GOVERNMENT POLYTECHNIC NASHIK

(AN ACADEMICALLY AUTONOMOUS INSTITUTE OF GOVT. OF MAHARASHTRA)

CURRICULUM - 2016

DIPLOMA PROGRAMME
IN
AUTOMOBILE ENGINEERING

INDEX

PREFACE

Government Polytechnic, Nashik is established in 1980. The institute has been conferred an academically autonomous status in 1995 by Government of Maharashtra because of excellent performance.

The vision of the institute is to be a premier technical training and development institute catering to the skill and professional development in multi-domain for successful employment / self-employment by offering certified and accredited NSQF compliant programmes. The institute shall be the center for excellence in skill development and community development through different training programmes, business incubation and entrepreneurship development. For this the institute is committed to provide education for skill development, engineering diploma and continuing education programmes for enhancement of employability skills of the aspirants in the job/self-employment through continually developing quality learning systems. The institute aims at holistic and student centric education in collaboration with business, industry and having practice based education. To achieve this continuous efforts are made to design the curriculum considering the latest development in the industrial sector and technology.

The three year Diploma Programme in Automobile Engineering is being offered since 2003 under MSBTE. After academic autonomy, first curriculum was implemented in 2003 and subsequently it was revised and implemented in 2007 and 2011. The curriculum revision is a regular activity and outcome based education approach is adopted for designing the curriculum. The revised outcome based curriculum is designated as "Curriculum 2016". The implementation of Curriculum 2016 will be effective from the academic year 2016- 17.

For designing the curriculum, the various domains have been identified. For Automobile Engineering Programme these domains are Automobile Manufacturing, Automobile Service Sector, R & D Departments and RTO Sector. The questionnaire has been designed to get the responses from these domain areas from different stake holders i.e. industries, teachers and students. The feedback from different stake holders has been analysed and roles, functions, activities, tasks and attitudes necessary for Diploma Automobile Engineer have been identified. The programme structure is finalised and the content detailing of individual course has been carried out by group of experts, and approved by Programme Wise Committee (PWC), Board of Studies (BOS) and Governing Body (GB).

In this Curriculum-2016, the student has to acquire 200 credits for successful completion of Diploma Programme. The courses of curriculum are structured at different 5 levels i.e. Foundation Courses, Basic Technology Courses, Allied Courses, Applied Technology Courses and Diversified Courses.

The minimum entry level is 10^{th}. However, the curriculum provides "Multi Point Entry and Credit system (MPEC)" for the students opting admission after passing 12^{th}, ITI, MCVC. At higher entry level, the students will get exemptions in certain courses as per the rules.

There is flexibility for opting the courses as per the choice of students. The curriculum provides "Sample Path" as a guide line for selection of courses in each term for entry level as 10^{th}. The List of Courses for Award of Class after completion of Diploma Programme is prescribed separately in this curriculum.

The fulfilment of programme outcome as stated in the Curriculum-2016 will depend on its effective implementation. The teachers who are implementing the curriculum were also involved in the design process of curriculum, hence, I hope that the Curriculum-2016 will be implemented in effective way and the pass outs will acquire the requisite knowledge and skills to satisfy the industrial needs.

(Prof. DNYANDEO PUNDALIKRAO NATHE)
Principal
Government Polytechnic, Nashik

GOVERNMENT POLYTECHNIC NASHIK

VISION

To be a premier technical training and development institute catering to the skill and professional development in multi-domain for successful employment/self-employment by offering certified and accredited NSQF compliant programmes. The institute shall be the center for excellence in skill development and community development through different training programmes, business incubation and entrepreneurship development.

MISSION

The Government Polytechnic Nashik, an autonomous institute of Government of Maharashtra has the mission to provide education for skill development, engineering diploma and continuing education programmes for enhancement of employability skills of the aspirants in the job/self-employment through continually developing quality learning systems. The institute aims at holistic and student centric education in collaboration with business, industry and having practice based education.

AUTOMOBILE ENGINEERING DEPARTMENT

VISION

The department envisions to be the centre for excellence in training and entrepreneurship development in the sector of automobile engineering to meet the growing demand for manpower in the technology based vehicles at shop floor and enterprise level.

MISSION

Department of Automobile Engineering is committed

M1. To impart quality education & training to the aspiring learners for successful employment and self-employment.
M2. To develop the problem solving and leadership skills required in the self-employment and job.
M3. To inculcate the domain knowledge, skills, work ethics in the field of automotive engineering industry and business.
M4. To provide practice based training and support by establishing the student centric learning systems.

JOB PROFILE OF AUTOMOBILE ENGINEERING ENGINEERS

A Diploma Automobile Engineer has to carry out various activities in various areas during his implementation of engineering knowledge.

Automobile Engineering job opportunities are available in following domains:

a. Automobile Manufacturing
b. Automobile Service Sector
c. R & D Departments
d. RTO Sector

In above domain areas Diploma Automobile Engineer has to perform following duties,

1. Developing himself.
2. Act as a member of Family / Community / Nation.
3. As a lecturer of new technology.
4. As a technologist in different types of industries / departments / sections such as,
    a. Shop floor (Processing / Manufacturing / Testing).
    b. Inspection and Quality Control.
    c. Sales and Marketing.
    d. Maintenance / Servicing.
    e. Design and Development.
    f. Planning.
    g. Purchase.

DIPLOMA PROGRAMME IN AUTOMOBILE ENGINEERING

RATIONALE

The Automobile utilization is being increasing in almost all engineering and social areas by replacing the conventional modes of mobility. To continue with and to withstand the needs and demands in the areas those are not yet touched needs to have knowledgeable persons / experts to take over the responsibilities / challenges.

The need of Automotive, its servicing and maintenance, safety and various transportation with diversified needs, as on today in India and abroad is not fulfilling the requirements of customers. To cope up with the needs of the industries and society, the nearby area is established with various automobile industries, their ancillary units, sales and service units. They all together are struggling / developing to meet the current qualitative, quantitative increasing needs.

To cater the proper services to the society and industries and growing needs, it is essential to produce suitable technical manpower.

No doubt today we talk about problems due to the accidents of the Automobile areas that is in reality due to illiteracy about the discipline in the common people. On the other hand the Automobile use is proven their suitability / sustainability in various fast dynamic areas over a long span of time.

Apart from the Automobile oriented courses, the program also offers courses to develop the students with necessary competency to fulfil the needs arising out of emerging allied areas of Automobile engineering.

The program also offers the courses in diversified fields of Automobile Engineering so as to acquire skills in specialized areas of Automobile Engineering.

In the prevailing situations, to cope up with present basic needs, the program also offers computer oriented courses to develop their knowledge in computer fundamentals, languages, packages and CAD / CAM / Auto LISP and their applications to engineering field.

PROGRAMME EDUCATIONAL OBJECTIVES (PEOs)

I. To prepare students for successful careers in industry and self-employment.
II. To develop the ability among students to synthesize data and technical concepts for application to automotive design.
III. To provide opportunity for students to work as part of teams on multidisciplinary projects.
IV. Introduce them to professional ethics and codes of professional practice.

PROGRAMME OUTCOMES (POs)

On successful completion of Diploma Programme in Automobile Engineering, the passouts will be able to,

a. **Basic Knowledge:** Demonstrate basic knowledge in mathematics, science in Automobile engineering.

b. **Discipline Knowledge:** Demonstrate the ability to conduct experiments, interpret and analyze data and report results.

c. **Experiments and Practice:** Demonstrate the ability to design an automotive or a thermal system or a mechanical process that meets desired specifications and requirements.

d. **Engineering Tools:** Demonstrate the ability to function on engineering and science tools, as well as on multidisciplinary design tools.

e. **The Engineer and Society:** Demonstrate the ability to identify, formulate and solve Automobile engineering problems

f. **Environment and Sustainability:** Have the confidence to apply engineering solutions in societal contexts.

g. **Ethics:** Demonstrate an understanding of their professional and ethical responsibilities.

h. **Individual and Team Work:** Diploma engineer will be broadly educated and will have an understanding of the impact of engineering on society, demonstrate awareness of contemporary issues and have a clear idea of homologation requirements.

i. **Communication:** Communicate effectively in verbal, written and graphical forms.

j. **Project Management and Finance:** Design, plan and execute projects related to automobile industries in an orderly manner with due considerations for financial constraints.

k. **Life-long Learning**: Recognize the need and be adaptable for independent and life-long learning in the context of technological changes.

PROGRAMME SPECIFIC OUTCOMES (PSOs)

On successful completion of Diploma Programme in Automobile Engineering, the student will be able to,

PSO 1. Demonstrate knowledge and hands-on competence in the application of automotive technology.

PSO 2. Control environmental pollution by Appling basics of physics or chemistry, material science, and pollution control.

PSO 3. Diagnose the faults and trouble shooting of vehicle systems.

MAPPING OF MISSION AND PROGRAMME EDUCATIONAL OBJECTIVES

Sr. No.	Mission	Component of Mission Statement	PEO/s
1	M1	To impart quality education & training to the aspiring learners for successful employment and self-employment.	I and III, IV
2	M2	To develop the problem solving and leadership skills required in the self-employment and job.	I and III, IV
3	M3	To inculcate the domain knowledge, skills, work ethics in the field of automotive engineering industry and business.	II and III
4	M4	To provide practice based training and support by establishing the student centric learning systems.	I and II, IV

MAPPING OF PROGRAMME EDUCATIONAL OBJECTIVES AND PROGRAMME OUTCOMES

Sr. No.	Programme Educational Objectives (PEOs)	Programme Outcomes (POs)
1	I. To prepare students for successful careers in industry and self-employment.	a, b, c, d, j
2	II. To develop the ability among students to synthesize data and technical concepts for application to automotive design.	b ,c ,d ,e ,f ,g, j
3	III. To provide opportunity for students to work as part of teams on multidisciplinary projects.	g, h, i, j, k
4	IV. Introduce them to professional ethics and codes of professional practice.	b, c, e, g, h, i, j, k

MAPPING OF PROGRAMME SPECIAL OUTCOMES AND PROGRAMME OUTCOMES

Sr. No.	Programme Specific Outcomes (PSOs)	Programme Outcomes (POs)
1	I. Demonstrate knowledge and hands-on competence in the application of automotive technology.	a, b, c, f, g, j, k
2	II. Control environmental pollution by Appling basics of physics or chemistry, material science, and pollution control.	a, c, f, g, I ,k
3	III. Diagnose the faults and trouble shooting of vehicle systems.	a, b, c, d, e, h, i. j. k

MAPPING OF PROGRAMME OUTCOME AND COURSES

Sr. No.	Programme Outcome (POs)	Courses
a	**Basic Knowledge** Demonstrate basic knowledge in mathematics, science in Automobile engineering.	Communication Skills Development of Life Skills Basic Mathematics Engineering Mathematics Applied Physics Applied Chemistry Engineering Graphics Engineering Mechanics Applied Mathematics Workshop Practice
b	**Discipline Knowledge:** Demonstrate the ability to conduct experiments, interpret and analyze data and report results.	Engineering Drawing Thermal Engineering Strength of Materials Mechanical Engineering Drawing Engineering Drawing Electrical Technology Principles of Electronics Theory of Machines and Mechanisms Automobile Engines-I Automobile Chassis Automobile Manufacturing Processes-I
c	**Experiments and Practice:** Demonstrate the ability to design an automotive or a thermal system or a mechanical process that meets desired specifications and requirements.	Engineering Graphics Workshop Practice Engineering Drawing Mechanical Engineering Drawing Automobile Engines-I and II Automobile Chassis Automobile Electrical and Electronic Systems Vehicle Maintenance and Garage Practice Two Wheeler Technology Automobile Manufacturing Processes-I and II Automobile Mechatronics Automobile Pollution Alternate Fuels Automobile Car Conditioning Industrial Fluid Power
d	**Engineering Tools:** Demonstrate the ability to function on engineering and science tools, as well as on multidisciplinary design tools.	Engineering Graphics Workshop Practice Engineering Drawing Mechanical Engineering Drawing Solid Modelling

Sr. No.	Programme Outcome (POs)	Courses
		Design and Drawing of Auto Component
e	**The Engineer and Society:** Demonstrate the ability to identify, formulate and solve Automobile engineering problems	Automobile Manufacturing Processes-I and II Industrial Organization and Management Entrepreneurship Development Supervisory Skills Project Design and Drawing of Auto Components Vehicle Maintenance and Garage Practice
f	**Environment and Sustainability:** Have the confidence to apply engineering solutions in societal contexts.	Renewable Energy Sources Metrology and Quality Control Two Wheeler Technology Industrial Fluid Power Car Air Conditioning Automobile Pollution Alternate Fuels Industrial Organization and Management Vehicle Maintenance and Garage Practice
g	**Ethics:** Demonstrate an understanding of their professional and ethical responsibilities.	Development of Life Skills Material and Marketing Management Industrial Organization and Management Professional Practices Supervisory Skills
h	**Individual and Team Work:** Diploma engineer will be broadly educated and will have an understanding of the impact of engineering on society, demonstrate awareness of contemporary issues and have a clear idea of homologation requirements.	Development of Life Skills Industrial Organization and Management Entrepreneurship Development Material and Marketing Management Vehicle Maintenance and Garage Practice Professional Practices Seminar Project
i	**Communication:** Communicate effectively in verbal, written and graphical forms.	Communication Skills Material and Marketing and Management Professional Practices Seminar Project Supervisory Skills Industrial Organization and Management
j	**Project Management and Finance:** Design, plan and execute projects related to automobile industries in an orderly manner with due considerations for financial constraints.	Transport Management and Motor Industry Entrepreneurship Development Supervisory Skills Material Management Marketing Management Industrial Organization and Management

Sr. No.	Programme Outcome (POs)	Courses
		Project
k	**Life-long Learning**: Recognize the need and be adaptable for independent and life-long learning in the context of technological changes.	Development of Life Skills Professional Practices Seminar Project

PROGRAMME - DIPLOMA IN AUTOMOBILE ENGINEERING
PROGRAMME STRUCTURE

SCHEME AT A GLANCE

Level	Name of Level	Number of Courses offered	Number of Curses to be Completed	TH	TU	PR	Total Credits	Marks
Level-1.	Foundation Courses	09	09 Compulsory	24	02	20	46	950
Level-2.	Basic Technology Courses	11	11 Compulsory	36	--	30	66	1400
Level-3.	Allied Courses	09	05 (03 Compulsory & 02 Electives)	10	--	04	14	400
Level-4.	Applied Technology Courses	10	10 Compulsory	27	--	26	53	1250
Level-5.	Diversified Courses	08	04 (02 compulsory & 02 Electives)	11	--	10	21	500
TOTAL		**35 compulsory + 12 Electives = 47**	**35 Compulsory + 04 Electives = 39**	**108**	**02**	**90**	**200**	**4500**
Grand Total		**47**	**39**	**108**	**02**	**90**	**200**	**4500**

Abbreviations: TH: Theory, TU: Tutorial, PR: Practical

PROGRAMME - DIPLOMA IN AUTOMOBILE ENGINEERING
PROGRAMME STRUCTURE
LEVEL – 1
FOUNDATION COURSES

Sr. No.	Course Code	Course Title	Course Abbr	TEACHING SCHEME				EXAMINATION SCHEME						
				TH	TU	PR	Total Credits	Theory Paper		Test	PR	OR	TW	Total
								Hrs	Mark					
1	6101	Communicatio n Skills	CMS	03	--	02	05	03	80	20	--	--	50	150
2	6102	Development of Life Skills	DLS	01	--	02	03	--	--	--	--	--	50	50
3	6103	Basic Mathematics	BMT	03	01	--	04	03	80	20	--	--	--	100
4	6104	Engineering Mathematics	EMT	03	01	--	04	03	80	20	--	--	--	100
5	6105	Applied Physics	PHY	04	--	02	06	02#	80#	20#	--	--	50	150
6	6106	Applied Chemistry	CHY	04	--	02	06	02#	80#	20#	--	--	50	150
7	6107	Engineering Graphics	EGR	02	--	04	06	--	--	--	25	--	25	50
8	6108	Engineering Mechanics	EMH	04	--	02	06	03	80	20	--	--	50	150
9	6109	Workshop Practice	WSP	--	--	06	06	--	--	--	--	--	50	50
TOTAL			**--**	**24**	**02**	**20**	**46**	**14**	**480**	**120**	**25**	**--**	**325**	**950**

Level: 1

Total courses : 09
Total Credits : 46
Total marks : 950

Abbreviations:

Abbr : Course Abbreviation, TH: Theory, TU: Tutorial, PR: Practical, OR: Oral, TW: Term Work.

Course code Indication:

Example : 6101
First digit : 6 : Indicates last digit of Year of Implementation of Curriculum
Second digit : 1 : Indicates Level.
Third & Fourth digit : 01 : Indicates Course Number.

Assessment of PR / OR / TW:

1) All orals and practical are to be assessed by external & internal examiners.
2) * Indicates TW to be assessed by external & internal examiners.
3) Other TW are to be assessed by internal examiners.
4) # Indicates online exam

PROGRAMME - DIPLOMA IN AUTOMOBILE ENGINEERING
PROGRAMME STRUCTURE
LEVEL – 2
BASIC TECHNOLOGY COURSES

Sr. No.	Course Code	Course Title	Course Abbr	Teaching Scheme				Examination Scheme						
				TH	TU	PR	Total Credits	Theory Paper		Test	PR	OR	TW	Total
								Hrs	Marks					
01	6211	Thermal Engineering	TEG	04	--	02	06	03	80	20	--	25	25	150
02	6212	Engineering Drawing	EDG	02	--	04	06	04	80	20	--	--	25	125
03	6213	Strength of Materials	SOM	04	--	02	06	03	80	20	--	--	25	125
04	6214	Mechanical Engineering Drawing	MED	03	--	04	07	04	80	20	--	25	25	150
05	6216	Theory of Machines and Mechanisms	TOM	04	--	02	06	03	80	20	--	--	25	125
06	6219	Computer Aided Drawing and Drafting	CDR	01		04	05	--	--	--	--	--	25	25
07	6220	Electrical Technology	ELT	03	--	02	05	03	80	20	--	--	25	125
08	6221	Principles of Electronics	POE	03	--	02	05	03	80	20	--	--	25	125
09	6252	Automobile Engines – I	AEN	04	---	02	06	03	80	20	--	25	25	150
10	6253	Automobile Chassis	ACH	04	---	02	06	03	80	20	---	25	25	150
11	6254	Automobile Manufacturing Processes-I	AMF	04	--	04	08	03	80	20	--	--	50	150
TOTAL			**--**	**36**	**--**	**30**	**66**	**--**	**800**	**200**	**--**	**100**	**300**	**1400**

Level : 2

Total Courses : 11
Total Credits : 66
Total Marks : 1400

Assessment of PR / OR / TW:

1) All orals & practical's are to be assessed by external & internal examiners.
2) * Indicates TW to be assessed by external & internal examiners.
3) Other TW are to be assessed by internal examiners.

PROGRAMME - DIPLOMA IN AUTOMOBILE ENGINEERING
PROGRAMME STRUCTURE
LEVEL - 3
ALLIED COURSES

Sr. No.	Course Code	Course Title	Course Abbr	Teaching Scheme				Examination Scheme						
				TH	TU	PR	Total Credits	Theory Paper		Test	PR	OR	TW	Total
								Hrs	Marks					
01	6301	Applied Mathematics	AMT	03	--	--	03	03	80	20	--	--	--	100
02	6302	Environmental Studies	EVS	--	--	02	02	--	---	--	--	--	50	50
03	6303	Industrial Organisation and Management	IOM	03	--	--	03	03	80	20	--	--	--	100
Elective I : Any **ONE** of the following														
04	6305	Supervisory Skills	SSL	03	--	--	03	03	80	20	--	--	--	100
	6306	Marketing Management	MKM	03	--	--	03	03	80	20	--	--	--	100
	6307	Material Management	MMT	03	--	--	03	03	80	20	--	--	--	100
Elective II : Any **ONE** of the following														
05	6309	Entrepreneurship Development	EDP	01	--	02	03	--	--	--	--	--	50	50
	6310	Renewable Energy Sources	RES	01	--	02	03	--	--	--	--	--	50	50
	6313	Solid Modelling	SDM	01	--	02	03	--	--	--	--	--	50	50
TOTAL			**--**	**10**	**--**	**04**	**14**	**09**	**240**	**60**	**--**	**--**	**100**	**400**

Level: 3

Total Courses : 05
Total Credits : 14
Total Marks : 400

Assessment of PR / OR / TW:

1) All orals & practical's are to be assessed by external & internal examiners.
2) * Indicates TW to be assessed by external & internal examiners.
3) Other TW are to be assessed by internal examiners.

PROGRAMME - DIPLOMA IN AUTOMOBILE ENGINEERING
PROGRAMME STRUCTURE
LEVEL - 4
APPLIED TECHNOLOGY COURSES

Sr. No.	Course Code	Course Title	Course Abbr	Teaching Scheme				Examination Scheme						
				TH	TU	PR	Total Credits	Theory Paper		Test	PR	OR	TW	Total
								Hrs	Marks					
01	6410	Professional Practices	PPR	--	---	04	04	--	--	--	---	---	50	50
02	6411	Seminar	SEM	--	---	02	02	--	--	--	--	--	50	50
03	6412	Project	PRO	---	--	04	04	--	--	--	--	50	50*	100
04	6413	Metrology and Quality Control	MQC	04	--	02	06	03	80	20	25	--	25	150
05	6446	Vehicle Dynamics and Aerodynamics	VDA	04	---	02	06	03	80	20	---	25	25	150
06	6447	Automobile Engines – II	AUE	03	---	02	05	03	80	20	---	25	25	150
07	6448	Design of Auto Components	DAC	04	---	02	06	04	80	20	---	25	25	150
08	6449	Automobile Manufacturing Processes-II	AMA	04	---	04	08	03	80	20	---	--	50	150
09	6450	Automobile Electrical and Electronic Systems	AES	04	---	02	06	03	80	20	---	25	25	150
10	6451	Transport Management and Motor Industry	TMI	04	---	02	06	03	80	20	---	25	25	150
TOTAL			**--**	**27**	**--**	**26**	**53**	**22**	**560**	**140**	**25**	**175**	**350**	**1250**

Level: 4

Total Courses : 10
Total Credits : 53
Total Marks : 1250

Assessment of PR / OR / TW:

1) All orals & practical's are to be assessed by external & internal examiners.
2) * Indicates TW to be assessed by external & internal examiners.
3) Other TW are to be assessed by internal examiners.

PROGRAMME - DIPLOMA IN AUTOMOBILE ENGINEERING
PROGRAMME STRUCTURE
LEVEL - 5
DIVERSIFIED COURSES

Sr. No.	Course Code	Course Title	Course Abbr	Teaching Scheme				Examination Scheme						
				TH	TU	PR	Total Credits	Theory Paper		Test	PR	OR	TW	Total
								Hrs	Marks					
01	6564	Vehicle Maintenance and Garage Practice	VGP	03	---	04	07	03	80	20	25	--	25	150
02	6565	Two Wheeler Technology	TWT	02	---	02	04	---	---	---	25	---	25	50
Elective III : Any **ONE** of the following														
03	6566	Automobile Mechatronics	AMX	03	---	02	05	03	80	20	---	--	50	150
	6567	Automobile Design with CAD / CAM	ADC	03	---	02	05	03	80	20	---	--	50	150
	6568	Industrial Fluid Power	IFP	03	---	02	05	03	80	20	---	--	50	150
Elective IV : Any **ONE** of the following														
04	6569	Automobile Air Conditioning	AAC	03	---	02	05	03	80	20	---	---	50	150
	6570	Automobile Pollution	AUP	03	---	02	05	03	80	20	---	---	50	150
	6571	Alternate Fuels	AFL	03	---	02	05	03	80	20	---	---	50	150
TOTAL			**--**	**11**	**--**	**10**	**21**	**09**	**240**	**60**	**50**	**--**	**150**	**500**

Level: 5

Total Courses : 04
Total Credits : 21
Total Marks : 500

Assessment of PR / OR / TW:

1) All orals & practical's are to be assessed by external & internal examiners.
2) * Indicates TW to be assessed by external & internal examiners.
3) Other TW are to be assessed by internal examiners.

PROGRAMME - DIPLOMA IN AUTOMOBILE ENGINEERING

Courses for Award of Class

Sr.No.	Course code	Course Title	Course Abbr	TEACHING SCHEME				EXAMINATION SCHEME						
				TH	TU	PR	Total Credits	Theory Paper		Test	PR	OR	TW	Total
								Hrs	Mark					
01	6303	Industrial Organization and Management	IOM	03	--	--	03	03	80	20	--	--	--	100
02	6411	Seminar	SEM	--	--	02	02	--	--	--	--	--	50	50
03	6412	Project	PRO	--	--	04	04	--	--	--	--	50	50*	100
04	6413	Metrology and Quality Control	MQC	04	--	02	06	03	80	20	--	25	25	150
05	6446	Vehicle Dynamics and Aerodynamics	VDA	04	--	02	06	03	80	20	--	25	25	150
06	6447	Automobile Engines - II	AUE	03	--	02	05	03	80	20	--	25	25	150
07	6448	Design of Auto Components	DAC	04	--	02	06	04	80	20	--	25	25	150
08	6450	Automobile Electrical and Electronic Systems	AEE	04	--	02	06	03	80	20	--	25	25	150
09	6451	Transport Management and Motor Industry	TMI	04	--	02	06	03	80	20	--	25	25	150
10	6564	Vehicle Maintenance and Garage Practice	VGP	03	--	04	07	03	80	20	25	--	25	150
Any **ONE** from **Elective III**														
11	6566	Automobile Mechatronics	AMX	03	--	02	05	03	80	20	--	--	50	150
	6567	Automobile Design with CAD/CAM	ADC	03	--	02	05	03	80	20	--	--	50	150
	6568	Industrial Fluid Power	IFP	03	--	02	05	03	80	20	--	--	50	150
Any **ONE** from **Elective IV**														
12	6569	Automobile Air Conditioning	AAC	03	--	02	05	03	80	20	--	--	50	150
	6570	Automobile Pollution	AUP	03	--	02	05	03	80	20	--	--	50	150
	6571	Alternate Fuels	AFL	03	--	02	05	03	80	20	--	--	50	150
TOTAL			**--**	**35**	**--**	**26**	**61**	**--**	**800**	**200**	**25**	**200**	**375**	**1600**

Total Courses : 12
Total Credits : 61
Total Marks : 1600

Assessment of PR / OR / TW:

1) All orals & practical's are to be assessed by external & internal examiners.
2) * Indicates TW to be assessed by external & internal examiners.
3) Other TW are to be assessed by internal examiners.

PROGRAMME - DIPLOMA IN AUTOMOBILE ENGINEERING
SAMPLE PATH
ENTRY LEVEL- 10+

Nature of Course	First Year		Second Year		Third Year		Total
	Odd Term	**Even Term**	**Odd Term**	**Even Term**	**Odd Term**	**Even Term**	
Compulsory	6101(05) CMS	6104(04) EMT	6211(06) TEG	6216(06) TOM	6411(02) SEM	6303(03) IOM	35
	6102(03) DLS	6105(06) PHY	6213(06) SOM	6252(06) AEN	6413(06) MQC	6412(04) PRO	
	6103(04) BMT	6108(06) EMH	6214(07) MED	6253(06) ACH	6447(05) AUE	6446(06) VDA	
	6106(06) CHY	6109(06) WSP	6220(05) ELT	6254(08) AMF	6449(08) AMA	6448(06) DAC	
	6107(06) EGR	6212(06) EDG	6221(05) POE	6410(04) PPR	6564(07) VGP	6450(06) AES	
	6302(02) EVS	6219(05) CDR	6301(03) AMT	6565(04) TWT	--	6451(06) TMI	
Total credits (Compulsory)	**26**	**33**	**32**	**34**	**28**	**31**	**184**
Elective	--		--	I) Any **ONE** from **Elective: II** 6309:EDP, 6310:RES 6313:SDM, :**(03)**	I) Any **ONE** from **Elective: I** : 6305:SSL, 6306:MKM, 6307:MMT :**(03)** II) Any **ON**E from **Elective: III** : 6566:AMX, 6567:ADC, 6568:IFP : **(05)**	I) Any **ONE** from **Elective IV**: 6569:AAC, 6570:AUP, 6571:AFL :**(05)**	04
Total Credits (Elective)	**Nil**	**Nil**	**Nil**	**03**	**08**	**05**	**16**
Total Courses	**06**	**06**	**06**	**07**	**07**	**07**	**39**
Total Credits (Compulsory + Elective)	**26**	**33**	**32**	**37**	**36**	**36**	**200**
Grand Total of Credits							**200**

Note : figures in bracket indicates total credits

PROGRAMME : Diploma Programme in CE / ME / PS / EE / IF / CM / EL / AE / DD / ID
COURSE : Communication Skills (CMS) **COURSE CODE** : 6101

TEACHING AND EXAMINATION SCHEME:

Teaching Scheme				Examination Scheme								
Hrs / week			Credits	TH Paper Hrs.	Marks							
TH	TU	PR				TH	TEST	TH+TEST	PR	OR	TW	TOTAL
03	--	02	05	03	Max.	80	20	100	--	--	50	150
					Min.	32	--	40	--	--	20	--

1.0 RATIONALE:

Proficiency in English is one of the basic needs of technical students hence this curriculum aims at developing the functional and communicative abilities of the students. As Communication skills play a decisive role in the career development and entrepreneurship this course will guide and direct to develop a good personality and effective communication too. This course is compiled with an aim of shaping minds of engineering students while catering to their needs.

2.0 COURSE OBJECTIVES:

The student will be able to,

1. Understand & use basic concepts of Communication in an organisation and social context.
2. Use reasonably and grammatically correct English language with reading competency.
3. Utilise the skills to be a competent communicator.
4. Develop comprehension skills, improve vocabulary and acquire writing skills.
5. Overcome language and communication barriers with the help of effective communication techniques.

3.0 COURSE OUTCOMES:

The course content should be taught and learning imparted in such a manner that students are able to acquire required learning outcome in cognitive, psychomotor and affective domain to demonstrate following course outcomes:

1. Apply the process and identify types of Communication for being an effective communicator
2. Identify the barriers in the communication process and apply ways to overcome them
3. Interpret graphical information precisely
4. Use formal written skills for business correspondence.
5. Exhibit listening & reading skills for improving competencies in communication.
6. Pronounce English sounds with correct stress and intonation in day to day conversations.
7. Construct correct grammatical sentences in oral and written communication.

4.0 COURSE DETAILS:

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics	Hours
Unit-I **Communication**	1a. Define communication & objectives 1b. Describe the process of Communication 1c. Differentiate between types of communication	1.1 Meaning of communication: definition, objectives and Importance of communication 1.2 Elements/Process of communication 1.3 Types of communication: Formal, Informal, Verbal, Nonverbal, vertical, Horizontal, Diagonal	04
Unit-II	2a. Explain types of	2.1 Barriers to Communication	04

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics	Hours
Communication Barriers	barriers 2b. Describe the principles of effective communication 2c. Discuss ways to overcome barriers. 2d. Identify various barriers	a) Physical Barrier • Environmental (time, noise, distance and surroundings) • Personal(deafness, stammering, ill-health, spastic, bad handwriting, temporary physical disabilities) b) Mechanical: Machines/means oriented c) Psychological : Day dreaming prejudice, emotional, blocked mind, generation gap, status, inactiveness, perception d) Language: Difference in language, technical jargons pronunciation and allusion 2.2 Ways to overcome barriers 2.3 Principles of effective communication	
Unit-III **Nonverbal & Graphical communication**	3a. Explain use of body language in oral conversations 3b. Label and interpret the graphical information correctly 3c. Describe the importance of graphical and nonverbal methods in technical field.	3.1 Non-verbal codes: • Proxemics • Chronemics • Artefacts 3.2 Aspects of body language(Kinesics) 3.3 Graphical communication • Advantages and disadvantages of graphical communication • Tabulation of data and its depiction in the form of bar graphs and pie charts.	06
Unit-IV **Formal Written Communication**	4a. Develop notices, circulars and emails 4b. Draft letters on given topics 4c. Prepare technical reports. 4d. Develop various types of paragraphs.	4.1 Office Drafting :Notice, Memo, Circulars and e-mails 4.2 Job application and resume 4.3 Business correspondence : Enquiry, Reply to an enquiry order, complaint, adjustment, 4.4 Technical Report Writing : Accident report, Fall in Production / survey, progress Investigation / maintenance 4.5 Paragraph writing -Types of paragraphs • Descriptive • Technical • Expository	12
Unit-V **Listening skills**	5a. Differentiate between hearing and listening. 5b. Apply techniques of effective listening.	5.1 Listening versus hearing 5.2 Merits of good listening 5.3 Types of listening 5.4 Techniques of effective listening	02
Unit-VI **Reading Skills**	6a. Describe various methods to develop vocabulary 6b. Develop reading	6.1 Reading for comprehension 6.2 Reading styles 6.3 Developing vocabulary 6.4 Methods of word formation: prefixes,	06

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics	Hours
	competencies. 6c. Explain steps to comprehend passage	suffixes, collocations, synonyms, antonyms, Homophones, Homonyms. 6.5 Comprehension of unseen passages	
Unit-VII **Speaking Skills**	7a. Demonstrate Correct Pronunciation, stress and intonation in everyday conversation 7b. Develop formal conversational techniques. 7c. Deliver different types of speech	7.1 Correct Pronunciation -Introduction to sounds vowels, consonants, stress, intonation 7.2 Conversations : • Meeting & Parting • Introducing & influencing requests • Agreeing & disagreeing • Formal enquiries 7.3 Speech-Types of speech • Welcome Speech • Farewell speech • Vote of thanks	06
Unit-VIII **Language Grammar**	8a. Use grammatically correct sentence in day to day oral and written communication 8b. Distinguish between determiners & apply correctly in communicative use 8c. Use correct verb for given course. 8d. Use appropriate preposition as per time, place and direction. 8e. Transform the sentences.	8.1 Tense • Present Tense(Simple, Continuous, perfect, perfect Continuous) • Past Tense(Simple, Continuous, perfect, perfect Continuous) • Future Tense(Simple) 8.2 Determiners • Articles (A, An, The) • Some, Any, Much, Many, All, Both, Few, A few, The few, Little, A little, The little, Each, Every. 8.3 Modal Auxiliaries Can, Could, May, Might, Shall, Should, Will, Would, Must, Have to, Need, ought to 8.4 Sentence Transformation • Voice • Degree • Affirmative, Negative, Assertive, 8.5 Prepositions • Time • Place • Direction 8.6 Conjunctions	08
		TOTAL	**48**

5.0 SUGGESTED SPECIFICATION TABLE WITH MARKS (THEORY):

Unit No.	Unit Title	Distribution of Theory Marks			
		R Level	U Level	A and above Levels	Total Marks
I	Communication	--	02	04	06
II	Communication Barriers	02	02	02	06
III	Nonverbal & Graphical communication	--	02	08	10
IV	Formal Written Communication	--	04	18	22
V	Listening Skills	--	--	04	04
VI	Reading Skills	--	02	06	08
VII	Speaking Skills	02	02	04	08
VIII	Language Grammar	**--**	04	12	16
	TOTAL	**04**	**18**	**58**	**80**

Legends: R = Remembrance (Knowledge); U = Understanding; A = Application and above levels (Revised Bloom's taxonomy)

Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.

6.0 ASSIGNMENTS/PRACTICALS/TASKS:

The tutorial/practical/assignment/task should be properly designed and implemented with an attempt to develop different types of cognitive and practical skills **(Outcomes in cognitive, psychomotor and affective domain)** so that students are able to acquire the desired programme outcome/course outcome.

Note*: Here only outcomes in psychomotor domain are listed as practical/exercises. However, if these practical/exercises are completed appropriately, they would also lead to development of* ***Programme Outcomes/Course Outcomes in affective domain*** *as given in the mapping matrix for this course. Faculty should ensure that students also acquire Programme Outcomes/Course Outcomes related to affective domain.*

Sr. No.	Unit No.	Practical Exercises (Outcomes in Psychomotor Domain)	Hours
1	I	Communicate on the given topic/situation.	02
2	II	Identify communication barriers	02
3	III	Non-verbal communication	02
4	IV	Business letter writing &job application	02
5	IV	Draft official letter	02
6	IV	Technical report writing on given topic	04
7	V	Attend a seminar and preparing notes	02
8	VI	Vocabulary building with different methods	02
9	VII	Language lab Experiment for correct pronunciation of sounds	04
10	VII	Write & present conversations on given situations	02
11	VIII	Grammar application-various exercises on grammar	04
12	I to VIII	Mini project (on given topic)	04
		TOTAL	**32**

7.0 STUDENT ACTIVITIES:

Following is the list of proposed student activities like

1. Prepare charts on types of communication.
2. Convert language information in graphical or nonverbal codes.
3. Maintaining own dictionary of difficult words, words often confuse, homophones & homonyms.

4. Listening daily English news on television or radio & to summarise it in their language.

8.0 SPECIAL INSTRUCTIONAL STRATEGIES (If any):

1. Use audios of correct pronunciations.
2. Show videos about use of body language in oral formal conversations

9.0 LEARNING RESOURCES:

A) Books

Sr.No.	Title of Book	Author	Publication
1	Effective English Communication	Krishna Mohan and Meenakshi Raman	Tata McGraw Hill Publishing Co. Ltd.
2	English for practical purpose	Z. N. Patil	Macmillan
3	Spoken English	Basal and Harrison	Orient Longman
4	Contemporary English Grammar	R. C. Jain, David Green	Macmillan
5	Business correspondence and Report writing	R. C. Sharma and Krishna Mohan	Tata McGraw Hill Publishing
6	English Communication for Polytechnics	S. Chandrashekhar & others	Orient Black Swan
7	Active English Dictionary	S. Chandrashekhar & others	Longman

B) Software/Learning Websites

1. http://www.communicationskills.co.in
2. http://www.mindtools.com
3. http://www.communication.skills4confidence
4. http://www.goodcommunication skills.net
5. http://www.free-english-study.com/
6. http://www.english-online.org.uk/
7. http://www.englishclub.com
8. http://www.learnenglish.de
9. http://www.talkenglish.com/
10. http://www.englishgrammarsecrets.com
11. http://www.myenglishpages.com/
12. http://www.effective-business-letters.com/
13. http://www.englishlistening.com/
14. http://www.class-central.com

C) Major Equipments/ Instruments with Broad Specifications

1. Digital English Language Laboratory.
2. Computers for language laboratory software
3. Headphones with microphone

10.0 MAPPING MATRIX OF PO'S AND CO'S:

Course Outcomes	Programme Outcomes										
	a	b	c	d	e	f	g	h	i	j	k
CO1									H		M
CO2									H		M
CO3	M								H		M
CO4		M							H		M
CO5	M								H		M
CO6		M							H		
CO7	M								H		M

H: High Relationship, M: Moderate Relationship, L: Low Relationship.

PROGRAMME : Diploma Programme in CE / ME / PS / EE / IF / CM / EL /AE / DD / ID
COURSE : Development of Life Skills (DLS) **COURSE CODE :** 6102

TEACHING AND EXAMINATION SCHEME:

Teaching Scheme				Examination Scheme							
Hrs / week			Credits	TH Paper Hrs.	Marks						
TH	TU	PR				TH	TEST	TH+TEST	PR	OR	TW	TOTAL
01	--	02	03	--	Max.	---	--	--	--	--	50	50
					Min.	--	--	--	--	--	20	--

1.0 RATIONALE:

This course will develop the student as an effective member of the team in the organization. It will develop the abilities and skills to perform at highest degree of quality. It enhances his/her capabilities in the field of searching, assimilating information, handling people effectively and solving challenging problems.

