, double filaments, asymmetric and dual units, vertical and side control of lamps, fog light, side light, brake light, instrument light, indicator lights, reversing light, lamp mounting.
- Wiring: HT and LT, their specifications, cable colour codes, wiring Harness, Cable connections, Wiring diagrams, of cars and two wheeler, Fuses, faults and rectification.

7. **Electrical Accessories** (05 hrs)

- Fuel gauges:- bimetallic and balancing coil type, Air pressure gauges, temperature gauges, Ammeter, warning light, speedometers, wind screen wipers, horns, horn relay, electric fuel pump, Faults and rectification.

8. **Miscellaneous Electrical Equipment** (03 hrs)

- Impulse Speedometer, tachometer, heaters, defrosters, Air conditioner, and Electric door locks, window actuation, Seat adjusters.

9. **Electronic Devices** (02 hrs)

- Familiarisation to automobile Electronic devices, Sensing Units, Computer controlled Sensors.

10. **Electronics and Computer Applications in Automobiles** (04 hrs)

Brief introduction of circuit-symbols, Integrated circuits, Amplifiers, filters stepper and synchronous motors, Logic gates, Combinational and sequential logics, Flip flops, sensors. Analog and digital devices, converters, signal conditioners, communication chips, multiplexed wiring, working of ECU, microprocessor and its applications, concept of operation by wire.

**LIST OF PRACTICALS**

1. Testing of Battery with hydrometer and high rate discharge tester, charging of Batteries.
2. Testing and measurement of ignition timing and dwell angle with timing light and cam angle tester.
3. Testing, cleaning and setting of spark plug on spark plug cleaning and testing machine.
4. Testing of alternator rotor and stator winding for short circuit, ground and broken circuit.
5. Head light beam setting.

6. Testing and setting of horn and relay.
7. Testing and fault tracing of field winding, armature and magnetic switch for short circuit, grounding of a starter.
8. Testing dipper switch, flasher unit and indicator circuits and fault tracing.
9. Testing and fault tracing of different components of transistorized ignition system.
10. Testing of magneto ignition circuit and Adjustment.
11. Identification of colour codes for continuity test in a wiring harness.
12. Study and sketching of complete wiring circuit of an Indian vehicle.

### **INSTRUCTIONAL STATREGY**

*Teachers should lay emphasis on concepts and principles while imparting instructions. As far possible, subject teaching should be supplemented by demonstrations in the laboratory. During practical work, individual students should be given opportunities to perform practicals independently.*

### **RECOMMENDED BOOKS**

1. *Automobile Engineering by Kirpal Singh*
2. *Automotive Electrical Equipment by P.L. Kohli*
3. *Automotive Electrical Equipment by William H. Crouse*
4. *Automobile Engineering by R.B. Gupta*

### **SUGGESTED DISTRIBUTION OF MARKS**

<b>Topic No.</b>	<b>Time Allotted (Hrs)</b>	<b>Marks Allotted (%)</b>
1	04	06
2	15	23
3	07	11
4	10	16
5	08	12
6	06	10
7	05	08
8	03	05
9	02	04
10	04	05
<b>Total</b>	<b>64</b>	<b>100</b>

## 5.4 COMPUTER AIDED DRAFTING

L T P

- - 4

### RATIONALE

*The diploma holders are required to integrate the drawings through a soft copy to the machines during production. Thus competency in computer aided drafting is essential. Hence this subject is required.*

### DETAILED CONTENTS

#### 1. Introduction to Cad

- Introduction to Cad: - Advantages and applications, setting the drawing environment: Limits, Grid, Snap, Axis, Units, Ortho, Co-Ordinates ON, OFF Units and Color.
- 2D Drawing entities - Point - Line - Arc - circle, Ellipse, Polygon, and Trace. Object Selection using Object Snap (OSNAP).
- Editing commands: Selection of entities by different methods - copy, Move, Scale, Rotate, Fillet, Chamfer, Mirror, Array-Polar, Rectangular. Measure, Divide, and Erase.
- Drawing Display Methods: Zoom, Pan, and View.
- Adding Texts and Dimensions: Text, Dimension-linear, continued, angular

#### 2. More Learning For Productivity of Drawing

- Pedit commands. Working on multiple layers Layer concepts in CAD -Various options with layer command - Hatch command - Creating line types library and user made library.
- Preparing the schematic drawing of a workshop building in one layer, the blocks of machines in another Layer and Electrical connection on another layer.

#### 3. Advanced Cad Features

- Drawing 2D figure of complex shape
- Extruding it into a 3D drawing
- Understanding 3D Co-ordinate values, Creating and viewing a drawing in 3D.
- Rotating the drawings- Meshing 3D drawing.
- Turning a 3D into 2D Ortho Graphic projection.

#### 4. Advanced 3DFeatures

- Understanding model space and paper space.
- Drawing and working in UCS.
- UCS icon, 3D editing-Union, Subtraction, 3 D Orbit.
- Basic 3D entities command, Box, Cylinder, Cone, Chamfer, Revolve.

5.
  - i) Develop an LISP program that acts as a simple calculator having addition, subtraction, multiplication and division operations.
  - ii) Develop an LISP program that abbreviates some of the CAD commands (Eg: e for erase, C for copy etc.)
  - iii) Develop an LISP program to parametoize certain 2D shapes such as bolt, pulley, gear etc.
  - iv) Developing CAD slides and presenting it.
  - v) Configuring the CAD package with the following settings.
    - One User
    - ISM SVGA monitor
    - Microsoft Serial Mouse at COM1
    - DMP 52 plotter at COM2

#### INSTRUCTIONAL STATREGY

1. *Teachers should demonstrate himself doing it.*
2. *Emphasis should be given on dimensioning and layout of sheet.*
3. *Teacher should ensure use of IS Codes related to drawing.*

## 5.5 GENERIC SKILLS AND ENTREPRENEURSHIP DEVELOPMENT

L T P  
3 - -

### RATIONALE

*Generic Skills and Entrepreneurship Development is one of the courses from “Human Science” subject area. Generic skills have emerged as an important component of employability skills, which enable an individual to become and remain employable over lifetime and to lead happy and prosperous life. Entrepreneurship development aim at developing conceptual understanding for setting-up one’s own business venture/ enterprise. This aspect of Human Resource Development has become equally important in the era, when wage employment prospects have become meager.*

*Both the subject areas are supplementary to each other and soft skills are required to be developed in diploma passouts for enhancing their employability and self confidence.*

### DETAILED CONTENTS

1. **Introduction to Generic Skills** (4 hrs)
  - 1.1 Importance of Generic Skill Development (GSD)
  - 1.2 Global and Local Scenario of GSD
  - 1.3 Life Long Learning (LLL) and associated importance of GSD.
  
2. **Managing Self** (8 hrs)
  - 2.1 Knowing Self for Self Development
    - Self-concept, personality, traits, multiple intelligence such as language intelligence, numerical intelligence, psychological intelligence etc.
  