2.0 COURSE OBJECTIVES:

The student will be able to,

1. Develop the abilities and skills to perform at highest degree of quality as an individual as well as a member of core group or team.
2. Enhance capabilities in the field of searching, assimilating information, managing the given task, handling people effectively and solving challenging problems.
3. Understand and use personal management techniques.
4. Analyse their strengths, weaknesses, opportunities and threats.

3.0 COURSE OUTCOMES:

The course content should be taught and learning imparted in such a manner that students are able to acquire required learning outcome in cognitive, psychomotor and affective domain to demonstrate following course outcomes:

1. Analyse self attitude and behaviour.
2. Acquire self learning techniques by using various information sources
3. Identify personal strengths to get future opportunities.
4. Develop presentation skills with the help of effective use of body language.
5. Enhance leadership traits and recognise the importance of team work.
6. Face interview without fear
7. Resolve conflict and solve problems by appropriate methods.
8. Set the goal for personal development.

4.0 COURSE DETAILS:

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics	Hours
Unit-I **Self Analysis**	1a. Explain types of Motivation. 1b. Differentiate between types of attitude. 1c. Describe types of behaviour 1d. Analyse SWOT of an individual	1.1 Motivation-types, need 1.2 Attitude-types, tips for developing positive attitude 1.3 Behaviour-types-passive, assertive, aggressive 1.4 Confidence building-need, importance 1.5 SWOT analysis-(significance)	02
Unit-II **Self Learning Techniques**	2a. Explain the self learning techniques by enhancing memory and	2.1 Need & importance of SLT 2.2 Information source-Primary, secondary, tertiary 2.3 Enhancing Memory and concentration	02

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics	Hours
(SLT)	concentration 2b. Apply practical skills for effective learning 2c. Identify the information sources	2.4 Learning Practical Skills- need of Practical Skills types of practical skills-technical, organisational, human Domains of learning 1)cognitive 2)Affective 3)psychomotor 2.5 information search techniques-library search, internet search	
Unit-III **Self Development & management**	3a. Explain the Need of self Management 3b. Set the goals for personal development	3.1 Stress management-remedies to avoid, minimize stress 3.2 Health management –importance of Diet & exercise 3.3 Time management-time planning, tips for effective time management 3.4 Goal setting-need and importance 3.5 Creativity	03
Unit-IV **Emotions**	4a. Explain nature and types of human emotions 4b. Differentiate between cognitive and emotional intelligence	4.1 Basic emotions- 4.2 Emotional intelligence 4.3 Emotional stability/maturity	01
Unit-V **Presentation skills**	5a. Develop presentation skills with the help of body language 5b. Describe utilisation of voice quality in oral conversations	5.1 Body Language – Codes, dress and appearance, postures, gestures Facial expressions 5.2 Voice and language 5.3 Use of aids:-OHP, LCD projector, white board	02
Unit-VI **Group discussion and interview techniques**	6a. Participate in group discussion 6b. Face interview without fear.	6.1 introduction to group discussion 6.2 ways to carry group discussion 6.3 Parameters-analytical, logical thinking, Decision making 6.4 Interview techniques Necessity, tips for handling common questions	02
Unit-VII **Team work**	7a. Recognise the importance of team work 7b. Enhance leadership qualities	7.1 stages of team development 7.2 Understand and work with dynamic group 7.3 Ingredients of effective teams. 7.4 leadership in teams, handling frustration in group	02
Unit-VIII **Conflicts & Problem Solving.**	8a. Describe sources of conflicts and resolve conflicts 8b. Develop lateral thinking abilities 8c. Identify innovative methods in solving Problems.	8.1 sources of conflict 8.2 Resolution of conflict 8.3 ways to enhance interpersonal relation 8.4 Steps in problem solving 8.5 Problem solving techniques-trial, error & brainstorming	02
		TOTAL	**16**

5.0 SUGGESTED SPECIFICATION TABLE WITH MARKS (THEORY):

Not Applicable

6.0 ASSIGNMENTS/PRACTICALS/TASKS:

The tutorial/practical/assignments/tasks should be properly designed and implemented with an attempt to develop different types of cognitive and practical skills **(Outcomes in cognitive, psychomotor and affective domain)** so that students are able to acquire the competencies.

***Note**: Here only outcomes in psychomotor domain are listed as practical/exercises. However, if these practical/exercises are completed appropriately, they would also lead to development of **Programme Outcomes/Course Outcomes in affective domain** as given in a common list at the beginning of curriculum document for this programme. Faculty should refer to that common list and should ensure that students also acquire those Programme Outcomes/Course Outcomes related to affective domain.*

Sr. No.	Unit No.	Practical Exercises (Outcomes in Psychomotor Domain)	Approx. Hrs. required
1	I	Self Introduction-giving personal details for introducing self	02
2	II	SLT-Access the book on biography of scientist/industrialist/invention from the library or internet	02
3	I	Deliver a seminar for 10 minutes using presentation aids.	02
4	IV	Prepare PowerPoint slides on given topic and make presentation	02
5	VII	Case study for problem solving in an organisation	04
6	V	Discuss a topic in a group & prepare minutes of discussion.	02
7	VI	Prepare questionnaire for your friend or any person in the organisation to check emotional intelligence.	02
8	VII	Goal setting for achieving the success-SMART goal.	02
9.	I	SWOT Analysis for yourself with respect to your Strength, Weakness, Opportunities & Threats	04
10	III	Attend a seminar or a guest lecture and note down the important points and prepare a report of the same.	02
11	VIII	Undertake any social activity in a team and prepare a report about it(i.e. tree plantation, blood donation, environment protection, rain water harvesting)	04
12	III	Management of self-stress management, time management, health management	04
		TOTAL	**32**

7.0 STUDENT ACTIVITIES:

Following is the list of proposed student activities like

1. Preparing personal time table.
2. Performing YOGA as a routine part of daily life.
3. Practicing breathing exercises.
4. Improving concentration by chanting and meditation.
5. Focusing on behavior skills and mannerism
6. Searching information on internet and newspapers.
7. Concentrating on various aspects of personality development.

8.0 SPECIAL INSTRUCTIONAL STRATEGIES (If any):

1. Use of videos on personality development.
2. Use of power point presentation on health, time & stress management
3. Case study of an organization
4. Use of videos to show interviews of successful personalities.

9.0 LEARNING RESOURCES:

A) Books

Sr.No.	Title of Book	Author	Publication
1	Make Every Minute Count	Marion E Haynes	Kogan Page India
2	Body language	Allen Pease	Sudha Publication Pvt. Ltd.
3	Presentation Skills	Michael Hatton	ISTE New Delhi
4	Organizational Behavior	Pearson Education Asia	Tata McGraw Hill
5	Working in Teams	Chakravarty, Ajanta	Orient Longman
6	Develop Your Assertiveness	Bishop, Sue	Kogan Page India
7	Adams Time Management	Marshall Cooks	Viva Books
8	Time Management	Chakravarty, Ajanta	Rupa and Company
9	Target setting & Goal Achievement	Richard hale, Peter whilom	Kogan page India
10	Creativity &problem solving	Lowe and Phil	Kogan page (I)P Ltd
11	Basic Managerial Skills for all	E. H. Mc Grah, S. J.	Pretice Hall of India, Pvt. Ltd.

B) Software/Learning Websites

1. http://www.mindtools.com
2. http:// www.successconsciousness.com
3. http://www.studyhabits.com
4. http:// www.motivateus.com
5. http://www.quickmba.com
6. http:// www.success77.com
7. http:// www.stress.org
8. http:// www.topachievement.com
9. http://www.ethics.com
10. http:// www.creativityforlife.com
11. http:// www.motivation.com
12. http:// www.queendom.com

C) Major Equipments/ Instruments with Broad Specifications

Not Applicable

10.0 MAPPING MATRIX OF PO'S AND CO'S:

Course Outcomes	Programme Outcomes										
	a	b	c	d	e	f	g	h	i	j	k
CO1	L	M			L		L	M	H		H
CO2	M	M			L	L	H		M		H
CO3					M		M	M	H		H
CO4	L	L			L	M	M		H		M
CO5					L		M	M	H	M	L
CO6		L			L	M			H		M
CO7	L				M	M	L	M	M	L	L
CO8	L	L			L	M	L	L	H		L

H: High Relationship, M: Moderate Relationship, L: Low Relationship.

PROGRAMME : Diploma Programme CE / ME / PS / EE / IF / CM / EL / AE
COURSE : Basic Mathematics (BMT) **COURSE CODE** : 6103

TEACHING AND EXAMINATION SCHEME:

Teaching Scheme				Examination Scheme								
Hrs / week			Credits	TH Paper Hrs.	Marks							
TH	TU	PR				TH	TEST	TH+TEST	PR	OR	TW	TOTAL
03	01	--	04	03	Max.	80	20	100	--	--	--	100
					Min.	32	--	40	--	--	--	--

1.0 RATIONALE:

This course is classified under foundation course and intends to teach the students basic facts, concepts and principles of Mathematics, as a tool to analyse the engineering problems and lay down the understanding of basic technology courses.

2.0 COURSE OBJECTIVES:

The student will be able to,

1. Acquire the knowledge of mathematical terms definitions, principles and procedure of algebra, trigonometry and co-ordinate geometry.
2. Develop the process of logical thinking.
3. Comprehend the principles of the other courses.
4. Solve problems by using analytical & systematic approach.

3.0 COURSE OUTCOMES:

The course content should be taught and learning imparted in such a manner that students are able to acquire required learning outcome in cognitive, psychomotor and affective domain to demonstrate following course outcomes:

1. Apply logarithm concept for solving mathematical problems
2. Solve determinant and matrix
3. Solve simultaneous equation in three variables
4. Use partial fraction to solve engineering problems
5. Apply binomial theorem to solve engineering problems
6. Determine properties of triangle and solution of triangle
7. Use coordinate geometry for solving problems in straight lines and circles

4.0 COURSE DETAILS:

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics	Hours
Unit-I **Logarithm**	1a. Define logarithm use it for conversion 1b. Apply laws of logarithm to solving problems 1c. Identify common logarithm and Naperian logarithm	1.1 Concept and definition of Logarithm, conversion of exponential and logarithmic forms 1.2 Laws of logarithms and change of base formula 1.3 Common logarithm and **Naperian** logarithm definition and **notation only.**	03
Unit-II **Determinant & Matrix Algebra**	2a. Calculate determinant of order two and three and apply Cramer's Rule. 2b. Calculate area Of Triangle & condition of co linearity 2c. Define various types of	2.1 Determinant of order two and three, Cramer's Rule for Three Variables. Area of Triangle and Condition of Co linearity. 2.2 Definition of a matrix, types of matrix, algebra of matrices,	10

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics	Hours
	matrices; solve problems using Algebra of matrix. 2d. Calculate Inverse of matrix	equality of matrices, scalar multiplication, product of two matrices, Transpose of matrix. 2.3 Minor, cofactor and ad joint of matrix, Inverse of matrix by ad Joint matrix method.	
Unit-III **Partial Fraction**	3a. Identify proper & improper 3b. Resolve partial fraction method of Case I, Case II and Case III.	3.1 Rational function, proper and Improper rational Functions 3.2 Concept of partial fraction. Case-1. The denominator contains linear non repeated factors. Case-2. the denominator contains linear but repeated factors Case-3. the denominator contains quadratic irreducible factors	05
Unit-IV **Binomial Theorem**	4a. State Binomial Theorem for Positive integral Index. 4b. Use T_{R+1} for finding middle term general term 4c. Use approximation Theorem for solving problems	4.1 Binomial Theorem for positive integral index, formula for Tr+1, Middle term, particular term. 4.2 Binomial Theorem for rational and negative index (expansion up to four terms only), approximation theorem, simple problems	04
Unit-V **Measurement Of Angle**	5a. Conversion of sexagesimal systems & circular systems	5.1 Measurement of angles, sexagesimal systems & circular systems, co-terminal angles, positive and negative angles, conversion of angle to radian to degree and degree to radians.	02
Unit-VI **Trigonometric Ratios**	6a. Calculate trigonometric ratios of any angle, Solve problem using fundamental Identities. 6b. Solving problem using allied, Compound, Multiple and Sub multiple forms.	6.1 Trigonometric ratios of any angle, graph of trigonometric functions fundamental identities 6.2 Trigonometric ratios of allied, compound, multiple and sub multiple angles, sum &product forms.	08
Unit-VII **Inverse Trigonometric Functions**	7a. Convert & solving inverse trigonometry function 7b. Use of $\tan^{-1}x + \tan^{-1}y$ form to solve problem.	7.1 Concept and definition of trig. Function, Relation between inverse trig. functions	02
Unit-VIII **Properties Of Angle And Solution Of Triangle**	8a. Use properties of triangle : Sine rule, Cosine rule to solve mathematical problems 8b. Solve any triangle problems	8.1 Sine rule, cosine rule & law of tangent (simple problems) 8.2 solutions of triangle	04
Unit-IX **Equation Of Straight Line**	9a. Calculate Slope, X and Y, intercept Use various form of Straight line to solve problems.	9.1 Slope and intercepts of straight line, various form of straight line, angle between two lines, condition for two parallel or perpendicular lines, perpendicular distance formula,	06

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics	Hours
		distance between two parallel lines.	
Unit-X **Equation Of Circle**	10a. Calculate Radius & Centre of general circle 10b. Apply various form of circle 10c. Calculate Equation of tangent & normal to the circle.	10.1 Equation Of std. circle, center radius form, general form of circle, Diameter form of circle, equation of tangent and normal to the circle.	04
		TOTAL	**48**

5.0 SUGGESTED SPECIFICATION TABLE WITH MARKS

Unit No.	Unit Title	Distribution of Marks			
		R Level	U Level	A and above Levels	Total Marks
I	Logarithm	02	02	02	06
II	Determinant And Matrix Algebra	04	08	04	16
III	Partial Fraction	02	04	02	08
IV	Binomial Theorem	02	02	02	06
V	Measurement Of Angle	02	02	--	04
VI	Trigonometric Ratios	04	04	04	12
VII	Inverse Trigonometric Function	02	02	--	04
VIII	Properties of Triangle And Solution Of Triangle	02	02	04	08
IX	Equation Of Straight Line	02	04	04	10
X	Equation Of Circle	02	02	02	06
	TOTAL	**24**	**32**	**24**	**80**

6.0 ASSIGNMENTS/ TUTORIAL /TASKS

Sr. No.	Unit No.	Batch wise Tutorial Exercises **Tutorial:** Ten question of multiple choice with justification	Approx. Hrs. required
1	I	Logarithm	01
2	II	Determinant	01
3	II	Matrix Algebra	02
4	III	Partial Fraction	01
5	IV	Binomial Theorem	02
6	V	Measurement And Angle	01
7	VI	Trigonometric Ratios	01
8	VI	Trigonometric Ratios	01
9	VII	Inverse Trigonometric Ratios	02
10	VIII	Properties of Triangle And Solution Of Triangle	01
11	IX	Straight Line	02
12	X	Circle	01
		TOTAL	**16**

7.0 STUDENT ACTIVITIES:

Following is the list of proposed student activities like

1. Teacher guided self learning activities.
2. Applications to solve identified Engineering problems and use of Internet.

8.0 SPECIAL INSTRUCTIONAL STRATEGIES (If any):

Not Applicable

9.0 LEARNING RESOURCES:

A) Books

Sr.No.	Title of Book	Author	Publication
1	Mathematics for polytechnic student (I)	S. P. Deshpande	Pune Vidyarthi Gruha
2	Trigonometry	S. L. Loney	S. Chand
3	Higher Engineering Mathematics	B. S. Grewal	Khanna
4	College Algebra	F.G. Valles	Charter Publication.
5	Higher Algebra	H. S. Halls & S.R. Night	
6	Matrices	F. Ayers	Schan Series. Metric Edition Book, Palace of India.

B) Software/Learning Websites

1. http://www.mathsisfun.com
2. http://mathinsight.org/logarithm_basics
3. http://www.mathportal.org/linear-algebra/determinants/determinant-of-a-matrix.php
4. http://www.math.hmc.edu/calculus/tutorials/matrixalgebra/
5. http://ibgwww.colorado.edu/~carey/p7291dir/handouts/matrix.algebra.pdf
6. http://www.purplemath.com/modules/binomial2.htm
7. http://www.themathpage.com/atrig/line.htm
8. http://i1.dainikbhaskar.com/web2images/education/maths_13659_13897.pdf
9. http://mathworld.wolfram.com/InverseTrigonometricFunctions.html
10. http://aieee.examcrazy.com/maths/formula-tips/Co-ordinate-Geometry-circle.asp

C) Major Equipments/ Instruments with Broad Specifications

1. Scientific Calculator
2. Computer system with Printer and Internet system.
3. LCD Projector

10.0 MAPPING MATRIX OF PO'S AND CO'S:

Course Outcomes	Programme Outcomes										
	a	b	c	d	e	f	g	h	i	j	k
CO1	H		M								L
CO2	H		M								L
CO3	H		L								L
CO4	H		L								L
CO5	H		M								L
CO6	H		M								L
CO7	H		M								L

H: High Relationship, M: Moderate Relationship, L: Low Relationship.

PROGRAMME : Diploma Programme CE / ME / PS / EE / IF / CM / EL / AE
COURSE : Engineering Mathematics (EMT) **COURSE CODE** : 6104

TEACHING AND EXAMINATION SCHEME:

Teaching Scheme				Examination Scheme								
Hrs / week			Credits	TH Paper Hrs.	Marks							
TH	TU	PR				TH	TEST	TH+TEST	PR	OR	TW	TOTAL
03	01	--	04	03	Max.	80	20	100	--	--	--	100
					Min.	32	--	40	--	--	--	--

1.0 RATIONALE:

The study of mathematics is necessary to develop in the students the skills essential new for the disciplines like Genetic Engineering, Biotechnology and Information Technology etc. This course is extension of Basic Mathematics and stepping to learn applied mathematics. Engineering mathematics lays down the foundation to understand and express principles and laws involved in other technology courses.

2.0 COURSE OBJECTIVES:

The student will be able to,

1. Acquire knowledge of differential calculus, vector algebra, statistics and probability, complex numbers.
2. Develop the ability to apply mathematical methods to solve engineering problem
3. Acquire sufficient mathematical techniques necessary for daily and practical problems.

3.0 COURSE OUTCOMES:

The course content should be taught and learning imparted in such a manner that students are able to acquire required learning outcome in cognitive, psychomotor and affective domain to demonstrate following course outcomes :

1. Solve function and limit of function
2. Apply derivatives to solve engineering problems
3. Apply vector to solve engineering problems
4. Determine statistics probability to solve engineering problems
5. Solve engineering problems using complex number

4.0 COURSE DETAILS:

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics	Hours
Unit-I **Function**	1a. Solve problem of functions, State even & odd function, identify various types of function.	1.1. Definition of function, types of functions, Basic functions such as algebraic, exponential, logarithmic, trigonometric, inverse trigonometric functions, explicit, implicit, composite, inverse, parametric, exponential even & odd functions, simple problems	03
Unit-II **Limits**	2a. Apply limit of various types of Functions.	2.1. Definition of limit, limit of Functions such as algebraic Functions, trigonometric functions, logarithm and exponential functions	05
Unit-III **Derivatives**	3a. Solve problems of derivative with the help of rules & formulae of	3.1 Concept and definition of derivative, Notation, standard Formulae and rules of derivative	10

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics	Hours
	derivative. 3b. Differentiate various types of functions 3c. Calculate second order of derivative.	3.2 Methods of differentiation, derivative of composite functions, implicit function. Parametric function. Inverse function. Logarithmic Differentiation. 3.3 Second order derivatives, simple problems.	
Unit IV **Application Of Derivatives**	4a. Apply geometrical meaning of derivative; solve the problem based on related rates, radius of curvature & maxima minima.	4.1 Geometric meaning of derivative 4.2 Error theorem. 4.3 Related rates, radius of curvature 4.4 Maxima & Minima	06
Unit V **Vectors**	5a. Apply algebra of vector 5b. Calculate scalar and vector products 5c. Apply vector algebra to find work done and moment of force, Area of parallelogram	5.1. Definition of vector, position vector, algebra of vector (equality, addition, subtraction and scalar multiplication) 5.2. Dot (scalar) and vector (cross) product of two vectors. 5.3. Application of vectors, work done and moment of force about a point and line.	08
Unit VI **Statistics & Probability**	6a. Calculate range, mean deviation, standard deviation for group and ungrouped data, coefficient of variance 6b. Apply the theory of probability to solve problem 6c. Apply addition and multiplication theorems	6.1. Measure of dispersion such as range, mean deviation, standard deviation, variation and coefficient of variation. 6.2. Definition of random experiment, sample space event, occurrence of events and types of events (impossible, mutually exclusive, exhaustive and equally likely) 6.3. Definition of probability, addition and multiplication theorems of probability.	08
Unit VII **Complex Number**	7a. Solve problem based on complex number(real and imaginary part, polar form) 7b. Apply Algebra of complex number to solve problem 7c. Solve problem of Euler's function & circular function, Hyperbolic function.	7.1. Definition of complex number, Cartesian, polar and exponential forms of complex number. 7.2. Algebra of complex no. (equality, addition, subtraction multiplication and division) 7.3. De–Moiver's theorem (without proof) and simple problems. 7.4. Euler's form of circular functions, Hyperbolic functions and relation between them.	08
TOTAL			**48**

5.0 SUGGESTED SPECIFICATION TABLE WITH MARKS:

Unit No.	Unit Title	Distribution of Marks			
		R Level	U Level	A and above Levels	Total Marks
I	Function	02	02	--	04
II	Limits	02	04	02	08
III	Derivative	06	08	06	20
IV	Application Of Derivative	02	04	06	12

Unit No.	Unit Title	Distribution of Marks			
		R Level	U Level	A and above Levels	Total Marks
V	Vector	04	06	02	12
VI	Statistics And Probability	04	04	04	12
VII	Complex Number	04	04	04	12
	TOTAL	**24**	**32**	**24**	**80**

6.0 ASSIGNMENTS/TUTORIAL/TASKS:

Sr. No.	Unit No.	Batch wise Tutorial Exercises (Outcomes in Psychomotor Domain) **Tutorial:** Ten question of multiple choice with justification	Approx. Hrs. required
1	I	Function	01
2	II	Limits I	01
3	II	Limits II	01
4	III	Derivative I	01
5	III	Derivative II	01
6	III	Derivative III	02
7	III	Second Order Derivative	01
8	IV	Application Of Derivative	02
9	V	Vector	02
10	VI	Statistics	01
11	VI	Probability	01
12	VII	Complex Number	02
		TOTAL	**16**

7.0 STUDENT ACTIVITIES:

Following is the list of proposed student activities like

1. Teacher guided self learning activities.
2. Applications to solve identified Engineering problems and use of Internet.
3. Learn graphical software: Excel, DPlot and Graph.

8.0 SPECIAL INSTRUCTIONAL STRATEGIES (If any):

Not Applicable

9.0 LEARNING RESOURCES:

A) Books

Sr.No.	Title of Book	Author	Publication
1	Mathematics for polytechnic student (II)	S. P. Deshpande	Pune Vidyarthi Gruha
2	Higher Engineering Mathematics	B. S. Grewal	Khanna
3	Advanced Engineering Mathematics	H.K. Das	Khanna Publication
4	Calculus of single variable	R.T. Smith	Tata McGraw Hill.
5	Engineering Mathematics	S.S. Shastri	Pretice Hall Publication

B) Software/Learning Websites

1. http://schools.aglasem.com/1341
2. http://www.emathzone.com/tutorials/calculus/types-of-functions.html
3. http://www.mathsisfun.com/algebra/vectors.html
4. http://www.mathsisfun.com/data/
5. http://mathworld.wolfram.com/ComplexNumber.html

C) Major Equipments/ Instruments with Broad Specifications

1. Scientific Calculator
2. Computer system with Printer and Internet system.
3. LCD Projector.

10.0 MAPPING MATRIX OF PO'S AND CO'S:

Course Outcomes	Programme Outcomes										
	a	**b**	**c**	**d**	**e**	**f**	**g**	**h**	**i**	**j**	**k**
CO1	H		M								L
CO2	H		M								L
CO3	H		M								L
CO4	H		M								L
CO5	H		M								L

H: High Relationship, M: Moderate Relationship, L: Low Relationship.

PROGRAMME : Diploma Programme in CE / ME / PS / EE / IF / CM / EL / AE
COURSE : Applied Physics (PHY) **COURSE CODE :** 6105

TEACHING AND EXAMINATION SCHEME:

Teaching Scheme				Examination Scheme							
Hrs / week			Credits	Online Exam Hrs.	Marks						
TH	TU	PR				TH	TEST	TH+TEST	PR	OR	TW	TOTAL
04	--	02	06	02	Max.	80#	20#	100	--	--	50	150
					Min.	32	--	40	--	--	20	--

 # Indicates online examination

3.0 RATIONALE:

Physics is associated with our lives at every stage. A good scientific attitude is essential for every human being to increase his/her quality of life. Today learning Physics has become more challenging because it is no more a watertight compartment. The approach is now inter-disciplinary and integrated with emphasis on the principle with their application.

4.0 COURSE OBJECTIVES:

The student will be able to,

1. Understand and apply the laws of Physics in various contexts.
2. Apply their knowledge of basic Physics to solve problems and present the solution in a clear and concise manner.
3. Acquire and develop experimental skills including the use of variety of laboratory instruments, taking of data for interpretation and its analysis.
4. Develop skill in the presentation of clear and concise written accounts of laboratory work.

5.0 COURSE OUTCOMES:

The course content should be taught and learning imparted in such a manner that students are able to acquire required learning outcome in cognitive, psychomotor and affective domain to demonstrate following course outcomes:

1. Differentiate between various systems of measurement and identify proper unit of a physical quantity.
2. Identify the properties of Laser and Optical fibre as well as their engineering applications.
3. Acquire the knowledge about superconductors, indoor lighting.
4. Identify conductors & insulators of heat and analyse the relation between pressure, volume and temperature of gas.
5. Recognise elastic properties of materials and types of modulus of elasticity.
6. Identify the properties such as surface tension of liquids and viscosity of fluids.
7. Be aware of the propagation of sound and acoustics of building.
8. Distinguish between various effects produced by an electric charge.
9. Gain broad ideas about capacitors, semiconductors and p-n junction diode.
10. Discover the basics and applications of photoelectric cell and X rays.

6.0 COURSE DETAILS:

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics	Hours
Unit-I **Units & Measurements**	1a. Differentiate between fundamental &derived quantities/units. 1b. Determine dimension of a physical quantity. 1c. Calculate different	1.1 Need of measurements, units of measurements, systems of units, SI units, fundamental & derived units, fundamental & derived quantities. 1.2 Dimension of physical quantity, dimensional analysis & its uses, order of magnitude & significant	08

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics	Hours
	types of errors in measurements. 1d. Illustrate use of vernier caliper and screw gauge for linear measurements.	figures. 1.3 Accuracy & errors, instrumental, systematic and random error, estimation of error-average value, absolute error, relative error & percentage error, numerical. 1.4 Measuring instruments-vernier caliper and micrometer screw gauge.	
Unit-II **Light**	2a. Calculate refractive index of material of prism. 2b. Identify advantages of optical fibre over conducting wire. 2c. Differentiate between types of optical fibre. 2d. Recognise the principle of photometry. 2e. Acquire knowledge about indoor lighting.	2.1 Refraction of light, refractive index and its significance, Refraction through prism, Derivation of Prism formula. 2.2 Total internal reflection of light (TIR), Optical fibre, advantages and disadvantages, construction of optical fibre. 2.3 Transmission characteristics of Optical, fibre, types of optical fibre-step & graded index fibre, Application of optical fibre. 2.4 Luminous flux, luminous intensity, illumination, candela, lumen, illuminance, inverse square law of illuminance, principle of photometry. 2.5 Indoor lighting-direct, indirect, semi-indirect, utilization factor, efficiency of source, maintenance factor, space to height ratio, total luminous flux, numericals.	08
Unit-III **Laser**	3a. Describe the principle of laser. 3b. Acquire knowledge about He-Ne laser 3c. Identify applications of holography	3.1 Laser, Properties of laser, spontaneous absorption, spontaneous emission and stimulated emission, population inversion, pumping, life time, meta-stable-state. 3.2 Construction, advantages & disadvantages of Helium-Neon Laser, applications of Laser. 3.3 Holography recording and Reconstruction of hologram, Application of holography.	06
Unit-IV **Current Electricity**	4a. Demonstrate ohm's law, use of metre bridge to find resistance. 4b. Use potentiometer to find internal resistance. 4c. Identify positive/ Negative temperature coefficient of resistance of	4.1 Ohm's law, Specific resistance, conductance, conductivity, Wheatstone's network, balancing condition, metre bridge. 4.2 Theory of shunt, fall of potential along wire, potentiometer. 4.3 Effect of temperature on resistance of metals, semiconductors & insulators, temperature coefficient of resistance, positive& negative temperature coefficient of resistance.	08

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics	Hours
	material. 4d. Calculate electrical energy consumed in kWh. 4e. Distinguish between properties of conductor & superconductor.	4.4 Heating effect of electric current, electric power, electric energy, kilowatt hour. 4.5 Superconductivity, graph of temperature versus resistance for mercury, superconductors, properties and application of superconductors, Numericals.	
Unit-V **Transfer of Heat & Gas laws**	5a. Illustrate conversion of temperature. 5b. Distinguish between good & bad conductors of heat on the basis of thermal conductivity. 5c. Calculate coefficients of expansion of solids. 5d. Identify the relation between pressure, volume & temperature of gas. 5e. Gain idea about specific heats of gases. 5f. Distinguish between isothermal, adiabatic, isobaric & isochoric process.	5.1 Temperature & heat, Celsius & Fahrenheit scale, conduction, convection, radiation. 5.2 Conduction of heat –variable state, steady state and temperature gradient, law of thermal conductivity, coefficient of thermal conductivity, applications of thermal conductivity. 5.3 Expansion of solids, Coefficient of linear, areal and cubical expansion and relation between them. 5.4 Statement of Boyle's law, Charle's law, Gay Lussac's law, concept of absolute zero, Kelvin scale of temperature. 5.5 General gas equation, universal gas constant, Work done in expanding a gas at constant pressure, specific heats of a gases and relation between them (equation only). 5.6 Isothermal, isobaric and isochoric and adiabatic process, difference between these processes, numericals.	08
Unit-VI **(ONLY For CE / ME / PS / AE)** **Elasticity**	6a. Differentiate between elasticity, plasticity & rigidity 6b. Calculate moduli of elasticity of materials. 6c. Illustrate applications of elasticity.	6.1 Deforming force, restoring force, elasticity, plasticity and rigidity. 6.2 Stress and strain with their types, elastic limit, Hooke's law, moduli of elasticity (Y, η, K) and their significance, Poisson's ratio. 6.3 Stress-strain diagram for wire under increasing load, factor of safety, applications of elasticity, Numericals.	06
Unit-VII **(ONLY For CE / ME / PS / AE)** **Surface Tension**	7a. Acquire knowledge about surface tension of liquids & its effects. 7b. Recognise effects of impurities & temperature on surface tension of liquid. 7c. Calculate surface tension of liquid.	7.1 Cohesive and adhesive force, range of molecular forces, sphere of influence, surface energy, Surface tension, molecular theory of surface tension. 7.2 Effect impurities and temperature on surface tension, relation between surface tension & surface energy 7.3 Angle of contact, capillary action relation between surface tension, capillary rise, radius of capillary,	06

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics	Hours
		application of surface tension, numericals.	
Unit-VIII **(ONLY For CE / ME / PS / AE)** **Viscosity**	8a. Identify applications of Pascal's law. 8b. Gain knowledge about viscosity of fluids. 8c. Find viscosity of fluids using Stoke's law 8d. Distinguish between types of flow of fluid. 8e. Identify significance of Reynold's number.	8.1 Pressure, pressure due to liquid column, hydrostatic paradox, Pascal's law and its applications. 8.2 Viscosity, velocity gradient, Newton's law of viscosity, coefficient of viscosity and its unit. 8.3 Stoke's law, expression for relation between coefficient of viscosity and terminal velocity. 8.4 Types of flow, Streamline and turbulent flow, advantages of streamline flow. 8.5 Critical velocity, Reynold's number and its significance, Bernoulli's principle & its applications, application of viscosity, Numericals.	06
Unit-IX **(ONLY For CE / ME / PS / AE)** **Sound and acoustic**	9a. Recognise frequency of audible & other sound waves. 9b. Calculate sound intensity in decibel scale. 9c. Illustrate properties & applications of Ultrasonic waves. 9d. Calculate reverberation time using Sabine formula. 9e. Plan acoustical planning of a hall.	9.1 Introduction to sound, frequency of sound and limits of Audibility, intensity of sound. 9.2 Reflection of sound, absorption coefficient, transmission coefficient, reflection coefficient, Loudness and intensity level, threshold of hearing & pain, Decibel scale. 9.3 Ultrasonic waves-properties & applications. 9.4 Echo, Reverberation, standard reverberation time, Sabine's formula. 9.5 Condition for good Acoustics, factors affecting acoustical planning of auditorium. Numericals.	08
Unit-VI **(only for EE / IF / CM / EL)** **Electrostatics**	6a. Calculate force between two charges using Coulomb's law. 6b. Illustrate different properties of electric lines of force. 6c. Calculate electric potential due an electric charge. 6d. Identify importance of potential of earth.	6.1 Coulomb's inverse square law, permittivity of medium, unit charge, electric field, electric field intensity. 6.2 Electric lines of force and their properties, electric flux, Electric flux density and relation between them, Electric flux associated with charge. 6.3 Electric potential, potential difference, potential gradient, dielectric strength, breakdown potential, expression for PD between two points due to point charge, expression for absolute potential at point. 6.4 Potential due to charged sphere. (three cases), potential of earth, numericals.	08
Unit-VII	7a. Illustrate charging &discharging of	7.1 Capacitor, Capacitance and its unit, dielectric, effect of dielectric,	06

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics	Hours
(only for EE / IF / CM / EL) **Capacitance**	capacitor. 7b. Calculate effective capacitance of combination of capacitors. 7c. Identify types of capacitors. 7d. Calculate energy stored by a capacitor.	dielectric constant, dielectric breakdown, Principle of capacitor. 7.2 Charging and discharging of Capacitor, Capacitor in series and parallel. 7.3 Types of capacitor- fixed & variable. 7.4 Expression for capacitance of parallel plate capacitor, capacitance of spherical and cylindrical capacitor equation only, energy stored by charged capacitor (equation only), numericals.	
Unit-VIII **(only for EE / IF / CM / EL)** **Photo electricity and X-rays**	8a. Acquire knowledge about photoelectric effect. 8b. Identify characteristics of Photoelectric effect. 8c. Calculate KE of photoelectrons using Einstein's equation. 8d. Recognise production of X-rays. 8e. Illustrate properties & applications of x-rays.	8.1 Planck's quantum theory, Photo electric effect, experiment to study photoelectric effect. 8.2 Characteristics of photoelectric effect, threshold frequency, threshold-wavelength, photoelectric work function, stopping potential. 8.3 Einstein's photoelectric equation, photoelectric Cell and types, applications of photoelectric cell. 8.4 Origin of X-rays, production of X-rays using Coolidge's X-ray tube, minimum wavelength of X-ray. 8.5 Properties of X-rays, applications of X- rays, numericals.	06
Unit-IX **(only for EE / IF / CM / EL)** **Band Theory of Solids**	9a. Classify solids on the basis of band theory. 9b. Classify Semiconductors. 9c. Illustrate forward & reverse bias of P-N Junction diode.	9.1 Energy bands in solids-valence band, conduction band and forbidden energy gap, classification of solids on the basis of band theory : conductor, insulator and semiconductor. 9.2 Properties of semiconductor, classification of semiconductors intrinsic & extrinsic, P type & N type semiconductors. 9.3 P-N junction diode, forward & reverse bias characteristics of P-N junction diode, advantages of semiconductor devices.	06
		TOTAL	**64**

7.0 SUGGESTED SPECIFICATION TABLE WITH MARKS (THEORY):

Unit No.	Unit Title	Distribution of Theory Marks			
		R Level	U Level	A and above Levels	Total Marks
Units common for all programmes					
I	Units and measurements	04	02	04	10
II	Light	02	04	04	10
III	Laser	02	04	02	08
IV	Current electricity	02	04	04	10
V	Transfer of heat & gas laws	02	04	04	10

Unit No.	Unit Title	Distribution of Theory Marks			
		R Level	U Level	A and above Levels	Total Marks
Units ONLY FOR CE/ME/PS/AE					
VI	Elasticity	02	04	02	08
VII	Surface tension	02	04	02	08
VII	Viscosity	02	02	04	08
IX	Sound and Acoustics	02	02	04	08
Units ONLY FOR EE/IF/CM/EL					
VI	Electrostatics	02	04	02	08
VII	Capacitance	02	04	02	08
VIII	Photo electricity & X-rays	02	02	04	08
IX	Band theory of solids	02	02	04	08
	TOTAL	**20**	**30**	**30**	**80**

Legends: R = Remembrance (Knowledge); U= Understanding; A= Application and above levels (Revised Bloom's taxonomy)

Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.

8.0 ASSIGNMENTS/PRACTICALS/TASKS:

The tutorial/practical/assignments/tasks should be properly designed and implemented with an attempt to develop different types of cognitive and practical skills **(Outcomes in cognitive, psychomotor and affective domain)** so that students are able to acquire the competencies.

***Note**: Here only outcomes in psychomotor domain are listed as practical/exercises. However, if these practical/exercises are completed appropriately, they would also lead to development of **Programme Outcomes/Course Outcomes in affective domain** as given in a common list at the beginning of curriculum document for this programme. Faculty should refer to that common list and should ensure that students also acquire those Programme Outcomes/Course Outcomes related to affective domain.*

Sr. No.	Unit No.	Practical Exercises (Outcomes in Psychomotor Domain)	Approx. Hrs. Required
		Common practicals	
1	I	Measure the dimensions of different objects using Vernier caliper	02
2	I	Measure the dimensions of different objects using micrometer screw gauge	02
3	II	Determine the refractive index of material of prism using spectrometer	02
4	IV	Verify ohm's law and determine resistivity of material of given wire.	02
5	IV	Verify law of resistance in series & parallel using metre bridge.	02
6	V	Determine coefficient of linear expansion using Pullinger's apparatus.	02
7	V	Verify Boyle's law	04
8	IV	Verify principle of potentiometer.	02
		Practicals for CE/ME/PS/AE	
1	VI	Verify Hooke's law of elasticity and determine Young's modulus of material of wire using Searle's apparatus.	04
2	VII	Determine surface tension of water using capillary rise method.	02
3	VIII	Verify Stoke's law of viscosity and determine coefficient of viscosity of given fluid.	04
4	IX	Determine coefficient of absorption of sound of given acoustical material.	04
		Practicals for EE/IF/CM/EL	
1	VII	Verify law of capacitance in series/parallel.	02

Sr. No.	Unit No.	Practical Exercises (Outcomes in Psychomotor Domain)	Approx. Hrs. Required
2	VII	Charging & discharging of capacitor and determine its time constant.	04
3	VIII	To study I-V characteristic of photoelectric cell.	04
4	IX	To study I-V characteristics of PN junction diode in forward/reverse biased condition.	04
		TOTAL	**32**

7.0 STUDENT ACTIVITIES:

Following is the list of proposed student activities like

1. Prepare charts of Vernier caliper, screw gauge, travelling microscope, spherometer & spectrometer for lab demonstration.
2. Study acoustical planning of institute's auditorium hall.
3. Study lighting system of institute's conference hall.

8.0 SPECIAL INSTRUCTIONAL STRATEGIES (If any):

1. Show videos based on topics in the curriculum (total internal reflection, population inversion, different laws of physics) for better understanding of the concepts.
2. Show videos of practical demonstration before performance of practical for better understanding of practical.

9.0 LEARNING RESOURCES:

A) Books

Sr.No.	Title of Book	Author	Publication
1	Engineering Physics	R K Gaur & S L Gupta	Dhanpat Rai Pub.
2	Applied Physics	Prof. Arthur Beiser	Tata McGraw hill Pub.
3	Engineering Physics	D K Bhattacharya	Oxford University press
4	Physics	Halliday & Resnick	Wiley India

B) Software/Learning Websites

1. www.physicsclassroom.com
2. www.physics.org
3. www.physics.brown.edu
4. http://scienceworld.wolfram.com/physics/
5. http://hyperphysics.phy-astr.gsu.edu/hbase
6. www.msu.edu/~brechtjo/physics
7. http://www.rp-photonics.com/laser_applications.html
8. http://webphysics.davidson.edu/alumni/jimn/He-Ne/Pages/Theory.htm
9. http://physix_jun.tripod.com/fibres_4.htm
10. http://www.suite101.com/content/optics-total-internal-reflection-a51310
11. http://teachers.web.cern.Ch/teachers/archive/HST2001/accelerators/superconductivity/superconductivity.htm
12. http://en.wikipedia.org/wiki/Acoustics

C) Major Equipments/ Instruments with Broad Specifications

1. Vernier Caliper (LC = 0.02mm)
2. Micrometer screw gauge (LC = 0.01mm)
3. Aneroid barometer
4. Digital stop watch
5. Travelling Microscope
6. Regulated power supply
7. Apparatus to verify Boyles law
8. Stoke's App to measure viscosity
9. Metre bridge

10. Searle's apparatus for Young's modulus
11. Pullinger's apparatus
12. Gas burner with regulator, LPG gas cylinder and lighter
13. Spectrometer
14. Bunsen's photometer.
15. Ammeter, voltmeter, galvanometer, rheostat, resistance box
16. Potentiometer.

10.0 MAPPING MATRIX OF PO'S AND CO'S:

Course Outcomes	Programme Outcomes										
	a	**b**	**c**	**d**	**e**	**f**	**g**	**h**	**i**	**j**	**k**
CO1	H		M	M	L			H	L		L
CO2	H		M	L	L			M	L		
CO3	H		M	L	L			M			
CO4	H	M	M	L	M	L		M			L
CO5	H	M	M	L	M			M			
CO6	H	M	L	L	M			M			
CO7	H		L	L	M	L		M	L		L
CO8	H		M	L	M			L	L		
CO9	H		M	L	M			M	L		
CO10	H		L	L	M	L		L	L		L

H: High Relationship, M: Moderate Relationship, L: Low Relationship.

PROGRAMME : Diploma Programme in CE / ME / PS / EE / IF / CM / EL / AE
COURSE : Applied Chemistry (CHY) **COURSE CODE** : 6106

TEACHING AND EXAMINATION SCHEME:

Teaching Scheme				Examination Scheme							
Hrs / week			Credits	Online Exam. Hrs.	Marks						
TH	TU	PR				TH	TEST	TH+TEST	PR	OR	TW	TOTAL
04	-	02	06	02	Max.	80#	20#	100	--	--	50	150
					Min.	32	--	40	--	--	20	--

 # indicates online examination

1.0 RATIONALE:

Chemistry is the basic science course which is essential to all engineering programmes. The basic aim of teaching science is to develop in the students the habit of scientific inquiry, ability to establish the cause and effect. The study of basic concepts of chemistry like atomic structure, water treatment, metals and alloys, corrosion, lubricants, non metallic materials, fuels, environmental effects etc will help the students to understand engineering courses where the emphasis is laid on the application of these concepts. Teaching of chemistry should be aimed at developing the right type of aptitude in the students and the ability to predict the result under given conditions.

Thus good foundation in basic science will help the students in their self development to cope up with continuous flow of innovation.

2.0 COURSE OBJECTIVES:

The student will be able to,

1. Develop scientific attitude in students.
2. Apply knowledge of chemistry in engineering situations.
3. Develop in students the habit of scientific enquiry, ability to establish cause and effect.

3.0 COURSE OUTCOMES:

The course content should be taught and learning imparted in such a manner that students are able to acquire required learning outcome in cognitive, psychomotor and affective domain to demonstrate following course outcomes:

1. Apply the principles of chemistry to engineering situations.
2. Apply knowledge to correlate the properties of materials, their engineering uses and protection.
3. Write electronic configuration of various elements.
4. Apply various applications of electrolysis in engineering situations.
5. Illustrate various methods of softening of hard water.
6. Use the appropriate metals and alloys for different engineering applications.
7. Differentiate various types of corrosion and gain knowledge on control measures associated with corrosion
8. Select lubricants for machines.
9. Enlist the various characteristics of good fuel.

4.0 COURSE DETAILS:

Unit	Major Learning Outcomes (in cognitive domain)	Topics & subtopics	Hours
Unit-I **Atomic Structure**	1a. Describe structure of an atom 1b. Explain Bohr's theory and distinguish between orbit and	1.1 Structure of an atom, fundamental particles of an atom, concept of atomic number, mass number. 1.2 Bohr's theory, orbit, orbital, shapes of orbital, energy level, sub energy level	06

Unit	Major Learning Outcomes (in cognitive domain)	Topics & subtopics	Hours
	orbital		
	1c. Describe rules for arrangement of electrons 1d. Give electronic configuration 1e. Describe the different types of compounds 1f. Explain the formation of various electrovalent and covalent compounds	1.3 Hund's rule, Aufbau principle, Rules for distribution of electrons in shell and sub shells. 1.4 Electronic configuration of atoms having atomic number 1-30 1.5 Electrovalent and covalent compounds, electrovalency and covalency 1.6 Formation of covalent compound e.g. H_2O, CH_4, O_2, N_2, C_2H_2 1.7 Formation of electrovalent compound e.g. NaCl, $CaCl_2$, $AlCl_3$	
Unit-II **Electro chemistry**	2a. Explain basic concepts of electrochemistry. 2b. Explain theory of ionization and factors affecting it 2c. Explain mechanism of electrolysis with examples. 2d. Describe faraday's first and second laws and solve numerical. 2e. Explain the applications of electrolysis 2f. Describe the construction and working of cells	2.1 Definition of electrochemistry, atom, ion, electrode, cell, electrolysis, electrolytes, non-electrolytes, anode, cathode. 2.2 Arrhenius theory of ionization, degree of ionization, factors affecting degree of ionization. 2.3 Electrolysis, mechanism, electrolysis of fused NaCl, aqueous NaCl using platinum electrode, $CuSO_4$ solution using Copper electrode. 2.4 Faraday's first and second law, 2.5 Numericals on Faraday's laws. 2.6 Process of electroplating and electro refining 2.7 Types of cell- e.g. Dry cell, Ni-Cd cell, introduction to solar cell	08
Unit-III **Water**	3a. Explain sources, impurities, properties of water. 3b. Differentiate between hard and soft water 3c. Describe the ill effect of hard water in domestic and industrial field 3d. Explain the different methods for removal of hardness of water. 3e. Describe the different treatments of drinking water 3f. Explain the concept of pH and pOH numerical related with it, applications	3.1 Sources of water- Rain, surface, underground water. Impurities in water- suspended, colloidal, dissolved, biological 3.2 Physical and chemical properties of water. 3.3 Hard and soft water. Types of hardness of water, Salts producing hardness of water, Units of hardness of water. 3.4 Domestic field- cooking, washing, bathing, drinking. Industrial field- paper, textile, dye, sugar industry. 3.5 Temporary hardness- boiling, Clark's method. 3.6 Permanent hardness- Permutit's method, ion exchange method. 3.7 Methods of purification of water: Screening, Sedimentation, coagulation, filtration, Sterilization of water. 3.8 Definition of pH and pOH, pH scale and numerical. 3.9 Applications of pH in engineering. -city water supply, corrosion, effluent	10

Unit	Major Learning Outcomes (in cognitive domain)	Topics & subtopics	Hours
	of pH in engineering.	treatment, electroplating.	
Unit-IV **Metals**	4a. Explain the basic concepts of metallurgy. 4b. Describe different characteristics of metal. 4c. Explain the metallurgy of iron. 4d. Describe the physical properties and applications of metals.	4.1 Definition of ore, mineral, gangue 4.2 Hardness, toughness, brittleness, tensile strength, malleability, ductility, machinability, weldability 4.3 Flow sheet of metallurgy 4.4 Steps of metallurgy : a. Concentration: physical, chemical. b. Reduction: smelting, alumino thermic process. c. Refining: poling, liquation, distillation, electrorefining. 4.5 Physical properties and applications of Fe, Cu, Al, Cr, Ni, Sn, P	08
Unit-V **Alloys**	5a. Describe the meaning of alloy, its preparation and its purposes of formation. 5b. Explain the classification of alloys and their applications	5.1 Definition of alloy, different methods of preparation of alloy, 5.2 Purposes of formation of an alloy. 5.3 Classification of alloys • Ferrous alloy- alloys steel and its applications. • Non ferrous alloy-Copper alloy-brass, bronze, gun metal, Monel metal Aluminum alloy-Duralumin • Solder alloy and its types.	06
Unit-VI **Corrosion**	6a. Describe magnitude of corrosion, meaning of corrosion, types of corrosion 6b. Explain the factors affecting the atmospheric and immersed corrosion 6c. Explain different methods of protection of metal from corrosion	6.1 Magnitude of corrosion, definition of corrosion, types of corrosion- a)Atmospheric corrosion- definition, types – b) corrosion due to oxygen, mechanism of corrosion due to oxygen, nature of film and its role in corrosion process c)Corrosion due to other gases 6.2 Immersed corrosion- definition, it's mechanism, galvanic and concentration cell corrosion 6.3 Factors affecting atmospheric and immersed corrosion 6.4 Methods of protection of metal from corrosion- hot dipping, metal spraying, sherardizing, electroplating of metal cladding, organic coating-paints and varnish	10
Unit-VII **Lubricants**	7a. Describe lubricants, its function and classification of lubricants. 7b. Explain lubrication and it's types 7c. Describe physical and chemical properties of	7.1 Definition of lubricant, function of lubricants, classification of lubricants. 7.2 Definition of lubrication, types of lubrication 7.3 Physical properties- viscosity, viscosity index, oiliness, flash and fire point, volatility, cloud and pour point. 7.4 Chemical properties- acid value, saponification value, emulsification.	08

Unit	Major Learning Outcomes (in cognitive domain)	Topics & subtopics	Hours
	lubricants 7d. Explain selection of lubricants for various machines	7.5 Properties and names of lubricants used for various machines like delicate instruments, heavy load and low speed machine, gears, cutting tools, I.C. Engine, steam engine	
Unit-VIII **Fuels**	8a. Describe fuels, characteristics of good fuel, types of fuel 8b. Describe solid fuel-e.g. coal in detail 8c. Describe liquid fuel e.g. -petroleum 8d. Describe gaseous fuel their advantages 8e. Distinguish between solid liquid and gaseous fuels	8.1 Definition of fuel, characteristics of good fuel, classification of fuel 8.2 Solid fuel-e.g. coal, it's types, properties of good coal, selection of coal, analysis of coal, determination of C and H in coal 8.3 Liquid fuel-e.g. petrol, classification of petrol, refining of petrol 8.4 Gaseous fuel e.g. LPG, natural gas, biogas 8.5 Advantages of gaseous fuel over solid and liquid fuels 8.6 Comparison between solid, liquid and gaseous fuels	08
		TOTAL	**64**

5.0 SUGGESTED SPECIFICATION TABLE WITH MARKS (THEORY):

Unit No	Unit title	Distribution of Theory marks			
		R level	**U level**	**A level**	**Total**
1	Atomic Structure	04	02	02	08
2	Electrochemistry	04	04	04	12
3	Water	04	04	04	12
4	Metals	04	02	04	10
5	Alloys	02	02	02	06
6	Corrosion	04	02	06	12
7	Lubricants	04	02	04	10
8	Fuels	04	02	04	10
	TOTAL	**30**	**20**	**30**	**80**

Legends: R = Remembrance (Knowledge); U = Understanding; A = Application and above levels (Revised Bloom's taxonomy)

Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.

6.0 ASSIGNMENTS/PRACTICALS/TASKS:

The tutorial/practical/assignment/task should be properly designed and implemented with an attempt to develop different types of cognitive and practical skills **(Outcomes in cognitive, psychomotor and affective domain)** so that students are able to acquire the desired programme outcome/course outcome.

Note*: Here only outcomes in psychomotor domain are listed as practical/exercises. However, if these practical/exercises are completed appropriately, they would also lead to development of* ***Programme Outcomes/Course Outcomes in affective domain*** *as given in the mapping matrix for this course. Faculty should ensure that students also acquire Programme Outcomes/Course Outcomes related to affective domain.*

Sr. No.	Unit No.	Practical Exercises (Outcomes in Psychomotor Domain)	Approx. Hrs. required
1 to 5	I	Inorganic qualitative analysis of any five solutions	10
6	II	Determination of electrochemical equivalent of copper.	02
7 to 8	III	Strength of given acidic solution using standard base solution.	04
9	III	Determination of pH of different unknown solutions.	02
10	III	Determination of chloride content in given water sample.	02
11 to 12	III	Determination of hardness of water	04
13	V	Determination of % of Fe in given ferrous alloy sample.	02
14	VI	To find relation between decrease in weight due to corrosion of metal and time.	02
15	VII	Determination of viscosity of given lubricating oil.	02
16	VIII	Determination of % of moisture in given coal sample by proximate analysis.	02
		TOTAL	**32**

7.0 STUDENT ACTIVITIES:

Following is the list of proposed student activities like

1. Draw structures and write electronic configurations of atoms having atomic number 1-30.
2. Testing of water samples.
3. Sampling and collection of coal.

8.0 SPECIAL INSTRUCTIONAL STRATEGIES (If any):

1. CAI package, video demonstration, charts, models, visits and expert seminar/lecture.

9.0 LEARNING RESOURCES:

A) Books

Sr.No.	Title of Books	Author	Publication
1	Engineering Chemistry	Jain & Jain	Dhanpat Rai and Sons
2	A Text Book of Polytechnic Chemistry	V. P. Mehta	Jain Brothers
3	Engineering Chemistry	S. S. Dara	S. Chand Publication
4	Industrial Chemistry	B. K. Sharma	Goel Publication
5	Environmental Chemistry & Pollution control	S. S. Dara	S. Chand Publication
6	Engineering Chemistry	M. M. Uppal	Khanna Publisher New Delhi

B) Software/Learning Websites

1. http://chemistry.osu.edu/~woodward/ch121/ch2_atoms.htm
2. http://www.nyu.edu/pages/mathmol/textbook/atoms.html
3. www.chemguide.co.uk/atoms/properties/gcse.html
4. http://www.water-research.net/index.php/water-treatment/tools/hard-water-hardness
5. http://www.unitedutilities.com/documents/WaterhardnessFactSheet.pdf
6. http://www.explainthatstuff.com/alloys.html
7. http://www.gordonengland.co.uk/xcorrosion.htm
8. http://cuiet.info/notes/chemistry/Lubricants.pdf
9. http://www.ignou.ac.in/upload/unit-3.pdf

C) Major Equipments/ Instruments with Broad Specifications

1. Muffle furnace
2. Distillation Plant
3. Computer lab with 20 Computers for online theory exam.
4. Digital pH meter
5. Ostwald's viscometer
6. Electronic weighing balance (0 to 100gm capacity).
7. Digital Stop watch.
8. Lovibond comparator
9. Regulated DC power supply
10. Rheostat
11. Ammeter

10.0 MAPPING MATRIX OF PO'S AND CO'S:

Course Outcomes	Programme Outcomes										
	a	**b**	**c**	**d**	**e**	**f**	**g**	**h**	**i**	**j**	**k**
CO1	H	M	M		L			L			L
CO2	H		M	M	L						L
CO3	H			M							L
CO4	H			M							L
CO5	H	M	L		M			L			
CO6	H	M		M	M						L
CO7	H			M	M						L
CO8	H			M	M						L
CO9	H										L

H: High Relationship, M: Moderate Relationship, L: Low Relationship.

PROGRAMME : Diploma Programme in CE / ME / EE / IF / CM / EL / AE
COURSE : Engineering Graphics (EGR) **COURSE CODE** : 6107

TEACHING AND EXAMINATION SCHEME:

Teaching Scheme				Examination Scheme								
Hrs / week			Credits	TH Paper Hrs.	Marks							
TH	TU	PR				TH	TEST	TH+TEST	PR	OR	TW	TOTAL
02	--	04	06	--	Max.	--	--	--	25	--	25	50
					Min.	--	--	--	10	--	10	--

1.0 RATIONALE:

Engineering Graphics is the language of engineers. The concepts of Engineering Graphics are used to develop & express the ideas and convey the instructions, which are used to carry out jobs in the Engineering field. This preliminary course aims at building a foundation for the further course in drawing and other allied courses.

2.0 COURSE OBJECTIVES:

The student will be able to,

1. Understand the use of drawing tools and equipments.
2. Understand the significance of engineering curves for various applications.
3. Understand the projections of point and line inclined to one reference plane.
4. Interpret the pictorial view and understand orthographic projection of the simple object.
5. Interpret the orthographic projection and understand pictorial view of the simple object.
6. Understand the significance of sectional view in the drawing.

3.0 COURSE OUTCOMES:

The course content should be taught and learning imparted in such a manner that students are able to acquire required learning outcome in cognitive, psychomotor and affective domain to demonstrate following course outcomes:

1. Draw the engineering curves for given engineering applications.
2. Draw the projections of point and lines inclined to one reference plane only.
3. Draw and dimension orthographic projections of given object.
4. Interpret orthographic projections of object and draw isometric view.
5. Draw sectional view of simple objects as per IS convention.

4.0 COURSE DETAILS:

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics	Hours
Unit-I **Drawing instruments and their uses**	1a. Use Instruments for drawing, Scales, Lines, & their applications.	1.1 Letters and numbers (single stroke vertical) 1.2 Convention of lines and their applications. 1.3 I.S. codes for planning and layout. 1.4 Scale (reduced, enlarged & full size) plain scale and diagonal scale. 1.5 Geometrical constructions and drawing polygons	04
Unit-II **Engineering curves**	2a. Draw Conic curves, involutes and Cycloid. 2b. State the applications of engineering	2.1 Methods for drawing an ellipse concentric circle, directrix focus and arc of circle method. 2.2 Methods for drawing parabola by directrix focus and rectangular method. 2.3 Methods for drawing a hyperbola by	08

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics	Hours
	curves.	directrix focus and rectangular method. 2.4 Procedure for drawing involutes of circle and polygon (up to hexagon) 2.5 Procedure for drawing cycloid, epicycloid and hypocycloid 2.6 Loci of points on Single slider crank mechanism with given specifications.	
Unit-III **Projections of Point and Line**	3a. Draw the projection of point 3b. Draw projection of line	3.1 Projection of point in the different quadrants. 3.2 Projection of line parallel to one plane and inclined to another reference plane only.	04
Unit-IV **Orthographic Projections**	4a. Interpret & draw orthographic views from given pictorial view.	4.1 Concept of Orthographic projections. 4.2 Conversion of pictorial view into Orthographic views only first angle projection method for simple objects.	06
Unit-V **Isometric Projections**	5a. Interpretation of isometric view. 5b. Draw isometric view from given orthographic views	5.1 Use of Isometric scale. 5.2 Comparison of true scale with isometric scale 5.3 Conversion of orthographic views into isometric View / projection	06
Unit-VI **Sectional View**	6a. Draw sectional view of simple drawing	6.1 Representation of sectional plane 6.2 Conversion of orthographic views into sectional View	04
		TOTAL	**32**

5.0 SUGGESTED SPECIFICATION TABLE WITH MARKS (Theory)

Not Applicable

6.0 ASSIGNMENTS/PRACTICALS/TASKS:

The tutorial/practical/assignment/task should be properly designed and implemented with an attempt to develop different types of cognitive and practical skills **(Outcomes in cognitive, psychomotor and affective domain)** so that students are able to acquire the desired programme outcome/course outcome.

***Note**: Here only outcomes in psychomotor domain are listed as practical/exercises. However, if these practical/exercises are completed appropriately, they would also lead to development of **Programme Outcomes/Course Outcomes in affective domain** as given in the mapping matrix for this course. Faculty should ensure that students also acquire Programme Outcomes/Course Outcomes related to affective domain.*

Sr. No.	Unit No.	Practical Exercises (Outcomes in Psychomotor Domain)	Approx. Hrs. required
1	I	Two sheets on letters, numbers and representation of lines and redraw the figures.	08
2	II	Sheet on six engineering curves	12
3	III	Sheet on projections of line. (04 problems)	12
4	IV	Sheet on orthographic projection. (02 problems)	12
5	V	Sheet on isometric views and projection. (04 problems)	12
6	VI	Sheet on sectional view. (02 problems)	08
		TOTAL	**64**

7.0 STUDENT ACTIVITIES:

Following is the list of proposed student activities like

1. Collect the information about application of engineering curves.
2. Sketch the orthographic views of simple engineering product in sketch book.
3. Sketch isometric view of simple engineering product in sketch book.
4. Sketch sectional view of simple engineering product in sketch book.

8.0 SPECIAL INSTRUCTIONAL STRATEGIES (If any):

1. Show Three Dimensional models of different objects.
2. Use softwares, CAI packages for better imagination.

9.0 LEARNING RESOURCES:

A) Books

Sr.No.	Title of Book	Author	Publication
1	Engineering Drawing	N. D. Bhatt	Charotar Publishing House
2	Engineering Drawing	P. J. Shaha	S. Chand
3	Engineering Drawing and Graphics	K. Venugopal	New Age International

B) Software/Learning Websites

1. AutoCAD
2. Solid works.

C) Major Equipments/ Instruments with Broad Specifications

Not applicable

10.0 MAPPING MATRIX OF PO'S AND CO'S:

Course Outcomes	Programme Outcomes										
	a	b	c	d	e	f	g	h	i	j	k
CO1	H	H	H								L
CO2	H	H									
CO3	H	M	M	M					L		L
CO4	H	M	M	M					L		
CO5	H	M		H							

H: High Relationship, M: Moderate Relationship, L: Low Relationship.

PROGRAMME : Diploma Programme in CE / ME / PS / EE / AE
COURSE : Engineering Mechanics (EMH) **COURSE CODE** : 6108

TEACHING AND EXAMINATION SCHEME:

Teaching Scheme				Examination Scheme								
Hrs / week			Credits	TH Paper Hrs.	Marks							
TH	TU	PR				TH	TEST	TH+TEST	PR	OR	TW	TOTAL
04	--	02	06	03	Max.	80	20	100	--	--	50	150
					Min.	32	--	40	--	--	20	--

1.0 RATIONALE:

This course helps students in understanding correlation between different engineering and day to day's problems with the knowledge of different laws and principles of mechanics. It helps in solutions to problems related to forces acting on body. It also helps in understanding concepts and applications of Equilibrium, friction, centroid and Kinetics.

It helps in understanding concepts of work, power and energy. Study of simple machines gives idea about input, output, efficiency and friction of machine. Understanding of this course facilitates easy learning of higher level course like strength of materials, Mechanics of structures, Theory of structures, Reinforced concrete structures and Design of steel structures.

2.0 COURSE OBJECTIVES:

The student will be able to,

1. Understand the basic concepts of Forces, Equilibrium, Friction, Centre of gravity, Kinetics, Kinematics and simple Machines
2. Understand the basic concepts related to resolution and composition of forces, equilibrium condition and frictional force, centre of gravity, momentum, impulse energy and mechanism of machines.
3. Understand the basic principles of Lami's Theorem, Newton's law of motion, law of conservation of energy, law of machines and laws of friction.

3.0 COURSE OUTCOMES:

The student shall be able to acquire specified learning outcomes in cognitive, psychomotor and affective domain to demonstrate the following course outcomes:

1. Describe working of different machines and calculate Velocity Ratio & Efficiency of different Machines.
2. Draw free body diagram of forces acting on a body.
3. Apply laws and principles of mechanics to different practical situations.

4.0 COURSE DETAILS:

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics	Hours
Unit-I **Fundamental concepts**	1a. Differentiate Scalar and Vector quantities 1b. Define basic terms relevant to mechanics. 1c. Describe different coordinate systems.	1.1 Mechanics and its relevance to Engineering, Fundamental concepts – scalar quantities, vector quantities. 1.2 Concept of rigid body, Definitions of deformable body, Particle, mass and weight Statics, Dynamics (Kinematics and Kinetics). 1.3 Reference frames of Axes a) Rectangular co – ordinate system b) Polar co-ordinate system. 1.4 Fundamental units, derived units and different systems of units.	04

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics	Hours
		1.5 Newton's laws.	
Unit- II **Simple Lifting Machines**	2a. Compute M.A, V.R., Efficiency, Law of Machine for given Machines	2.1 Basic concepts – load, effort, input, output, mechanical advantage, velocity ratio, efficiency of machine, Law of machine, friction in the machine, ideal machine, reversibility of machine 2.2 Study of machines- simple wheel and axle, differential axle and Wheel, pulley blocks, simple screw jack, worm and worm wheel, winch crab (single & double purchase). 2.3 Numerical examples on above mentioned machines	08
Unit-III **Force**	3a. Identify and differentiate different force system 3b. Apply the laws to compute the resultant of given force system	3.1 Concept of force, Coplanar and Non coplanar force system Classification of co planer force system such as collinear, Concurrent, Non concurrent, Parallel, Like Parallel, Unlike Parallel and General force System. 3.2 Law of transmissibility of a force, parallelogram law of forces, resolution and composition of forces, resultant, triangle law of forces, polygon law of forces. 3.3 Resultant of a coplanar concurrent force system (Analytical method) 3.4 Turning effect of force – Moment, Couple, nature of moment, characteristics of couple. 3.5 Varignon's theorem of moments and its application to coplanar parallel and non-concurrent force systems. Resultant of coplanar non concurrent force system (Analytical method)	16
Unit-IV **Equilibrium**	4a. Draw Free Body Diagram 4b. Apply Lami's Theorem 4c. Compute support reactions for given beam	4.1 Concept of Equilibrium, Analytical Conditions of equilibrium, equilibrant. 4.2 Free body diagram (FBD) 4.3 Lami's theorem and its applications 4.4 Reactions at supports of beams - types of supports, types of loads types of beam 4.5 Determination of beam reactions- cantilever beam, simply supported beam and overhanging beam subjected to concentrated loads, uniformly distributed loads and applied moments or couples (Analytical method only)	13
Unit-V **Friction**	5a. Appreciate Friction and its engineering application 5b. Calculate friction forces and coefficient of friction	5.1 Introduction, frictional force 5.2 Laws of friction (static friction only), coefficient of friction, angle of friction, angle of repose. 5.3 Body resting on Horizontal plane, inclined plane and forces acting on the body in any direction	07

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics	Hours
Unit-VI **Centroid and Centre of Gravity**	6a. Distinguish between Centroid and Centre of Gravity 6b. Compute Centroid and Centre of Gravity of different plane laminas and solids	6.1 Definition and Concept of centre of gravity and Centroid. 6.2 Centroid of line segment, centroid of regular areas such as rectangle, square, triangle, circle, semicircle, quarter circle. Problems on location of centroid of composite area consisting of above mentioned regular areas. 6.3 Centre of gravity of regular solids such as cube, rectangular prism, sphere, hemisphere, cylinder, solid cone. Problems on location of centre of gravity of composite solids consisting of above mentioned regular solids.	08
Unit-VII **Dynamics**	7a. State equations of motion. 7b. State Newton's Laws, Impulse Momentum equation and Work Energy Principle 7c. To compute work, Power and Energy	7.1 Introduction to dynamics, definition of Kinematics and, types of motion of particle, equations of motion, (No numerical problems on Kinematics) 7.2 Introduction to kinetics, Newton's laws, 7.3 definition of Impulse, momentum, Impulse momentum equation, law of conservation of momentum (No numerical Problems on above) 7.4 Work-power Energy, definitions, units, graphical representation of work, law of conservation of energy, work energy principle, Numerical examples.	08
		TOTAL	**64**

5.0 SUGGESTED SPECIFICATION TABLE WITH MARKS (THEORY):

Unit No.	Unit Title	Distribution of Theory Marks			
		R Level	U Level	A and above Levels	Total Marks
I	Fundamental concepts	02	02	--	04
II	Simple Lifting Machines	02	--	06	08
III	Force	02	04	12	18
IV	Equilibrium	02	04	12	18
V	Friction	--	02	08	10
VI	Centroid and Centre of Gravity	--	04	08	12
VII	Dynamics	02	04	04	10
	TOTAL	**10**	**20**	**50**	**80**

Legends: R = Remembrance (Knowledge); U = Understanding; A = Application and above levels (Revised Bloom's taxonomy)

Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.

6.0 ASSIGNMENTS/PRACTICALS/TASKS:

The tutorial/practical/assignments/tasks should be properly designed and implemented with an attempt to develop different types of cognitive and practical skills **(Outcomes in cognitive, psychomotor and affective domain)** so that students are able to acquire the competencies.

***Note**: Here only outcomes in psychomotor domain are listed as practical/exercises. However, if these practical/exercises are completed appropriately, they would also lead to development of **Programme Outcomes/Course Outcomes in affective domain** as given in a common list at the beginning of curriculum document for this programme. Faculty should refer to that common list and should ensure that students also acquire those Programme Outcomes/Course Outcomes related to affective domain.*

Sr. No.	Unit No.	Practical Exercises (Outcomes in Psychomotor Domain)	Approx. Hrs. required
	A	Any **Four** of following Exercises	
1	I	Differential axle and wheel	02
2		Simple screw jack	02
3		Worm and worm wheel	02
4		Single gear crab	02
5		Double gear crab	02
6		Two sheaves & three sheaves pulley block	02
7		Differential pulley block	02
8		Geared pulley block	02
	B	Any **Two** of following Exercises	
9	III	Verification of law of polygon of forces	04
10		Verification of law of moments	04
11		Study of forces in the members of jib crane	04
	C	All of the following Exercises	
12	IV	Verification of Lami's theorem	04
13	IV	Beam Reactions	04
14	V	Determination of coefficient of friction	04
15	VI	Centroid of Regular and Irregular Lamina	04
		TOTAL	**32**

7.0 STUDENT ACTIVITIES:

Following is the list of proposed student activities like

1. Observe and list different activities at home, on Roads and common places where simple machines are used.
2. Observe and list different activities at home, on Roads and common places where principles of Mechanics are involved.

8.0 SPECIAL INSTRUCTIONAL STRATEGIES (If any):

1. Show different simple lifting machines used in workshops and other work places.
2. Show Videos and slides involving application of different Principles of Mechanics.

9.0 LEARNING RESOURCES:

A) Books

Sr.No.	Title of Book	Author	Publication
1	Theory and problems of Engineering Mechanics- Schaum's outline series Statics and Dynamics SI Edition	E. Nelson, Charles Best & William McLean.	McGraw Hill
2	Engineering Mechanics statics and dynamics	Singer	Harper Collins Publisher, India.
3	Vector mechanics for Engineers (statics and Dynamics)	Ferdinand P. Beer, E Russell Johnson	McGraw Hill
4	Applied Mechanics for polytechnics	P. S. Sawhney & Manikpure	S. Chand & Co. Ltd
5	A text book of Applied Mechanics	Ramamrutham	Dhanpat Rai Pub. Co.

Sr.No.	Title of Book	Author	Publication
			(P) Ltd, New Delhi
6	Text Book in Applied Mechanics	M. M. Malhotra, R. Subramanion, P. S. Gahlot	New Age International (P) Ltd. Publishers, New Delhi

B) Software/Learning Websites

www.nptel.com, www.youtube.com, www.howstuffworks.com, www.sciencedirect.com, www.wikipedia.org

C) Major Equipments/ Instruments with Broad Specifications

Force Table, Differential Axle & Wheel, Single and Double Purchase crab, Worm & Worm Wheel, Simple Screw Jack, Pulley Blocks and Reaction of Beam Apparatus.

10.0 MAPPING MATRIX OF PO'S AND CO'S:

Course Outcomes	Programme Outcomes										
	a	b	c	d	e	f	g	h	i	j	k
CO1	H	H						M			M
CO2	H	H						M			
CO3		H									M

H: High Relationship, M: Moderate Relationship, L: Low Relationship.

PROGRAMME : Diploma Programme in CE / ME / EE / PS / AE
COURSE : Workshop Practice (WSP) **COURSE CODE** : 6109

TEACHING AND EXAMINATION SCHEME:

Teaching Scheme				Examination Scheme							
Hrs / week			Credits	TH Paper Hrs.	Marks						
TH	TU	PR				TH	Test	TH+TEST	PR	OR	TW	TOTAL
--	--	06	06	--	Max.	--	--	--	--	--	50	50
					Min.	--	--	--	--	--	20	--

1.0 RATIONALE:

Engineering diploma technician is expected to know conventional workshop practices like welding, Fitting, Drilling, Tapping, Plumbing and hot working processes. The students are required to identify, operate and control various power tools and machines. They should be able to select and use various tools and equipments for various operations and processes like welding, fitting, taping, Plumbing and forging.

The students are advised to undergo each skill experience with remembrance, understanding and application with special emphasis on attitude of enquiry to know why and how for the various instructions and practices imparted to them in each shop.

2.0 COURSE OBJECTIVES:

The student will be able to,

1. Develop basic engineering workshop skills in the students.
2. Impart basic know how of various hand tools and their uses in different sections of workshop.
3. Enhance hands on experiences to learn manufacturing, production and advanced manufacturing processes.
4. Develop a skill in dignity of labour, precision at work place, team working and development of right attitude.

3.0 COURSE OUTCOMES:

The course content should be taught and learning imparted in such a manner that students are able to acquire required learning outcome in cognitive, psychomotor and affective domain to demonstrate following course outcomes:

1. Know basic workshop processes.
2. Read and interpret job drawing.
3. Identify, select and use various marking, measuring, holding, striking and Cutting tools & equipments.
4. Operate, control different machines and equipments.
5. Inspect the job for specified dimensions
6. Produce jobs as per specified dimensions.
7. Adopt safety practices while working on the shop floor

4.0 COURSE DETAILS:

There are no separate classes for theory. The relevant theory has to be discussed before the practical during the practical sessions.

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics
Unit-I **Introduction of workshop**	1a. Sketch general workshop layout. 1b. Follow preliminary safety rules in workshop.	1.1 Workshop layout. 1.2 Importance of various shops/ sections of workshop. 1.3 Types of jobs to be done in different sections of workshop. 1.4 General safety rules and work procedures in the

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics
		workshop.
Unit-II **Fitting Section**	2a. Select appropriate Fitting tools for required application. 2b. Prepare the simple Job as per drawing and specifications by using fitting tools.	2.1 Sketches, specifications and applications of different work holding fitting tools. 2.2 Fitter's bench vice, V-block, Clamps. Sketches, specifications, material, applications and methods of using fitting marking and measuring tools-marking table, surface plate, angle plate, universal scribing block, try-square, scriber, divider, centre punch, letter punch, callipers, digital vernier callipers, height gauge etc. 2.3 Types, sketches, specifications, material, applications and methods of using of fitting cutting tools hacksaw, chisels, twist drill, taps, files, dies. 2.4 Types, sketches, specifications, material, applications and methods of using of fitting finishing tools-files, reamers. 2.5 Sketches, specifications and applications of miscellaneous tools, hammers, spanners, screwdrivers sliding screw wrench. 2.6 Demonstration of various fitting operations such as chipping, filing, scraping, grinding, sawing, marking, drilling, tapping.etc. 2.7 Preparation of simple and male- female joints. 2.8 Safety precautions at work place in fitting section.
Unit -III **Carpentry Section**	3a. Select appropriate Fitting tools for required application. 3b. Prepare the simple Job as per drawing and specifications by using carpentry tools.	3.1 Types, sketch, specification, material, applications and methods of using of carpentry tools-saws, planner, chisels, hammers, pallet, marking gauge, vice, try square, rule etc. 3.2 Types of woods and their applications. 3.3 Types of carpentry hardware's and their uses. 3.4 Demonstration of carpentry operations such as marking, sawing, planning, chiseling, grooving, boring, joining etc. 3.5 Preparation of wooden joints. 3.6 Safety precautions.
Unit - IV **Plumbing Section**	4a. Select appropriate pipe fitting tool for the required application. 4b. Prepare the simple job as per specification using pipe fitting tools.	4.1 Types, specification, material and applications of pipes. 4.2 Types, specification, material and applications of pipe fittings. 4.3 Types, specifications, material, applications and demonstration of pipe fitting tools. 4.4 Demonstration of pipe fitting operations such as marking, cutting, bending, threading, assembling, dismantling etc. 4.5 Types and application of various spanners such as flat, fix, ring, box, adjustable etc. 4.6 Preparation of pipe fitting jobs. 4.7 Safety precautions.
Unit -V **Welding Section**	5a. Select appropriate equipment and consumables for required application.	5.1 Types, specification, material and applications of arc welding transformers. 5.2 Types, specification, material and applications of arc welding accessories and consumables.

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics
	5b. Prepare the simple jobs as per specification using proper metal joining and cutting method.	5.3 Demonstration of metal joining operations- arc welding, soldering and brazing. Show effect of current and speed. Also demonstrate various welding positions. 5.4 Demonstrate gas cutting operation. 5.5 Preparation of metal joints. 5.6 Safety precautions.
Unit -VI **Smithy Section**	6a. Select appropriate Smithy tools for the required application. 6b. Prepare the simple jobs as per specification using Smithy tools.	6.1 Introduction to tools and equipments. 6.2 Smithy and Forging operations 6.3 One job of J Hook or I Hook 6.4 (Using round or square bar)
Unit -VII **Tin Smithy**	7a. Select appropriate tin smithy tool for the required application. 7b. Prepare the simple job as per specification using tin smithy tools.	7.1 Concept and conversions of SWG and other gauges in use. 7.2 Use of wire gauge. 7.3 Types of sheet metal joints and applications. 7.4 Types, sketch, specification, material, applications and methods of using tin smithy tools-hammers, stakes, scissors / snips etc. 7.5 Demonstration of various tin smithy tools and sheet metal operations such as shearing, bending and joining. 7.6 Preparation of tin smithy job. 7.7 Safety precautions.

5.0 ASSIGNMENTS/PRACTICALS/TASKS:

The tutorial/practical/assignment/task should be properly designed and implemented with an attempt to develop different types of cognitive and practical skills leading to the achievement of the competency. **(Outcomes in cognitive, psychomotor and affective domain)** so that students are able to acquire the desired programme outcome/course outcome.