  - 2.2 Managing Self - Physical
    - Personal grooming, Health, Hygiene, Time Management
  
  - 2.3 Managing Self – Intellectual development
    - Information Search: Sources of information
    - Reading: Purpose of reading, different styles of reading, techniques of systematic reading.
    - Note Taking: Importance of note taking, techniques of note taking
    - Writing: Writing a rough draft, review and final draft.
  
  - 2.4 Managing Self – Psychological
    - Stress, Emotions, Anxiety-concepts and significance
    - Techniques to manage the above

3. **Managing in Team** (6 hrs)
  - 3.1 Team - definition, hierarchy, team dynamics
  - 3.2 Team related skills- sympathy, empathy, co-operation, concern, lead and negotiate, work well with people from culturally diverse background
  - 3.3 Communication in group - conversation and listening skills
  
- 4 **Task Management** (3 hrs)
  - 4.1 Task Initiation, Task Planning, Task execution, Task close out
  - 4.2 Exercises/case studies on task planning towards development of skills for task management
  
5. **Problem Solving** (5 hrs)
  - 5.1 Prerequisites of problem solving- meaningful learning, ability to apply knowledge in problem solving
  - 5.2 Different approaches for problem solving.
  - 5.3 Steps followed in problem solving.
  - 5.4 Exercises/case studies on problem solving.
  
6. **Entrepreneurship**
  - 6.1 Introduction (22 hrs)
    - Concept/Meaning and its need
    - Competencies/qualities of an entrepreneur
    - Entrepreneurial Support System e.g., District Industry Centres (DICs), Commercial Banks, State Financial Corporations, Small Industries Service Institute (SISIs), Small Industries Development Bank of India (SIDBI), National Bank of Agriculture and Rural Development (NABARD), National Small Industries Corporation (NSIC) and other relevant institutions/organizations at State/National level.
  
  - 6.2 Market Survey and Opportunity Identification (Business Planning)
    - How to start a small scale industry
    - Procedures for registration of small-scale industry
    - List of items reserved for exclusive manufacture in small-scale industry
    - Assessment of demand and supply in potential areas of growth.
    - Understanding business opportunity
    - Considerations in product selection
    - Data collection for setting up small ventures.
  
  - 6.3 Project Report Preparation
    - Preliminary Project Report
    - Techno-Economic Feasibility Report
    - Exercises regarding "Project Report Writing" for small projects

## **INSTRUCTIONAL STRATEGY**

*This subject will require a blend of different teaching and learning methods beginning with lecture method. Some of the topics may be taught using question answer, assignment, case studies or seminar. In addition, expert lectures may be arranged from within the institution or from management organizations. Conceptual understanding of Entrepreneurship, inputs by teachers and outside experts will expose the students so as to facilitate in starting ones own business venture/enterprise. The teacher will discuss success stories and case studies with students, which in turn, will develop managerial qualities in the students. There may be guest lectures by successful diploma holding entrepreneurs and field visits also. The students may also be provided relevant text material and handouts.*

## **RECOMMENDED BOOKS**

1. *Generic skill Development Manual, MSBTE, Mumbai.*
2. *Lifelong learning, Policy Brief ([www.oecd.org](http://www.oecd.org))*
3. *Lifelong learning in Global Knowledge Economy, Challenge for Developing Countries – World Bank Publication*
4. *Towards Knowledge Society, UNESCO Paris Publication*
5. *Your Personal Pinnacle of Success by DD Sharma, Sultan Chand and Sons, New Delhi*
6. *Human Learning, Ormrod*
7. *A Handbook of Entrepreneurship, Edited by BS Rathore and Dr JS Saini; Aapga Publications, Panchkula (Haryana)*
8. *Entrepreneurship Development by CB Gupta and P Srinivasan, Sultan Chand and Sons, New Delhi*
9. *Handbook of Small Scale Industry by PM Bhandari*

## **SUGGESTED DISTRIBUTION OF MARKS**

<b>Topic No.</b>	<b>Time Allotted (hrs)</b>	<b>Marks Allotted (%)</b>
1.	4	5
2.	8	15
3.	6	10
4.	3	10
5.	5	10
6.	22	50
<b>Total</b>	<b>48</b>	<b>100</b>

## 5.6 AUTO REPAIR AND MAINTENANCE

L T P  
- - 8

### RATIONALE

*Testing and trouble shooting in an area which forms the main job of a diploma holder in automobile engineering. The competencies in knowing the working and testing of the engine, electrical system will go a long way in instilling confidence for a place in the world of work. The practice in above areas has thus been included in the curriculum. This also includes the driving practice without which testing of vehicle is not possible.*

### DETAILED CONTENTS

1. Servicing of Lubrication system - Flushing, crank case cleaning and replacing oil, filter element.
2. Servicing of fuel system - petrol feed system, cleaning and flushing fuel tank.
3. Servicing feed pump - mechanical pump, electrical pump and testing.
4. Servicing carburetor, cleaning and adjusting of carburettor.
5. Servicing of the air cleaners.
6. Overhauling of Petrol Engine.
7. Engine testing and finding out fuel consumption.
8. Engine out put and efficiency.
9. Emission test using exhaust gas analyzers.
10. Operation and use of engine Analyzer, Analysis of Petrol engine performance.
11. Trouble shooting of engine - Diagnosing and rectifying to the following troubles - Engine overheating, high oil consumption, engine noises and knocks, high fuel consumption, starter turns the engine on but the engine does not start, engine fires but dies out, engine misfires, lack of power, poor acceleration, engine produces black or white smoke.
12. Inside and outside inspection/checking of vehicle, checking of engine oil, horn, starter, cooling water before starting of engine.
13. Painting practice of vehicles to change colour from base.

### RECOMMENDED BOOKS

1. *Automobile Repair by Abbay*
2. *Automobile Practical by N.K. Mangal*
3. *Car Maintenance & Repair W.Judge*

## 5.7 DRIVING PRACTICE-I

L T P

- - 4

### RATIONALE

*Driving is an essential part of learning of an Automobile Engineering Diploma holder. Testing of vehicles is not possible unless driving is known. Driving is learnt only by practice on the vehicle. The driving involves knowledge of motor vehicle act provisions and traffic rules. Practical skills in application of the act. Provision is learnt only by actual practice.*

### DETAILED CONTENTS

1. Know your vehicles- Different elements and their functions.
2. Vehicles controls- Hand controls, Foot controls, other controls, Major/Minor Controls.
3. Predriving checks- before sitting on the driver seats, after sitting on the driver's seat.
4. **Beginning to Drive**
  - Road users characteristics
  - Road sense
  - Traffic sense
  - Anticipation, Judgment
  - Gear changing (high to low and low to high)
  - Holding steering for controlling
  - Road signs & signals
  - Road marking
  - Traffic Signals (hand signal, traffic signs, Automotic lights).
  - Starting the engine
  - Precautions before moving the vehicles.
  - Precautions after moving the vehicles.
  - Positioning on road
  - Parking
  - Stopping distance
  - Following Distance
  - Passing
  - Turning
  - Stopping
  - Reversing
  - Driver's responsibility on road
  - Driving techniques

5. **Driving Practice**  
Simple (in the ground or within the institution about 30 K.M. per students per semester).
6. **Important Provisions of Motor Vehciles Act**  
Learing License, Display of learning sign on the vehicle, Regular Driving license, General Insurance, Vehicle Registation, Pollution test standards/certificates., log book and other documents.
7. **Accidents & Safety:**  
Causes of accidents and precaution to avoid accidents
8. Routine Maintenance, Engine lubrication and cooling system, Bettery top up and charge, Tyres air and wear, Washing, cleaning, greasing and polishing etc.