***Note**: Here only outcomes in psychomotor domain are listed as practical/exercises. However, if these practical/exercises are completed appropriately, they would also lead to development of **Programme Outcomes/Course Outcomes in affective domain** as given in the mapping matrix for this course. Faculty should ensure that students also acquire Programme Outcomes/Course Outcomes related to affective domain.*

Sr. No.	Unit No.	Practical Exercises (Outcomes in Psychomotor Domain)	Hours
1	I	Prepare carpentry and fitting shop layout.	02
2	II	Demonstrate use of different fitting tools– like work holding, marking, measuring, cutting, finishing and miscellaneous. Student will also prepare the report with sketch, specifications and applications of fitting tools demonstrated.	04
3	II	**Two jobs :** Prepare one simple and another male-female type Fitting jobs as per given drawings and specifications.	10
4	III	Demonstrate use of different carpentry tools. Student will also prepare the report with sketch, specifications and applications of carpentry tools demonstrated.	04
5	III	Prepare one Job From the following allotted to a group of 4 to 6 student	12

Sr. No.	Unit No.	Practical Exercises (Outcomes in Psychomotor Domain)	Hours
		depending of volume work. Involving different joints, Turning and paining operation, surface finishing by emery paper, varnishing and polishing e. g. Electric switch board, pat, Chaurang, Table, Racks etc. OR One simple job involving any one joint like mortise and tendon dovetail bridle half lap etc. One Job per student	
6	IV	Demonstrate use of different pipe fitting tools. Student will also prepare the report with sketch, specifications and applications of pipe fitting tools demonstrated.	04
7	IV	**Two jobs :** Prepare pipe fitting jobs as per drawings and specifications.	12
8	V	Demonstrate use of different welding transformers and consumables. Also demonstrate arc welding, gas cutting, soldering and brazing operations. Student will also prepare the report with sketch, specifications and applications of welding tools demonstrated.	04
9	V	Prepare jobs using arc welding, gas cutting and spot welding, brazing and soldering process:- One simple job involving "Butt", "lap" and "T" joint and utility article as per drawing and specifications.	12
10	VI	Demonstrate use of different smithy tools, operations. Student will also prepare the report with sketch, specifications and applications of smithy tools demonstrated.	04
11	VI	**One job :** Prepare one smithy job as per drawing having Job of J Hook or I Hook (Using round or square bar)	12
12	VII	Demonstrate use of different tin smithy tools. Student will also prepare the report with sketch, specifications and applications of tin smithy tools demonstrated.	04
13	VII	**One job :** Prepare one tin smithy job as per drawing having shearing, bending, joining and riveting.	12
		TOTAL	**96**

6.0 STUDENT ACTIVITIES:

Following is the list of proposed student activities like

1 Prepare student reports as asked in the workshop practical assignment.
2 Visit the nearer timber merchant. Collect the information on types and appearance of wood being sold by them.
3 Visit the nearer plywood merchant. Collect the information on type and thickness being sold by them.
4 Visit nearer fabricator. Collect the information on welding electrodes, transformers and accessories being used by them.
5 Down load movies showing correct practices for fitting, carpentry, Smithy and welding.
6 Assignments on workshop technology tools equipments & processes used in above shops.

NOTES:

1. It is compulsory to follow safety norms while working in the workshop.
2. Preparation Workshop book is compulsory. Record of activities performed by
3. Student in each period is also compulsory and must be duly certified by concerned technical staff and teacher in routine workshop book.
4. Keep your all tools duly resharpened/ready.
5. It is compulsory to submit reports of student activities and workshop book.
6. Student's activities are compulsory to perform.
7. Students are to be continuously assessed for competencies achieved.
8. Each student is required to submit the specified term work

7.0 SPECIAL INSTRUCTIONAL STRATEGIES (If any):

1. Show CAI computer software related to workshop technology.
2. CBT Packages.

8.0 LEARNING RESOURCES:

A) Books

Sr.No.	Title of Book	Author	Publication
1.	Mechanical workshop practice.	K.C. John	PHI
2	Workshop Technology-I.	Hazra and Chaudhary Media	promoters & Publisher private limited
3	Workshop Technology-I.	W.A. J. Chapman	Taylor & Francis.
4	Comprehensive Workshop Technology (Manufacturing Processes).	S.K. Garg	Laxmi publications.
5	Workshop practice manual.	K. Venkata Reddy	B.S. Publications.
6	Workshop familiarization.	E. Wilkinson	Pitman engineering craft series.
7	Workshop Technology	B. S. Raghuwanshi	Dhanpat Rai and Sons, New Delhi
8	Workshop Technology	H. S. Bawa	Tata McGraw Hill Publishers, New Delhi
9	I.T.B. Handbook.	--	Engineering industry Training Board.
10	Production Technology Hand Book HMT	--	Tata-McGraw Hill Publisher, New Delhi.

B) Software/Learning Websites

1. http//www.nptel.ac.in
2. http//www.howstuffworks.com
3. http://www.abmtools.com/downloads/Woodworking%20Carpentry%20Tools.pdf
4. http://www.weldingtechnology.org
5. http://www.newagepublishers.com/samplechapter/001469.pdf
6. http://www.youtube.com/watch?v=TeBX6cKKHWY
7. http://www.youtube.com/watch?v=QHF0sNHnttw&feature=related
8. http://www.youtube.com/watch?v=Kv1zo9CAxt4&feature=relmfu
9. http://www.piehtoolco.com
10. http://sourcing.indiamart.com/engineering/articles/materials-used-hand-tools/

C) Major Equipments/ Instruments with Broad Specifications

Sr.No.	Name Of Equipments/ Instruments	Qty
	Carpentry Section	
1	Circular saw	1
2	Jig - saw	1
3	Wood Planer	1
4	Drilling Machine Bench Type	1
5	Universal wood working Machine	1
6	Bench Grinder	1
7	Hand Tools Kit	20 Sets
8	Carpentry Bench Vice	20
9	Wood Turning Lathe	5
10	Measuring Tools & Gauges	20 Sets
11	Electrician Tool Kit	2
12	Carpentry Work Bench	20
13	Band Saw	1
14	Band saw and Circular Saw Sharpener	1
15	Chain And Chisel Mortising Machine	1

Sr.No.	Name Of Equipments/ Instruments	Qty
16	Vertical Sander	1
17	Heavy Duty Circular Saw	1
18	Heavy Duty Variable Speed Reciprocating Saw Kit	1
19	Single Speed Impact Drill.	1
20	ANGLE GRINDER.	1
21	Cordless drill (Keyed Chuck)	1
22	Heavy Duty palm grip sander	1
23	Heavy Duty Router	1
	Fitting Shop	
1	Marking Table with scribers	2
2	Surface plate	2
3	Measuring Instruments, Marking Instruments, Fitting Hand Tools	2 Each
4	Tap & die set.	5 Sets
5	Bench Drilling Machine	1
6	Bench Grinder	1
7	Fitting Shop Vice Size- 100/150 mm.	20
8	Electrically operated Hand Drilling Machine (pistol Type)	2
9	Power Hack Saw Machine	1
10	Pedestal Grinder	1
11	Hand Grinder	1
12	Fitter's Work Bench	10
13	Hand Press Double (Pillar Type)	1
14	Arbor Press	1
	Smithy Shop	
1	Hearth with blower	5
2	Anvil	5
3	Leg Vice Size-150mm.	5
4	Swage Black	2
5	Tools and Gauges	20
6	Power Hammer	1
7	Bench Grinder	1
8	Work Bench With vice	2
9	Induction Hardening equipment	1
	Welding Shop	
1	Oil Cooled Arc Welding Transformer Three Phase With Standard Accessories	2
2	Single Phase Air-cooled arc Welding Transformer with Accessories	2
3	Light Duty Spot Welding Machine	1
4	Oxy-Acetylene Gas Welding Set	1
5	Soldering Irons	2
6	Double Ended Pedestal Type Grinder	1
7	Welding accessories	1
8	Electrician Tool Kit	2 Set
9	MIG / Welding Equipment	1
10	T. I. G. Welding set.	1
11	Work Bench With Vice Size- 1800 x 1200 x 750 mm	2
12	Welding Table Size-1200 x 1200 x 750 mm With sliding tray	2
13	DC Arc Welding Transformer Rectifier type 3 Phase	1
14	Brazing Equipment and Accessories	1
15	Heavy Duty Angle Grinder.	1
16	Heavy Duty 10 mm. VSR Cordless Drill / Driver Kit.	1
	Sheet Metal & Plumbing Shop	
1	Shearing Machine	1

Sr.No.	Name Of Equipments/ Instruments	Qty
2	Sheet Bending Machine	1
3	Pipe Bending Devices	1
4	Hand Tools and other Equipment	1
5	Pipe Threading Dies	5
6	Portable Drilling Machine	1
7	Plumber Pipe Vice Size- 50 mm., 12 mm. to 24 mm.	1 & 20
8	Plumber's Tool Kit	1
9	Stoving Oven	1
10	Plumber's Work Bench Size-1800 x 1200 x 750 mm	2
11	Swaging Machine	1
12	Universal sheet Folding Machine	1
13	Double Column Power Press	1
14	Hydraulic Press	1
15	Circle Cutting Machines	1

Note: - Latest Technology & specifications are to consider at the time procurement.

9.0 MAPPING MATRIX OF PO'S AND CO'S:

Course Outcomes	Programme Outcomes										
	a	**b**	**c**	**d**	**e**	**f**	**g**	**h**	**i**	**j**	**k**
CO1		H							M	L	M
CO2		M							M		
CO3	H										
CO4			H	M							M
CO5		M	H	L				H			
CO6			H		M		H	H			
CO7			H			L	H				

H: High Relationship, M: Moderate Relationship, L: Low Relationship.

PROGRAMME : Diploma Programme in Mechanical Engineering(ME) / Automobile Engineering(AE)
COURSE : Thermal Engineering (TEG) **COURSE CODE :** 6211

TEACHING AND EXAMINATION SCHEME:

Teaching Scheme				Examination Scheme								
Hrs / week			Credits	TH Paper Hrs.	Marks							
TH	TU	PR				TH	TEST	TH+TEST	PR	OR	TW	TOTAL
04	--	02	06	03	Max.	80	20	100	--	25	25	150
					Min.	32	--	40	--	10	10	--

1.0 RATIONALE:

Mechanical / Automobile Engineers have to work with various power producing & power absorbing devices like IC Engines, boilers, turbines, compressors, pumps, plastic processing machines etc. In order to understand the principles, construction & working of these devices, it is essential to understand the concept of energy, work, heat & conversion between them. Hence it is important to study the course of Thermal Engineering, which is a core course. It includes the study of various sources of energy, basic laws & concept of thermodynamics, gas laws, properties of steam & generation. Heat transfer forms the basis for different power engineering application. Boilers find application in different process industries. Steam turbines and condensers are the major component of any steam power plant. IC Engines is the heart of the Automobile vehicles. Plastic processing works with heat transfer. Mechanical / Automobile Engineer should understand working and application of these devices.

2.0 COURSE OBJECTIVES:

The student will be able to,

1. Know various sources of energy & their applications.
2. Understand fundamental concepts of thermodynamics systems.
3. Understand various laws of thermodynamics.
4. Understand Gas laws & ideal gas processes to various thermodynamic systems.
5. Understand properties of system by using steam tables/ Mollier charts.
6. Know construction & working of boilers, mountings & accessories.

3.0 COURSE OUTCOMES:

The course content should be taught and learning imparted in such a manner that students are able to acquire required learning outcome in cognitive, psychomotor and affective domain to demonstrate following course outcomes:

1. Identify the different sources of energy.
2. Explain different gas laws & process for thermodynamic system.
3. Select the boiler for various ranges of pressure.
4. Determine of quantity of steam for different application.
5. Identify sources of leakage in condenser.
6. Select heat exchanger as per application.

4.0 COURSE DETAILS:

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics	Hours
Unit-I **Sources of** **energy**	1a. Classify the energy sources and state its example. 1b. Describe a. Solar water heater	1.1 Brief description of energy sources, • Classification of energy sources. • Renewable, Non-Renewable. 1.2 Fossil fuels, including CNG, LPG. 1.3 Solar flat plate and concentrating collectors & its application.	08

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics	Hours
	b. Wind mill c. Tidal energy d. Biogas plant	• Solar Water Heater • Photovoltaic Cell, Solar Distillation. 1.4 Wind, Tidal, Geothermal 1.5 Biogas, Biomass, Bio-diesel 1.6 Hydraulic, Nuclear 1.7 Fuel cell – list of fuel cells	
Unit-II **Fundamentals of Thermodynamics**	2a. Differentiate between extensive & intensive properties with example 2b. Differentiate between heat and work. 2c. Explain second law of thermodynamic 2d. Apply steady flow equation for boiler, engine, nozzle, turbine, compressor & condenser.	2.1 Concepts of pure substance, types of systems, properties of systems, Extensive and Intensive properties with units and conversion like P, V, ρ and temperature. Point function and path function. 2.2 Work and Energy Thermodynamic definition of work, heat, difference between heat and work, P. E., K. E, Internal Energy, Flow work, concepts of enthalpy, entropy. 2.3 Laws of Thermodynamic Zeroth Law, Temperature measurement, principle of energy conservation, irreversibility, First & second Law of Thermodynamics, Kelvin Plank, Clausius statements and their equivalence, Concept of perpetual motion machine 1 and 2. 2.4 Application of Thermodynamic laws Steady Flow Energy equation and its application to open system like boiler, engine, nozzle, turbine, compressor & condenser. 2.5 Application of Second law to Heat Engine, Heat Pump and Refrigerator.	12
Unit-III **Ideal Gases**	3a. Write the characteristic gas equation. 3b. Differentiate between Isobaric & Isochoric process for ideal gases 3c. Compare Adiabatic & polytropic process 3d. Calculate enthalpy, entropy and work done for various gas processes	3.1 Equation of state, characteristic gas constant and universal gas constant. 3.2 Ideal gas processes: • Isobaric, Isochoric, Isothermal, Adiabatic, Polytropic, Isentropic with representation of the processes on P-V and T-S diagram (only simple numerical)	08
Unit-IV **Steam and Steam Boiler**	4a. Explain generation of steam with help of T.H chart &	4.1 Generation of steam at constant pressure with representation on various charts such as T-H, T-S, H-S, P-H. Properties of steam and use of steam	14

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics	Hours
	T.S. chart. 4b. Compare constant enthalpy & constant entropy processes. 4c. Explain Rankin cycle for vapour processes 4d. Differentiate between mounting & accessories 4e. Calculate enthalpy of steam	table (simple numerical on properties of steam), Quality of steam and its determination with Separating, throttling and combined Separating and throttling calorimeter (no numerical on calorimeter). 4.2 Vapour process: • Constant pressure, constant volume, constant enthalpy, constant entropy (numerical using steam table and Mollier chart), Rankin Cycle. 4.3 Steam Boilers: • Classification of boilers. • Construction and working of • Cochran, Babcock and Wilcox, Lamont and Loeffler boiler. Boiler, draught natural and Mechanical. 4.4 Boiler mounting and accessories [to be covered in practical].	
Unit-V **Steam Turbines and Condensers**	5a. Classify steam turbines 5b. Explain construction and working of steam turbines 5c. Compare Impulse turbine & Reaction turbine 5d. Describe Regenerative feed heating with sketch. 5e. Explain the Working of condenser 5f. Differentiate between force draught & natural draught for cooling tower.	5.1 Steam nozzle: • Continuity equation, types of nozzles, concept of Mach number, critical pressure, application of steam nozzles. 5.2 Steam turbine: • Classification of turbines, Construction and working of Impulse and Reaction turbine. 5.3 Compounding of turbines, Regenerative feed heating, bleeding of steam, nozzle control governing of steam turbine & types (no velocity diagrams) 5.4 Steam condenser: • Dalton's law of partial pressure, function and classification of condensers, construction and working of condensers. 5.5 Sources of air leakage, concept of condenser efficiency, vacuum efficiency 5.6 Cooling Towers. need, types • Force draught, natural draught and induced draught. (**No numerical on above contents**)	12
Unit-VI **Heat Transfer**	6a. Explain modes of Heat transfer 6b. Describe Heat transfer by various modes. 6c. Explain various Heat exchangers. 6d. Calculate heat transfer for	6.1 Modes of heat transfer: • Conduction, convection and radiation. 6.2 Heat transfer by conduction • Fourier's law, thermal conductivity, conduction through cylinder, thermal resistance, composite walls, combined conduction and convection (Simple numerical) 6.3 Heat transfer by Radiation:	10

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics	Hours
	composite wall	• Thermal Radiation, Absorptivity, Transmissivity, Reflectivity, Emissivity, black and gray bodies, Stefan-Boltzman law. 6.4 Heat Exchangers: • Shell and tube, plate type, multiphase heat exchangers. Materials Used and applications of heat exchangers.	
		TOTAL	**64**

5.0 SUGGESTED SPECIFICATION TABLE WITH MARKS (THEORY):

Unit No.	Unit Title	Distribution of Theory Marks			
		R Level	U Level	A and above Levels	Total Marks
I	Sources of energy	04	02	02	08
II	Fundamentals of Thermodynamics	06	04	06	16
III	Ideal gases	04	04	08	16
IV	Steam and steam Boiler	08	04	04	16
V	Steam turbines and condensers	08	04	04	16
VI	Heat transfer	04	02	02	08
	TOTAL	**34**	**20**	**26**	**80**

Legends: R = Remembrance (Knowledge); U = Understanding; A = Application and above levels (Revised Bloom's taxonomy)

Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.

6.0 ASSIGNMENTS/PRACTICALS/TASKS:

The tutorial/practical/assignments/tasks should be properly designed and implemented with an attempt to develop different types of cognitive and practical skills **(Outcomes in cognitive, psychomotor and affective domain)** so that students are able to acquire the competencies.

***Note**: Here only outcomes in psychomotor domain are listed as practical/exercises. However, if these practical/exercises are completed appropriately, they would also lead to development of **Programme Outcomes/Course Outcomes in affective domain** as given in a common list at the beginning of curriculum document for this programme. Faculty should refer to that common list and should ensure that students also acquire those Programme Outcomes/Course Outcomes related to affective domain.*

Sr. No.	Unit No.	Practical Exercises (Outcomes in Psychomotor Domain)	Approx. Hrs. required
1	I	Collection of technical data and specification of photovoltaic cell by referring to manufacturers' catalogues.	04
2	I	Demonstration of solar water heating system.	02
3	I	Report on application of non –conventional energy, wind power generation plant / biogas plant / hydraulic plant.	04
4	IV	Demonstration of mountings & accessories of boilers with help of model.	04
5	V	Demonstration of steam turbine & compounding of steam turbine.	04
6	V	Compare different types of condensers and its applications.	02
7	VI	Calculation of thermal conductivity of a solid metallic rod.	02

Sr. No.	Unit No.	Practical Exercises (Outcomes in Psychomotor Domain)	Approx. Hrs. required
8	V	Report on cooling towers.	02
9	VI	Compare various heat exchangers.	04
10	IV	Demonstration of boiler with the help of model to trace flue gas path & water circuit (fire tube & water tube boiler.)	04
		TOTAL	**32**

7.0 STUDENT ACTIVITIES:

Following is the list of proposed student activities like

1. Collect specification of photovoltaic cell and market rates of prizes.
2. Collect technical specification of solar water heater.
3. Collect technical specification of windmill.
4. Identify condenser used in power plant.
5. Find different materials used for heat exchanger.
6. Check thermal conductivity of various materials.

8.0 SPECIAL INSTRUCTIONAL STRATEGIES (If any):

1. Arrange a visit to thermal power plant.
2. Arrange a visit to heat exchanger manufacturing unit.
3. Arrange expert seminar of industry person in the area of renewable energy sources.

9.0 LEARNING RESOURCES:

A) Books

Sr.No.	Title of Book	Author	Publication
1	A Course in Thermal Engineering	Domkundwar V. M.	Dhanpat Rai & Co.
2	A Course in Thermal Engineering	P. L. Ballaney	Khanna Publishers
3	A text book of Thermal Engineering.	R. S. Khurmi	S. Chand & co. Ltd.
4	A Course in Thermal Engineering	R. K. Rajput	Laxmi Publication, Delhi
5	Heat Engine Vol. - I & II	Patel and Karmchandani	Acharya Publication
6	Engineering Thermodynamics	P. K. Nag	Tata McGraw Hill
7	Thermal Engineering	B. K. Sarkar	Tata McGraw Hill

B) Software/Learning Websites

1. www.forbesmarshall.com
2. www.studyvill.com

C) Major Equipments/ Instruments with Broad Specifications.

1. Measurement of thermal conductivity by Searle's apparatus.
2. Model/charts/ PPT

10.0 MAPPING MATRIX OF PO'S AND CO'S:

Course Outcomes	Programme Outcomes										
	a	b	c	d	e	f	g	h	i	j	k
CO1	H	M									
CO2	M	H	H								
CO3	L		H			H					
CO4	M	H	H	M							
CO5	H	M	L								
CO6	H	L	L								

H: High Relationship, M: Moderate Relationship, L: Low Relationship.

PROGRAMME : Diploma Programme in ME / PS / AE
COURSE : Engineering Drawing (EDG) **COURSE CODE :** 6212

TEACHING AND EXAMINATION SCHEME:

Teaching Scheme				Examination Scheme							
Hrs / week			Credits	TH Paper Hrs.	Marks						
TH	TU	PR			TH	TEST	TH+TEST	PR	OR	TW	TOTAL
02	--	04	06	04	Max.	80	20	100	--	--	25	125
					Min.	32	--	40	--	--	10	--

1.0 RATIONALE:

Engineering drawing is the graphical language of engineers. It describes the scientific facts, concepts, principles and techniques of drawing in any engineering field to express the ideas, conveying the instructions, which are used to carry out jobs in engineering field. This course aim for building a foundation for the further course in drawing and other allied courses.

2.0 COURSE OBJECTIVES:-

The student will be able to,

1. Understand the basic concepts of engineering drawing.
2. Visualize the objects.
3. Draw different views in different positions of objects.
4. Draw the different views of machine elements.

3.0 COURSE OUTCOMES:

The course content should be taught and learning imparted in such a manner that students are able to acquire required learning outcome in cognitive, psychomotor and affective domain to demonstrate following course outcomes:

1. Interpret missing view from given orthographic view
2. Draw auxiliary views of machine component.
3. Draw projections of line and plane inclined to both reference planes.
4. Differentiate true shape and apparent shape of solids.
5. Interpret the positions of section plane and draw projections of solids.
6. Develop lateral surfaces of different solids.

4.0 COURSE DETAILS:

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics	Hours
Unit-I **Missing Views (only for ME/AE)**	1a. 1a. Interpret given orthographic views 1b. 1b. Draw missing views of different objects	1.1 Draw missing view from the given Orthographic views - simple components (First Angle Projection Method only)	04
Unit-I **Orthographic Projections (only for PS)**	1a. Interpret & draw orthographic views from given pictorial view.	1.1 Concept of Orthographic projections. 1.2 Conversion of pictorial view into Orthographic views only first angle projection method.	04
Unit-II **Auxiliary Views**	2a. Interpret given orthographic views 2b. Draw auxiliary views	2.1 Draw complete view from the given partial orthographic views 2.2 Draw auxiliary view for the given machine part.	04
Unit-III **Projection of Lines and Planes**	3a. Draw projections of line 3b. Draw projections of planes.	3.1 Draw projections of lines inclined to both reference planes 3.2 Draw projections of planes	08

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics	Hours
		inclined to both reference planes	
Unit-IV **Projections of Solids**	4a. Interpret orientation of solids with respect to principal planes. 4b. Draw its projection.	4.1 Projections of Prism, Pyramid, Cone, Cylinder, Tetrahedron, Cube with their axes inclined to one reference plane and parallel to other.	05
Unit-V **Sections of Solids**	5a. Interpret orientation of section plane with respect to principal planes. 5b. Interpret orientation of solids with respect to principal planes. 5c. Draw projection of solid.	5.1 Solids: -Prism, Pyramid, Cone, Cylinder, Tetrahedron, Cube resting on their base on HP/VP. 5.2 Section plane inclined to one reference plane and perpendicular to other.	05
Unit-VI **Developments of Surfaces**	6a. Interpret orientation of solids with respect to principal planes. 6b. Develop the lateral surfaces of various solids and understand its engineering applications	6.1 Developments of Lateral surfaces of cube, prisms, cylinder, pyramids, cone and their applications such as tray, funnel, Chimney, pipe bends etc.	06
TOTAL			**32**

5.0 SUGGESTED SPECIFICATION TABLE WITH MARKS (THEORY):

Unit No.	Unit Title	Distribution of Theory Marks			
		R Level	U Level	A and above Levels	Total Marks
I (only for ME/AE)	Missing views	02	04	10	16
I (only for PS)	Orthographic Projections	02	04	10	16
II	Auxiliary views	02	04	06	12
III	Projections of Lines and Planes	02	06	08	16
IV	Projection of solid	02	04	06	12
V	Section of Solids	02	04	06	12
VI	Development of surface	02	04	06	12
	TOTAL	**12**	**26**	**42**	**80**

Legends: R = Remembrance (Knowledge); U = Understanding; A = Application and above levels (Revised Bloom's taxonomy)

6.0 ASSIGNMENTS/PRACTICALS/TASKS:

S. No.	Unit No.	Practical Exercises (Outcomes in Psychomotor Domain)	Hours
1 (only for ME/AE)	I (only for ME/AE)	Draw one sheet on missing views. (Two problems)	08
1 (only for PS)	I (only for PS)	Draw one sheet on orthographic projection. (Two problems)	08
2	II	Draw one sheet on auxiliary views. (Two problems)	08
3	III	Draw one sheet on projections of lines. (Four problems) Draw one sheet on projections of planes. (Four problems)	12
4	IV	Draw two sheets on projections of solids. (Four problems)	12
5	V	Draw two sheets on sections of solids. (Four problems)	12
6	VI	Draw two sheets on development of surfaces. (Four problems)	12
		TOTAL	**64**

7.0 STUDENT ACTIVITIES:

Following is the list of proposed student activities like

1. Identify applications of prism, pyramid, cone and cylinder.
2. Observe applications of development of lateral surfaces.
3. Observe applications of projections of lines, planes.
4. Find applications of auxiliary views.

8.0 SPECIAL INSTRUCTIONAL STRATEGIES (If any):

1. Show CAI / confront computer software related to Engineering Drawing.
2. Arrange expert lectures of industry/academic person in the area of course.

9.0 LEARNING RESOURCES:

A) Books

Sr.No.	Title of Book	Author	Publication
1	Engineering Drawing	N. D. Bhatt	Charotar Publishing House
2	Engineering Drawing	R.K.DHAWAN	S. Chand and Company
3	engineering Drawing and Graphics + AutoCAD	K. Venugopal	New Age Publication
4	Engineering Graphics	K. R. Mohan	Dhanpat Rai and Publication Co.
5	Machine Drawing	R.K. Dhawan	S. Chand Co.

B) Indian Standards: SP46-1988

C) Software/Learning Websites

1. http://www.design-technology.info/IndProd/drawings
2. http://www.cognifront engineering.edu
3. Software Sketch up,

D) Major Equipments/ Instruments with Broad Specifications

1. Half Imperial size drawing sheet for practical/TW.
2. A3 size sketch book for class/assignment work.

10.0 MAPPING MATRIX OF PO'S AND CO'S:

Course Outcomes	Program Outcomes										
	a	b	c	d	e	f	g	h	i	j	k
CO1	H										
CO2		H									
CO3			M	H							
CO4				M							
CO5			M								
CO6					H						

H: High Relationship, M: Moderate Relationship, L: Low Relationship.

PROGRAMME : Diploma Programme in ME / PS / AE
COURSE : Strength of Materials (SOM) **COURSE CODE :** 6213

TEACHING AND EXAMINATION SCHEME:

Teaching Scheme				Examination Scheme								
Hrs / week			Credits	TH Paper Hrs.	Marks							
TH	TU	PR				TH	TEST	TH+TEST	PR	OR	TW	TOTAL
04	--	02	06	03	Max.	80	20	100	--	--	25	125
					Min.	32	--	40	--	--	10	--

1.0 RATIONALE:

Machine parts are made up of various materials and subjected to different types of loads. Their sustainability depends on the properties of the materials used. Different materials have different properties, which are important criteria for the design of the component. It is therefore essential, for technician to understand basic principles of design. This course deals with study of behaviors of machine parts under the applications of different types of forces. It also provides the laboratory work through which a technician confirms behavior of material under different types of load and appreciates the importance of the testing.

2.0 COURSE OBJECTIVES:

The student will be able to,

1. Understand different types of forces acting on machine parts.
2. Understand behaviour of materials under various types of forces.
3. Apply the basic principles to solve the problems.

3.0 COURSE OUTCOMES:

The course content should be taught and learning imparted in such a manner that students are able to acquire required learning outcome in cognitive, psychomotor and affective domain to demonstrate following course outcomes:

1. Calculate various material properties under direct loading Condition.
2. Calculate stresses on given plane for the element with given state of stress.
3. Draw shear force and bending moment diagram for different beams.
4. Calculate stresses due direct and bending in different components and draw stress distribution diagram.

4.0 COURSE DETAILS:

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics	Hours
Unit-I **Stress and Strain**	1a. Define different properties of Material 1b. Analyse simple, composite / compound sections and Calculate direct stress, different strains 1c. Compute punching shear stresses	1.1 Concepts of elastic, plastic and rigid bodies, concepts of deformation, stresses and strains different material Properties like Ductility, Brittleness, Hardness, Toughness, Malleability, Fatigue etc. 1.2 Axial tensile and compressive loads, Hooke's Law, axial stresses, axial strain, lateral strain, Poisson's ratio, volumetric strain, problems on bars of uniform cross section and different cross sections (stepped bars). 1.3 Behaviour of mild steel under tensile loading, stress-strain curve, limit of proportionality, yield stress, Ultimate stress, Breaking stress, factor of safety,	15

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics	Hours
		safe stress, working stress. 1.4 Composite sections under axial load, modular ratio, simple problems on analysis of composite sections 1.5 Concept of bi-axial stresses, tri-axial stresses, equations of total strain in three directions, Equation for Volumetric Strain. 1.6 Definition of temperature stress, nature of stresses. Simple problems on temperature stresses in homogeneous sections only 1.7 Concept of shear load, shear stress and shear strain, modulus of rigidity, simple shear, complementary shear stresses, Punching Shear. 1.8 Elastic constants, relation between modulus of Elasticity, modulus of rigidity and bulk modulus. (No derivations of these relations)	
UNIT- II **Shear Force and Bending Moment**	2a. Draw Shear Force & Bending Moment Diagram for Statically Determinate Beams	2.1 Concept and definitions of shear force and bending moment, sign conventions, relation between bending moment, shear force and rate of loading. 2.2 Shear force and bending moment diagrams for simply supported, cantilever and overhanging beams subjected to concentrated loads, uniformly distributed load and couples, point of zero shear, Point of contra-flexure	12
UNIT-III **Moment of Inertia**	3a. Compute Moment of Inertia of Symmetric & asymmetric structural sections	3.1 Concept of moment of inertia for plane areas, radius of gyration, expression for moment of inertia about centroidal axes for regular plane areas such as rectangular, triangular, circular and semicircular sections. Section modulus 3.2 Parallel axes theorem, perpendicular axes theorem and polar moment of inertia. Moment of inertia of composite sections.	07
Unit-IV **Principal Planes & Principal Stresses**	4a. Calculate Normal and shear stress on a inclined plane in a element subjected to plane stress condition 4b. Calculate Principal Stresses, Principal Planes, maximum shear stress and their Planes.	4.1 Concepts of simple shear, Complementary shear, Element subjected to general state of stress (Plane stress condition i.e. Normal stresses in x, y direction and shear stress all in same plane). 4.2 Equations for Normal stress, shear stress on any plane, Principal planes and Principal stresses, maximum shearing stresses and their planes. (No Derivations of these equations) Resultant stress, angle of obliquity, Numerical problems on above.	09
UNIT-V **Bending Stresses**	5a. Apply Bending Theory. 5b. Calculate Bending Stresses	5.1 Concept of pure bending, theory simple bending, Assumption in the theory of pure bending, stress distribution diagram, Equation of moment of resistance, flexure	07

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics	Hours
	5c. Draw stress distribution diagram	equation (Derivation not required). 5.2 Application of theory of bending, moment of resistance for symmetrical and unsymmetrical sections of beam. Simple numerical problems on standard sections. (No problems on built up sections)	
Unit-VI **Direct and Bending Stresses**	6a. Calculate Direct & Bending Stresses of various machine and structural components 6b. Draw stress distribution diagram for the given section	6.1 Concept of direct and eccentric loads 6.2 Tension and compression members subjected to load with eccentricity about one principal axis only, stress distribution, nature of stresses. 6.3 Condition for no tension, limits of eccentricity, maximum and minimum resultant stresses, core of section for rectangular & Circular sections, middle third rule. Resultant stress distribution diagram at given section. (No problems on Chimneys and Dam sections)	08
Unit-VII **Torsion**	7a. Calculate shear stresses due to torsion 7b. Draw shear stress distribution diagram for the shaft 7c. Calculate power transmitted by the shaft	7.1 Theory of pure torsion, twisting moment of resistance, equation of torsion, Assumptions in theory of pure torsion. 7.2 Shear stress distribution across a section of solid or hollow circular shafts, strength of solid circular shafts, polar modulus. 7.3 Power transmitted by solid circular shaft. (Numerical Problems on Solid circular shafts only)	06
		TOTAL	**64**

5.0 SUGGESTED SPECIFICATION TABLE WITH MARKS (THEORY):

Unit No.	Unit Title	Distribution of Theory Marks			
		R Level	U Level	A and above Levels	Total Marks
I	Stress and Strain	02	06	12	20
II	Shear Force and Bending Moment	02	04	10	16
III	Moment of Inertia	02	02	04	08
IV	Principal planes & principal stresses	02	02	06	10
V	Bending Stresses		02	06	08
VI	Direct and Bending Stresses	02	02	06	10
VII	Torsion		02	06	08
	TOTAL	**10**	**20**	**50**	**80**

Legends: R = Remembrance (Knowledge); U = Understanding; A = Application and above levels (Revised Bloom's taxonomy)

Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.

6.0 ASSIGNMENTS/PRACTICALS/TASKS:

The tutorial/practical/assignments/tasks should be properly designed and implemented with an attempt to develop different types of cognitive and practical skills **(Outcomes in cognitive, psychomotor and affective domain)** so that students are able to acquire the competencies.

***Note**: Here only outcomes in psychomotor domain are listed as practical/exercises. However, if these practical/exercises are completed appropriately, they would also lead to development of **Programme Outcomes/Course Outcomes in affective domain** as given in a common list at the beginning of curriculum document for this programme. Faculty should refer to that common list and should ensure that students also acquire those Programme Outcomes/Course Outcomes related to affective domain.*

S. No.	Unit No.	Practical Exercises (Outcomes in Psychomotor Domain)	Approx. Hrs. required
		Any Eight of the Following Exercises	
1	I	Identify and Observe Functions of different parts of Universal Testing Machine.	02
2	I	Tension test on mild steel, plotting stress strain curve, significant points.	04
3	I, IV	Compression test on metals.	02
4	I	Shear test on mild steel, aluminium and brass rod. **(Any Two Metals)**	04
5	I	Izod and Charpy impact test on mild steel, aluminium, copper and brass **(Any Two Metals).**	04
6	II, III, V	Bending test on timber / metal specimens.	04
7	VII	Torsion test.	04
8	I	Rockwell hardness test.	02
9	I	Brinell hardness test	02
10	II	Drawing shear force and bending moment diagrams, 6 problems.	04
		TOTAL	**32**

7.0 STUDENT ACTIVITIES:

Following is the list of proposed student activities like

1. Observe and collect samples of different mechanical engineering materials used in Industry.
2. Carry out tests on different mechanical engineering materials in laboratory.

8.0 SPECIAL INSTRUCTIONAL STRATEGIES (If any):

1. Show Videos and slides involving conduct of Test on different Materials.
2. Arrange industry Visit.

9.0 LEARNING RESOURCES:

A) Books

Sr.No.	Title of Book	Author	Publication
1	Strength of materials	Singer and Pytel	Harper & Row, Publishers, New York
2	Mechanics of Materials	Beer & Johnson	Mc Gr. Hills
3	Strength of Materials	Schaum's outline Series William Nash	McGraw Hill
4	Strength of Materials	Timo Shenko and Young	CBS Publisher & distributors
5	Strength of Materials	Ramamrutham	Dhanpat Rai and sons
6	Strength of materials	Khan R. S.	S. Chand
7	Strength of Materials	B. K. Sarkar	Tata McGraw Hill
8	Strength of materials	Sunil S. Deo	Nirali Publications

B) Software/Learning Websites

1. www.nptel.com, www.youtube.com, www.howstuffworks.com,
2. www.sciencedirect.com, www.wikipedia.org

C) Major Equipments/ Instruments with Broad Specifications

1. Digital Universal Testing Machine (1000kN), Compression Testing Machine (200 tonne), Torsion Testing Machine, Impact testing Machine, Hardness testing Machine.

10.0 MAPPING MATRIX OF PO'S AND CO'S:

Course Outcomes	Programme Outcomes										
	a	**b**	**c**	**d**	**e**	**f**	**g**	**h**	**i**	**j**	**k**
CO1	H										
CO2	H	H									
CO3	H	H									
CO4		H	M								

H: High Relationship, M: Moderate Relationship, L: Low Relationship.

PROGRAMME : Diploma Programme in Mechanical Engineering(ME)/Automobile Engineering(AE)
COURSE : Mechanical Engineering Drawing(MED) **COURSE CODE :** 6214

TEACHING AND EXAMINATION SCHEME:

Teaching Scheme				Examination Scheme								
Hrs / week			Credits	TH Paper Hrs.	Marks							
TH	TU	PR				TH	TEST	TH+TEST	PR	OR	TW	TOTAL
03	--	04	07	04	Max.	80	20	100	--	25	25	150
					Min.	32	--	--	--	10	10	--

1.0 RATIONALE:

A diploma technician has to work in different areas like R and D, Design, Tool Room, Production, Production planning, Industrial Engineering, Stores, Quality Control, Marketing, Purchase etc.

For expressing the ideas & communicating the instructions to shop level, knowledge of production drawing is essential. This course aims to impart the knowledge of production drawing, assembly drawing & develop the drawing & drawing reading skill.

2.0 COURSE OBJECTIVES:

The student will be able to,

1. Interpret industrial drawing.
2. Interpret instructions related to manufacturing components.
3. Use IS convention of representing various machine components.
4. Visualize the assembly of given set of details of machine components.
5. Know the significance and use of tolerances of size, forms and positions.

3.0 COURSE OUTCOMES:

The course content should be taught and learning imparted in such a manner that students are able to acquire required learning outcome in cognitive, psychomotor and affective domain to demonstrate following course outcomes:

1. Identify and draw the intersection of surfaces.
2. Interpret and draw standard conventions of different machine components.
3. Apply tolerances and surface roughness symbols to drawing.
4. Identify and draw production drawing for assembly and detail.

4.0 COURSE DETAILS:

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics	Hours
Unit-I **Intersection of Surfaces**	1a. Draw intersection or penetration of any two surfaces or solids	1.1 Prism with prism 1.2 Cylinder with cylinder 1.3 Prism with cylinder (Axis of both the solids are perpendicular with each other) 1.4 Cylinder with cone	06
Unit-II **Conventions used for representation**	2a. Draw conventional representation of pipes, welded joints, bearings, pulleys etc. 2b. Know various types of engineering materials.	2.1 Long & short break in pipes, rods & shafts. 2.2 Bearings. 2.3 Engineering materials 2.4 Half, removed, revolved, off set, partial, local broken & aligned section. 2.5 Wheels & pulleys containing hubs spoke, holes in section. 2.6 Welded joints representation of different welds preparation of working drawing as per IS.	06

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics	Hours
		2.7 Standard conventions for the pipe fitting in pipe lines e. g. nipple, coupling, reducing socket, elbows, bends, plugs, tee, cross etc. 2.8 Standard conventions for flanged joint, union joint, hydraulic joint, socket & spigot joint as per IS code	
UNIT-III **Machine/Engine Parts.**	3a. Draw various types of Keys, couplings, joints. 3b. Sketch engine parts and valves	3.1 Keys-sunk, saddle, taper, woodruff, cone. 3.2 Couplings: muff, flanged, flexible, universal & Oldham. 3.3 Joints: pin & cotter. 3.4 Pulleys: solid type built up, V- belt, rope & fast and loose. 3.5 Engine parts-piston connecting rod crank shaft, eccentric, stuffing box etc. 3.6 Valves-stop valves & non-return valves. 3.7 Bearings-journal, ball, footstep, Plummer block.	08
UNIT- IV **Limits, Fits and Tolerances.**	4a. Calculate the limits and tolerances. 4b. Apply geometrical tolerances on part drawing.	4.1 Limit systems 4.2 Tolerances (dimensional form & position) 4.3 Fits-types 4.4 Calculation of limits, tolerances 4.5 Geometric tolerances.	04
UNIT-V **Surface Roughness Symbols**	5a. State the various machining symbols. 5b. Apply roughness and surface finishing symbols to machine parts drawing.	5.1 Surface roughness symbols. 5.2 Machining symbols. 5.3 Indication of surface roughness & machining symbols.	04
UNIT-VI **Production Drawing and Processes Sheets**	6a. Prepare process sheet and production drawing. 6b. Draw production drawing and give details of Mfg. process.	6.1 Processes sheets 6.2 Production drawing 6.3 Preparation of production drawing & process sheet of component such as tenon, slip bushes, gears, flange, shaft, connector.	10
UNIT-VII **Production Drawing of Assembles/ Details to assembly/ Assembly to details.**	7a. Draw assembly drawing of machine parts. 7b. Draw detail drawing of machine parts. 7c. Prepare bill of material for the assembly and details.	7.1 Part references on assembly drawings 7.2 Production drawing on assemblies like • Protected type flange coupling • Universal coupling / Oldham Coupling • I. C. Engine piston • Footstep bearing & pedestal bearing. • Stuffing box. • Steam stop valve. • Hydraulic cylinder • Petrol / Diesel engine connecting rod • Screw Jack • Square tool post • Feed check valve • Milling machine / lathe tail stock • Non return valve	10
TOTAL			**48**

5.0 SUGGESTED SPECIFICATION TABLE WITH MARKS (THEORY):

Unit No.	Unit Title	Distribution of Theory Marks			
		R Level	U Level	A and above Levels	Total Marks
I	Intersection of surfaces	04	04	04	12
II	Conventional Representation	04	04	04	12
III	Machine/Engine Parts	04	04	04	12
IV	Limits, fits and Tolerances		02	06	08
V	Surface Roughness Symbols		02	02	04
VI	Production Drawing and Process Sheets	04	04	06	14
VII	Production Drawing of Assembles/ Details to assembly/ Assembly to details	04	08	06	18
	TOTAL	**20**	**28**	**32**	**80**

Legends: R = Remembrance (Knowledge); U = Understanding; A = Application and above levels (Revised Bloom's taxonomy)

Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.