#### **INSTRUCTIONAL STATREGY**

*After the demonstration, the students be asked to practice.*

# Elective –I

## 5.8.1 AUTOMOTIVE BODY

L T P  
4 - -

### RATIONALE

*Automobile body is very important aspect of management/operation of vehicles. Basic knowledge to diploma students of automobile engineering is significant as they have to deal with the manufacture and up keep of auto body especially accident repair. Hence the subject is added in the syllabus.*

### DETAILED CONTENTS

1. **Auto Body** (10 hrs)
  - Introduction
  - Main features and functions of body
  - Body requirements
  - Types, shapes - Car, Jeep, Medium and Heavy truck Half body, Articulated
  - Design principles
  - Frame construction - tubular, interlated, channel section, Car Frame, Truck frame, Ladder.
  
2. **Body Structures** (12 hrs)
  - Frame less construction
  - Integral construction
  - Semi Unitary or Endo - Skeleton
  - Unitary with sub-frame
  - Car body paneling
  - Special purpose bodies
  - Passenger and luggage requirements, all metal bodies, Coach built bodies.
  - Auto floors, cowl assembly, front end assembly, roof assembly, doors and door fittings.
  
3. **Body Materials** (10 hrs)
  - Requirements of body materials
  - Types of materials and their specifications
  - Timber - ply wood, fibre, boards
  - Steel, M.S. - Angle, Channel, Strips
  - Aluminum alloys - Sheets, Strips, Channels etc.
  - Rivets/Screws
  - Glass - Coloured glass
  - Toughened
  - Fiber reinforced
  - General parts like door handles, hinges, latches locks - Plastics, fibre glass

4. **Seating's and Upholstery** (12 hrs)
- Importance/need of seats
  - Types of seats
  - Seat designs/cont-ours
  - Rigidity and comfort
  - Adjusting mechanisms
  - Seat making
  - Seat materials- Rubber/Foam/Jute, mats/Springs Sutri
  - Seating clothes - Cotton, Rexins, Leather
  - Seats covers and colours, Correct, Upholstry, cuxtain, and curtain materials
  - Maintenance/cleanliness of seat and item of upholstery
  - Interior Fitting-covers/mats, decoration, electrical fittings.
4. **Safety Standards** (08 hrs)
- Safety standards regarding
  - Anchorage
  - Instruments/controls
  - Windshields, glass, wipers
  - Doors, Windows, Roofs
  - Head rests
  - Safety belts
6. **Body Maintenance and Accident repairs** (12 hrs)
- Periodic maintenance for nuts/bolts/latches and moveable parts.
  - General body repairs, replacement of panels and damaged portions, denting systematic, preparatory work, ironing of dents, finishing and patching welding, soldering. General and special tools and equipments for repair work.

#### INSTRUCTIONAL STATREGY

1. *Practical aspects of different bodies may be demonstrated.*
2. *Use of tools may be demonstrated.*

#### RECOMMENDED BOOKS

1. *Automotive Body by Anil Chhikara; SK Kataria Publication.*
2. *Automobile Engineering by G.B. Narang.*
3. *Automobile Engineering by K.M. Gupta.*
4. *Automobile Engineering by Dr. Kirpal Singh.*

#### SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Hrs)	Marks Allotted (%)
1	10	15
2	12	20
3	10	15
4	12	20
5	08	12
6	12	18
<b>Total</b>	<b>64</b>	<b>100</b>

## Elective –I

### 5.8.2 AUTOMOTIVE REFRIGERATION AND AIRCONDITIONING

L T P  
4 - -

#### RATIONALE

*Human comfort has gained priority in latest developments in automobile fields. Automobile air conditioning is now forming part of new technology vehicles. A diploma holder in Automobile Engineering must know basics of refrigeration and air-conditioning and their applications. Hence this subject.*

#### DETAILED CONTENTS

1. **Principles of Refrigeration** (12 hrs)
  - 1.1 Meaning
  - 1.2 Refrigeration Methods
  - 1.3 Units of Refrigeration
  - 1.4 Reversed Carnot Cycle
  - 1.5 Heat Pump
  - 1.6 Coefficient of Performance
  - 1.7 Rating of Refrigeration Machines
  
2. **Refrigeration Systems** (16 hrs)
  - 2.1 Air Refrigeration cycle-applications and its limitations.
  - 2.2 Vapour Compression Cycle.
  - 2.3 Effect of subcooling and super heating.
  - 2.4 Departure of actual vapour compression cycle from theoretical cycle.
  - 2.5 Effect of varying condensing and suction temperature on coefficient of performance.
  - 2.6 Simple mathematical calculation with pressure - enthalpy charts.
  - 2.7 Vapour absorption cycle.
  - 2.8 Actual vapour absorption cycle and application.
  
3. **Refrigerants** (06 hrs)
  - 3.1 Important properties of a refrigerant.
  - 3.2 Properties and application of commonly used refrigerants such as R11, R12, R22, NH<sub>3</sub> and Water.
  - 3.3 Newer refrigerants.
  
4. **Refrigeration System, Components and Controls** (04 hrs)
  - 4.1 Function, types, specification and constructional details of components such as compressor, condenser, throttling device, evaporator, oil, separator, accumulator.
  - 4.2 Various controls - solenoid valve, thermostat, low pressure/high pressure cut out, safety switch.

5. **Psychrometry** (08 hrs)
- 5.1 Various terms- Dry and wet bulb temperatures, saturation, dew point, adiabatic saturation, temperature, relative humidity, absolute humidity, humidity ratio.
- 5.2 Psychrometric chart and its uses.
- 5.3 Psychrometric processes - sensible heating and sensible cooling, humidification and dehumidification, cooling and dehumidification, heating and humidification, and their representation of psychrometric chart.
- 5.4 Simple problems.
6. **Air Conditioning** (08 hrs)
- 6.1 Introduction
- 6.2 Metabolism in human body
- 6.3 Human comfort
- 6.4 Applications of air-conditioning
7. **Air conditioning System** (10 hrs)
- 7.1 Principles of automobile air conditioning.
- 7.2 Air distribution systems, concept of filter, damper, fan, blower, air register and diffuser, case/duct system, engine cooling and heater circuit.
- 7.3 Auto air conditioning systems - operating conditions, car air conditioning, bus air conditioning, truck air conditioning, performance, rating, typical installations.
- 7.4 Causes of failure of auto air conditioners.
- 7.5 Trouble shooting

#### **INSTRUCTIONAL STATREGY**

*Teachers should lay emphasis on concepts and principles related to heating system and air conditioning of automobiles. It is important to make use of audio-visual aids/video films to support the recommended materials.*

#### **RECOMMENDED BOOKS**

1. *Automobile air conditioning by Boyce H Dwiggins, Delman Thomson Publishers.*
2. *Automobile air conditioning by Crouse and Mghin, McGraw Hill Book Company.*
3. *Thermal Engineering by A.A. Sara, Satya Prakashan New Delhi.*
4. *Air Conditioning and Refrigeration by R.K. Rajput, Luxmi Publications, New Delhi.*

#### **SUGGESTED DISTRIBUTION OF MARKS**

<b>Topic No.</b>	<b>Time Allotted (Hrs)</b>	<b>Marks Allotted (%)</b>
1	12	20
2	16	25
3	06	10
4	04	06
5	08	12
6	08	12
7	10	15
<b>Total</b>	<b>64</b>	<b>100</b>

## 6.1 BASICS OF MANAGEMENT

L T P  
3 - -

### RATIONALE

*Since the diploma holders are expected to take up middle level managerial positions, their exposure to basic management principles is very essential. Some topics like Structure of Organization, Leadership, Motivation, Customer Relationship Management (CRM), Legal Aspects of Business, Environmental Considerations, Accident and Safety: Total Quality Management (TQM), Intellectual Property Rights (IPR) etc. have been included in the subject.*

### DETAILED CONTENTS

1. **Introduction:** (8 Hrs)  
Definition and concept of Management, functions of management viz. planning, organizing, staffing, coordinating, controlling; Various areas of management - Human Resource Management (HRM), Financial Management, Marketing Management, Material Management etc.
2. **Structure of Industrial Organization** (4 Hrs)  
Concept and structure of an organization, hierarchical management structure (top, middle and lower level management) and functional management structure.
3. **Leadership** (4 Hrs)  
Concept, importance, types and qualities of a good leader
4. **Motivation** (4 Hrs)  
Concept and importance of motivation - drives and incentives, intrinsic and extrinsic motivation, brief about theories of motivation.
5. **Customer Relationship Management (CRM)** (6 Hrs)  
Need, various types of customers, customer satisfaction, life- long customer, Customer Satisfaction Index (CSI) and its significance in playing effective role of engineers in changing scenario.
6. **Legal Aspects of Business** (12 Hrs)
  - a) Elementary knowledge of Income Tax, Sales Tax, Excise Rules, Provident Fund
  - b) Elementary knowledge of Factory Act, 1948 and Payment of Wages Act 1936, Workmen Compensation Act, Industrial Dispute act 1947, Employees State Insurance Act 1978.
  - c) Labour Welfare schemes including wage payment-types, system of wage payment and incentives.
  - d) Intellectual Property Rights (IPR): Concepts, definition, infringements and remedies related to patents, copyrights, trademarks, and designs. Introduction to registering procedure, patent rules.
  - e) Accident and Safety: Classification, precaution and treatment after accident, safety practices promotion, personal protection equipment (PPEs) for safety at work places.
7. Introduction to Total Quality Management (TQM) and steps to achieve this. (2 hrs)

8. Environmental Considerations (8 Hrs)
- Concept of ecology and environment
  - Factors contributing to Air, Water, Noise Pollution
  - Pollution Control Board
  - Disaster Management-basic idea

### INSTRUCTIONAL STRATEGY

*It is observed that the diploma holders generally take up middle level managerial positions, therefore, their exposure to basic management principles is very essential. Accordingly students may be given conceptual understanding of different topics related to management. Some of the topics may be taught using question answer, assignment or seminar. The teacher will discuss success stories and case studies with students, which in turn, will develop appropriate managerial qualities in the students. In addition, expert lectures may also be arranged from within the institutions or from management organisations. Appropriate extracted reading material and handouts may be provided.*

### RECOMMENDED BOOKS

- Principles of Management by Philip Kotler TEE Publication*
- Principles and Practice of Management by Shyamal Bannerjee: Oxford and IBM Publishing Co, New Delhi.*
- Financial Management by MY Khan and PK Jain, Tata McGraw Hill Publishing Co.: 7, West Patel Nagar , New Delhi.*
- Modern Management Techniques by SL Goel: Deep and Deep Publications Pvt Limited , Rajouri Garden, New Delhi.*
- Management by James AF Stoner, R Edward Freeman and Daniel R Gilbert Jr. : Prentice Hall of India Pvt Ltd, New Delhi.*
- Essentials of Management by H Koontz, C O' Daniel , Mc Graw Hill Book Company, New Delhi.*
- Marketing Management by Philip Kotler, Prentice Hall of India, New Delhi*
- Total Quality Management by Dr DD Sharma, Sultan Chand and Sons, New Delhi.*
- Intellectual Property Rights and the Law by Dr. GB Reddy.*
- Service Quality Standards, Sales & Marketing Department, Maruti Udyog Ltd.*
- Customer Relationship Management: A step-by-step approach, Mohamed & Sagadevan Oscar Publication, Delhi*
- Customer Relation Management, Sugandhi RK, Oscar Publication, Delhi*
- Environment Engineering by GN Pandey & GC Pandey, Tata McGraw Hill Publication.*

### SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (hrs)	Marks Allotted (%)
1.	8	15
2.	4	10
3.	4	10
4.	4	12
5.	6	10
6.	12	15
7.	2	08
8.	8	20
<b>Total</b>	<b>48</b>	<b>100</b>

## 6.2 AUTOMOBILE RECONDITIONING

L T P  
4 - -

### RATIONALE

*A diploma holder is supposed to encounter vehicle breakdown and maintenance problems during his duties. He should be able to check up the performance of the vehicle and take correct measure to make up for power losses and other such defects occurring due to wear and tear in operation. It is rather highly uneconomical to out rightly reject and replace the whole unit observed to be faulty if it is possible to recondition the some of the parts like cylinder, piston, crankshaft etc. at a lesser cost. It is with this consideration that reconditioning should be undertaken. This subject is designed to give foundational knowledge and skill regarding reconditioning and maintenance.*

### DETAILED CONTENTS

1. **Servicing and Maintenance** (10 hrs)
  - Servicing and its necessity. Types of servicing. Classifying motor vehicles for servicing.
  - Engine deknocking methods, precautions to minimize carbon deposits in the combustion chamber.
  - Road services, inspection before and after servicing road test and test report.
  - Concept of maintenance.
  - Preventive maintenance.
  - Maintenance schedules.
  - Seasonal maintenance.
  - Break down maintenance.
  - Maintenance chart.
  
2. **Overhauling** (10 hrs)
  - Explanation of overhauling, necessity of overhauling, period of overhauling, Delaying of overhauling period, Precautions taken during overhauling.
  - Overhauling procedure (Dismantling and assembling) of engine, clutch, gear box, differential, axles, brake assemblies, suspension system, steering system.
  