6.0 ASSIGNMENTS/PRACTICALS/TASKS:

The tutorial/practical/assignment/task should be properly designed and implemented with an attempt to develop different types of cognitive and practical skills **(Outcomes in cognitive, psychomotor and affective domain)** so that students are able to acquire the desired programme outcome/course outcome.

Note*: Here only outcomes in psychomotor domain are listed as practical/exercises. However, if these practical/exercises are completed appropriately, they would also lead to development of* ***Programme Outcomes/Course Outcomes in affective domain*** *as given in the mapping matrix for this course. Faculty should ensure that students also acquire Programme Outcomes/Course Outcomes related to affective domain.*

S. No.	Unit No.	Practical Exercises (Outcomes in Psychomotor Domain)	Hours
1	I	Draw sheet on Intersection of Surfaces (Four Problems)	06
2	II	Draw sheet for conventional representation of pipe fittings, different types of sections welding symbols and hydraulic joints.	08
3	III	Draw sheet for machine parts like wheels, pulleys, spokes, tool post, valves, bearings and engine parts.	08
4	IV, V	Draw sheet for representation of limits, fits & tolerances, surface finish & machining symbols.	04
5	VI	Draw sheet on Production drawing of simple machine parts.	10
6	VII	Prepare sheet on Assembly drawing using CAD.	10
7	VII	Prepare sheet on Details drawing using CAD.	10
8		Prepare production drawing sheet for Assembly or Detail drawing using 3D software.	08
		TOTAL	**64**

7.0 STUDENT ACTIVITIES:

Following is the list of proposed student activities like

1. Make paper model of intersection of surfaces.
2. Practices to create their drawing.
3. Communicate a simple mechanical engineering drawing through the use of drawing instruments.
4. Use proper symbols on the machine parts.
5. Select and use particular tolerances.
6. Accurately measure the design drawing

8.0 SPECIAL INSTRUCTIONAL STRATEGIES (If any):

1. Show CAI computer software related to Mechanical Engineering drawing.
2. Arrange a visit to industry, workshop for observing various machine parts, works.
3. Arrange expert seminar of industry person in the area of Mechanical Engineering drawing.

9.0 LEARNING RESOURCES:

A) Books

Sr.No.	Title of Book	Author	Publication
1	Engineering Drawing	N D Bhatt	Charotar Publishing House
2	Machine Drawing	N D Bhatt	Charotar Publishing House
3	Engineering Graphics	Siddheshwar Shastri	TMH
4	Production Drawing	K L Narayana	PHI
5	Engineering Drawing & Graphics	K Venugopal	New Age Publication

B) Software/Learning Websites

1. http://www.engineeringdrawing.org
2. http://www.mechanical-engg.com

C) Major Equipments/ Instruments with Broad Specifications.

1. Drawing instruments such as mini drafter, set square, drawing board, pencils, sheet, engineering Compass etc.

10.0 MAPPING MATRIX OF PO'S AND CO'S:

Course Outcomes	Programme Outcomes										
	a	b	c	d	e	f	g	h	i	j	k
CO1		M									
CO2			M								
CO3				L							
CO4		H	M				L				

H: High Relationship, M: Moderate Relationship, L: Low Relationship.

PROGRAMME : Diploma Programme in Mechanical Engineering(ME) / Automobile Engineering(AE)
COURSE : Theory of Machines and Mechanisms (TOM) **COURSE CODE :** 6216

TEACHING AND EXAMINATION SCHEME:

Teaching Scheme				Examination Scheme							
Hrs / week			Credits	TH Paper Hrs.	Marks						
TH	TU	PR				TH	TEST	TH+TEST	PR	OR	TW	TOTAL
04	--	02	06	03	Max.	80	20	100	--	--	25	125
					Min.	32	--	40	--	--	10	--

1.0 RATIONALE:

It is a core Technology course in Mechanical / Automobile Engineering Discipline. Mechanical / Automobile Engineering Diploma Holders often come across various mechanisms in practice. He should be able to analyze, identify and interpret various mechanisms and machines in day-to-day life. In maintaining various machines, a diploma technician should have sound knowledge of fundamentals of machine and mechanism. It will be helpful to technician to understand the mechanisms from operational point of view

In better way, this course imparts the facts, concepts, principles, procedure, kinematics and dynamics involved in different machine elements and mechanisms like lever, gear, cam, follower, belt, flywheel, brake, dynamometer, clutch etc.

Detail knowledge of above-mentioned aspect with deep insight to the practical applications develops a professional confidence in them to become successful Engineer.

2.0 COURSE OBJECTIVES:

The student will be able to,

1. Know different machine elements and mechanisms.
2. Understand Kinematics and Dynamics of different machines and mechanisms.
3. Understand selection criteria of drive for specific application.
4. Appreciate concept of balancing and Vibration.
5. Develop ability to come up with innovative ideas

3.0 COURSE OUTCOMES:

The course content should be taught and learning imparted in such a manner that students are able to acquire required learning outcome in cognitive, psychomotor and affective domain to demonstrate following course outcomes:

1. Identify and analyze given mechanism for velocity and acceleration
2. Draw and design cam profile for given application
3. Select a drive for given application
4. Analyze balancing of rotating masses in a single plane.
5. Interpret interrelationship between components of various braking mechanisms
6. Assemble and dismantle clutches

4.0 COURSE DETAILS:

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics	Hours
Unit-I **Fundamentals and Mechanisms**	1a. Define various terms related to mechanisms 1b. Explain different Inversions of Mechanism 1c. Explain construction and working of	1.1 Kinematics of Machines: Definition of Kinematics, Dynamics, Statics, Kinetics, Kinematic link, Kinematic pair and its types, constrained motion and its types, Kinematic chain and its types, Mechanism, inversion, machine and structure. 1.2 Inversions of four bar chain, Single	08

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics	Hours
	various mechanisms.	Slider Crank chain and Double Slider Crank Chain 1.3 Some common mechanism, Geneva Mechanism, mini drafter, Bicycle free wheel Sprocket mechanism	
Unit-II **Velocity and Acceleration in Mechanism**	2a. Define various terms related to velocity and acceleration 2b. Draw and analyse simple mechanisms 2c. Draw and interpret velocity and acceleration diagrams	2.1 Concept of relative velocity and acceleration of a point on link, angular velocity and angular acceleration, inter-relation between linear and angular velocity and acceleration. 2.2 Drawing of velocity and acceleration diagram of a given configuration, diagrams of simple mechanisms. Determination of velocity and acceleration of a point on link by relative velocity method [Excluding Coriollis components of acceleration]. 2.3 Analytical method [no derivation] and Klein's construction to determine velocity and acceleration of different links in single slider crank mechanism.	12
UNIT-III **Cams and Followers**	3a. Define the terms related to Cam and followers. 3b. Classify Cams and Followers 3c. Draw cam profile as per the given applications	3.1 Concept, definition and application of Cams and Followers. 3.2 Classification of Cams and Followers. 3.3 Different follower motions and their displacement diagrams like uniform velocity, SHM, uniform acceleration and Retardation. 3.4 Drawing of profile of radial cam with knife-edge and roller follower with and without offset with reciprocating motion (graphical method).	06
Unit-IV **Power Transmission**	4a. State broad classification of Drives. 4b. Calculate velocity ratio, belt tensions, slip, angle of contact, power transmitted in belt drives 4c. Select suitable drives and Mechanisms for a particular application.	4.1 Types of Drives – Belt, Chain, Rope, Gear and their comparison with applications, advantages & limitations 4.2 Belt Drives - flat belt, V– belt & its applications, material for flat and V-belt, angle of lap, belt length. Slip and creep. Determination of velocity ratio, ratio of tight side and slack side tension, centrifugal tension and initial tension, condition for maximum power transmission (Simple numerical, no derivation) 4.3 Gear Drives – Spur gear terminology, types of gears and gear trains, their selection for different application, train value & Velocity ratio for simple, compound, reverted and epicyclic gear train, Law of gearing (No numerical).	10
Unit-V	5a. Differentiate between uniform	5.1 Clutches- Uniform pressure and Uniform Wear theories.	06

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics	Hours
Clutches & Bearings	pressure and uniform wear theories 5b. Explain construction and working of various clutch 5c. Calculate torque and power lost in friction	5.2 Function of Clutch and its application, Construction and working of i) Single plate clutch, ii) Multi plate clutch, iii) Centrifugal Clutch iv)Cone clutch v) Diaphragm clutch. (Simple numerical on single and Multi plate clutch). 5.3 Bearings – i) Simple Pivot, ii) Collar Bearing, iii) Conical pivot. Torque & power lost in friction (no derivation). Simple numerical.	
Unit-VI **Brakes, Dynamometers**	6a. Differentiate between brakes and dynamometers 6b. Construction and working of various brakes and dynamometers	6.1 Function of brakes and dynamometer, types of brakes and dynamometers, comparison between brakes and dynamometer. 6.2 Construction and working of i) Shoe brake, ii) Band brake, iii) Internal expanding shoe brake iv) Disc brake. 6.3 Construction and working of Dynamometers i) Rope Brake, ii) prony brake iii) Torsion	08
Unit-VII **Flywheel, Governors and Balancing**	7a. Understand function of flywheel and governor. 7b. Classify and compare governors. 7c. Appreciate necessity of balancing 7d. Calculate balancing mass analytically and graphically 7e. Understand causes and effects of vibrations	7.1 Flywheel - Concept, function and application of flywheel with the help of turning moment diagram for single cylinder 4-Stroke I. C. Engine (No Numerical). Coefficient of fluctuation of energy, coefficient of fluctuation of speed and its significance. 7.2 Governors - Types, concept, function and application & Terminology of Governors. 7.3 Comparison between Flywheel and Governor. 7.4 Concept of Balancing. Balancing of single rotating mass. Analytical and graphical method for balancing of several masses revolving in same plane. 7.5 Concept and terminology used in vibration, causes of vibrations in machines, their harmful effects and remedies.	14
		TOTAL	**64**

5.0 SUGGESTED SPECIFICATION TABLE WITH MARKS (THEORY):

Unit No.	Unit Title	Distribution of Theory Marks			
		R Level	U Level	A and above Levels	Total Marks
I	Fundamentals and Mechanisms	06	06	--	12
II	Velocity and Acceleration in Mechanism	04	04	06	14
III	Cams and Followers	02	04	04	10
IV	Power Transmission	04	06	06	16
V	Clutches & Bearings	02	04	02	08

Unit No.	Unit Title	Distribution of Theory Marks			
		R Level	U Level	A and above Levels	Total Marks
VI	Brakes, Dynamometers	04	04	--	08
VII	Flywheel, Governors and Balancing	04	04	04	12
	TOTAL	**26**	**32**	**22**	**80**

Legends: R = Remembrance (Knowledge); U = Understanding; A = Application and above levels (Revised Bloom's taxonomy)

Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.

6.0 ASSIGNMENTS/PRACTICALS/TASKS:

The tutorial/practical/assignments/tasks should be properly designed and implemented with an attempt to develop different types of cognitive and practical skills **(Outcomes in cognitive, psychomotor and affective domain)** so that students are able to acquire the competencies.

***Note**: Here only outcomes in psychomotor domain are listed as practical/exercises. However, if these practical/exercises are completed appropriately, they would also lead to development of **Programme Outcomes/Course Outcomes in affective domain** as given in a common list at the beginning of curriculum document for this programme. Faculty should refer to that common list and should ensure that students also acquire those Programme Outcomes/Course Outcomes related to affective domain.*

S. No.	Unit No.	Practical Exercises (Outcomes in Psychomotor Domain)	Approx. Hrs. required
1	I	Sketch and describe working of quick return mechanism for a shaper. Find the ratio of time of cutting stroke to the return stroke to understand quick return motion in shaping operation	02
2	I	Sketch and describe the working of the following mechanisms with its application, a) Bicycle free wheel sprocket mechanism b) Geneva mechanism c) Ackerman's steering gear mechanism d) Foot operated air pump mechanism	04
3	II	Determine velocity and acceleration of various links of the given mechanism, by relative velocity method (minimum two mechanisms)	04
4	II	Determine velocity and acceleration in an I. C. engine's slider crank mechanism by Klein's construction	04
5	III	Draw the profile of a radial cam for the given follower type to obtain the desired follower motion (minimum 4 problems)	04
6	IV	Determine slip, length of belt, angle of contact in an open belt drive to understand its performance	02
7	VII	Draw a schematic diagram of centrifugal governor and describe its working. Draw a graph between radius of rotation versus speed of governor	02
8	VI	Sketch, Dismantle and assemble mechanically operated braking mechanism of an automobile.	04
9	V	Dismantle and assemble multi-plate clutch of two wheeler. Draw neat sketch and state the functions of various components	04
10	VII	Determine graphically counterbalance mass and its direction for complete balancing of a system of several masses rotating in same plane and verify it analytically.	02
		TOTAL	**32**

7.0 STUDENT ACTIVITIES:

Following is the list of proposed student activities like

1. Collect real life examples of various mechanisms in various areas like automobiles, toys, actuators, material handling equipments.
2. Develop different ideas of mechanisms in the form of mini project by a group of students and its presentation
3. Visit automobile workshop and study various mechanisms

8.0 SPECIAL INSTRUCTIONAL STRATEGIES (If any):

1. Show CAI computer software related to mechanisms
2. Arrange a visit to S.T. workshop/ Industry to have basic idea about TMM.
3. Arrange expert lecture of industry person in the area of TMM

9.0 LEARNING RESOURCES:

A) Books

Sr.No.	Title of Book	Author	Publication
1	Theory of Machine	S. S. Rattan	TATA McGraw Hill companies, II Edition
2	Theory of machines	R. S, Khurmi Gupta	Eurasia publishing House Pvt. Ltd. 2006 edition
3	Theory of machines	P. L. Ballaney	Khanna Publication
4	Theory of machines	Timo Shenko	Wiley Eastern
5	Theory of machines	Jagdishlal	Bombay Metro – Politan book ltd.
6	Theory of machines	Ghosh - Mallik	Affilated East west press
7	Theory of machines	Thomas Bevan.	CBS Publication
8	Theory of machines	J. E. Shigley	Tata McGraw Hill

B) Software/Learning websites

1. http://www.howthingswork.com
2. http://www.mechanisms.co/index.html
3. http://www.technologystudent.com/
4. http://www.creativemechanisms.com
5. http://youtube.com

C) Major Equipments/ Instruments with Broad Specifications

1. Models of various mechanisms for demonstration
2. Working model of Universal governor
3. Models of automobile brakes, clutches and cam-followers

10.0 MAPPING MATRIX OF PO'S AND CO'S:

Course Outcomes	Programme Outcomes										
	a	b	c	d	e	f	g	h	i	j	k
CO1	L	M	M		L						
CO2	L	H	M	M	H						
CO3			M	H	H		M				
CO4		L	H	M	M	L					
CO5		M	L	M	H	M					
CO6		M	L	M	H	L		L			M

H: High Relationship, M: Moderate Relationship, L: Low Relationship.

PROGRAMME : Diploma Programme in Mechanical Engineering(ME)/Automobile Engineering(AE)
COURSE : Computer Aided Drawing and Drafting(CDR) **COURSE CODE :** 6219

TEACHING AND EXAMINATION SCHEME:

Teaching Scheme				Examination Scheme							
Hrs / week			Credits	TH Paper Hrs.	Marks						
TH	TU	PR				TH	TEST	TH+TEST	PR	OR	TW	TOTAL
01	--	04	05	--	Max.	--	--	--	--	--	25	25
					Min.	--	--	--	--	--	10	--

1.0 RATIONALE:

Computer has become inevitable in today era and finds their application in various stages of production. This course has been introduced at diploma level in order to develop the skills in student so that they can generate various digital production drawings as required in industry using various CAD softwares.

2.0 COURSE OBJECTIVES:

The student will be able to,

1. Interpret the drawing and understand the graphical user interface for drafting.
2. Know the different draw and modify commands used for computer aided drawing.
3. Know the display and zoom commands and pan and dimension the object.
4. Know drafting using ISO snap for isometric drawing.
5. Understand the use of layout for plotting the drawing.

3.0 COURSE OUTCOMES:

The course content should be taught and learning imparted in such a manner that students are able to acquire required learning outcome in cognitive, psychomotor and affective domain to demonstrate following course outcomes:

1. Select proper software for drafting.
2. Draw and dimension the drawing of machine parts using software like AutoCAD.
3. Draw, edit and modify the new machine parts and assembly drawing.
4. Make a block, array, rotate, offset using necessary commands.
5. Plot the assembly and production drawing using CAD software.

4.0 COURSE DETAILS:

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics	Hours
Unit-I **Introduction to Computer Aided Drafting**	1a. Understand and use basics of CAD systems.	1.1 Introduction to Computer Aided Drafting (CAD) - Applications, Various commercial Softwares. 1.2 Co-ordinate system- Cartesian & Polar- Absolute, Relative mode. 1.3 Initial settings commands snap, grid, ortho, osnap, limits, units, scale, ltscale. 1.4 Object Selection methods picking, window, crossing, fence, last, previous etc.	02
Unit-II **Zoom and Display Commands**	2a. View drawing. 2b. Format drawing entities.	2.1 Zoom Commands: all, previous, out, in, extent, real time, dynamic, window and pan. 2.2 Formatting commands: Layers, block, line type, line weight, colour.	03
UNIT-III	3a. Draw 2-D drawings 3b. Measure length and	3.1 Draw Command - Line, arc, circle, rectangle, polygon, ellipse, spline, block,	03

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics	Hours
Draw object commands	area	hatch 3.2 Enquiry commands – distance, area	
UNIT- IV **Edit and Modify commands**	4a. Edit 2 D drawings. 4b. Modify 2 D drawings	4.1 Modify Command : Erase, oops, break, trim, copy, move, mirror, offset, fillet, chamfer, array, extend, rotate, scale, lengthen, stretch, measure, divide, explode and align. 4.2 Edit commands: Move, Copy and Stretch.	03
UNIT-V **Isometric and 3D Drawings**	5a. Draw and modify 3 D drawings. 5b. Find materials mass property. 5c. Draw isometric drawings.	5.1. 3D Edit Commands -Pline, 3Dpoly, pedit, join splinedit commands. 5.2. View Commands - View ports, UCS, WCS commands 5.3. 3D Object and 3D operations: 3 D Object - Cube, Cylinder, Cone, Sphere and Wedge. 5.4. Three D operations - extrude, revolve. Command for drawing isometric object.	03
UNIT-VI **Dimensioning and Plot Commands**	6a. Apply dimensions. 6b. Write text or remarks. 6c. Plot a drawing.	6.1 Dimensioning commands: Dimension styles, Dimensional Tolerances and Geometrical Tolerances. 6.2 Text commands: dtext, mtext command. 6.3 Plotting a drawing: paper space, model space, creating table and plot commands.	02
		TOTAL	**16**

5.0 SUGGESTED SPECIFICATION TABLE WITH MARKS (THEORY):

Not Applicable

6.0 ASSIGNMENTS/PRACTICALS/TASKS:

The tutorial/practical/assignment/task should be properly designed and implemented with an attempt to develop different types of cognitive and practical skills **(Outcomes in cognitive, psychomotor and affective domain)** so that students are able to acquire the desired programme outcome/course outcome.

***Note**: Here only outcomes in psychomotor domain are listed as practical/exercises. However, if these practical/exercises are completed appropriately, they would also lead to development of **Programme Outcomes/Course Outcomes in affective domain** as given in the mapping matrix for this course. Faculty should ensure that students also acquire Programme Outcomes/Course Outcomes related to affective domain.*

S. No.	Unit No.	Practical Exercises (Outcomes in Psychomotor Domain)	Hours
1	I, II	Setting the initial drawing setup.	04
2	III, IV	Use of Draw, Edit & Modify commands by giving some suitable objects.	08
3	III	Redraw figures (at least 2) (One sheet)	04
4	III, IV	Orthographic projections (One sheet)	08
5	III, IV	Sectional views (One sheet)	04
6	IV, V	Details of production drawing with dimensions, tolerances, geometrical tolerances,	08
7	VI	Machining, welding and surface finish symbols (One sheet)	08
8	VI	Assembly drawing with dimensions, geometrical tolerances, fits. (One	08

S. No.	Unit No.	Practical Exercises (Outcomes in Psychomotor Domain)	Hours
		sheet)	
9	VI	Isometric drawing of at least 2 components. (One sheet)	08
10	V, VI	Draw 3 D primitives and do 3 D operations on it.	04
		TOTAL	**64**

7.0 STUDENT ACTIVITIES:

Following is the list of proposed student activities like

1. Collect the drawings of different machine parts.
2. Collect the production drawings of different assemblies and details of bench vice, bearings, couplings.
3. Prepare the PDF file of your drawing of assembly or detail.
4. Know the different 2 D drawing software currently used and compare it with one which you are using.

8.0 SPECIAL INSTRUCTIONAL STRATEGIES (If any):

1. Demonstrate graphical user interface and the different commands.
2. Arrange a visit to industry for production drawing.

9.0 LEARNING RESOURCES:

A) Books

Sr.No.	Title of Book	Author	Publication
1	AutoCAD: A Problem-Solving Approach	Sham Tickoo	Thomson Learning EMEA, Limited
2	Mastering Auto CAD	George Omura	BPB Publication

B) Software/Learning Websites

1. Beginners AutoCAD 2011 Tutorial DVD, Advanced AutoCAD 2011 Tutorial DVD, 2
2. Learning AutoCAD 2012 Tutorial DVD – Publisher – Infinite Skills Inc. Email : directsales@infiniteskills.com
3. EKHO Institute presents Professional AutoCAD Training Videos
4. Learning AutoCAD 2012 Tutorial DVD - Video Training.

C) Major Equipments/ Instruments with Broad Specifications

1. Computer lab with 20 PCs and CAD software.
2. LCD projector in the A. V. Hall.
3. Plotter of the A2 size or higher.

10.0 MAPPING MATRIX OF PO'S AND CO'S:

Course Outcomes	Programme Outcomes										
	a	b	c	d	e	f	g	h	i	j	k
CO1				M							
CO2		H		M							L
CO3				H							L
CO4				H							M
CO5		H	H	M				L	M		H

H: High Relationship, M: Moderate Relationship, L: Low Relationship.

PROGRAMME : Diploma Programme in ME / PS / AE
COURSE : Electrical Technology (ETE) **COURSE CODE :** 6220

TEACHING AND EXAMINATION SCHEME:

Teaching Scheme				Examination Scheme								
Hrs / week			Credits	TH Paper Hrs.	Marks							
TH	TU	PR				TH	TEST	TH+TEST	PR	OR	TW	TOTAL
03	--	02	05	03	Max.	80	20	100	--	--	25	125
					Min.	32	--	40	--	--	10	--

1.0 RATIONALE:

A diploma technician has to handle and maintain electrical equipments machinery/instruments which involve use of devices, its parts, working principles of electrical engineering. For effective operation & maintenance of these systems they must have sound knowledge of concepts, principles, operation, industrial applications of electrical machines, electrical circuits, Switches and relays.

2.0 COURSE OBJECTIVES:

The student will be able to,

1. Acquire the Knowledge of the basic Electric rules, laws related to electric, magnetic circuits & electromagnetic induction
2. Understand fundamentals of AC single phase supply
3. Understand the basic rules & laws to solve DC circuit
4. Know the various effects of an electric current
5. Get acquainted with Star and delta connection.
6. Familiarize with Machines, transformers and relays
7. Know the various types of switches

3.0 COURSE OUTCOMES:

The course content should be taught and learning imparted in such a manner that students are able to acquire required learning outcome in cognitive, psychomotor and affective domain to demonstrate following course outcomes:

1. Apply the basic rules and laws to solve DC circuit.
2. Differentiate between Electric and magnetic circuit.
3. Classify single phase and three phase DC supply system.
4. Identify the pats of DC motor and state its applications.
5. State applications of single phase and three phase induction motors.
6. Interpret connections of switches and relays.
7. Use the transformer in application circuits.

4.0 COURSE DETAILS:

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics	Hours
Unit-I **Fundamentals.**	1a. Define basic electrical parameters 1b. State & apply Ohm's law to various circuits. 1c. Explain the laws of resistance. 1d. Differentiate between voltage drop and terminal Voltage 1e. Solve numerical based on	1.1 Concept of electric current, voltage, resistance, inductance & capacitance 1.2 Ohm's Law, concept of voltage drop and terminal Voltage 1.3 Kirchhoff's current & voltage laws. (Simple Numericals) 1.4 Effects of electric current Heating, Magnetic & Chemical.	04

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics	Hours
	Kirchhoff's current & voltage laws 1f. State the effects of electric current		
Unit-II **Magnetism and Electromagnetic Induction**	2a. State various parameters for magnetism. 2b. Explain concept & laws of magnetic circuit. 2c. Differentiate between electric & magnetic circuit. 2d. Explain concept & laws of Electromagnetic Induction. 2e. Solve numerical based on induced EMF by different methods.	2.1 Definitions: magnetic flux, magnetic flux density, magnetic field strength, Magnetic Circuit: MMF, Reluctance, Permeance & Reluctivity 2.2 Comparison of electric & magnetic circuit 2.3 Fleming's Right hand rule, Lenz's law 2.4 Dynamically induced EMF & statically induced EMF, Self induced EMF and Mutually induced EMF (Simple Numericals)	08
Unit-III **Single Phase & Three phase system**	3a. Define various Parameters of AC fundamentals. 3b. State current, voltage & power relationship in pure resistive, inductive & capacitive circuit. 3c. Explain concept of reactance, impedance and power factor for R-L-C series circuit. 3d. Draw the power triangle 3e. State advantages of poly phase system over single phase system. 3f. Solve numerical based on Star and Delta Connection.	3.1 Comparison of DC & AC supply. 3.2 Equation for instantaneous value of alternating voltage & current 3.3 Definitions : Waveform, cycle, Time period, frequency, electrical and mechanical angle, Maximum value, average value & RMS value of sine wave, Form factor & Peak factor 3.4 Current, voltage & power relationship in pure Resistive, inductive & capacitive Circuit. 3.5 Concept of reactance, impedance, power factor for R-L-C series Circuit. 3.6 Concept of Active (kW), Reactive (kVAR) & Apparent power (kVA) 3.7 Advantages of polyphase system over single phase system 3.8 Star Connection, relation between line values & phase values of current, voltages (No derivation) (Simple Numericals) 3.9 Delta Connection, relation between line values & phase values of current, voltages (No derivation) (Simple Numericals)	08
Unit-IV **Transformer**	4a. State Working Principle of single phase transformer 4b. Classify single phase transformer 4c. Describe construction of	4.1 Working Principle of single phase transformer 4.2 Construction details : Parts & their function 4.3 Classification –Core type & shell	08

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics	Hours
	Single phase transformer. 4d. Derive emf equation of transformer. 4e. State concept of kVA rating of a transformer and transformation ratio. 4f. Solve numerical on Transformation ratio, regulation and efficiency. 4g. Interpret performance of transformer from Load Test. 4h. Draw winding connections of three phase transformer. 4i. State working concept of Autotransformer & its applications.	type 4.4 Derivation of EMF equation of a transformer 4.5 kVA rating of a transformer, Voltage ratio, current ratio, & transformation ratio (Simple Numericals) 4.6 Losses in transformer, Efficiency & Regulation of transformer by load test (Simple Numericals) 4.7 Three Phase transformer, winding Connections 4.8 Autotransformer-concept & Applications	
Unit-V **DC Motor**	5a. Explain construction and working principle of DC motor 5b. State types of DC Motor with their Applications. 5c. Draw connection diagram and Speed-Torque characteristic of DC shunt Motors. 5d. Explain speed control methods. 5e. Explain 3 point starter	5.1 Construction and working 5.2 Principle 5.3 Classification on the basis of connection 5.4 Speed-Torque Characteristic of DC shunt motor and speed control 5.5 Applications 5.6 Necessity of starter, 3 point starter	04
Unit-VI **Three Phase Induction Motor**	6a. Explain construction and working principle of induction motor. 6b. State types of induction motor with their applications. 6c. Draw connection diagram and Torque slip characteristic of induction motors. 6d. Explain Necessity of starter for induction motor. 6e. State selection criteria of induction motor. 6f. State types enclosures of Induction motor.	6.1 Principle of operation 6.2 Construction, Types of rotor : squirrel cage & slip ring 6.3 Synchronous speed & slip speed 6.4 Torque-slip characteristics of induction motor 6.5 Necessity of starter & Different types of starter (only names) 6.6 Reversal of rotation of three phase motor 6.7 Applications in industry 6.8 Selection criteria of motor 6.9 Types of enclosures	08
Unit-VII **Single Phase Motors**	7a. State types of single phase Induction motor. 7b. Draw schematic diagram & Torque speed characteristic of single phase induction motors. 7c. List down applications of	7.1 Types-Resistance split phase, Capacitor split phase (Schematic diagram, T-N characteristic & applications) 7.2 Universal Motor – Principle of operation, T-N characteristic, Applications	04

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics	Hours
	single phase motors.		
Unit-VIII **Switches and relays**	8a. Explain construction and Woking of relays and switches 8b. Explain limit switches and actuators 8c. State applications of switches, relays and contactors	8.1 Basic Construction, working, connections, types and applications of: • Electromechanical relay, • Single-pole double-throw (SPDT) switch • Double-pole, double-throw (DPDT) switch 8.2 Actuators, Limit Switches, Power Contactors.	04
		TOTAL	**48**

5.0 SUGGESTED SPECIFICATION TABLE WITH MARKS (THEORY):

Unit No.	Unit Title	Distribution of Theory Marks			
		R Level	U Level	A and above Levels	Total Marks
I	Fundamentals	04	04	-	08
II	Magnetism & Electromagnetic Induction	04	04	04	12
III	Single Phase & Three Phase System	04	04	06	14
IV	Transformer	02	04	06	12
V	Dc Motor	02	02	04	08
VI	Three Phase Induction Motor	04	04	06	14
V II	Single Phase Motors	02	-	04	06
V III	Switches and relays	02	04	-	06
	TOTAL	**24**	**26**	**30**	**80**

Legends: R = Remembrance (Knowledge); U = Understanding; A = Application and above levels (Revised Bloom's taxonomy)

Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.

6.0 ASSIGNMENTS/PRACTICALS/TASKS:

The tutorial/practical/assignments/tasks should be properly designed and implemented with an attempt to develop different types of cognitive and practical skills **(Outcomes in cognitive, psychomotor and affective domain)** so that students are able to acquire the competencies.

***Note**: Here only outcomes in psychomotor domain are listed as practical/exercises. However, if these practical/exercises are completed appropriately, they would also lead to development of **Programme Outcomes/Course Outcomes in affective domain** as given in a common list at the beginning of curriculum document for this programme. Faculty should refer to that common list and should ensure that students also acquire those Programme Outcomes/Course Outcomes related to affective domain.*

Sr. No.	Unit No	Practical Exercises (Outcomes in Psychomotor Domain)	Approx. Hrs required
1	I	Verification of Ohm's Law	02
2	I	Verification Of KCL & KVL	04
3	III	Determine power, Power factor and Impedance Of R-L-C series circuit.	02
4	I	Use of Multimeter for measurement of AC & DC voltage, resistance, continuity	02
5	V	Starting and speed control of DC shunt motor below & above normal	06

Sr. No.	Unit No	Practical Exercises (Outcomes in Psychomotor Domain)	Approx. Hrs required
		speed	
6	VI	To plot speed torque characteristics of three phase induction motor	02
7	IV	Load test on single phase transformer for determination of Efficiency & regulation	04
8	--	Demonstration and Study of Servomotor	02
9	--	Demonstration and Study of Stepper motor	02
10	--	Demonstration & study of Electric heating, Induction heating, dielectric heating	06
		TOTAL	**32**

7.0 STUDENT ACTIVITIES:

Following is the list of proposed student activities like

1. Assignments for solving numerical
2. Collect leaflet/data of switches, relays.
3. Visit to transformer/motor manufacturing unit

8.0 SPECIAL INSTRUCTIONAL STRATEGIES (if any)

1. Arrange Industrial visit /Expert lecture

9.0 LEARNING RESOURCES:

A) Books

Sr.No.	Title of Book	Author	Publication
1	A text book of electrical technology Volume- I	B.L. Theraja A.K. Theraja	S. Chand & Co.
2	Basic Electrical Engineering.	V.N. Mittal	Tata McGraw Hill
3	Electrical Technology	Edward Hughes	E.L.B.S.
4	Fundamentals of Electrical Engineering	M.N. Mittal	Everest Publishing House

B) Software/Learning Websites

1.www.howstuffworks.com
2.www.kpsec.freeuk.com

C) Major Equipments/ Instruments with Broad Specifications

1. Ammeters
2. Voltmeters
3. Wattmeters
4. Tachometer
5. Rheostats
6. Lamp Bank
7. Single phase Transformer
8. Auto transformer
9. Three phase induction motor
10. Stepper motor
11. Servomotor

10.0 MAPPING MATRIX OF PO'S AND CO'S:

Course Outcomes	Programme Outcomes										
	a	**b**	**c**	**d**	**e**	**f**	**g**	**h**	**i**	**j**	**k**
CO1	H	M									
CO2		H									
CO3		H									
CO4		H	M								
CO5		H									
CO6		H	M								
CO7			H		M						

H: High Relationship, M: Moderate Relationship, L: Low Relationship.

PROGRAMME : Diploma Programme in ME / PS / AE
COURSE : Principles of Electronics (POE) **COURSE CODE :** 6221

TEACHING AND EXAMINATION SCHEME:

Teaching Scheme				Examination Scheme							
Hrs / week			Credits	TH Paper Hrs.	Marks						
TH	TU	PR				TH	TEST	TH+TEST	PR	OR	TW	TOTAL
03	--	02	05	03	Max.	80	20	100	--	--	25	125
					Min.	32	--	40	--	--	10	--

1.0 RATIONALE:

A technician come across machines / equipments / testing instruments /equipments & systems involving use of devices, parts working on principles of electronics engineering. For effective operation & maintenance of these systems, a technician should have a sound knowledge of facts, concepts, principle, procedure and operation of electronic devices / Instruments, electronic circuits, devices, transducers, measuring instruments / meters.

2.0 COURSE OBJECTIVES:

The student will be able to,

1. Understand principle and terminology of electronics.
2. Understand the use of semiconductor devices in electronic circuits
3. Interpret the characteristics of electronic devices.
4. Understand the working of basic electronic, digital circuits, digital instruments, transducers.

3.0 COURSE OUTCOMES:

The course content should be taught and learning imparted in such a manner that students are able to acquire required learning outcome in cognitive, psychomotor and affective domain to demonstrate following course outcomes:

1. Select and identify appropriate semiconductor devices required for various electronic applications.
2. Draw input and output waveform of different electronic circuits.
3. Explain working and applications of different digital circuits.
4. Understand the basic facts and concepts and working of measurement and electronic instrumentation system.
5. Identify and use various transducers, sensors and actuators for measurement of electrical, non-electrical quantity.