3. **General Components** (10 hrs)
  - Method of engine decarbonising and its need.
  - Method and necessity of engine sump flushing, cleaning of oil filter and air cleaner.
  - Necessity and method of adjustment of dynamo/alternator belt tension, valve clearance, spark pluk gap.
  - Valve seat cutting and grinding, valve refacing
  - Systematical approach to disconnect engine parts and accessories from chassis, removal of engine assembly, use of engine dismentalling tools, cleaning of engine components.
  - Storage of tyre and tubes.

- Factors determining retreading of tyre.
  - Salient features of hot and cold retreading plants.
4. **Reconditioning of Cylinders** (08 hrs)
- Cylinder wear - ovality and taper in cylinder and their measurement.
  - Necessity of cylinder reboring
  - Dimensions for reboring with reference to any engine i.e. M&M vehicle, Tata vehicle, Leyland vehicle(Indian vehicles).
  - Number of rebores in light and heavy motor vehicle engines.
  - Reconditioning of cylinder by boring, boring machines operation and procedure.
  - Ridge removing, cylinder honing.
  - Fitting and removing cylinder liners
5. **Piston and Piston Rings** (04 hrs)
- Measurement of piston ring side clearance and worn gudgeon pin holes.
  - Method and procedure of replacement of pistons and piston rings.
  - Piston grooves cleaning. Over size of piston and rings of light and heavy engines.
6. **Crank shaft, Cam shaft and Engine Bearing** (08 hrs)
- Necessity and method of crank shaft and cam shaft grinding, effect on the performance of engine.
  - Operation of crank shaft and cam shaft grinding machine size of crank shaft and cam shaft grinding amount.
  - Building up worn journals.
  - Over sizes of crank and cam shaft bearings.
  - Alignment of connecting rod, replacement of big and small end bearing and its over sizes.
  - Changing of connecting rod bush.
  - Bearing clearance, its measurement and effect on engine performance.
7. **Welding** (08 hrs)
- Introduction to welding
  - Types of welding
  - Principles and uses of gas welding - high pressure and low pressure.
  - Description of gas welding equipment, different types of flames and their applications.
  - Fluxes and fillers
  - Welding techniques and safety precautions
  - Principles of arc welding
  - Description of AC and DC welding equipment and their applications.
  - Electrodes and their specifications

- Resistance welding, its types and uses
- Welding defects and testing of its joints
- Modern techniques of welding - brief description and uses
- Welding of different metals
- Metal spraying

8. **Painting** (06 hrs)

- Preparation of surfaces for painting
- Undercoating, its necessity
- Sequence of painting
- Testing of coated surfaces
- Spray and oven painting
- Paint sprayers and sanders

**INSTRUCTIONAL STATREGY**

*The teacher may preferably treat the subject can Lecture Cum Demonstration basis.*

**RECOMMENDED BOOKS**

1. *Automobile Engineering, Vol I and II by Kirpal Singh.*
2. *Practical Mechanic by Srivastava.*
3. *Automobile Engineering by GBS Narang.*

**SUGGESTED DISTRIBUTION OF MARKS**

<b>Topic No.</b>	<b>Time Allotted (Hrs)</b>	<b>Marks Allotted (%)</b>
1	10	14
2	10	18
3	10	18
4	08	10
5	04	06
6	08	12
7	08	12
8	06	10
<b>Total</b>	<b>64</b>	<b>100</b>

## 6.3 MOTOR VEHICLE ACT AND TRANSPORT MANAGEMENT

L T P  
4 - -

### RATIONALE

A diploma holder is supposed to perform following types of functions:

- Significance of vehicle accident
- Accidental vehicle claim study
- Compensation from Insurance Company
- Thorough study of Motor Vehicle Act
- Driving Practices of 2/4 wheelers (private and commercial vehicles)

Therefore, it is essential to teach them Motor basic principles, essentials and appropriateness practices covering Motor Vehicle Act and driving of different vehicles. Hence this subject has been included in this course. It is expected that efforts will be made by the teacher to provide learning experiences to students for developing necessary competencies related to this subject area.

### DETAILED CONTENTS

1. **Motor Vehicle Act** (08 hrs)  
Definition and provisions (Salient features of M.V. Act).  
Requisites and formalities for following:
  - Different forms, application for various Uses
  - Registration of old and new vehicles
  - Private and commercial vehicle
  - Transfer of vehicle - Local and State to State.
2. **Inspection and Fitness of Vehicle** (06 hrs)
  - Fitness of vehicle
  - Private and Commercial,
  - Permit consideration for transport and public service
3. **Insurance** (08 hrs)
  - Different types.
  - Procedure to get Accidental claim and compensation
  - Surveyor duties, Relations between company and surveyor
4. **Driving** (08 hrs)
  - Driving License
  - Different types of driving licenses
  - Procedure to get license.
  - Private, commercial, invalid, international license
  - Principle of Driving
  - Driving procedure
  - Driving precautions
  - Driving in abnormal conditions: Like Hilly, night, fog, typhoon, heavy traffic, rainy

5. **Road Safety** (06 hrs)
- Road Signs
  - Imposition of Penalties for violation
  - Act and Articles
  - Duties of Driver
  - Duties of conductor, Duties of Helpers
6. **Pollution Control** (08 hrs)
- Different contents of exhaust gas
  - Prescribed standards for vehicles
  - Control of pollution
  - Fuel efficiency
  - Storage, Handling and efficient use of fuels & oils.
7. **Transport Management** (20 hrs)
- Structure of fleet organization
  - State transport - optimum utilization of fleet
  - Road worthiness requirement
  - Maintenance of log book
  - History sheet, causes and prevention of: Road Accident  
Analysis of Accident
  - Economy of replacement
  - Inspection Procedure-Required accessories, preliminary requirements, Exterior and interior inspection, inspecting the engine compartment, inspecting the Trunk Bottom, Test Drive
  - Assessment of used vehicles for sale and purchase
  - Automotive Associations in India.

#### **INSTRUCTIONAL STATREGY**

*Topics need to be supplemented by examples from Practical life problems as experienced by Drivers.*

#### **RECOMMENDED BOOKS**

1. *Journal of Transport Management by C.I.R.T. Pune*
2. *Motor Vehicle Act of India (with Latest Amendment)*
3. *Motor Vehicle Act with Rules by B.S. Kohli*
4. *Automobile Engineering Vol I by Dr. Kirpal Singh*

#### **SUGGESTED DISTRIBUTION OF MARKS**

<b>Topic No.</b>	<b>Time Allotted (Hrs)</b>	<b>Marks Allotted (%)</b>
1	08	12
2	06	12
3	08	12
4	08	12
5	06	12
6	08	15
7	20	25
<b>Total</b>	<b>64</b>	<b>100</b>

## 6.4 AUTO RECONDITIONING WORKSHOP

L T P

- - 6

### RATIONALE

*A diploma holder in Automobile Engineering should have a reasonable practice in overhauling, reconditioning, pump calibration and maintenance of automobiles. This subject in actual practice of shop floor had been added to impart competency to handle above work areas.*

### DETAILED CONTENTS

1. Decarbonising of Engines - removing carbon deposits from engine combustion chamber, piston crown, and valve parts. Latest trends in decarbonising.
2. Inspection of crankshaft - bearing replacement and setting of journal bearings, crank pin bearings and crank shaft bearings, measuring bearing clearances by gauges.
3. Servicing of valve and valve mechanism - replacement of valves, valve seats, valve guide, checking and replacement of defective springs, facing of valve, tappet and rocker arm and seat reconditioning, lopping adjusting of valve tappets.
4. Overhauling of Diesel engine.
5. Testing of fuel injector in fuel injection tester.
6. Callibration of fuel injection pump on fuel callibration machine.
7. Operation and use of engine analyzer, analysis of diesel engine performance.
8. Surfacing of cylinder heads, cylinder blocks and manifolds with cylinder head refacing machine.
9. Practice in cylinder ridge removing.
10. Practice in cylinder boring machine, measuring ovality and taperness of cylinder bore, using cylinder dial gauge, inside micrometer, telescopic gauge, use of direct reading micrometer.
11. Practice in honing cylinder blocks, keeping allowance of cylinder clearances.
12. Demonstration in crankshaft of metal spraying and grinding, measuring of ovality and taperness of journals and crank pins. Setting and grinding of

- cam shaft journals, heat treatment of crank shaft, crack detection and demagnetising.
13. Practice of crankshaft, crankpin, journal grinding, main journal grinding on crankshaft grinding machine.
  14. Aligning of the connecting rod.
  15. Practice of cam shaft journals on line boring machine.
  16. Practice in fitting cylinder liners - sleeving and desleeving.
  17. Practice in nozzle grinding and lapping, setting of injection pressure and nature of spray.
  18. Practice in bending and nipple forming of fuel pipes.
  19. Practice on brake drum lathe, measuring ovality, skimming the brake drum.
  20. Visit to Tyre retreading plant in the near by area.

#### **RECOMMENDED BOOKS**

1. *Automobile Engineering by Kirpal Singh, Standard Publishers Distributors Limited, Delhi*
2. *Automotive Electrical Equipment by P.L. Kohli*
3. *Automotive Electrical Equipment by William H. Crouse*
4. *Automobile Engineering by R.B. Gupta, Satya Prakashan.*

#### **INSTRUCTIONAL STRATEGY**

*All the practicals need thorough practice by the students as it is required to be given more thrust. The students must understand the constructional details, functions of each of the parts and minute details of settings.*

## 6.5 PRODUCTION PLANNING AND COSTING

L T P  
4 - -

### RATIONALE

*A diploma holder in Automobile Engineering is supposed to look after the planning scheduling and production control activities in the industry. Also he is required to manage the materials function. He is also required to estimate the cost of new components as well as that of repairs and reconditioning components. Therefore, it is essential to teach him concepts, principles, applications and practices covering production planning and control, material and process planning and cost estimation of components manufactured by different processes. Hence this subject has been included in this course. It is expected that efforts will be made by the teacher to provide enough learning experiences to the students for developing necessary competencies related to this subject area.*

### DETAILED CONTENTS

- |  |                 |
|--|-----------------|
| <b>A. Production Planning</b>                              | <b>(07 hrs)</b> |
| <b>1. Introduction</b>                                     |                 |
| - Necessity of Planning and control.                       |                 |
| - Functions of production, planning and control Department |                 |
| - Factors determining control procedure.                   |                 |
| - Advantages of PPC.                                       |                 |
| - Types of production.                                     |                 |
| <b>2. Planning</b>   | <b>(08 hrs)</b> |
| - Material planning and allocation.                        |                 |
| - Allocation for optimum utilization.                      |                 |
| - Make or buy decision.                                    |                 |
| - Break even analysis.                                     |                 |
| - Process planning.  |                 |
| - Procedure for process planning.                          |                 |
| - Process planning sheet.                                  |                 |
| - Calculation of man and machine hours.                    |                 |
| <b>3. Production Control</b>                               | <b>(04 hrs)</b> |
| - Objectives   |                 |
| - Routing  |                 |
| - Loading and scheduling                                   |                 |
| - Dispatching  |                 |
| - Follow up  |                 |
| <b>4. Plant Layout &amp; Material Handling</b>             | <b>(05 hrs)</b> |
| - Concept of plant layout                                  |                 |
| - Method of Plant Layout                                   |                 |
| - Work Station Design                                      |                 |
| - Introduction and function of material handling           |                 |
| - Material handling equipments.                            |                 |
| - Safety Precaution in their use.                          |                 |

5. **Inspection and Quality Control** (07 hrs)
- Inspection - Need and Planning for Inspection
  - Types of Inspection
  - Role of Operator and Inspector in Inspection
  - Quality Control and Quality Assurance - Meaning and Need.
  - Statistical Quality Control
  - Acceptance Sampling
  - Control Charts for variables and Attributes
  - Concept of TQM
6. **Standards and Codes** (03 hrs)
- National and International Codes
  - ISO-9000 - Concept, its evaluation and implications
7. **Inventory Control** (06 hrs)
- Importance
  - Store room operation
  - Inventory control techniques
  - Just in Time (JIT) Concept
- B. **Costing** (04 hrs)
8. **Introduction**
- Definition, and importance of estimating and costing. Difference between estimating and costing. Importance of preparing realistic estimates® Estimating procedures.
9. **Elements of Cost** (14 hrs)
- Direct materials - components.
  - Direct Labour
  - Indirect materials such as lubricants, Cotton waste
  - Indirect Labour
  - Other direct expenses such as of hired equipments.
  - Overhead expenses - rent of building, office expenses.
  - Depreciation and other costs like service charges.
  - Profits - concepts and requirements.
  - Terms used in costing.
  - Prime cost
  - Fabrication/service cost/factory cost
  - Production cost
  - Ultimate cost
  - Selling price
  - Fixed costs
  - Variable costs.
  - Estimation of costs.
  - Perception of job/work order.
  - Different units of work (Bifurcation as per type, Section etc).

- Analysis of time
- Handling time
- Preparation time
- Work time
- Inspection and despatch time
- Computation of charges: Labour Charges like operator, Supervisory and Helper charges, Storage charges, Components charges, material charges, Total charges.
- Estimation of service charges.
- Estimation of overhauling charges.
- Estimation of fabrication charges.
- Estimation of operational cost of a vehicle.
- Cost estimation for machines job.
- Cost estimation for cast, forged and welded jobs.