4.0 COURSE DETAILS:

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics	Hours
Unit-I **Semiconductor devices**	1a. Draw symbols of PN junction diode, UJT, SCR, TRIAC. 1b. Draw and explain characteristics of PN junction diode and zener diode. 1c. Draw and explain working of NPN transistor. 1d. Compare CE, CB, CC configuration of transistor	1.1 PN junction Diode – symbol, Construction, VI Characteristics, Working, application 1.2 Zener Diode – symbol, Construction, VI characteristics, Working, application 1.3 Transistor –Definition, Types-NPN, PNP, symbol, working. 1.4 Transistor configuration: CE, CB, CC(only circuit diagrams) 1.5 Input and output characteristics of CE configuration, Comparison between CE, CB, CC configuration 1.6 UJT, SCR, TRIAC, DIAC Symbol,	06

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics	Hours
		working, characteristics.	
Unit-II **Rectifiers & Filter**	2a. Categorize diode rectifiers and filters. 2b. Draw and explain operation of Half Wave Rectifier, along with input/output waveform. 2c. Draw and explain operation of Full Wave Bridge Rectifier with filter. 2d. Define Peak Inverse Voltage, Ripple Factor and TUF. 2e. Draw and explain working of zener diode as voltage regulator.	2.1 Classification of rectifiers. 2.2 Rectifiers: Definition, Need for Rectification. Circuit diagram and operation of Half Wave Rectifier, Full Wave Rectifier (center-tapped), Full Wave Bridge Rectifier(no derivations), Definition of Ripple Factor, Efficiency, PIV, TUF, Comparison of Rectifiers 2.3 Filters: Definition, Necessity of Filters, Types of Filters – C, LC, CLC- Circuit Diagram, working with Input- Output Waveform, Comparison of Filters 2.4 Zener voltage regulator	08
UNIT-III **Amplifiers & Oscillator**	3a. Describe the principle of Single and multistage amplifiers and state its need. 3b. Draw the circuit diagram and explain the working of two stages RC coupled amplifier. 3c. Differentiate between positive and negative feedback. 3d. Draw the circuit diagram and explain the working of RC phase shift oscillator	3.1 Single Stage CE amplifier, Circuit Diagram, function of components, working and frequency response of single stage amplifier 3.2 Multistage amplifiers: Need for multistage amplifier. Types of Coupling: RC coupled, Transformer coupled, Direct Coupled. Circuit Diagram, Frequency response and Function of each component 3.3 General theory of feedback: Types of feedback – negative & positive feedback. Barkhausen's criteria. 3.4 Operating principles of RC & LC oscillators 3.5 RC oscillators – RC phase shift 3.6 LC oscillators – Colpitts, piezoelectric effect, Crystal oscillator circuit diagram, equation for frequency of oscillation	08
UNIT-IV **Linear Integrated Circuits :**	4a. Draw labeled block diagram of op-amp. 4b. Differentiate between Inverting amplifier and Inverting amplifier 4c. Derive equation for gain for inverting configuration of op-amp. 4d. Draw and Explain Op-amp as adder. 4e. Draw block diagram	4.1 OP-amp-Block diagram, symbol, pin configuration of 741 4.2 Configuration of OP-amp-open and closed loop 4.3 Inverting amplifier 4.4 Non inverting amplifier 4.5 Applications – adder, subtractor. circuit diagram and derivation 4.6 Timer 555 – Block diagram, pin configuration. Circuit diagram and working of Astable multivibrator, monostable multivibrator using IC555	08

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics	Hours
	of IC 555		
UNIT-V **Digital Instruments**	5a. Draw block diagram of digital multimeter and explain its operation. 5b. Draw and explain working of CRO. 5c. Draw and explain block diagram of Regulated power supply.	5.1 Digital Multi meter -Block Diagram and operation only, application 5.2 Block Diagram and working of CRO. Working principle of CRT, applications of CRO 5.3 Function generator and working principle, block diagram, operation 5.4 Regulated power supply: block diagram and working	06
UNIT-VI **Digital Circuits**	6a. Convert decimal to binary or binary to decimal. 6b. Draw symbol and Write truth table of basic gates. 6c. Explain 4:1 Multiplexer with its block diagram. 6d. Draw and explain Encoder. 6e. Explain Ripple counter.	6.1 Number systems types: binary to decimal and decimal to binary 6.2 Logic gates and, OR, NOT, NAND, NOR symbols, truth table 6.3 Flip flop – RS. JK, truth table and working, Encoder(8:3), Decoder(3:8), 6.4 Multiplexer(4:1)logical block diagram and working, Demultiplexer(1:4) logical block diagram and working, 6.5 Basic principle of shift register (SISO)and counter (Ripple) 6.6 Display – LED & Seven segment display.	06
UNIT-VII **Industrial application and Transducers**	7a. Draw circuit and explain operation of UJT as a relaxation oscillator. 7b. Draw circuit diagram and explain operation of light dimmer. 7c. Draw circuit diagram and explain operation of battery charger circuit 7d. Explain different types of transducers and control circuit.	7.1 Single phase fully controlled rectifier with resistive and inductive load. 7.2 UJT as relaxation oscillator 7.3 Light dimmer 7.4 Battery charger 7.5 Transducers, sensors and actuators – Definition, types and difference between them, proximity sensor, Temperature(RTD), pressure(Strain gauge), displacement (LVDT)transducers 7.6 Level and temperature control circuits	06
		TOTAL	**48**

5.0 SUGGESTED SPECIFICATION TABLE WITH MARKS (THEORY):

Unit No.	Unit Title	Distribution of Theory Marks			
		R Level	U Level	A Level	Total Marks
I	Semiconductor devices	02	08	--	10
II	Diode rectifiers and filters	04	08	--	12
III	Amplifiers & Oscillator:	04	08	--	12
IV	Linear Integrated Circuits	04	04	04	12
V	Digital Instruments	02	08		10
VI	Digital Circuits	04	04	04	12
VII	Industrial application and transducers	--	08	04	12
	TOTAL	**20**	**48**	**12**	**80**

Legends: R = Remembrance (Knowledge); U = Understanding; A = Application and above levels (Revised Bloom's taxonomy)

Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.

6.0 ASSIGNMENTS/PRACTICALS/TASKS:

The tutorial/practical/assignments/tasks should be properly designed and implemented with an attempt to develop different types of cognitive and practical skills **(Outcomes in cognitive, psychomotor and affective domain)** so that students are able to acquire the competencies.

***Note**: Here only outcomes in psychomotor domain are listed as practical/exercises. However, if these practical/exercises are completed appropriately, they would also lead to development of **Programme Outcomes/Course Outcomes in affective domain** as given in a common list at the beginning of curriculum document for this programme. Faculty should refer to that common list and should ensure that students also acquire those Programme Outcomes/Course Outcomes related to affective domain. (Perform Any TEN* **ASSIGNMENTS / PRACTICALS / TASKS** listed below)

S. No.	Unit No.	Practical Exercises (Outcomes in Psychomotor Domain)	Approx. Hrs. required
1	I	Plot Forward characteristics of Semiconductor PN junction diode.	02
2	I	Plot reverse characteristics of Semiconductor PN junction diode.	02
3	II	Observe and plot input and output wave form for half wave rectifier.	02
4	II	Observe and plot input and output wave form for full wave rectifier (any one).	02
5	II	Observe and plot input and output wave form for full wave rectifier with filter (any one).	02
6	II	Observe the performance of zener shunt regulator.	02
7	III	Observe output waveforms for oscillator (any one).	02
8	IV	Demonstrate the use of op-amp as Adder.	02
9	V	To Observe front panel controls of Digital multimeter and perform measurement of • DC voltage, DC Current • AC voltage, AC current • Resistance • Continuity testing	04
10	V	Measure frequency, voltage, phase difference (by time measurement) using CRO	02
11	V	Observe front panel control of function generator	02
12	VI	Verify the truth table for logic gates (AND, NOT, OR, NAND, NOR)	02
13	VI	Verify truth table of 4:1 Multiplexer	04
14	VII	Displacement Measurement by using LVDT	02
		TOTAL	**32**

7.0 STUDENT ACTIVITIES:

Following is the list of proposed student activities like

1. Download data sheets of Semiconductor diode, zener diode, BJT, IC 741, Timer IC 555
2. Collect data about prices of electronic components such as semiconductor diode, zener diode etc.

8.0 SPECIAL INSTRUCTIONAL STRATEGIES (If any):

1. Show video to demonstrate the working principles, constructional features, testing and maintenance of different types of electronic components, devices and circuits.

9.0 LEARNING RESOURCES:

A) Reference Books

Sr.No.	Title of Book	Author	Publication
1	A text book of Applied Electronics	R.S. Sedha	S. Chand Publisher,
2	Principles of Electronics	V.K. Mehta	S. Chand, ISBN:8121924502, 9788121924504
3	Electronic Devices And Circuits	G.K. Mittal	Khanna
4	Modern Digital Electronics	R. P. Jain	Tata McGraw-Hill Education Pvt. Ltd. (TMH) Fourth Edition
5	Electrical and electronic measurements and instrumentation	A.K. Sawhney	Dhanpat Rai and co.
6	Operational Amplifiers	R. Gaikwad	Prentice-hall of India, New Delhi ISBN No. 0750656948

B) Software/Learning Websites

1. http://www.electronicstheory.com
2. http://www.nptl.com
3. http://www.electronictutorial.com
4. http://www.allaboutcircuit.com

C) Major Equipments/ Instruments with Broad Specifications

a. Cathode ray oscilloscope
b. Function Generator
c. Regulated power supply
d. CRO Probe
e. V-I Characteristics of PN diode – Experimental kit
f. V-I Characteristics of zener diode – Experimental kit
g. Half wave rectifier – Experimental kit
h. Full wave rectifier – Experimental kit
i. Bridge Full wave rectifier with and without filter– Experimental kit
j. RC phase shift oscillator– Experimental kit
k. Colpitts oscillator– Experimental kit
l. OP-amp as adder – Experimental kit
m. Verification of logic gates- Experimental kit
n. Multiplexer(4:1)- Experimental kit
o. UJT relaxation oscillator- Experimental kit
p. Digital multimeter

10.0 MAPPING MATRIX OF PO'S AND CO'S:

Course Outcomes	Programme Outcomes										
	a	b	c	d	e	f	g	h	i	j	k
CO1		H									
CO2				M							
CO3	M										
CO4					H						
CO5		H									

H: High Relationship, M: Moderate Relationship, L: Low Relationship.

PROGRAMME : Diploma Programme in Automobile Engineering (AE)
COURSE : Automobile Engines – I (AEN) **COURSE CODE :** 6252

TEACHING AND EXAMINATION SCHEME:

Teaching Scheme				Examination Scheme								
Hrs / week			Credits	TH Paper Hrs.	Marks							
TH	TU	PR				TH	TEST	TH+TEST	PR	OR	TW	TOTAL
04	--	02	06	03	Max.	80	20	100	--	25	25	150
					Min.	32	--	40	--	10	10	--

1.0 RATIONALE:

The Engine is the most important part of automobile vehicle. An automobile engineer should know various types of the engines, their working and different systems employed in sound working of automobile engine. This course intend to develop the skills of identification and location of engine parts and its functions, procedure for disassembly, assembly and testing of all systems and its components related to automobile engine.

2.0 COURSE OBJECTIVES:

The student will be able to,

1. Understand working principles, comparison & application of IC engine.
2. Know constructional details of different types of engine.
3. Understand working of various systems required in engine (Fuel injection, cooling, lubrication).
4. Know the types of ignition system in IC engine.
5. Perform test on IC engine.
6. Preparing heat balance sheet.

3.0 COURSE OUTCOMES:

The course content should taught and learning imparted in such a manner that students are able to acquire specific learning outcomes in cognitive, psychomotor and affective domain to demonstrate the following course outcomes:

1. Classify to automobile engine.
2. Find out problem in Automobile Engine parts.
3. Use of lubrication system in engine.
4. Use principle of ignition system in automobile.
5. Engine related problem.

4.0 COURSE DETAILS:

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics	Hours
Unit-I **Engine Principles and Fundamentals**	1a. Write engine nomenclature. 1b. Working principle of 2-S & 4-S engine. 1c. Classify IC engine. 1d. Use of IC Engine. 1e. Difference between SI and CI Engines.	1.1 Introduction. 1.2 Basic engine nomenclature. 1.3 Classification of automobile engines. 1.4 Working cycles –Otto, Diesel & Dual. 1.5 Use of engines. 1.6 Four stroke SI and CI engine. 1.7 Two stroke cycle engine. 1.8 Comparison of two stroke and four stroke cycle engine.	12
Unit-II **Constructional**	2a. Describe function construction & material for engine	2.1 Cylinder block, cylinder liner, types of liner, comparison of dry and wet liner 2.2 Cylinder head, gaskets, type of	12

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics	Hours
Features of Automobile Engine Components	components. 2b. Types of drives, draw and describe various mechanisms. 2c. Describe valve mechanism in engine	gaskets etc. 2.3 Piston, Piston rings, Piston ring joints, Piston pin. 2.4 Crank shaft, camshaft, Types of camshaft drives, Connecting rod 2.5 Valve, valve cooling, valve mechanisms, valve timing, manifolds, silencers, fly wheel etc.	
UNIT-III **Engine Cooling System**	3a. Explain types of cooling system in IC engine. 3b. Function &working of cooling system components. 3c. Write reason for scaling in cooling system.	3.1 Introduction – Purpose of cooling 3.2 Systems- Air cooling system, water cooling systems. 3.3 Comparison of air & water cooling systems. 3.4 Parts of cooling system. 3.5 Function of thermostat, water expansion tank, Temperature Indicator 3.6 Pressure cap, water pump, fan and fan belt, radiator. 3.7 Cooling water additions 3.8 Cooling water additives	06
UNIT-IV **Lubrication System**	4a. Describe purpose of lubrication system 4b. State different types of lubrication system 4c. State oil grading	4.1 Introduction. 4.2 Purpose of lubrication, parts to be lubricated, functions and properties of engine lubricating oils, additives for lubricants, classification of lubricating oils. 4.3 Dry Sump lubrication system, wet sump lubrication system, petroil lubrication system, pressurised lubrication system, splash lubrication system. 4.4 Crankcase ventilation. 4.5 Oil grading	06
UNIT-V **Fuel Systems**	5a. State basic principle of carburisation 5b. Working principle of carburettor 5c. Working of different types of carburettor 5d. State different injection system in petrol and diesel engines. 5e. Various circuits/systems/in carburettors. 5f. Explain different fuel injection pump.	5.1 Fuel feed system in petrol engines. 5.2 Mechanical fuel pump, electrical fuel pump 5.3 Principles of carburetion. 5.4 Simple carburettor. 5.5 Starting, Idling & slow running, acceleration, Main metering system, choke system. 5.6 S. U. Carburettor, Solex carburettor. 5.7 Requirements of fuel injection system. 5.8 Various components of Diesel Fuel injection system. 5.9 Types of fuel injection pumps for single and multi cylinder engines, inline and rotary types of fuel injection pumps. 5.10 Working of fuel injectors.	12

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics	Hours
		5.11 Air fuel mixture ratio in petrol and diesel engine. 5.12 Mixture requirement for Transient condition	
UNIT-VI **Ignition Systems**	6a. Need of ignition system 6b. Working of different types of ignition system 6c. State different types of spark advance mechanism.	6.1 Need of ignition system 6.2 Battery (coil) ignition system 6.3 Ignition coil, distributor, spark plug, cords condenser, C. B. points. 6.4 Magneto ignition system, Types of magneto 6.5 Comparison of Battery coil and magneto ignition system 6.6 Ignition timing 6.7 Spark advance mechanisms – vacuum and centrifugal.	08
UNIT-VII **IC Engine Testing and Governing System**	7a. Performance parameters. 7b. Engine Testing, Prepare heat balance system. 7c. State different Governing systems.	7.1 Engine power – IP, FP & BP, Mechanical, thermal, relative, volumetric efficiencies. fuel consumption, BSFC 7.2 Morse and motoring test, heat balance sheet. 7.3 Numerical on engine power & heat balance sheet.	08
		TOTAL	**64**

5.0 SUGGESTED SPECIFICATION TABLE WITH MARKS (THEORY):

Unit No.	Unit Title	Distribution of Theory Marks			
		R Level	U Level	A and above Levels	Total Marks
I	Engine principles and fundamentals	02	04	06	12
II	Constructional features of automobile engine components	02	04	06	12
III	Engine cooling system	02	02	06	10
IV	Lubrication system	02	02	06	10
V	Fuel Systems	02	04	08	14
VI	Ignition systems	02	02	06	10
VII	IC engine testing and governing system	02	04	04	12
	TOTAL	**14**	**22**	**44**	**80**

6.0 ASSIGNMENTS/PRACTICALS/TASKS:

Sr. No.	Unit No.	Practical Exercises (Outcomes in Psychomotor Domain)	Approx. Hrs. required
1	I	Demonstration of two stroke cycle engine.	02
2	II	Identify various components of engine	02
3	III	Dismantling and reassembling of following types of engines: any one from a and b each. 1. Two stroke: moped, scooter, motor cycle single cylinder petrol or diesel engines. 2. Four stroke petrol or diesel engines.	02
4	III	Remove the radiator and thermostat from the vehicle, check it for leak, clean and reverse flush the radiator and refit.	04

Sr. No.	Unit No.	Practical Exercises (Outcomes in Psychomotor Domain)	Approx. Hrs. required
5	III	Remove the water pump, clean, inspect and refit	02
6	V	Remove the carburettor from the engine of motor cycle, identify and check the components, draw the circuit and refit.	02
7	V	Remove the carburettor from the car engine, identify and check the components, draw the circuit and refit.	04
8	V	Open the fuel injection pump and fuel injectors identify the components – sketch and reassemble	02
9	VI	Open the distributor, identify the components adjust the C. B. Point Gap and check the working of advance mechanisms.	04
10	VII	Trial on single / multi-cylinder petrol and diesel engine, with calculation of heat balance sheet	04
11	VII	Morse test on multi-cylinder engine.	04
		TOTAL	**32**

7.0 STUDENT ACTIVITIES:

Following is the list of proposed student activities like

1. Collect market rates for various engine components
2. Form chart of causes and remedies of various engine parts lubricants
3. Collect information of types of ignition system components
4. List out common trouble shooting in engine injection system.

8.0 SPECIAL INSTRUCTIONAL STRATEGIES (If any):

1. Show video/Animation on working of engine components.
2. Arrange a visit to ST Workshop or any other service centre.
3. Arrange expert seminar of industry person in the area of engine design.

9.0 LEARNING RESOURCES:

A) Books

Sr.No.	Title of Book	Author	Publication
1	A course in internal combustion engines	M. L. Mathur, R. P. Sharma	Dhanpat Rai and sons.
2	Automobile engineering	G. B. S. Narang.	Khanna Publication
3	Automobile Engineering	R. B. Gupta.	S. Chand
5	Automobile Engineering (Vol I)	Dr. Kripal Singh.	Standard Publication
6	Motor Cycle Mechanics	George Lear and Lynnr Mosher	Prentice Hall Inc.
7	Automobile Mechanics	S. Shrinivasan	Tata McGraw Hill
8	Automobile Engineering	Kirpal Singh(1, 2)	Standard Publication
9	Internal Combustion Engine	V. Ganeshan	Tata McGraw Hill

B) Software/Learning Websites

1. www.nptel.com
2. www.howstuffworks.com
3. www.aera.org
4. www.autoshop101.com

C) Major Equipments/ Instruments with Broad Specifications

1. Lubrication System model
2. Ignition system model
3. MIFF system
4. Compression test

10.0 MAPPING MATRIX OF PO'S AND CO'S:

Course Outcomes	Programme Outcomes										
	a	**b**	**c**	**d**	**e**	**f**	**g**	**h**	**i**	**j**	**k**
CO1	H	L	L								
CO2	L	M	H								
CO3	L	H								L	L
CO4	L		H								
CO5	L		H						L	L	

H: High Relationship, M: Moderate Relationship, L: Low Relationship.

PROGRAMME : Diploma Programme in Automobile Engineering (AE)
COURSE : Automobile Chassis (ACH) **COURSE CODE :** 6253

TEACHING AND EXAMINATION SCHEME:

Teaching Scheme				Examination Scheme								
Hrs / week			Credits	TH Paper Hrs.	Marks							
TH	TU	PR				TH	TEST	TH+TEST	PR	OR	TW	TOTAL
04	--	02	06	03	Max.	80	20	100	--	25	25	150
					Min.	32	--	40	--	10	10	--

1.0 RATIONALE:

This course intends the student to apply the concept and working principle of the major assemblies of the vehicle and their construction / developments, performance of vehicle and its stability, dynamics for the safe riding, body construction and the modern trends in automobile.

2.0 COURSE OBJECTIVES:

The student will be able to,

1. Draw various vehicle layout and chassis frame.
2. Describe construction and working of clutches and gear boxes.
3. Explain assembly and importance of propeller shaft and final drive.
4. Explain construction, working of front axle and steering system.
5. Distinguish construction and importance of various suspension systems.
6. Write construction and or working of brakes, wheels and tyres.

3.0 COURSE OUTCOMES:

The course content should taught and learning imparted in such a manner that students are able to acquire specific learning outcomes in cognitive, psychomotor and affective domain to demonstrate the following course outcomes:

1. Sketch the various vehicle layout and Chassis Frame.
2. Evaluate construction and working of clutches and gear boxes.
3. Prepare procedure of assembly of propeller shaft and final drive.
4. Analyse construction and working of front axle and steering system.
5. Judge construction and working of various suspension system.
6. Observe the precautions brakes, wheels and tyres.

4.0 COURSE DETAILS:

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics	Hours
Unit-I **Vehicle layout and Chassis frame**	1a. Describe vehicle layout & frames 1b. List out different frame materials.	1.1 Definition of an automobile. 1.2 General Vehicle layout; types of layout. 1.3 Layout of the Front Engine Rear Wheel Driven Vehicle And Explain Location and Function of Major Vehicle Components and Systems in Brief (with Sketch) 1.4 Major assemblies – their locations and their functions. 1.5 Necessity of Frame and its functions 1.6 Type of frames, Conventional (Ladder and X – Member type), Semi integral and Integral types, frames construction, material, frame alignment. Frame sections- Channel, Box and Tubular Sections 1.7 Classification of Vehicle layout with respect to	08

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics	Hours
		Location of Engine, No of Live Axle, Arrangement of Engine, Passenger and Luggage section its Application 1.8 Chassis lubrication. 1.9 Classification and specifications of Chassis. 1.10 Two wheeler frame 1.11 Unibody construction: (Chassis less vehicle, monocoque vehicle, Frame less vehicle)	
Unit-II **Clutches**	2a. State clutch function & its application 2b. Differentiate between fluid flywheel 2c. State clutch trouble shooting	2.1 Function of clutch and its necessity. 2.2 Various types of clutches used in Automobiles – single plate (Coil and Diaphragm) multiplate clutches, dry & wet clutches, centrifugal clutch, semi-centrifugal clutch, diaphragm clutch and automatic clutches, variator drive 2.3 Materials used for clutch lining. 2.4 Fluid Coupling –Principle, Construction and working 2.5 Automatic transmission devices- Fluid flywheel. 2.6 Clutch troubles and service procedures. 2.7 Electromagnetic clutch 2.8 Variable speed clutches 2.9 Duel mass flywheel 2.10 Clutch operation mechanism – Mechanical, Hydraulic, Vacuum 2.11 Torque Convertor- Construction and working and application, Lock up Torque Converter	08
UNIT-III **Gear Boxes**	3a. Describe working of Gear Box. 3b. Differentiate between different gear box	3.1 Function and necessity of Gear Box. Lubrication of Gear Box 3.2 Types of gear boxes–sliding mesh, constant mesh, synchromesh type. Power Flow Diagram 3.3 Forward and reverse gear ratio, Gear Selector Mechanism with gear lever on top of gear box. 3.4 Gear shift mechanism. Overdrive, Transfer Case	08
UNIT-IV **Propeller Shaft and Final Drive**	4a. Describe propeller shaft with its application 4b. State different types of propeller shaft drive 4c. Explain working of differential with its types. 4d. Differentiate between Two & Four wheel drive	4.1 Necessity and function of Propeller Shaft, Universal joint and slip joint. 4.2 Hotchkiss drive and torque tube drive. 4.3 Construction details of Hollow propeller shaft 4.4 Type of universal joints, Hooks joint 4.5 Constant Velocity Rezappa and Tripod Joint 4.6 Propeller shaft trouble shooting. 4.7 Necessity and function of final drive and differential 4.8 Working of differential and differential lock. Backlash in differential. 4.9 Types of rear axle - semi - floating, three quarter floating and full floating type. Loads acting on rear axle. 4.10 Rear axle casing- split and banjo type, double reduction axles	10

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics	Hours
		4.11 Two wheel and four wheel drive, 4.12 Differential problems and maintenance	
UNIT-V **Front Axle and Steering**	5a. Describe types of Front axles 5b. Differentiate between Ackermann's & Davis Steering gear mechanism 5c. State different steering geometry.	5.1 Front Axle: Types of front axle - Dead axle, live axle. 5.2 Type of stub axle arrangements- Elliot, reverse Elliot, Lamoine, reverse Lamoine. 5.3 Front wheel assembly. 5.4 Steering system. 5.5 Steering linkages. Steering geometry and its effects –Caster, camber and king pin Inclination, toe in– toe out, correct steering angle. Understeering and oversteering, Turning radius. 5.6 Construction, working and application of Steering gear box – rack and pinion type, re-circulating ball type and worm and roller type. 5.7 Collapsible steering column 5.8 Ackerman Principle and linkage. 5.9 Electronically controlled power steering system, 5.10 Power assisted steering and its types (Hydraulic and electrical)	10
UNIT-VI **Suspension Systems**	6a. Explain Different types of Suspension system 6b. Draw sketch of Leaf spring and Shock absorber	6.1 Front and rear axle suspension, rigid and independent suspension. Types of Independent suspension system – McPherson Strut, Wishbone type 6.2 Leaf spring and their types, coil spring torsion bar arrangement and shock absorber. 6.3 Use of Anti roll bar, stabilizer bar. 6.4 Shock absorbers – Telescopic and Gas Filled 6.5 Air Suspension 6.6 Electronically controlled Suspension 6.7 Suspension system trouble shooting	08
UNIT-VII **Brake Systems**	7a. State the function and importance of Brakes 7b. Differentiate between simple braking system and anti-lock breaking system.	7.1 Function and necessity of brakes. 7.2 Types of brakes, mechanical, hydraulic, air brakes, parking brake, Vacuum Assisted Braking System 7.3 Braking Efficiency, Brake lining materials, power assisted brakes 7.4 Tandem master cylinder, wheel cylinder, brake valve, brake chamber, bleeding of brake and properties of brake fluid and their specifications 7.5 Construction and working of Anti lock Braking System 7.6 Trouble shooting for brakes	08
UNIT-VIII **Wheels and Tyres**	8a. Enlist types of wheels 8b. Prepare maintenance of tyre	8.1 Wheels – Functions, Types of wheels, wired spoke wheel, disc and alloy wheels 8.2 Tyre- Necessity of Tyre, construction, working and comparison of a tubed tyre and tubeless tyre	04

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics	Hours
		8.3 Type of Rims. 8.4 Types of tyre- Radial, cross ply, Belted bias tyre 8.5 Specification of tyre 8.6 Concept of Aspect Ratio 8.7 Types of Tread patterns 8.8 Effect of Inflation pressure on the life of tyre and tyre rotation 8.9 Tyre materials, construction, Tubular tyres. 8.10 Airless tyres 8.11 Troubleshooting of Wheels and tyres	
		TOTAL	**64**

5.0 SUGGESTED SPECIFICATION TABLE WITH MARKS (THEORY):

Unit No.	Unit Title	Distribution of Theory Marks			
		R Level	U Level	A and above Levels	Total Marks
I	Vehicle layout and Chassis frame	02	02	04	08
II	Clutches	--	04	06	10
III	Gear Boxes	02	04	04	10
IV	Propeller Shaft and Final Drive	02	02	08	12
V	Front Axle and Steering	02	04	06	12
VI	Suspension Systems	02	04	04	10
VII	Brake Systems	--	02	10	12
VIII	Wheels and Tyres	--	02	04	06
	TOTAL	**10**	**24**	**46**	**80**

6.0 ASSIGNMENTS/PRACTICALS/TASKS:

Sr. No.	Unit No.	Practical Exercises (Outcomes in Psychomotor Domain)	Approx. Hrs. required
1	I	1.1 Draw various vehicle layouts 1.2 Comparison layouts of two wheelers, three wheeler and four wheelers.	02
2	II	Dismantle / inspect / reassemble the single plate dry clutch mechanism – draw clutch plate, pressure plate arrangement and clutch operating mechanism.	04
3	II	Dismantle / inspect / reassemble the multiplate clutch used in two wheelers, observe the drive linkages and sketch the system.	02
4	II	Dismantle / inspect / reassemble the centrifugal clutch of mopeds. Observe the arrangement and sketch the system.	02
5	III	Dismantle / inspect / reassemble any one types of gear box, observe gear shifting, gear ratio and sketch the system.	04
6	IV	Dismantle /Inspect/ reassemble the differential and rear axle, observe, sketch and reassemble the unit with bearing location. Find the gear ratio of Final drive and state types of dismantle rear axle. Write report on Servicing of universal joints of different vehicles.	02
7	IV	Dismantle and assemble a Propeller shaft, Slip Joint and Universal Joint to understand their Construction and Working. Sketch the Same.	02
8	V	Dismantling and Assembling of Steering system and steering linkage.	04

Sr. No.	Unit No.	Practical Exercises (Outcomes in Psychomotor Domain)	Approx. Hrs. required
9	VI	Dismantling of front axle, rear axle, leaf spring and telescopic shock absorber, observe, sketch and reassemble.	04
10	VII	Observe and draw the layout of hydraulic braking system. Dismantle master cylinder, wheel cylinder and remove brake drum, identify and sketch the components and assemble it. Observe and draw the layout of hydraulically operated air/vacuum assisted braking system	02
11	VIII	Dismantle/ Inspect/ reassemble any two types of tyres, wheels, rims and tubes, observe, sketch and reassemble. Dismantle and assemble variodrive, observe its construction and working. List the components dismantled and draw their sketches.	04
		TOTAL	**32**

7.0 STUDENT ACTIVITIES:

Following is the list of proposed student activities like (Form group of two students)

1. Collect market rates for various vehicle components like clutch, gear box, brake shoes, wheels etc and write their features. Any two components.
2. Form chart (banner / flex type) for types of automobile system write their functions, necessity, applications. For any two systems e.g. brake system, suspension system.
3. Collect different parts of automobile system and write material, function of those parts – e.g. for synchromesh gear box.
4. Prepare trouble shooting chart for failure of four wheeler system (symptoms, causes and remedies).
5. List out Tyre pressure require to different vehicle.

8.0 SPECIAL INSTRUCTIONAL STRATEGIES (If any):

1. Show video/Animation on working of chassis components.
2. Arrange a visit to ST Workshop or any other service centre.
3. Arrange expert seminar of industry person in the area of Vehicle Body shop.
4. Select hand tools and special tools.

9.0 LEARNING RESOURCES:

A) Books

Sr.No.	Title of Book	Author	Publication
1	Mechanisms of Car	A. W. Judge, Lloyd S. R.	Pearsons
2	Automotive Mechanics	Joseph Heither	Bennett & McKnight
3	Automotive Mechanics	William Crouse	TTMGH
4	Automotive Engineering	G. B. S. Narang.	Tata McGraw Hill
5	Auto Engineering Vol I	Krupal Singh. Vol-I	Standard Publication
6	The Automobile	Harbans Singth Royat.	S. Chand Publication
7	Problem in Automobile Mechanics	Dr. N. K. Giri.	Khanna Publications
8	Theory of machines	D. L Ballaney.	Dhanpat Rai & Sons
9	Automobile Engineering	R. B. Gupta	Satya Prakashan, New Delhi.
10	Automobile Engineering	Ramlingam K. K.	Saitech Publication

B) Software/Learning Websites

1. http://www.auetocarindia.com
2. www.howstuffworks.com, www.npkauto.com, www.nokauto.com

C) Major Equipments/ Instruments with Broad Specifications

1. Wheel drive chassis.
2. ABS simulator
3. Hydraulic Power steering system model

10.0 MAPPING MATRIX OF PO'S AND CO'S:

Course Outcomes (Co's)	Programme Outcomes (Po's)										
	a	**b**	**c**	**d**	**e**	**f**	**g**	**h**	**i**	**j**	**k**
CO1	M	H	L							H	
CO2		H	H	M				H		M	
CO3	L	H	H	M	M	H					
CO4	L	H				M	L	M	M	H	
CO5	H	L	H	H	M	L	L	M			
CO6			H	M	M	H	L	H	H	H	

H: High Relationship, M: Moderate Relationship, L: Low Relationship.

PROGRAMME : Diploma Programme in Automobile Engineering (AE)
COURSE : Automobile Manufacturing Processes – I (AMF) **COURSE CODE :** 6254

TEACHING AND EXAMINATION SCHEME:

Teaching Scheme				Examination Scheme								
Hrs. / Week			Credits	TH Paper Hrs.	Marks							
TH	TU	PR				TH	TEST	TH+TEST	PR	OR	TW	TOTAL
04	--	04	08	03	Max.	80	20	100	--	--	25	125
					Min.	32	--	40	--	--	10	--

1.0 RATIONAL:

Manufacturing Processes is a core technology course for Mechanical/Automobile Engineering programme. Manufacturing is the basic area for any Mechanical/Automobile Engineering technician. The technician should be introduced to the basic processes of manufacturing. This course will help the student to be familiarized with working principles and operations like forging, rolling extrusion, press working, lathe, drilling milling, casting, welding, brazing and soldering etc which are the basic manufacturing processes. The basic knowledge of these processes will be helpful to select the most appropriate process for getting the desired results in terms of getting the raw material converted to finished product as per the requirements.

2.0 COURSE OBJECTIVES:

The student will be able to,

1. Name and Write the basic manufacturing processes for manufacturing different Components.
2. Operate & control different machines and equipments.
3. Inspect the job of specified dimensions.
4. Produce job for specified dimensions.
5. Select the specific manufacturing process for getting the desired type of output.
6. Adopt safety practices while working on various machines.

3.0 COURSE OUTCOMES:

The course content should taught and learning imparted in such a manner that students are able to acquire specific learning outcomes in cognitive, psychomotor and affective domain to demonstrate the following course outcomes:

1. Identify and Recommend the basic manufacturing process for manufacturing different components.
2. Assemble and Recommend different Machines and equipments for Automobile Industry.
3. Design job of specified dimension.
4. Produce and Rate the job for specified dimensions
5. Utilize and summarize the specific manufacturing process for getting required production in automobile.
6. Arrange and manage safety practices while working on various machines.

4.0 COURSE DETAILS:

UNIT	Major Learning Outcomes	Topic & Subtopic	Hours
A	**Nonchip forming processes**	**Nonchip forming processes**	
Unit I **Foundry and Pattern Making Engineering**	1a. List the Pattern making materials 1b. Classify Types of patterns 1c. Name the Patterns allowances	1.1 Pattern making materials, 1.2 Types of patterns 1.3 Patterns allowances, 1.4 Pattern color codes 1.5 Classification of Engineering material 1.6 Non ferrous metals and their alloys	08

UNIT	Major Learning Outcomes	Topic & Subtopic	Hours
Material	1d. Identify Pattern color codes 1e. Differentiate ferrous and non ferrous materials. 1f. Identify ferrous and non ferrous metals.	1.7 Other materials 1.8 Types of Foundries 1.9 Advantages and disadvantages of foundry process 1.10 Classification of engineering materials. 1.11 Non ferrous metals and their alloys. 1.12 Other materials.	
Unit –II **Molding**	2a. Classify Types of molding sands 2b. List Properties of molding sands 2c. Write Molding tools and their uses 2d. Describe Molding processes	2.1 Introduction 2.2 Types of molding sands 2.3 Gating and risers of Sand Casting 2.4 Properties of molding sands 2.5 Molding tools and their uses 2.6 Core, core print &core body 2.7 Molding processes a. Hand molding and Machine molding b. Green sand molding c. Dry sand molding d. Sweep molding e. Plate molding	08
Unit-III **Casting**	3a. Explain Melting furnaces 3b. Describe Special casting processes 3c. Identify Casting defects-causes and remedies 3d. Inspection and testing of casting	3.1 Introduction 3.2 Melting furnaces Pit, Tilting, Cupola furnaces, 3.3 Special casting processes : Die casting, centrifugal casting, 3.4 Casting defects-causes and remedies, 3.5 Inspection and testing of casting	12
Unit-IV **Powder metallurgy**	4a. Tell Powder metallurgy Process steps 4b. Describe Method of manufacturing powder 4c. Tabulate Advantages and disadvantages of powder metallurgy 4d. Write Applications	4.1 Introduction 4.2 Powder metallurgy Process steps 4.3 Method of manufacturing powders-blending, compacting, reinterring & sintering 4.4 Advantages and disadvantages of powder metallurgy. 4.5 Applications: self-lubricating bearings filters, permanent magnets, cermet's etc. 4.6 Self Lubricating bearing filters, permanent magnet, cermets etc.	08
B	**Chip forming processes**	**Chip forming processes**	
Unit-V **Fundamentals of machining**	5a. Classify cutting tools 5b. Sketch Single point cutting tools nomenclature & tool Signature 5c. List Cutting tools materials and its properties 5d. Describe Metal cutting processes 5e. List Chip formation and their types	5.1 Classification of cutting tools– Single & Multipoint. 5.2 Single point cutting tools, nomenclature & tool Signature 5.3 Cutting tools materials and its properties 5.4 Metal cutting processes – orthogonal And oblique cutting 5.5 Chip formation and their types – continuous, discontinuous, continuous with built up edge	12

UNIT	Major Learning Outcomes	Topic & Subtopic	Hours
Unit-VI **Basic machine tools** **6.1: Lathe**	6.1a. Classify Types of lathes 6.1b. Name Basic parts and their functions. 6.1c. List out Operations and tools 6.1d. Tell Accessories and attachment used on lathe	6.1.1 Introduction 6.1.2 Types of lathes – light duty, Medium duty and heavy duty lathe and CNC lathe. 6.1.3 Centre Lathe size and Specifications. 6.1.4 Basic parts and their functions. 6.1.5 Operations and tools – Turning, parting off, Knurling, Facing, Boring, drilling, Threading, Step turning, Taper turning. 6.1.6 Accessories and attachment used on lathe	08
6.2: **Drilling And Milling Machines**	6.2a. List out Basic parts and their functions for Radial drilling machine 6.2b. Classify Types of operations. 6.2c. Name the drill nomenclature 6.2d. List Types of milling machines. 6.2e. List Basic parts and their functions for milling machine 6.2f. Classify Types of operations.	6.2.1 Introduction 6.2.2 Classifications 6.2.3 Radial drilling machine – 6.2.4 Basic parts and their functions 6.2.5 Types of operations. 6.2.6 Twist drill nomenclature, forms and shapes 6.2.7 Work holding and tool holding devices on drill machines 6.2.8 Classification of Milling Machine 6.2.9 Major parts of Column and knees type 6.2.10 Universal Milling Machine 6.2.11 Standard Milling Cutters 6.2.12 Milling Operations like face milling, Gang Milling, Key way Milling and End Milling	08
		TOTAL	**64**

5.0 SUGGESTED SPECIFICATION TABLE WITH MARKS (THEORY):

Unit No.	Unit Title	Distribution of Theory Marks			
		R Level	U Level	A and above Levels	Total Marks
I	Pattern Making	02	04	04	10
II	Molding	02	04	06	12
III	Casting	02	02	08	12
IV	Powder metallurgy	--	02	08	10
V	Fundamentals of machining	--	06	10	16
VI	Basic machine tools	04	08	08	20
	TOTAL	**10**	**26**	**44**	**80**

Legends: R = Remembrance (Knowledge); U = Understanding; A = Application and above levels (Revised Bloom's taxonomy)

Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.

6.0 ASSIGNMENTS/PRACTICALS/TASKS:

The tutorial/practical/assignments/tasks should be properly designed and implemented with an attempt to develop different types of cognitive and practical skills **(Outcomes in cognitive, psychomotor and affective domain)** so that students are able to acquire the competencies.

***Note**: Here only outcomes in psychomotor domain are listed as practical/exercises. However, if these practical/exercises are completed appropriately, they would also lead to development of **Programme Outcomes/Course Outcomes in affective domain** as given in a common list at the beginning of curriculum document for this Programme. Faculty should refer to that common list and should ensure that students also acquire those Programme Outcomes/Course Outcomes related to affective domain.*

Each student is required to submit the following term work

Sr.No.	UNIT NO.	Practical Exercises	Hours
1	VI	One turning job on lathe containing the operations like plain turning, step turning, Grooving, knurling, chamfering.	24
2	I	Making of one simple wooden Pattern (2 - 4 students per group, each group should make different type of pattern).	16
3	II	Preparation of sand mould for above pattern	20
4	IV	Assignment on powder metallurgy and its applications	04
		TOTAL	**64**

7.0 STUDENT ACTIVITIES:

Following is the list of proposed student activities like

1. Visit the authorised dealers of automobile spare parts/components and collect the market rates of different genuine parts – Any four (Two and four wheelers)
2. Select any two automobile components and write their manufacturing process / procedure used in an industry. e.g. Engine Block, Connecting Rod, Crank Shaft, Bearings, Crank Case etc.
3. Select a auto component (approved by teacher) / or a job manufactured in practical task. Draw a manufacturing drawing by using Auto Cad / ProE / Catia software.
4. Identify the different manufacturers of automobile components and download images and write their features.
5. State the names of different auto parts which can be manufactured by using the manufacturing processes you learnt in this course, at least three of each process.

8.0 SPECIAL INSTRUCTIONAL STRATEGIES (If any):

1. Show Auto cad or Catia or PROE computer software related drawing of automobile components.
2. Arrange expert seminar of industry person in the area of design, drawing, cost estimation and validation of manufacturing procedure of any component.