**10. Sales and Purchase** (06 hrs)

- Market Trends and Survey
- Advertising and sales techniques
- After sales service
- Warrantee and its claim procedures
- Purchasing - various procedures

**INSTRUCTIONAL STRATEGY**

*Teacher is supposed to take examples from field to illustrate the concepts.*

**RECOMMENDED BOOKS**

1. *Production Estimating and Costing* by M. Adithan and B.S. Pabla
2. *Industrial Engineering and Management* by T.R. Banga, M.K. Agarwal and S.C. Sharma

**SUGGESTED DISTRIBUTION OF MARKS**

<b>Topic No.</b>	<b>Time Allotted (Hrs)</b>	<b>Marks Allotted (%)</b>
1	07	10
2	08	12
3	04	06
4	05	07
5	07	12
6	03	05
7	06	10
8	04	05
9	14	23
10	06	10
<b>Total</b>	<b>64</b>	<b>100</b>

## 6.6 DRIVING PRACTICE -II

L T P  
- - 4

### RATIONALE

*After learning the basics of driving the emphasis has to shift to driving under hard condition such as in snow, fog, heavy traffic, at night and steep gradient etc. suitable practice needs to be given to the students to make them aware of different situation in driving of the vehicle.*

### DETAILED CONTENTS

1. **Driving Techniques**
  - 1.1 Revision
  - 1.2 Maneuver in: Passing, Merging, Diverging, Overtaking, Crossing, Turning, Cornering, Reversing, Emergency stopping.
2. Use of bye pass, sub way, overbridge and fly over
3. Difficult driving- Night driving, Hill driving, Driving under special conditions like fog, heavy rain and snow etc.
4. Driving on highways: lane selection & lane discipline
5. Public relations and dealing with police
6. Fire Hazards
7. First Aid
8. Vehicle Repair & Maintenance: Break down recovery
9. Recovery from police: accident cases
10. Record keeping
11. Accounting
12. Practice on road upto 60 K.M. during the semester.

### INSTRUCTIONAL STRATEGY

*The students should be given practice as far as possible so that competency for driving is achieved.*

## 6.7 PROJECT WORK

L T P  
- - 8

### RATIONALE

The practical training cum project work is intended to place students for project oriented practical training in actual work situations for the stipulated period with a view to :

- i) Develop understanding regarding the size and scale of operations and nature of field work in which students are going to play their role after completing the courses of study.
- ii) Develop understanding of subject based knowledge given in the class room in the context of its application at work places.
- iii) Develop first hand experience and confidence amongst the students to enable them to use and apply polytechnic/institute based knowledge and skills to solve practical problems in the world of work.
- iv) Develop special skills and abilities like interpersonal skills, communication skills, attitudes and values.

This practical training cum project work should not be considered as merely conventional industrial training in which students are sent at work places with minimal supervision. This experience is required to be planned and supervised on regular basis by the polytechnic faculty. For the fulfillment of above objectives, polytechnic may establish close linkage with 8-10 relevant organization for providing such an experience. It is necessary that each organization is visited well in advance and activities to be performed by students are well defined. The chosen activities should be such which are of curricular interest to students and of professional value to industrial/field organizations. Each teacher is expected to supervise and guide 5-6 students.

Effort should be made to identify actual field problems as project work for the students. Project selected should not be too complex which is beyond the level of the students. The placement of the students for such a practical cum project work should match with the competency profile of students and the project work assigned to them. Students may be assessed both by industry and polytechnic faculty. The suggested performance criteria is given below :

- (1) Punctuality and regularity
- (2) Initiative in learning/working at site
- (3) Level/proficiency of practical skills acquired
- (4) Ability of solve live practical problems
- (5) Sense of responsibility
- (6) Self expression/communication skills
- (7) Interpersonal skills/Human Relation
- (8) Report Writing Skills
- (9) Viva Voce

The projects given to students should be such for which someone is waiting for solution. Some of the suggested project activities are given below:

1. Projects connected with repair and maintenance of machine parts.
2. Estimating and costing projects
3. Design of components/parts/jigs/fixtures.
4. Projects related to quality control.
5. Project work related to increasing productively.
6. Project connected with work study.
7. Projects relating to erection, installation, calibration and testing.
8. Projects related to wastage reduction.
9. Problem related to value analysis/value engineering
10. Project related to mistake proofing.

## **Elective-II**

### **6.8.1 TRACTOR AND FARM EQUIPMENT**

**L T P**  
**4 - -**

#### **RATIONALE**

*Diploma holder in Automobile Engineering have to deal with repair and maintenance of heavy duty vehicles such as tractors and farm equipments. The subject provides basic understanding of such vehicles and equipments. Hence this subject.*

#### **DETAILED CONTENTS**

1.     **Tractor** (10 Hrs)  
Classification of tractors, main tractor assemblies, functions on farm tractors, types of engine used, Horse power requirement, human factor in tractor design. Prominent Indian makes tractors, specifications, selection, maintenance and operation of tractors.
2.     **Tractor Theory** (08 Hrs)  
Basics trends in tractor design, forces acting on a tractor on move, parallel pull and rolling resistance, tractor stability and weight distribution.
3.     **Hydraulic System** (10 Hrs)  
Functions of hydraulic system, hydraulic components, and methods of attaching implements classification of hydraulic controls for hitches, integral hitch system, three pt hitches, and draft control system.
4.     **Tractor Chassis** (06 Hrs)  
Sailent features of engine, clutch, power transmission, final drive, brakes and steeping of Indian tractors.
5.     **Supplementary System** (06 Hrs)  
Power take off shaft, draw bar working, belt pulley, tractor control unit.
6.     **Tractor Wheels and Tyres** (06 Hrs)  
Sailent features of wheels and tyres, specifications of wheels and tyres, dual versus tandom tyres, tread design, effect of tyre inflation.
7.     **Agricultural Equipment** (14 Hrs)  
Types of agriculture equipment, trailer and mounted types, description and working principles of ploughs, single plough, disc plough, tiller, cultivator, reaper, winnowers, binder, trasher trailer, pumps, sprayers and attachments.
8.     **Repair and Maintenance** (04 Hrs)  
Faults and their rectification in tractor and farm equipment and their maintenance.

## **INSTRUCTIONAL STATREGY**

*The students are to be made well versant with working and constructional details of Tractors and Farm Equipment. Practical demonstrations will be more beneficial.*

## **RECOMMENDED BOOKS**

1. Farm machines and equipment by C.P. Nakra, Dhanpat Rai and Sons.
2. Manual of Tractors by Joachian Konard, Asia Publishing house.
3. Tractors and Agriculture Equipment by Jain and Roy.