9.0 LEARNING RESOURCES:

A) Books

Sr.No.	Title of Book	Author	Publication
1	Elements of workshop Technology- Volume I & II	S.K. Hajra Chaudhary, Bose, Roy	Media Promoters and Publishers limited
2	Processes and design for manufacturing	D.L. Wakyl	Prentice Hall
3	Production Technology	R.K. Jain	-Khanna publisher Delhi
4	Workshop Technology – Volume I,II & III	W.A.J. Chapman	ELBS & Edward Arnold publishers Ltd London
5	Introduction to Manufacturing Processes	John A Schey	McGraw Hills International
6	Manufacturing Technology	M. Aduthan and A.B. Gupta	New Age International

Sr.No.	Title of Book	Author	Publication
7	Workshop Technology – Volume I &II	H.S. Bawa	Tata McGraw-Hill publications
8	Production Technology	H.M.T.	H.M.T. Banglore
9	Manufacturing processes	B.H. Amstead, Phillip Ostwald, Myronl Begeman	John Wiley & Sons

B) Software/Learning Websites

1. www.nptel.com

C) Major Equipments/ Instruments with Broad Specifications

1. Different types of Casting of actual model
2. Chart on types of Machining and powder metallurgy methods
3. Images of different types of castings, powder metallurgy, molding, pattern makings etc. of actual model
4. Different types of actual model of Lathe Machine, Drill Machine, Milling Machine

10.0 MAPPING MATRIX OF PO'S AND CO'S:

Course Outcomes (Co's)	Programme Outcomes (Po's)										
	a	**b**	**c**	**d**	**e**	**f**	**g**	**h**	**i**	**j**	**k**
CO1	H	H	M							H	
CO2		H	H	M				H		M	
CO3	M	H	L	M	M	L					
CO4	L	H				M	H	M	M	H	
CO5	H	L	H	H	M	L	H	M	L	M	
CO6			H		M	H	L	H	M	H	

H: High Relationship, M: Moderate Relationship, L: Low Relationship.

PROGRAMME : Diploma Programme CE / ME / PS / EE / IF / CM / EL / AE
COURSE : Applied Mathematics (AMT) **COURSE CODE** : 6301

TEACHING AND EXAMINATION SCHEME:

Teaching Scheme				Examination Scheme								
Hrs / week			Credits	TH Paper Hrs.	Marks							
TH	TU	PR				TH	TEST	TH+TEST	PR	OR	TW	TOTAL
03	--	--	03	03	Max.	80	20	100	--	--	--	100
					Min.	32	--	40	--	--	--	--

1.0 RATIONALE:

The study of mathematics is necessary to develop in the students the skills essential for new technological development. This course introduces some applications of engineering, through which the students can understand mathematics with engineering principles.

2.0 COURSE OBJECTIVES:

The student will be able to,

1. Acquire knowledge of mathematical terms, concepts, principles and different methods.
2. Develop ability to apply mathematical method to solve engineering problems.
3. Acquire sufficient mathematical technique necessary for practical problems.
4. Apply the relation between mathematics and applications in engineering.

3.0 COURSE OUTCOMES:

The course content should be taught and learning imparted in such a manner that students are able to acquire required learning outcome in cognitive, psychomotor and affective domain to solve engineering and applied mathematical problems using

1. Methods of integration
2. Definite integral and its application
3. Differential equation and its application
4. Numerical methods for solving algebraic and simultaneous equations
5. Laplace's transform.
6. Probability distribution.

4.0 COURSE DETAILS:

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics	Hours
Unit-I **Integration**	1a. Solve integration problem using rules and formulae 1b. Apply method of integration for solving problem	1.1 Definition of integration, integral as anti-derivative, integration of standard functions. 1.2 Rules of integration (Integral of sum or difference of functions, scalar multiplication) 1.3 Methods of integration. a. Integration by method of substitution & by using trigonometric transformation b. Integration of rational functions & by method of partial fraction c. Integration by parts	12
Unit-II **Definite Integration And Its**	2a. Apply definite integration to solve engineering problems, area Volume and R.M.S.	2.1 Definite Integration a. Definition of definite integral b. Properties of definite integral with simple problems c. Application of definite integration Area	08

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics	Hours
Application	value.	under curve, area bounded by two curves. Volume generated by revolution of curve, RMS value & mean value.	
Unit-III **Differential Equations**	3a. To form and solve Differential Equation 3b. Apply various method to solve differential equations 3c. Solve engineering problems using differential equation.	3.1 Definition of differential equation, order and degree of differential equation. Formation of differential equation for function containing single or double constants. 3.2 Solution of differential equations of first order and first degree such as a. Variable separable form b. Reducible to variable separable c. Homogeneous differential equation d. Linear differential equation e. Bernoulli's differential equation. 3.3 Applications of differential equations.	08
Unit-IV **Numerical Methods**	4a. Solve algebraic equations by using Bisection method and Newton Raphson Method 4b. Solve simultaneous Equations by using Gauss-Seidel method and Jacobi's method 4c. Apply Lagrange's interpolation formula and Newton forward interpolation formula	4.1 Solution of algebraic equations using iterative method a. Bisection method b. Newton-Raphson method. 4.2 Solution of simultaneous equations containing three unknowns – iterative methods a. Gauss-Seidel method b. Jacobi's method 4.3 Interpolation a. Lagrange's interpolation formula b. Newton's forward difference 4.4 Interpolation formula	08
Unit-V **Laplace transform**	5a. Acquire knowledge of Laplace transform and Inverse Laplace transform. 5b. Apply Laplace Transform to solve Differential Equations.	5.1 Definition of Laplace transform and standard formulae of Laplace transform 5.2 Properties of Laplace transform (linearity, first & second shifting, multiplication by t^n, division by t) 5.3 Inverse Laplace transform, using partial fraction 5.4 Laplace transform of derivatives 5.5 Application of Laplace transform for solving differential equation.	06
Unit-VI **Probability Distribution**	5a. Apply Binomial Distribution 5b. Apply Poisson's Distribution 5c. Apply Normal Distribution	6.1 Binomial distribution 6.2 Poisson's distribution 6.3 Normal distribution (simple examples)	06
		TOTAL	**48**

5.0 SUGGESTED SPECIFICATION TABLE WITH MARKS (THEORY):

Unit No.	Unit Title	Distribution of Theory Marks			
		R Level	U Level	A and above Levels	Total Marks
I	Integration	04	08	08	20
II	Definite Integration and its application	04	04	04	12
III	Differential Equations	04	08	04	16
IV	Numerical Methods	04	04	08	16
V	Laplace Transform	02	04	02	08
VI	Probability distribution.	02	04	02	08
	TOTAL	**20**	**32**	**28**	**80**

6.0 ASSIGNMENTS/PRACTICALS/TASKS:

Unit wise home assignment, containing ten problems.

7.0 STUDENT ACTIVITIES:

Following is the list of proposed student activities like

1. Teacher guided self learning activities.
2. Applications to solve identified Engineering problems and use of Internet.
3. Learn graphical software: Excel, DPlot, Graph etc.

8.0 SPECIAL INSTRUCTIONAL STRATEGIES (If any):

Not Applicable

9.0 LEARNING RESOURCES:

A) Books

Sr.No.	Title of Book	Author	Publication
1	Mathematics for polytechnic student (III)	S. P. Deshpande	Pune Vidyarthi Gruha
2	Applied Mathematics	Kumbhojkar	Phadake Prakashan
3	Numerical Methods	S. S. Sastry	Prentice Hall Of India
4	Text book of Applied Mathematics, Volume I&II	P. N. Wartikar, J. N. Wartikar	Pune Vidyarthi Gruha Pune

B) Software/Learning Websites

1. http://www.mathsisfun.com/calculus/integration-definite.html
2. http://www.intmath.com/applications-integration/applications-integrals-intro.php
3. http://www.maths.surrey.ac.uk/explore/vithyaspages/differential.html
4. http://tutorial.math.lamar.edu/Classes/DE/LaplaceIntro.aspx
5. http://library2.lincoln.ac.nz/documents/Normal-Binomial-Poisson.pdf

C) Major Equipments/ Instruments with Broad Specifications

1. Scientific Calculator
2. Computer system with Printer and Internet system.
3. LCD Projector.

10.0 MAPPING MATRIX OF PO'S AND CO'S:

Course Outcomes	Programme Outcomes										
	a	b	c	d	e	f	g	h	i	j	k
CO1	H		M								L
CO2	H		M								L
CO3	H		M								L
CO4	H		M								L
CO5	H		M								L
CO6	H		M								L

H: High Relationship, M: Moderate Relationship, L: Low Relationship.

PROGRAMME : Diploma Programme in CE / ME / PS / EE / IF / CM / EL / AE / DD / ID
COURSE : Environmental Studies (EVS) **COURSE CODE** : 6302

TEACHING AND EXAMINATION SCHEME:

Teaching Scheme				Examination Scheme							
Hrs / week			Credits	TH Paper Hrs.	Marks						
TH	TU	PR				TH	TEST	TH+TEST	PR	OR	TW	TOTAL
--	--	02	02	--	Max.	--	--	--	--	--	50	50
					Min.	--	--	--	--	--	20	--

1.0 RATIONALE:

Environment essentially comprises of our living ambience, which gives us the zest and verve in all our activities. The turn of the twentieth century saw the gradual onset of its degradation by our callous deeds without any concern for the well being of our surrounding we are today facing a grave environmental crisis.

It is therefore necessary to study environmental issues to realize how human activities affect the environment and what could be possible remedies or precautions which need to be taken to protect the environment.

The curriculum covers the aspects about environment such as Environment and Ecology, Environmental impacts on human activities, Water resources and water quality, Mineral resources and mining, forests.

2.0 COURSE OBJECTIVES:

The student will be able to,

1. Understand and realize nature of the environment, its components and inter-relationship between man and environment.
2. Understand the relevance and importance of the natural resources in the sustainability of life on earth and living standard.
3. Comprehend the importance of ecosystem and biodiversity.
4. Identify different types of environmental pollution and control measures.
5. Correlate the exploitation and utilization of conventional and non-conventional resources.

3.0 COURSE OUTCOMES:

The course content should be taught and learning imparted in such a manner that students are able to acquire required learning outcome in cognitive, psychomotor and affective domain to demonstrate following course outcomes:

1. Explain uses of resources, their overexploitation and importance for environment
2. Describe major ecosystem
3. Suggest measurers for conservation of biodiversity
4. Identify measures for prevention of environmental pollution
5. Describe methods of water management
6. Identify effects of Climate Change, Global warming, Acid rain and Ozone layer
7. Explain Concept of Carbon Credits
8. State important provisions of acts related to environment

4.0 COURSE DETAILS:

There are no separate classes for theory. The relevant theory has to be discussed before the practical during the practical sessions.

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics
Unit-I **Importance of Environmental Studies**	1a. Define the terms related to Environmental Studies 1b. State importance of awareness about environment	1.1 Definition, Scope and Importance of the environmental studies 1.2 Need for creating public awareness about environmental issues
Unit-II **Natural Resources**	2a. Define natural resources 2b. Identify uses of natural resources, their overexploitation and importance for environment	2.1 Uses of natural resources, overexploitation of resources and importance for environment 2.2 Renewable and Non-renewable resources 2.3 Forest Resources 2.4 Water Resources 2.5 Mineral Resource 2.6 Food Resources
UNIT-III **Ecosystems**	3a. Define Ecosystem 3b. List functions of ecosystem 3c. Describe major ecosystem in world	3.1 Concept of Ecosystem 3.2 Structure and functions of ecosystem 3.3 Major ecosystems in the world
UNIT- IV **Biodiversity and its Conservation**	4a. Define biodiversity 4b. State levels of biodiversity 4c. Suggest measurers for conservation of biodiversity	4.1 Definition of Biodiversity 4.2 Levels of biodiversity 4.3 Threats to biodiversity 4.4 Conservation of biodiversity
UNIT-V **Environmental Pollution**	5a. Classify different types of pollution 5b. Enlist sources of pollution 5c. State effect of pollution 5d. Identify measures for prevention of pollution	5.1 Definition, Classification, sources, effects and prevention of • Air pollution • Water Pollution • Soil Pollution • Noise Pollution 5.2 E- waste management
UNIT-VI **Social Issues and Environment**	6a. Describe methods of water management 6b. Identify effects of Climate Change, Global warming, Acid rain and Ozone Layer 6c. Explain Concept of Carbon Credits	6.1 Concept of sustainable development 6.2 Water conservation, Watershed management. Rain water harvesting: Definition, Methods and Benefits. 6.3 Climate Change, Global warming, Acid rain, Ozone Layer Depletion, 6.4 Concept of Carbon Credits and its advantages
UNIT-VII **Environmental Protection**	7a. State important provisions of acts related to environment	7.1 Importance of the following acts and their provisions: • Environmental Protection Act • Air (Prevention and Control of Pollution) Act • Water (Prevention and Control of Pollution) Act • Wildlife Protection Act • Forest Conservation Act • Population Growth: Aspects, importance and effect on environment • Human Health and Human Rights • ISO 14000

5.0 SUGGESTED SPECIFICATION TABLE WITH MARKS (THEORY):

Not Applicable

6.0 ASSIGNMENTS/PRACTICALS/TASKS:

The tutorial/practical/assignments/tasks should be properly designed and implemented with an attempt to develop different types of cognitive and practical skills **(Outcomes in cognitive, psychomotor and affective domain)** so that students are able to acquire the competencies.

***Note**: Here only outcomes in psychomotor domain are listed as practical/exercises. However, if these practical/exercises are completed appropriately, they would also lead to development of **Programme Outcomes/Course Outcomes in affective domain** as given in a common list at the beginning of curriculum document for this programme. Faculty should refer to that common list and should ensure that students also acquire those Programme Outcomes/Course Outcomes related to affective domain.*

Sr. No.	Unit No.	Practical Exercises	Approx. Hrs. required
1	I	Report on Importance and public awareness of Environmental Studies.	04
2	II	Report on Use of natural resources and overexploitation of Resources	04
3	II	Visit /Video Demonstration to Renewable / Non-renewable (wind mill, hydropower station, thermal power station)/ resources of energy.	04
4	II	Visit to polyhouse and writing report on its effects on agriculture food production.	04
5	III	Assignment/Report on structure and functions of ecosystem.	04
6	IV	Visit to a local area to environmental assets such as river / forest / grassland / hill / mountain and writing report on it.	04
7	V	Group discussion on Environmental Pollution (Air pollution/Water pollution/Soil pollution/Noise pollution/E-waste)	04
8	V	Visit to study recycling of plastic and writing a report on it.	04
9	VI	Visit to Water conservation site / Watershed management site / Rain water harvesting site and writing a report on it.	04
10	VI	Visit to study organic farming/Vermiculture/biogas plant and writing a report on it.	04
11	VI	Video Demonstration /Expert Lecture Report on Climate Change and Global warming	04
12	VII	Write important provisions of Acts related to Environment/ Air (Prevention and Control of Pollution) Act/Water (Prevention and Control of Pollution) Act/ Wildlife Protection Act/ Forest Conservation Act	04
		TOTAL	**32**

Note: Any Four Visits/ Video Demonstration and Four Reports/Assignments from above list to be conducted.

7.0 STUDENT ACTIVITIES:

Following is the list of proposed student activities like

1. Collect articles regarding Global Warming, Climate Change
2. Collect information regarding current techniques, materials etc. in environmental system.
3. Tree plantation and maintenance of trees in the Campus.
4. Cleanliness initiative (Swachhata Abhiayan)

8.0 SPECIAL INSTRUCTIONAL STRATEGIES (If any):

1. Course Video
2. Expert Lectures

9.0 LEARNING RESOURCES:

A) Books

Sr.No.	Title of Book	Author	Publication
1	Environmental Studies	Erach Bharucha	Universities Press (India) Private Ltd, Hyderabad
2	Environmental Studies	Dr. Suresh K Dhameja	S K Kataria & Sons New Delhi
3	Basics of Environmental Studies	U K Khare	Tata McGraw Hill

B) Software/Learning Websites

Not Applicable

C) Major Equipments/ Instruments with Broad Specifications

Not Applicable

10.0 MAPPING MATRIX OF PO'S AND CO'S:

Course Outcomes	Programme Outcomes										
	a	b	c	d	e	f	g	h	i	j	k
CO1	H	M			M	H					M
CO2	H	M			M	H					M
CO3	H	M	M		M	H			M		M
CO4	H	M		M	M	H		M		M	M
CO5	H	M			M	H					M
CO6	H	M			M	H	M				M
CO7	H	M			M	H					M
CO8	H	M			M	H					M

H: High Relationship, M: Moderate Relationship, L: Low Relationship.

PROGRAMME : Diploma Programme in ME / PS / EE / IF / CM / EL / AE / DD
COURSE : Industrial Organization and Management (IOM) **COURSE CODE** : 6303

TEACHING AND EXAMINATION SCHEME:

Teaching Scheme				Examination Scheme								
Hrs / week			Credits	TH Paper Hrs.	Marks							
TH	TU	PR				TH	TEST	TH+TEST	PR	OR	TW	TOTAL
03	--	--	03	03	Max.	80	20	100	--	--	--	100
					Min.	32	--	40	--	--	--	--

1.0 RATIONALE:

Diploma engineer has to work in organization. One must know how organization works, structure of organization, departments & their roles in organization. One should be familiar with concept of organization & its importance in management.

2.0 COURSE OBJECTIVES:

The student will be able to,

1. Understand the concepts of organization.
2. Resolve the major challenges in the design of an effective organizational structure.
3. Develop critical thinking, research, oral and written communication skills.
4. Promote an understanding to create organizational values and satisfy their stakeholders.
5. Know the preventive measures for accidents and safety.
6. Apply the various tools for scientific management.

3.0 COURSE OUTCOMES:

The course content should be taught and learning imparted in such a manner that students are able to acquire required learning outcome in cognitive, psychomotor and affective domain to demonstrate following course outcomes:

1. Identify the organization and its types with ownerships.
2. State the principles of management.
3. Describe the types of accidents and its measures.
4. Write the duties of production supervisor and store officer.
5. State the functions of HRM and Marketing departments.
6. Apply the practices like CPM, PERT, Supply Chain Management etc. in manufacturing organizations.

4.0 COURSE DETAILS:

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics	Hours
Unit-I **Organization and Ownerships**	1a. Describe organization and its types 1b. State various types of ownership firms	a. Organization 1.1 Concept of organization 1.2 Types of organization structures as line, line and staff, functional organizational structures, their merits and demerits. b. Ownerships 1.3 Proprietorship 1.4 Partnership, Types of partners, Partnership deed. 1.5 Joint stock companies, Private Limited, Public Limited, Joint Ventures. 1.6 Govt. departments, Govt. undertaking, Public corporation	08

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics	Hours
		1.7 Cooperative Organizations 1.8 Merits & demerits of all above mentioned types of ownership.	
Unit-II **Scientific Management**	2a. Explain functions of scientific management 2b. State the principles of management. 2c. Describe different levels of management.	2.1 Concept and importance of scientific management. 2.2 Principles of Management, Taylor, Fayol's Theories of management. 2.3 Functions of Management, Levels of Management and skills at different levels	06
Unit-III **Industrial Developments in India and Industrial Acts**	3a. Explain the major areas of Indian industries 3b. Describe types of accidents & safety measures 3c. State provisions of industrial acts.	a. Industrial Developments in India 3.1 Major areas of industry in India (Automobile, Cement, Steel and Agro industries) 3.2 Introduction of WTO and GATT b. Industrial Acts 3.3 Safety Management • Causes of accidents • Types of Industrial Accidents • Preventive measures • Safety procedures 3.4 Industrial Legislation - Necessity of Acts, Provisions of following acts: • Indian Factory Act • Workman Compensation Act • ▪ Minimum Wages Act	08
Unit-IV **Production and Material Management**	4a. Explain the types of production systems 4b. Describe the material management techniques 4c. State use of ERP and MRP	a. Production Management 4.1 Concept of production management 4.2 Types of production systems – job, batch and mass 4.3 Merits and demerits of all above production systems b. Material Management 4.4 Inventory Concept, its classification, functions of inventory 4.5 ABC Analysis - Necessity & Steps 4.6 Economic Order Quantity Concept, graphical representation, determination of EOQ 4.7 Standard steps in Purchasing 4.8 Modern Techniques of Material Management- JIT, KANBAN, VSM, LEAN. 4.9 Material Resource Planning (MRP) - Functions of MRP, Input to MRP, Benefits of MRP 4.10 Enterprise Resource Planning (ERP) - Concept, advantages & disadvantages of ERP	10
Unit-V	5a. Explain the functions of marketing	a. Marketing Management 5.1. Concept of marketing management	08

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics	Hours
Marketing and Human Resource Management	management 5b. Describe selection procedure by HRM dept. 5c. Importance of Employee training	and importance 5.2. Functions of marketing promotion of sales, market segmentation, marketing mix, 4P's and Physical distribution. b. Human Resource Management 5.3. Recruitment selection procedure, Functions of HRM Dept. 5.4. Training of human resources-objectives, importance and methods of training	
Unit-VI **CPM/PERT and Supply Chain Management**	6a. Explain the importance of CPM/PERT 6b. Describe the need of SCM in industry	a. CPM/PERT 6.1 CPM & PERT – definitions of node, activity, dummy activity, resources, duration, network, earliest start time, earliest finish time, latest start time, latest finish time, float. 6.2 Drawing of network and determination of critical path. 6.3 Analysis of network. b. Supply Chain Management 6.4 Definition and Concept of SCM 6.5 SCM practices- Relational, Vendor Managed Inventory (VMI), Agile Manufacturing and Postponement. 6.6 Green SCM 6.7 Concept of cross docking 6.8 Case study of Wall Mart and Dell Computer	08
		TOTAL	**48**

5.0 SUGGESTED SPECIFICATION TABLE WITH MARKS (THEORY):

Unit No.	Unit Title	Distribution of Theory Marks			
		R Level	U Level	A and above Levels	Total Marks
I	a. Organization	--	04	--	04
	b. Ownerships	02	04	--	06
II	a. Scientific Management	02	04	02	08
III	a. Industrial Developments in India	02	04	--	06
	b. Industrial Acts	04	04	--	08
IV	a. Production Management	02	04	02	08
	b. Material Management	02	04	02	08
V	a. Marketing Management	--	08	--	08
	b. Human Resource Management	02	06	--	08
VI	a. CPM/PERT	02	02	04	08
	b. Supply Chain Management	02	02	04	08
	TOTAL	**20**	**46**	**14**	**80**

Legends: R = Remembrance (Knowledge); U = Understanding; A = Application and above levels (Revised Bloom's taxonomy)

Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.

6.0 ASSIGNMENTS/PRACTICALS/TASKS:

Not Applicable

7.0 STUDENT ACTIVITIES:

Following is the list of proposed student activities like

1. Collect the organization structures of manufacturing, cement, pharmacy, electrical, govt. Sectors.
2. Find out the information of above mentioned industries by internet.
3. Collect the rules of industrial acts by ILO websites.
4. Gather information about chain structures of material management by logistics' industries.
5. Collect the information about WTO and GATT by online resources.

8.0 SPECIAL INSTRUCTIONAL STRATEGIES (If any):

1. Show organization structures of different industries, govt. sectors, private firms etc.
2. Arrange a visit to industries, govt. offices located at nearby areas.
3. Arrange expert seminar/lectures by a resource person from industry in the area of manufacturing, HRM, Logistics etc.

9.0 LEARNING RESOURCES:

A) Books

Sr.No.	Title of Book	Author	Publication
1	Industrial Engineering & Management	Dr. O. P. Khanna	Dhanpat Rai & Sons New Delhi
2	Industrial Engineering & Management	Banga & Sharma	Khanna Publication
3	Business Administration & Management	Dr. S. C. Saksena	Sahitya Bhavan Agra
4	The process of Management	W. H. Newman E. Kirby Warren Andrew R. McGill	Prentice- Hall
5	Entrepreneurship Development & Management	Dr. R. K. Singal	S. K. Kataria & Sons, New Delhi
6	Production Planning & Control	Dr. R. K. Singal	S. K. Kataria & Sons, New Delhi

B) Software/Learning Websites

1. http://www.wto.org/
2. http://www.gatt.org/
3. http://www.worldtradelaw.net/
4. http://www.supplychainbrain.com/
5. http://www.legallyindia.com/

C) Major Equipments/ Instruments with Broad Specifications

Not Applicable

10.0 MAPPING MATRIX OF PO'S AND CO'S:

Course Outcomes	Programme Outcomes										
	a	b	c	d	e	f	g	h	i	j	k
CO1				M							
CO2					H		M				
CO3		M					L				
CO4	L					H					
CO5				L							L
CO6				H			M			H	H

H: High Relationship, M: Moderate Relationship, L: Low Relationship.

PROGRAMME : Diploma Programme in CE / ME / PS / EE / IF / CM / EL / AE
COURSE : Supervisory Skills (SSL) **COURSE CODE** : 6305

TEACHING AND EXAMINATION SCHEME:

Teaching Scheme				Examination Scheme								
Hrs / week			Credits	TH Paper Hrs.	Marks							
TH	TU	PR				TH	TEST	TH+TEST	PR	OR	TW	TOTAL
03	--	--	03	03	Max.	80	20	100	--	--	--	100
					Min.	32	--	40	--	--	--	--

1.0 RATIONALE:

A diploma engineer working in the industry has to co-ordinate and supervises a group of workers. An engineer should have a leadership attitude. This course will help to develop requisite traits in the diploma engineer.

2.0 COURSE OBJECTIVES:

The student will be able to,

1. Understand importance of scientific management.
2. Understand the controlling performance of process & people.
3. Know organizing, staffing and training of worker.
4. Understand the importance of leadership.
5. Know industrial psychology and human relation.
6. Know safety awareness and health administration in the industry.
7. Understand role of supervisor in industry.

3.0 COURSE OUTCOMES:

The course content should be taught and learning imparted in such a manner that students are able to acquire required learning outcome in cognitive, psychomotor and affective domain to demonstrate following course outcomes:

1. Explain the importance of scientific management.
2. Describe controlling performance of process & team of worker.
3. Explain the methods to train the worker.
4. State the qualities of leader.
5. Describe progressive disciplinary action to worker.
6. Enlist causes of accident and prevention of accident.
7. Explain the role of supervisor towards management and worker.

4.0 COURSE DETAILS:

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics	Hours
Unit-I **Scientific Management and Management of Job**	1a. Define the term management. 1b. Differentiate between management, administration and organisation. 1c. Explain the necessity and steps of scientific management. 1d. Describe handling complexity and its steps.	1.1 Management-definition, its job, Difference between management, administration and organization. Levels and its functions of management. 1.2 Definition, Necessity and, procedure of scientific management 1.3 Handling complexity and its steps. 1.4 Optimization and its steps.	06
Unit-II	2a. Explain objective of	2.1 Planning by supervisor, necessity,	06

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics	Hours
Supervisory Management	planning by supervisory 2b. Describe the different types of budget. 2c. Explain the controlling of performance of team of worker in term of quantity & cost.	steps and objectives 2.2 Budgeting at supervisory level, objective and its advantages. Types of budget. 2.3 Deciding mental & physical activities of workers. 2.4 Controlling the performance of process & team of worker in term of quantity / quality/ time/ cost.	
Unit-III **Organising, Staffing and Training.**	3a. Define organising. 3b. State physical resources needed for production. 3c. Explain staffing with human resources. 3d. Define Merit rating. 3e. Explain methods of merit rating. 3f. Describe needs & objectives of training. 3g. List types of training. Explain any one type	3.1 Organizing effectively the department, provision of physical resources, matching human need with job need, allotment of to individual and establishing relationship among person working in a group. 3.2 Staffing with the human Resources. 3.3 Appraisal of Employee performance or merit rating and its types. 3.4 Training-definition, needs and objectives its types –induction and orientation, by skill & old worker, on job training, apprentice training, by special schools.	06
Unit- IV **Activating the Work Force**	4a. Define-Motivation. 4b. Explain the motivating factors. 4c. State qualities of leader. 4d. Explain democratic leadership. 4e. Explain need of effective communication.	4.1 Motivation –definition, types and motivating factors. 4.2 Leadership-definition, qualities of leader, Role of leadership, methods-authoritarian, democratic and lassez- faire or free rein. 4.3 Effective employee communication.	08
Unit-V **Managing Problem Performance**	5a. State symptoms of troubled employee. 5b. Explain causes of industrial dispute. 5c. Describe collective bargaining. 5d. State the causes of substandard performance. 5e. Explain progressive disciplinary action.	5.1 Counseling troubled employees-symptoms, need and guidelines for counseling. 5.2 Industrial dispute-causes, strikes, settlement of industrial dispute, collective bargaining, conciliation & mediation and arbitration. 5.3 Disciplining-definition, Substandard performance, progressive disciplinary action.	06

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics	Hours
Unit-VI **Employee Health and Safety Under OSHA**	6a. Define accident. 6b. List causes of accident. 6c. Explain the effect of accident to industry, worker and society. 6d. Describe role of OSHA	6.1 Accident-definition, Causes of accident, Prevention of accident, effect of accident to industry, worker and society, Preparation of accident report and investigation. 6.2 Occupational diseases, hazards, safety awareness. 6.3 Role of OSHA. (Occupational safety & health administration), industrial health.	06
Unit-VII **Supervisor's Role in Labour Relation.**	7a. Explain role of supervisor towards management and work. 7b. Describe function of labour union.	7.1 Role of supervisor in management/ worker/fellow Supervisor/work. 7.2 Labour or trade union-function, right and liabilities.	04
Unit-VIII **Moving up in your Organisation**	8a. Explain activities to be done at end of shift by supervisor. 8b. Describe sort of attitude and action by supervisor while moving up in organization.	8.1 Taking charge of career to know organization, Department & Worker etc. Planning the day work, activities to be done before shift start, beginning, during and end of shift. 8.2 Moving up –sort of attitude and action by supervisor	06
		TOTAL	**48**

5.0 SUGGESTED SPECIFICATION TABLE WITH MARKS (THEORY):

Unit No.	Unit Title	Distribution of Theory Marks			
		R Level	U Level	A and above Levels	Total Marks
I	Scientific Management and Management of Job	04	04	04	12
II	Supervisory Management	04	04	04	12
III	Organizing, staffing and Training.	04	06	--	10
IV	Activating the work force.	06	04	--	10
V	Managing problem performance.	04	04	04	12
VI	Employee Health and safety under OSHA	04	02	04	10
VII	Supervisor's role in Labour Relation.	--	06	-	06
VIII	Moving up in your organisation.	04	04	--	08
	TOTAL	**30**	**34**	**16**	**80**

Legends: R = Remembrance (Knowledge); U = Understanding; A = Application and above levels (Revised Bloom's taxonomy)

Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.

6.0 ASSIGNMENTS/PRACTICALS/TASKS::

Not Applicable

7.0 STUDENT ACTIVITIES:

Following is the list of proposed student activities like

1. Prepare safety charts and slogan.
2. Exhibition of safety charts and slogan.

8.0 SPECIAL INSTRUCTIONAL STRATEGIES (If any):

1. Show video clips on management and motivation.
2. Arrange expert lecture of industry person in the area of safety awareness in industry.
3. Show video clip on safety in industry.

9.0 LEARNING RESOURCES:

A) Books

Sr.No.	Title of Book	Author	Publication
1	Industrial Engineering and management	O. P. Khanna	Dhanpat Rai & Sons
2	Industrial organization & Engineering Economics	Banga & Sharma	Khanna Publication
3	Industrial management	Shrinivasan	Dhanpat Rai & Sons

B) Software/Learning Websites

1. http://www.management.com
2. www.safety.com

C) Major Equipments/ Instruments with Broad Specifications

Not Applicable

10.0 MAPPING MATRIX OF PO'S AND CO'S:

Course Outcomes	Programme Outcomes										
	a	b	c	d	e	f	g	h	i	j	k
CO1	M			H					M		M
CO2			H	M			L	M	M		
CO3		M	H	M			M		M		M
CO4	H		M			H			M		M
CO5		M			M		M		M		
CO6		M			M		M		M		M
CO7				M	M	M	M	M	M		

H: High Relationship, M: Moderate Relationship, L: Low Relationship.

PROGRAMME : Diploma Programme in CE / ME / PS / EE / IF / CM / EL / AE
COURSE : Marketing Management (MKM) **COURSE CODE** : 6306

TEACHING AND EXAMINATION SCHEME:

Teaching Scheme				Examination Scheme								
Hrs / week			Credits	TH Paper Hrs.	Marks							
TH	TU	PR				TH	TEST	TH+TEST	PR	OR	TW	TOTAL
03	--	--	03	03	Max.	80	20	100	--	--	--	100
					Min.	32	--	40	--	--	--	--

1.0 RATIONALE:

The Marketing of product is the most important aspect of each industry. It needs to be systematically surveyed and planned as in the increasing competitive situation. An organization should have a profit for its existence. An engineer as entrepreneur, marketing set up of a company should have knowledge of marketing management. The job opportunities for an engineer in the marketing are increasing due to essentiality of person to deal the technical matter and give related feedback for improvement of product marketing function.

2.0 COURSE OBJECTIVES:

The student will be able to,

1. Understand various elements of market survey and design its methodology.
2. Understand the duties of marketing personal.
3. Learn the concept of pricing, branding, product mix etc.
4. Understand various marketing strategies.
5. Study various sales Forecasting methods and product diversification.
6. Acquire knowledge of various tools/techniques of Market research and product promotion.

3.0 COURSE OUTCOMES:

The course content should be taught and learning imparted in such a manner that students are able to acquire required learning outcome in cognitive, psychomotor and affective domain to demonstrate following course outcomes:

1. Assess market opportunities by analyzing customers, competitors, collaborators, considering strengths and weaknesses of a company.
2. Develop effective marketing strategies to achieve organizational objectives.
3. Design a strategy implementation program to maximize its chance of success.
4. Assess scope for international marketing.
5. Use various tools/techniques of Market research and product promotion.
6. Apply various innovative ideas of advertisement for enhancing the sales.

4.0 COURSE DETAILS:

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics	Hours
Unit-I **Marketing Management Concept**	1a. Explain the needs, wants and demands of customers. 1b. Describe the concept of marketing management.	1.1 Needs, wants and Demands, Types of market demands, Products (Goods, services and Ideas), cost and satisfaction.	10

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics	Hours
	1c. Explain the functions of marketing management. 1d. Differentiate between selling and marketing. 1e. Explain the techniques of maximizing, consumption, customer choice and satisfaction. 1f. Distinguish between macro and micro environment. 1g. Explain techniques of maximizing consumer satisfaction, choice, product life etc.	1.2 Markets, Marketers and prospects, primary purpose of marketing management. 1.3 Simple marketing system, value exchange and transaction, functions of marketing. 1.4 The product, production and selling concept. 1.5 The marketing concept, difference between marketing and selling, the social marketing concept. 1.6 Maximize consumption, satisfaction, choice, product life, quality, customer value and consumer satisfaction, Customer – delight, life time customer. 1.7 Marketing environment – value, macro and micro environment.	
Unit-II **Marketing Management Process**	2a. Explain various types of market segmentation. 2b. Explain product life cycle. 2c. Describe 4P's of marketing. 2d. Explain the significance of different techniques in product promotion. 2e. Differentiate between Direct and Indirect marketing.	2.1 Market segmentation: Basis for segmentation- Geographic / Demographic / psychographic segmentations, benefits of Market segmentation. 2.2 Product: Concept of Product, New product development process. 2.3 Product Life cycle, Stages in PLC and Marketing Strategies. 2.4 Marketing mix: 4 P's, significance of 4P's. 2.5 Methods of marketing- Direct and Mass marketing. 2.6 Product promotion- Role of advertisement, personnel selling and internet in marketing promotion, mail marketing.	08
Unit-III **Price Decisions**	3a. Explain the significance of pricing in marketing management. 3b. Describe the different pricing methodologies.	3.1 Importance of pricing, price setting in practice 3.2 Cost oriented pricing- mark-up pricing, target pricing. 3.3 Demand oriented pricing, price discrimination. 3.4 Competition oriented pricing- going rate pricing, sealed bid pricing.	06
Unit-IV **Marketing Research**	4a. Explain the concept, scope, objectives, importance and limitation of market research. 4b. Explain various methods of data collection. 4c. Describe the market	4.1 Market research – Introduction, Nature, Scope, objective, importance, limitations and issue formulation. 4.2 Source and collection of marketing data- primary data, secondary data. 4.3 Methods of collection of primary data- observation, mail, personal	08

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics	Hours
	research tools and techniques. 4d. Differentiate between primary data and secondary data.	interview, television etc. 4.4 Market Research Techniques-National Readership survey, consumer panel, test marketing.	
Unit-V **Advertising and sales management**	5a. Explain the concepts of marketing communication. 5b. Explain the different types of sales promotions. 5c. Describe the concepts of sales management. 5d. Describe the various types of advertising media.	5.1 Concept and the process of marketing communication. 5.2 Concept of Sales promotion and its types. 5.3 Advertising media – objectives and functions, Types of media, advertising budget, functions of advertising agency. 5.4 Sales management: Concept, objectives, sales forecasting. 5.5 Personnel selling- concept, salesmanship, qualities of salesman.	08
Unit-VI **Strategic marketing**	6a. Describe the concepts of strategic marketing management. 6b. Explain the concept of Strategic marketing	6.1 Objectives and concept of strategic marketing management, 6.2 Strategic marketing Analysis-SWOT Analysis, BCG Matrix.	04
Unit-VII **International and Export marketing**	7a. Explain the concept, scope, opportunities and challenges of international marketing. 7b. Describe the Multi-National Enterprises with examples. 7c. Explain the role of Indian Trade Promotion Organization. 7d. State and explain the benefits to exporters.	7.1 Concept, scope, challenges and opportunities in international marketing. 7.2 Foreign market entry strategies. 7.3 Concept of Multi-National Enterprises (MNE) with examples. 7.4 Institutional support from government to promote export. 7.5 Role of I.T.P.O. (Indian Trade Promotion Organization) 7.6 Benefits offered to exporters by Central government.	04
		TOTAL	**48**

5.0 SUGGESTED SPECIFICATION TABLE WITH MARKS (THEORY):

Unit No.	Unit Title	Distribution of Theory Marks			
		R Level	U Level	A and above Levels	Total Marks
I	Marketing Management concept	06	08	--	14
II	Marketing Management Process	04	08	04	16
III	Price Decisions	04	04	--	08
IV	Marketing Research	04	04	04	12
V	Advertising and sales management	04	08	04	16
VI	Strategic marketing	02	04	--	06
VII	International marketing – Export	02	02	04	08
	TOTAL	**26**	**38**	**16**	**80**

Legends: R = Remembrance (Knowledge); U = Understanding; A = Application and above levels (Revised Bloom's taxonomy)

Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.

6.0 ASSIGNMENTS/PRACTICALS/TASKS:

Not Applicable

7.0 STUDENT ACTIVITIES:

Following is the list of proposed student activities like

1. Group discussion on Brand Strategies of any one company.
2. Assignment / Report writing on:
   a. Distribution strategy of any one company.
   b. Promotional tools (communication mix) adopted by any one company.
   c. Comparative advertising strategies of any two companies.
   d. Sales promotions offered by FMCG companies/brands (Minimum two companies/brands).

8.0 SPECIAL INSTRUCTIONAL STRATEGIES (If any):

Not applicable

9.0 LEARNING RESOURCES:

A) Books

Sr.No.	Title of Book	Author	Publication
1	Introduction to Marketing science	Lal G. K.	Pearson edition international
2	Marketing	Dale Timge	Prentice hall
3	Marketing Engineering.	Lillen Gary	Pearson edition international
4	Marketing Management	Phillip Kolter	Pearson edition international
5	Modern Marketing Management	Francis G. K.	S. Chand & Company
6	Advertising Marketing Sales Management	Thakur D.	D&D Publication
7	Marketing Management	Mr. S. A. Sherlekar	Everest Publications.
8	How to Export	NABHI	NABHI Publication

B) Software/Learning Websites

1. http://www.business-standard.com/
2. http://studymarketing.org/
3. http://salesandmarketing.com/

C) Major Equipments/ Instruments with Broad Specifications

Not Applicable

10.0 MAPPING MATRIX OF PO'S AND CO'S:

Course Outcomes	Programme Outcomes										
	a	b	c	d	e	f	g	h	i	j	k
CO1				L			M	H	M	L	
CO2					H			H	H	H	
CO3			M	M	M		M	M	L		
CO4					M		H	L	M		
CO5					L		L	M	M	M	H
CO6			L	M	M	M	L	H	H	H	L

H: High Relationship, M: Moderate Relationship, L: Low Relationship.