## **SUGGESTED DISTRIBUTION OF MARKS**

<b>Topic No.</b>	<b>Time Allotted (Hrs)</b>	<b>Marks Allotted (%)</b>
1	10	16
2	08	12
3	10	15
4	06	10
5	06	10
6	06	11
7	14	20
8	04	06
<b>Total</b>	<b>64</b>	<b>100</b>

## Elective-II

### 6.8.2 CONSTRUCTION AND HEAVY EARTH MOVING MACHINERY

L T P  
4 - -

#### RATIONALE

*A diploma holder in Automobile Engineering has to deal with repair and maintenance of heavy duty vehicles. The subject provides basic understanding of such special vehicles.*

#### DETAILED CONTENTS

- 1. Earth Moving Equipment** (30 hrs)  
Function, classification and constructional features of the following: Excavators, scrappers, rippers, draglines, graders, shovels, trailers, loader. Dozers - Types, Poclain Difference in each type of engine used, features of clutch, power transmission, track chains, sprockets, springs and blades.
- 2. Hoisting Equipment** (14 hrs)  
Brief introduction and description of hoist winch, part lines, hoisting chains, slings, fork lift truck, cranes. Factors affecting the selection of hoisting equipment.
- 3. Rollers** (08 hrs)  
Types of rollers, type of engines used for rollers. Chassis, power transmission, steering, braking and other features.
- 4. Pneumatic Equipment** (08 hrs)  
Function and salient features of pneumatic tools - rock drills, hammers, chippers. Air operated grease gun and spray gun.
- 5. Calculations of hire charges for various types of earth moving equipments.** (04 hrs)

#### INSTRUCTIONAL STATREGY

*The students may be taken to workshops dealing in Repair of Heavy Earth Moving Machinery and given practical demonstration, expert lectures will also be beneficial.*

#### RECOMMENDED BOOKS

- 1. Construction Equipment by Mahesh Verma.*
- 2. On and with the Earth by Jagman Singh.*

#### SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Hrs)	Marks Allotted (%)
1	30	42
2	14	22
3	08	12
4	08	16
5	04	08
<b>Total</b>	<b>64</b>	<b>100</b>

## Elective-II

### 6.8.3 MARKETING, SALES AND AUTO SPARE SERVICES

L T P  
4 - -

#### RATIONALE

*A Diploma holder in Automobile Engineering is required to undertake marketing and sales. For this purpose, knowledge in the field of marketing is essential. This subject aims at providing necessary knowledge in taking marketing and sales decisions in the management of an enterprise.*

#### DETAILED CONTENTS

1. **Introduction** (03 hrs)
  - 1.1 Role and importance of marketing in an organization / industry.
  - 1.2 Nature and scope of marketing.
  - 1.3 Marketing- scope and functions
  - 1.4 Marketing concepts and their applications in Indian context.
  
2. **Marketing System** (04 hrs)
  - 2.1 Factors affecting marketing environment.
  - 2.2 Influence of marketing environment of marketing strategy.
  
3. **Consumer Behaviour** (05 hrs)
  - 3.1 Consumer markets.
  - 3.2 Classifying products into consumers and industrial products
  - 3.3 Factors determining consumer behaviour
  - 3.4 Different models of consumer behaviour
  
4. **Market Research and Information Systems** (04 hrs)
  - 4.1 Functions of marketing research
  - 4.2 Steps in conducting marketing research and market survey.
  - 4.3 Designing a marketing information system for an organization.
  
5. **Sales Forecasting** (04 hrs)
  - 5.1 Sales forecasting and market potential.
  - 5.2 Different methods of sales forecasting.
  
6. **Market Segmentation** (06 hrs)
  - 6.1 Basic of market segmentation.
  - 6.2 Different types of market segmentation.
  - 6.3 Strategies for market segmentation.
  
7. **Market Planning** (04 hrs)
  - 7.1 Characteristics of market planning.
  - 7.2 Designing a marketing plan.
  - 7.3 Analyzing marketing planning process.

8. **Marketing Mix Strategies** (06 hrs)  
 8.1 Elements of marketing mix.  
 8.2 Formulating marketing mix strategies.
9. **Product Planning** (08 hrs)  
 9.1 Product mix concept.  
 9.2 Branding policies  
 9.3 Packaging policies  
 9.4 Product life cycle and underlying strategies.  
 9.5 Introduction of a new product.
10. **Pricing Policies** (08 hrs)  
 10.1 Pricing objectives.  
 10.2 Price setting in practice  
 10.3 Different pricing strategies such as psychological pricing, unit pricing, prestige pricing, geographical pricing.  
 10.4 Price change decisions.  
 10.5 Discounts and allowances.
11. **Distribution Policies** (06 hrs)  
 11.1 Roles of agencies in distribution.  
 11.2 Types of distribution channels.  
 11.3 Designing a distribution channel.  
 11.4 Evaluating a distribution channel.  
 11.5 Criteria for selecting agencies.  
 11.6 Physical distribution systems (Physical logistics).
12. **Sales Promotion Policies** (06 hrs)  
 12.1 Promotion mix- advertising, publicity, sale, promotion and personal selling.  
 12.2 Advertising- objectives, media selection, designing advertising copy, evaluating advertising effectiveness.  
 12.3 Sales promotion- tools, sales promotion at manufacturer, dealer, retailer levels.  
 12.4 Sales management- selection, training, compensating, motivating and maintaining sales force.  
 12.5 After Sales service. Management and Provision of after sales service in the area, various strategies.

### **LIST OF PRACTICAL**

1. To establish a marketing strategy for a given product.
2. To design distribution channels for a given product.
3. To study consumer acceptability for a given product.
4. To write and evaluate an advertisement.
5. Identification of a new consumer product/industrial product and designing a Questionnaire for conducting market survey for given product.

## INSTRUCTIONAL STATREGY

*The teacher is required to demonstrate with the actual examples. The expert in the field to be invited for expert lectures. A visit to a reputed show room nearby may be arranged.*

### SUGGESTED DISTRIBUTION OF MARKS

<b>Topic No.</b>	<b>Time Allotted (Hrs)</b>	<b>Marks Allotted (%)</b>
1	03	05
2	04	05
3	05	08
4	04	08
5	04	07
6	06	10
7	04	07
8	06	10
9	08	15
10	08	15
11	06	05
12	06	05
<b>Total</b>	<b>64</b>	<b>100</b>

## 6.9 PRACTICE IN COMMUNICATION SKILLS

L T P  
- - 2

### RATIONALE

*For successful completion of diploma programme, a student should possess adequate command on language and communication skills so that he/she is able to express himself/herself with ease and felicity. The language used by the student should be appropriate to objectives and occasion. The contents of this subject shall provide practical training to the students through language laboratory.*

### LIST OF PRACTICAL EXERCISES

1. Exercises on phonetics
2. Interactive session (case studies)
3. Presentation of periodic progress reports (written/oral) and maintaining daily diary
4. Exercises on self assessment using tools like SWOT analysis.
5. Communication empowerment through breaking language Barriers.
6. Internet communication
7. Correspondence
  - 7.1 Resume writing
  - 7.2 Covering letter
  - 7.3 Follow-up correspondence
  - 7.4 Internal and External business Correspondence
8. Practice on public relation skills with live examples.
9. Practice on listening skills.
10. Speaking exercises with emphasis on voice modulation (reading and extempore)
11. Demonstration and practice on Body language and Dress sense.
12. Exercises on etiquettes and mannerism in difficult situations like business meetings, table manners, telephone etiquettes and manners related to opposite gender.
13. Exercises on wit and humour in conversations and creating lively environment.
14. Role play for effective Communication.
15. Cross-cultural Communication
16. Group Discussion
17. Mock interviews (telephonic/personal)

*Designed and Composed by: Sudhir Sen(CA)*