PROGRAMME : Diploma Programme in CE / ME / PS / EE / AE
COURSE : Material Management (MMT) **COURSE CODE** : 6307

TEACHING AND EXAMINATION SCHEME:

Teaching Scheme				Examination Scheme							
Hrs / week			Credits	TH Paper Hrs.	Marks						
TH	TU	PR				TH	TEST	TH+TEST	PR	OR	TW	TOTAL
03	--	--	03	03	Max.	80	20	100	--	--	--	100
					Min.	32	--	40	--	--	--	--

1.0 RATIONALE:

A diploma engineer has to work in different areas like Research and Design, Tool Room, Production, Production planning, Industrial Engineering, Stores, Quality Control, Marketing, Purchase.

For expressing the ideas communicating & the instructions to shop level, the knowledge of material management is essential. This course aims to avoid bottleneck due to shortage of materials and excessive inventory by quantity and number of parts, which will lead to increase in cost and ultimate loss to the industry.

2.0 COURSE OBJECTIVES:

The student will be able to,

1. Understand the importance of raw material planning according to production requirement.
2. Identify the procedures for selecting and giving orders to the suppliers.
3. Understand the importance and procedure of inventory management.
4. Apply the various tools used for inventory management.
5. Know the procedure for purchasing material.
6. Apply the latest tools and techniques for store management.

3.0 COURSE OUTCOMES:

The course content should be taught and learning imparted in such a manner that students are able to acquire required learning outcome in cognitive, psychomotor and affective domain to demonstrate following course outcomes:

1. Identify the types of materials and their requirements.
2. Explain the Co-ordination of material planning amongst the department.
3. Identify the different material handling equipments.
4. Enlist the duties of store officer
5. Explain the functions of production and store department.
6. Calculate the Economic Order Quantity as per requirement.

4.0 COURSE DETAILS:

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics	Hours
Unit-I **Functions of Material Management**	1a. Describe objectives of material management 1b. State functions of material management	1.1 Introduction to materials management 1.2 Objectives of material management 1.3 Functions of material management 1.4 Operating Cycle 1.5 Value analysis – Make or buy decisions.	06
Unit-II **Purchase Management**	2a. Explain functions of purchase management 2b. State the process of	2.1 Objective, scope & Functions of purchasing department 2.2 Responsibility of purchasing section 2.3 Purchasing procedure or purchasing	10

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics	Hours
	purchasing. 2c. Describe selection procedure of material.	cycle. 2.4 Material Requisition: Material Indent form, Travelling Requisition card, Bill of material 2.5 Determining Price: Price terms, Payment terms, cost comparative statement 2.6 Calling for bids or tender or quotation: Tender, Types of tenders, Invitation to BID or An Enquiry, Evaluation of bid. 2.7 Placing purchase order formats of indent/inquiry 2.8 Selection of sources of supply 2.9 Vendor development – Vendor evaluation and rating –Imports and Buyer 2.10 Supplier relationship, Negotiations - Insurance and claims managements	
Unit-III **Stores Management**	3a. Explain the function of stores department 3b. State types of stores 3c. Describe material issue system.	3.1 Functions of stores. 3.2 Location identification 3.3 Layout of store dept. 3.4 Stock taking and materials handling 3.5 Codification of materials 3.6 Duties of storekeepers 3.7 Types of stores, storage equipments/accessories 3.8 Receipt system inward good, stock items, direct purchase items. 3.9 Material issue system 3.10 Accounts of store or store records 3.11 Valuation of Material issue from store 3.12 FIFO, LIFO. 3.13 MIS for stores management	10
Unit-IV **Inventory Management**	4a. State the various inventory costs. 4b. Explain the inventory control system. 4c. State use of OR techniques in inventory management.	4.1 Concept and definition of inventory management 4.2 Classification of Inventory 4.3 Need & function of inventory 4.4 Economic order quantity: Order quantity, Lead time, Safety stock, Re-order point. Numerical analysis. 4.5 Inventory Cost: Procurement cost, Inventory carrying cost 4.6 ABC analysis. 4.7 Inventory control system: Two Bin systems, periodic inventory order system, combinations of two bin & periodic system. 4.8 Use of computer in inventory control system. 4.9 Application of Operations Research Techniques in Materials Management for inventory.	10

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics	Hours
Unit-V **Receiving and inspection**	5a. State the procedure for inspection at receipt quality store 5b. Describe quality checking and quantity checking 5c. Importance of material handling for intricate materials	5.1 Define inspection & their types, Goods receipt note 5.2 Inspection at vendor's work 5.3 Quality checking and Quantity checking levels 5.4 Rejected goods replacement procedure. 5.5 Repair processes for rejected material 5.6 Material handling for intricate materials	06
Unit-VI **Latest Trends in material management**	6a. Explain the importance of JIT 6b. Describe the need of SCM in industry 6c. State the need of E-material management	6.1 Concept of JIT (Just In Time) 6.2 Zero Inventory system 6.3 Introduction to supply chain 6.4 Developing supply chain to gain competitive advantage 6.5 Methods of transportation by air, rail, road, piping. 6.6 Value Stream Mapping (VSM) 6.7 KANBAN card system 6.8 E-Procurement	06
		TOTAL	**48**

5.0 SUGGESTED SPECIFICATION TABLE WITH MARKS (THEORY):

Unit No.	Unit Title	Distribution of Theory Marks			
		R Level	**U Level**	**A and above Levels**	**Total Marks**
I	Functions of material management	04	08	--	12
II	Purchase management	04	08	04	16
III	Stores management	04	08	04	16
IV	Inventory management	04	08	04	16
V	Receiving and inspection	02	06	--	08
VI	Latest trends in material management	02	10	--	12
	TOTAL	**20**	**48**	**12**	**80**

Legends: R = Remembrance (Knowledge); U = Understanding; A = Application and above levels (Revised Bloom's taxonomy)

Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.

6.0 ASSIGNMENTS/PRACTICALS/TASKS:

Not Applicable

7.0 STUDENT ACTIVITIES:

Following is the list of proposed student activities like

1. Collect the logistics information of manufacturing, cement, pharmacy, civil, electrical industries
2. Collect and study the literature on GSCM from any industry
3. Collect and analyse the information about guidelines of material handling procedures.
4. Collect and study information of appropriate material handling devices.

8.0 SPECIAL INSTRUCTIONAL STRATEGIES (If any):

1. Show supply chain structures of different industries.
2. Arrange a visit to logistics stores or in industries from nearby areas.
3. Arrange expert seminar/lectures by a resource person from industry in the area of manufacturing, Logistics etc.

9.0 LEARNING RESOURCES:

A) Books

Sr.No.	Title of Book	Author	Publication
1	Industrial Engineering & Management	O. P. Khanna	S. Chand & Co.
2	Industrial Organisation & Management Science	Banga & Sharma	Khanna Publication
3	Materials Management	Amner Deans S.	Khanna Publication
4	Materials Management	Gopal Krishnan	Khanna Publication
5	Supply chain management. Strategy, planning & operation	Sunil Chopra	Pearson Publication

B) Software/Learning Websites

1. http://www.supplychainbrain.com/
2. http://www.legallyindia.com/
3. http://www.cipmm-icagm.ca/en/
4. http://www.iimm.org/
5. http://matmgmt.ucr.edu/

C) Major Equipments/ Instruments with Broad Specifications

Not Applicable

10.0 MAPPING MATRIX OF PO'S AND CO'S:

Course Outcomes	Programme Outcomes										
	a	b	c	d	e	f	g	h	i	j	k
CO1		H				M					M
CO2				M				M	H		
CO3				M		M			H		M
CO4		H		M					H		
CO5	L				M				M		M
CO6	L		H	M			M			M	

H: High Relationship, M: Moderate Relationship, L: Low Relationship.

PROGRAMME : Diploma Programme in CE / ME / PS / EE / IF / CM / EL / AE / DD / ID
COURSE : Entrepreneurship Development (EDP) **COURSE CODE :** 6309

TEACHING AND EXAMINATION SCHEME:

Teaching Scheme				Examination Scheme							
Hrs / week			Credits	TH Paper Hrs.	Marks						
TH	TU	PR				TH	TEST	TH+TEST	PR	OR	TW	TOTAL
01	--	02	03	--	Max.	--	--	--	--	--	50	50
					Min.	--	--	--	--	--	20	--

1.0 RATIONALE:

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

2.0 COURSE OBJECTIVES:

The student will be able to,

1. Identify entrepreneurial opportunity.
2. Develop entrepreneurial personality, skills, values and attitude.
3. Analyze business ideas- project selection.
4. Develop awareness about enterprise management.
5. Take help of support systems like banks, Government, DIC etc.
6. Prepare preliminary project report.

3.0 COURSE OUTCOMES:

The course content should be taught and learning imparted in such a manner that students are able to acquire required learning outcome in cognitive, psychomotor and affective domain to demonstrate following course outcomes:

1. Develop Entrepreneurial skill by brainstorming games, SWOT analysis, Risk taking games
2. Collect information by Visiting to DIC and Nationalised Banks
3. Interview of successful entrepreneur
4. Learn the success stories from successful entrepreneur.
5. Select product after market survey for product comparison, specifications and feasibility study
6. Prepare preliminary project report

4.0 COURSE DETAILS:

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics	Hours
Unit-I **Entrepreneurship, Creativity and Opportunities**	1a. Conduct self analysis 1b. Overview of Entrepreneurship 1c. Generating business idea	1.1 Concept, Classification & Characteristics of an Entrepreneur 1.2 Creativity and Risk taking. 1.3 Concept of Creativity, brainstorming Risk Situation, Types of risk & risk	04

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics	Hours
	1d. Search business opportunities	takers. 1.4 Trade Related opportunities 1.5 Business Idea -Methods and techniques to generate business idea. 1.6 Transforming Ideas in to opportunities 1.7 SWOT Analysis 1.8 Scanning Business Environment	
Unit-II **Business Terminology, Information and Support Systems**	2a. Understand Classification of business sectors 2b. Acquiring help from support systems 2c. Planning of business activities	2.1 Types of business and industries, forms of ownership, Franchisee, Export, Network/Multilevel Marketing 2.2 Sources of Information. Information related to project, support system, procedures and formalities 2.3 Support Systems • Small Scale Business Planning, Requirements. • Statutory Requirements and Agencies. • Taxes and Acts	02
Unit-III **Market Assessment**	3a. Conducting Market survey 3b. Selection of product	3.1 Marketing - Concept and Importance 3.2 Market Identification, Survey Key components 3.3 Market Assessment	02
Unit-IV **Business Finance**	4a. Understanding terminology of finance 4b. Search and analyse sources of finance 4c. Financial ratio and profitability study	4.1 Cost of Project 4.2 Sources of Finance 4.3 Assessment of working capital 4.4 Product costing 4.5 Profitability 4.6 Break Even Analysis 4.7 Financial Ratios and Significance 4.8 Various govt. /bank schemes of finance (long term and short term)	04
Unit-V **Business Plan and Project Appraisal**	5a. Prepare a project report 5b. Conduct feasibility study	5.1 Preliminary project report preparation. 5.2 Project Appraisal & Selection Techniques • Meaning and definition • Technical, Economic feasibility • Cost benefit Analysis • Checklist	04
		TOTAL	**16**

5.0 SUGGESTED SPECIFICATION TABLE WITH MARKS (THEORY):

Not Applicable

6.0 ASSIGNMENTS/PRACTICALS/TASKS:

The tutorial/practical/assignments/tasks should be properly designed and implemented with an attempt to develop different types of cognitive and practical skills **(Outcomes in cognitive, psychomotor and affective domain)** so that students are able to acquire the competencies.

***Note**: Here only outcomes in psychomotor domain are listed as practical/exercises. However, if these practical/exercises are completed appropriately, they would also lead to development of **Programme Outcomes/Course Outcomes in affective domain** as given in a common list at the beginning of curriculum document for this programme. Faculty should refer to that common list and should ensure that students also acquire those Programme Outcomes/Course Outcomes related to affective domain.*

Sr. No.	Unit No.	Practical Exercises (Outcomes in Psychomotor Domain)	Hours
1	I	Entrepreneurship Awareness- Who am I?/ EOI/ Microlab Exercise	04
2	I	Creativity Exercises/games	02
3	I	Risk taking Exercises/games	02
4	II	Brainstorming/group discussion/problem solving exercises	04
5	III	Business Games and Related Exercises	04
6	II	Interview of an entrepreneur	02
7	IV	Event/task/activity management-group of 4-6 students will work together	04
		AND/OR	
1 to 7	I-IV	3 day Achievement Motivation Training workshop /Entrepreneurship Awareness Program	22
8	V	Visit to DIC/Bank/MSSIDC/MIDC/MPCB/Industry	04
9	V	Prepare a preliminary project report and study its feasibility	06
		TOTAL	**32**

7.0 STUDENT ACTIVITIES:

Following is the list of proposed student activities like

1. Assess yourself – are you an entrepreneur? (Self Analysis)
2. Report on
   - interview of successful entrepreneurs (minimum two)
   - interaction with the support systems
   - visit to small scale industry
3. Product survey - select one product and collect all its related information i.e. specification, price, manufacturer from at least three suppliers/ manufacturers
4. Prepare list of identified opportunities

8.0 SPECIAL INSTRUCTIONAL STRATEGIES (If any):

1. Conduct 3 days awareness camp for entrepreneurship by professional bodies
2. Arrange a visit to SSI/DIC
3. Arrange Interview / Expert lecture of an entrepreneur

9.0 LEARNING RESOURCES:

A) Books

Sr.No.	Title of Book	Author	Publication
1	Entrepreneurship Development	E. Gorden K. Natrajan	Himalaya Publishing, Mumbai
2	Entrepreneurship Development	Colombo plan staff college	Tata McGraw Hill Publishing Co. Ltd. New Delhi.
3	A Manual on How to Prepare a Project Report	J. B. Patel D. G. Allampally	EDI STUDY MATERIAL Ahmadabad
4	A Manual on Business Opportunity Identification & Selection	J. B. Patel S. S. Modi	
5	National Directory of Entrepreneur Motivator & Resource Persons.	S. B. Sareen H. Anil Kumar	
6	A Handbook of New Entrepreneurs	P. C. Jain	
7	The Seven Business Crisis & How	V. G. Patel	

Sr.No.	Title of Book	Author	Publication
	to Beat Them.		
8	Entrepreneurship Development of Small Business Enterprises	Poornima M. Charantimath	Pearson Education, New Delhi
9	Entrepreneurship Development	Vasant Desai	Himalaya Publishing, Mumbai
10	Entrepreneurship Theory and Practice	J. S. Saini B. S. Rathore	Wheeler Publisher, New Delhi
11	Entrepreneurship Development	--	TTTI, Bhopal / Chandigarh
12	Entrepreneurship Management	Aruna Kaulgad	Vikas Publication

B) Software/Learning Websites

Websites-

1. http:// www.ediindia.ac.in
2. http://www.dcmsme.gov.in/
3. http://www.udyogaadhaar.gov.in
4. www.smallindustryindia.com
5. www.sidbi.com
6. www.tifac.org.in

C) Video Cassettes /CDs

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

D) Major Equipments/ Instruments with Broad Specifications

Not applicable

10.0 MAPPING MATRIX OF PO'S AND CO'S:

Course Outcomes	Programme Outcomes										
	a	**b**	**c**	**d**	**e**	**f**	**g**	**h**	**i**	**j**	**k**
CO1			L				L	M			M
CO2					M		M	H	M	M	H
CO3					L		M	L	H	L	M
CO4					L	M	M	M	M	H	M
CO5					H	M	M	H	H	M	M
CO6	L	M	M	M	M	M	H	H	M	H	H

H: High Relationship, M: Moderate Relationship, L: Low Relationship.

PROGRAMME : Diploma Programme in CE / PS / EE / EL / AE
COURSE : Renewable Energy Sources (RES) **COURSE CODE** : 6310

TEACHING AND EXAMINATION SCHEME:

Teaching Scheme				Examination Scheme								
Hrs / week			Credits	TH Paper Hrs.	Marks							
TH	TU	PR				TH	TEST	TH+TEST	PR	OR	TW	TOTAL
01	--	02	03	--	Max.	--	--	--	--	--	50	50
					Min.	--	--	--	--	--	20	--

1.0 RATIONALE:

Modern society relies on stable, readily available energy supplies. Renewable energy is an increasingly important component of the new energy mix. The course covers energy conversion, utilization and storage for renewable technologies such as wind, solar, biomass, fuel cells and hybrid systems. Thermodynamics concepts (including the first and second law) form the basis for modelling the renewable energy systems. The course also touches the environmental consequences of energy conversion and how renewable energy can reduce air pollution and global climate change.

2.0 COURSE OBJECTIVES:

The student will be able to,

1. List various sources of energy and their applications in India and around the world.
2. Describe the challenges and problems associated with the use of various energy sources, with regard to future supply and the environment.
3. Determine potential solutions to the supply and environmental issues associated with energy sources.
4. Understand Emerging Energy Technologies.
5. Collect and organize information on renewable energy technologies as a basis for further analysis and evaluation.

3.0 COURSE OUTCOMES:

The theory should be taught and practical should be carried out in such a manner that students are able to acquire different learning out comes in cognitive, psychomotor and affective domain to demonstrate following course outcomes.

1. Enlist various energy sources and state their present scenario in India
2. State the solar energy applications and functions of system components.
3. Apply the basics of wind and ocean energy for electricity generation.
4. Describe the conversion process of biomass energy.
5. State and apply the various Emerging Energy Technologies

4.0 COURSE DETAILS:

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics	Hours
Unit-I **Energy Science and Sources**	1a. Define energy conservation law 1b. Identify various sources of energy and compare them. 1c. Understand the present energy situations and schemes for renewable energy promotion.	1.1 Concept of energy, Law of conservation of energy 1.2 Introduction to conventional energy sources and renewable energy sources 1.3 Comparison between energy sources 1.4 Present scenario in energy crises in India and world 1.5 Government schemes to promote	02

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics	Hours
		use of renewable energy sources	
Unit-II **Solar Energy**	2a. Define the basic conversation principle of solar energy. 2b. Describe the solar system used in water heating. 2c. State the applications of solar energy	2.1 Introduction to solar energy 2.2 Physical principles of conversion of solar radiation into heat 2.3 Flat plate collectors and concentric collectors 2.4 Solar energy storage system 2.5 Applications of solar energy in Water heating, Space heating and cooling, Greenhouses and electricity generation	04
Unit-III **Wind and Oceans Energy**	3a. Understand the concept of electrical wind generation. 3b. State basic components of WECS. 3c. Distinguish Wind and Oceans Energy 3d. Explain ocean thermal electric power generation 3e. Describe the principle of tidal power generation.	3.1 Basic principles of wind energy conversion 3.2 Site selection considerations 3.3 Basic components of a wind energy conversion system (WECS). 3.4 Advantages and disadvantages of WECS. 3.5 Applications of Wind energy. 3.6 Introduction of Oceans energy 3.7 Methods of ocean thermal electric power generation 3.8 Open cycle and closed cycle Ocean thermal energy conversion (OTEC) system 3.9 Basic principle of tidal power	05
Unit-IV **Bio mass Energy**	4a. State resources of Biomass energy. 4b. Describe the biomass conversion process. 4c. Know Bio Diesel and Bio Mass plant 4d. State information of Government schemes to promote use of biomass energy.	4.1 Introduction to biomass energy 4.2 Biomass energy resources 4.3 Biomass conversion process : Direct combustion, thermo chemical conversion, bio chemical conversion 4.4 Introduction to bio gas plant 4.5 Introduction to Bio Diesel, Bio Mass plant 4.6 Government schemes to promote use of biomass energy	03
Unit-V **Emerging Energy Technologies**	5a. Define the Hydrogen Energy. 5b. Describe properties of hydrogen and its sources. 5c. Know the hydrogen handling.	5.1 Hydrogen Energy 5.2 Properties of hydrogen 5.3 Hydrogen as source of renewable energy 5.4 Sources of hydrogen 5.5 Production of hydrogen 5.6 Storage and transportation 5.7 Introduction to Carbon Capture and Storage (CCS)	02
TOTAL			**16**

5.0 SUGGESTED SPECIFICATION TABLE WITH MARKS (THEORY):

Not Applicable

6.0 ASSIGNMENTS/PRACTICALS/TASKS:

The tutorial/practical/assignments/tasks should be properly designed and implemented with an attempt to develop different types of cognitive and practical skills **(Outcomes in cognitive, psychomotor and affective domain)** so that students are able to acquire the competencies.

***Note**: Here only outcomes in psychomotor domain are listed as practical/exercises. However, if these practical/exercises are completed appropriately, they would also lead to development of **Programme Outcomes/Course Outcomes in affective domain** as given in a common list at the beginning of curriculum document for this programme. Faculty should refer to that common list and should ensure that students also acquire those Programme Outcomes/Course Outcomes related to affective domain.*

A. SUGGESTED EXERCISES/PRACTICALS

S. No.	Unit No.	Practical Exercises (Outcomes in Psychomotor Domain)	Approx. Hrs. required
1	I	Group discussion on benefits of renewable energy sources.	02
2	II	Visit solar water heating system demonstrate and write report on demonstration of solar water heater	04
3	II	Report on demonstration of solar light with the connection diagram.	04
4	II	Visit to the solar power plant write report and draw layout of solar power plant.	06
5	III	Visit to the wind power plant write report and draw a layout of Wind power plant	06
6	IV	Report on demonstration of bio mass gasifier.	04
7	IV	Case study of Bio gas plant and tidal power plant	04
8	V	Group discussion on Emerging Energy Technologies and their future	02
		TOTAL	**32**

7.0 STUDENT ACTIVITIES:

Following is the list of proposed student activities like

1. Collect renewable energy information from web source.
2. Collect and analyse information from web site of BEE (Bureau of Energy Efficiency) and MEDA (Maharashtra Energy Development Agency) on energy.
3. Prepare a report on Government schemes to promote use of renewable energy sources.
4. Identify and collect different manufactures of solar water heater.

8.0 SPECIAL INSTRUCTIONAL STRATEGIES (If any):

1. Show video demonstration of solar water heater system.
2. Visit to solar plant to understand the working of solar generation.
3. Arrange expert lectures on new trends in renewable energy.

9.0 LEARNING RESOURCES:

A) Books

Sr.No.	Title of Book	Author	Publication
1	Renewable energy sources and conversion technology	Bansal Keemann, Meliss,	Tata McGraw Hill
2	Renewable energy resources and emerging technologies	Kothari D. P.	Prentice Hall of India Pvt. Ltd.
3	Non-Conventional energy Sources	Rai G. D.	Prentice Hall of India Pvt. Ltd.
4	Nonconventional Energy	Ashok V. Desai	New Age International Publishers Ltd

B) Learning Websites

1. Website of bureau of energy and efficiency: www.bee-india.nic.in
2. www.betterenergy.org
3. www.mahaurja.com Maharashtra Energy Development Agency (MEDA):
4. www.worldenergy.org
5. www.renewableenergyworld.com

C) Major Equipments/ Instruments with Broad Specifications

1. Solar water heating system
2. Solar lighting system

10.0 MAPPING MATRIX OF PO'S AND CO'S:

Course Outcomes	Programme Outcomes										
	a	**b**	**c**	**d**	**e**	**f**	**g**	**h**	**i**	**j**	**k**
CO1		M			L	H					
CO2			H								M
CO3		M				H					
CO4			H								
CO5					M	H					

H: High Relationship, M: Moderate Relationship, L: Low Relationship.

PROGRAMME : Diploma Programme in Plastic Engineering (PS) / Automobile Engineering (AE)
COURSE : Solid Modelling (SDM) **COURSE CODE** : 6313

TEACHING AND EXAMINATION SCHEME:

Teaching Scheme				Examination Scheme								
Hrs / week			Credits	TH Paper Hrs.	Marks							
TH	TU	PR				TH	TEST	TH+TEST	PR	OR	TW	TOTAL
01	--	02	03	--	Max.	--	--	--	--	--	50	50
					Min.	--	--	--	--	--	20	--

1.0 RATIONALE:

Solid Modelling is a technique of developing 3 dimensional digital model using computer graphics. Today 3D models are used in wide variety of engineering fields. Three dimensional computer graphics are widely used for product design, mould design and manufacturing, assembly design etc. Many commercial solid modelling types of software like Unigraphics-NX, CATIA, PRO-E, Solid Edge etc are available in the market. Diploma engineer should have the knowledge of solid modelling software to visualize the machine components and assembly like dies, moulds, cars, machine tools etc.

2.0 COURSE OBJECTIVES:

The student will be able to,

1. Specify requirement for solid modeling.
2. Understand principle of development of solid models.
3. Prepare assembly using details.
4. Generate orthographic drawing from solid models.
5. Know applications of solid modeling.

3.0 COURSE OUTCOMES:

The course content should be taught and learning imparted in such a manner that students are able to acquire required learning outcome in cognitive, psychomotor and affective domain to demonstrate following course outcomes:

1. Develop solid models, assemblies and generate 2 D drawings using solid modeling software.
2. Draw 2 D sketch, develop solid models and assemblies and then generate orthographic projections.
3. Apply geometric and dimensional constraints to drawing.
4. Apply sketch, extrude, revolve, hole, threading, array commands to drawing.
5. Draw orthographic views, sectional views, isometric views, details, assembly drawings, intersection of solids.

4.0 COURSE DETAILS:

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics	Hours
Unit-I **Solid Modelling Tools**	1a. Enlist applications of Solid Modelling 1b. Identify and select hardware and software for solid modelling	1.1 Concept of digital models, solid modeling 1.2 Applications, benefits, requirements 1.3 Different solid modeling packages, 1.4 Need of solid modeling packages for design, manufacturing and analysis 1.5 Cost saving due to solid modelling	03
Unit-II **Working in 2D**	2a. Draw 2D sketches 2b. Apply constraints	2.1 Working in sketcher mode 2.2 Drawing 2D entities with Line, Circle and Arc. 2.3 Modifying sketches with editing options.	03

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics	Hours
Environment		2.4 Applying constraints, Geometric and Dimensional constraints.	
Unit-III **Creation of Solid Models**	3a. Develop solid models 3b. Apply Boolean operations	3.1 Creating 3D solid models, creation of planes, reference planes. 3.2 Extruded objects, revolved objects and swiped objects, blending of objects. 3.3 Intersection of solids, Boolean operations. 3.4 Design of moulds for machine parts.	04
Unit-IV **Assembly Drawing**	4a. Create assemblies out of different parts 4b. Create assembly drawings	4.1 Concept of Top-down and Bottom-up assemblies 4.2 Assembly of different parts of mould 4.3 Relative degrees of freedom and constraints of assembly 4.4 Exploded views of assembly	02
Unit-V **Analysis of Assembly**	5a. Analyzing the various motions of assembly 5b. Mould flow analysis	5.1 Rotational and translational motions of assembly 5.2 Constraining motions 5.3 Simulation of material flow, tool path	02
Unit-VI **Drafting**	6a. Generate orthographic projections 6b. Apply dimensions, tolerances and geometric tolerances 6c. Prepare part list	6.1 **Projections** • Generate various views • Sectional, auxiliary and isometric views 6.2 **Bill of Materials** •Prepare part lists, name plate on sheet •Page set up and plotting drawing	02
TOTAL			**16**

5.0 SUGGESTED SPECIFICATION TABLE WITH MARKS (THEORY):

Not Applicable

6.0 ASSIGNMENTS/PRACTICALS/TASKS:

Sr. No.	Unit No.	Practical Exercises (Outcomes in Psychomotor Domain)	Approx. Hours
1	I	Know the Solid Modeling Software	02
2	II	Create 2D drawing of simple machine parts like pulley, shaft, flywheels, hooks, chairs, tables etc	04
3	II	Create 2D drawings of complicated machine parts like bearings clutch, cupboard, table etc	04
4	III	Create 3D models of simple machine elements from the sketches above	06
5	III	Create 3D models of simple machine elements for various machine parts used in assemblies	06
6	IV	Create an assembly of at least five pieces	04
7	IV	Create simulation of an assembly like slider crank mechanism	04
8	VI	Create various views and prepare bill of materials	02
TOTAL			**32**

7.0 STUDENT ACTIVITIES:

Following is the list of proposed student activities like

1. Solve assignments from books.
2. Practice given drawings by faculty.

8.0 SPECIAL INSTRUCTIONAL STRATEGIES (If any):

1. Demonstrations through LCD projector.
2. Expert lectures on CAD /CAM/ CAE and Reverse Engineering.

9.0 LEARNING RESOURCES:

A) Books

Sr.No.	Title of Book	Author	Publication
1	CATIA V5R17 for Designers Softcover,	Sham Tickoo	Cadcim Technologies
2	Pro/Engineer Wildfire for Designers Softcover,	Sham Tickoo	Cadcim Technologies
3	Solid Works For Designers Release 2006 Softcover,	Sham Tickoo	Cadcim Technologies
4	NX 4 for Designers Softcover,	Sham Tickoo, Deepak Maini	Cadcim Technologies
5	Solid Edge V19 for Designers Softcover,	Sham Tickoo, Deepak Maini	Cadcim Technologies
6	Various advance 3d modeling software manuals	--	--

B) Software/Learning Websites

Pro-Engineer

1. http://catiatutor.com/
2. http://www.cadenv.com/Tutorials/catia_tutorials/Catia.htm
3. http://www.frotime.com/
4. http://www.proetutorials.com/
5. http://www.solidworks.com/sw/resources/solidworks-tutorials.htm
6. http://www.solidengineering.co.nz/solidworks_free_tutorials.htm
7. http://www.solidedgetutorials.com/
8. http://appsci.queensu.ca/courses/APSC161/SETutorials.php
9. http://homepages.cae.wisc.edu/~me232/ug_tutorials/ug_tutorials.htm
10. http://www.jqoc.com/soft/Unigraphics-Tutorial/

C) Major Equipments/ Instruments with Broad Specifications

1. High end configuration desktops PCs (Minimum 04 GB RAM with Integrated Graphics Card)
2. LCD Projector

10.0 MAPPING MATRIX OF PO'S AND CO'S:

Course Outcomes	Programme Outcomes										
	a	b	c	d	e	f	g	h	i	j	k
CO1		H	M	M				H	L		
CO2		H	M	M				H	L		
CO3		H	H	H							
CO4	M		H								
CO5			H	M				M			H

H: High Relationship, M: Moderate Relationship, L: Low Relationship.

PROGRAMME : Diploma Programme in Automobile Engineering (AE)
COURSE : Professional Practices (PPR) **COURSE CODE :** 6410

TEACHING AND EXAMINATION SCHEME:

Teaching Scheme				Examination Scheme							
Hrs / week			Credits	TH Paper Hrs.	Marks						
TH	TU	PR				TH	TEST	TH+TEST	PR	OR	TW	TOTAL
--	--	04	04	--	Max.	--	--	--	--	--	50	50
					Min.	--	--	--	--	--	20	--

1.0 RATIONALE:

Most of the diploma holders join industries. Due to globalization and completion in the industrial and service sectors the selection for the job is based on campus interviews or competitive tests. While selecting candidates a normal practice adopted is to see general confidence. Attitude and ability to communicate and attitude in addition to basic technological concepts.

The purpose of introducing professional practice is to provide opportunity to students to undergo activities which will enable them to develop confidence. Information search Industrial visits, expert lectures and case study will increase participation of students in learning process.

2.0 COURSE OBJECTIVES:

The student will be able to,

1. Understand techniques of data collection.
2. Study professional techniques through industrial visits and expert lectures.
3. Understand and find solutions for technical problems.

3.0 COURSE OUTCOMES:

The course content should be taught and learning imparted in such a manner that students are able to acquire required learning outcome in cognitive, psychomotor and affective domain to demonstrate following course outcomes:

1. Collect technical information from different sources.
2. Write industrial visit reports.
3. Write report on expert lecture.
4. Develop problem solving techniques through case studies.

4.0 COURSE DETAILS:

Note: There are no separate classes for theory as given below. The relevant theory has to be discussed before the practical during the practical sessions.

UNIT	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics
UNIT I **Information search and data collection**	1a. List different software used in Automobile Engineering field 1b. List out various solar energy equipments 1c. Procedure for pump installation & maintenance 1d. Prepare proposal for starting small scale industry	1.1 Collection of information regarding different softwares user in Automobile Engineering and detailed study of any one of them 1.2 Market survey for solar energy equipments or non-conventional energy sources. 1.3 Pumps installation and maintenance. 1.4 Preparing a proposal of starting a small scale industry and collecting information regarding different schemes. 1.5 Collection of information to manufacture a product and calculating its market value. 1.6 Survey & interviews of successful entrepreneurs in nearby areas. 1.7 Preparing manuals regarding maintenance of

UNIT	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics
	1e. Prepare data base for manufacturing product 1f. List out successful entrepreneurs in near- by areas 1g. Prepare list of various material handling devices 1h. List out various industrial accidents	machinery & equipments in Automobile department. 1.8 Collecting of information regarding different types of material handling devices & plant layout used in industry. 1.9 Machine installation & maintenance. 1.10 Information regarding industrial accidents & its prevention techniques.
Unit II **Industrial visit.**	2a. Develop technical report writing skills on industrial visits 2b. Understand culture of industry	2.1 Industrial visits and report writing of: (Any Two) ▪ Manufacturing organizations for observing various manufacturing processes including heat treatment ▪ Material testing laboratories in industries or reputed organizations ▪ Auto workshop / Garage ▪ Plastic material processing unit ▪ ST workshop / City transport workshop ▪ Machine shop having CNC machines. ▪ City water supply pumping station ▪ Manufacturing unit to observe finishing and super finishing processes
Unit III **Expert lectures**	3a. Write report on the expert lecture to obtain the professional knowledge.	3.1 Expert lectures from professionals/ industries on. (Any Two) ▪ Environmental Pollution control ▪ Software for Automobile Engineering. ▪ Green technology. ▪ Advances in refrigeration & Air conditioning. ▪ Advances in manufacturing techniques. ▪ Nano technology. ▪ Industrial safety. ▪ Use of plastics in automobiles.
Unit IV **Case Study**	4a. Explain case study techniques 4b. Solve Automobile Engineering problems by case study technique. 4c. Suggest solution for problems by case study techniques	4.1. Case Study ▪ Observe the Space utilization in workshop & identify the problems regarding area. Suggest suitable solution. ▪ Measures to reduce the consumption of energy in department. ▪ Identify the location for installing non-conventional energy sources. ▪ Select a proper tool required for different manufacturing operations. ▪ Repair and maintenance of various instruments and machineries in Automobile Engineering.

5.0 SUGGESTED SPECIFICATION TABLE WITH MARKS (THEORY):

Not Applicable

6.0 ASSIGNMENTS/PRACTICALS/TASKS:

The tutorial/practical/assignment/task should be properly designed and implemented with an attempt to develop different types of cognitive and practical skills **(Outcomes in cognitive, psychomotor and affective domain)** so that students are able to acquire the desired programme outcome/course outcome.

***Note**: Here only outcomes in psychomotor domain are listed as practical/exercises. However, if these practical/exercises are completed appropriately, they would also lead to development of **Programme Outcomes/Course Outcomes in affective domain** as given in the mapping matrix for this course. Faculty should ensure that students also acquire Programme Outcomes/Course Outcomes related to affective domain.*

S. No.	Unit No.	Practical Exercises (Outcomes in Psychomotor Domain)	Approx. Hrs. required
1	I	**Information search, data collection and writing a report on the topic (Any Five)** a. Collection of documents, certificates and its market value required for manufacturer of product. b. Preparing a proposal of starting a small scale industry and collecting information regarding different schemes. c. Market survey for advanced engineering materials w.r.t. quality, rate and applications. d. Market survey for pumps, pipes and peripherals required for machinery. e. Collection of information regarding different softwares used in Automobile Engineering and detailed study of any one of them. f. Collection of market information including rates and specifications for non-conventional energy products like solar water heater. Solar lamp, wind turbine. g. Survey & interviews of successful entrepreneurs in nearby areas. h. Collecting of information regarding different types of material handling devices & plant layout used in nearby industry.	24
2	II	**Industrial visits (Any two)** a. Manufacturing Industries. b. Visit to cold storage plant c. Visit to calibration laboratory. d. Visit to Thermal/Hydraulic power station. e. Visit to Automobile workshop.	16
3	III	**Expert Lectures (Any Two)** The lectures from professionals/ industry expert to be organized (2 hrs. duration) on any 2 topics of following suggested areas or any other suitable topics. a. Environmental Pollution control b. Software for Automobile Engineering. c. Industrial Safety. d. Green technology. e. Advanced Manufacturing techniques f. Nano Technology. The brief report to be submitted on the expert lecture by each student as a part of term work.	08
4	IV	**Case study (Any Two)** a. Study of different types of plant layout in workshop and suggest suitable layout. b. Study the various energy saving techniques and suggestion	16

S. No.	Unit No.	Practical Exercises (Outcomes in Psychomotor Domain)	Approx. Hrs. required
		regarding reduction of consumption. c. Identify the location for installing non-conventional energy devices. d. Study different types of tools and select for particular manufacturing process. e. Repair and maintenance of various equipments in Automobile Engineering department.	
		TOTAL	**64**

7.0 STUDENT ACTIVITIES:

Following is the list of proposed student activities like

1. Collect specifications and rates of various machines and instruments.
2. Collect set of working drawings for Automobile Engineering machines and products.
3. Observe a video on expert lectures from internet on Automobile Engineering topic and draft a report on it.
4. Collect specifications of general and cutting tools.

8.0 SPECIAL INSTRUCTIONAL STRATEGIES (If any):

1. Show CAI computer software; arrange industrial visits, expert lectures, case studies related to Automobile Engineering.

9.0 LEARNING RESOURCES:

A) National and international Journals and Magazine. Production technology handbook, Automobile Engineering Review, handbook of Refrigeration, SAE Handbook.

B) Software/Learning Websites

1. http://www.howstuffworks.com
2. www.Slideshare.com.
3. www.ishare.com

C) Major Equipments/ Instruments with Broad Specifications

Not applicable

10.0 MAPPING MATRIX OF PO'S AND CO'S:

Course Outcomes	Programme Outcomes										
	a	**b**	**c**	**d**	**e**	**f**	**g**	**h**	**i**	**j**	**k**
CO1		H			H		H	H	H		M
CO2		H						M	H		M
CO3		H			M	M	M				H
CO4	H	H	H	H	M			M			H

H: High Relationship, M: Moderate Relationship, L: Low Relationship.

PROGRAMME : Diploma Programme in Automobile Engineering (AE)
COURSE : Seminar (SEM) **COURSE CODE :** 6411

TEACHING AND EXAMINATION SCHEME:

Teaching Scheme				Examination Scheme							
Hrs. / week			Credits	TH Paper Hrs.	Marks						
TH	TU	PR				TH	TEST	TH+TEST	PR	OR	TW	TOTAL
--	--	02	02	--	Max.	--	--	--	--	--	50	50
					Min.	--	--	--	--	--	20	--

1.0 RATIONALE:

An engineer or technician has to carry out variety of tasks & face problems and situations in his Professional life. He has to convey his ideas, communicate with people. Effective presentation of ideas, thoughts and information becomes a requisite skill for him.

The involvement of student in the seminar course will help him to plan and prepare the related topic by searching information from various sources, interact with others, analyse the information, document the content and present.

2.0 COURSE OBJECTIVES:

The student will be able to,

1. Develop abilities to search information
2. Suggest ideas through seminar
3. Collect data, information from various resources
4. Develop planning of seminar activities
5. Develop skill to communicate the problems and solutions
6. Develop skill to prepare reports
7. Develop presentation skills

3.0 COURSE OUTCOMES:

The course content should be taught and learning imparted in such a manner that students are able to acquire required learning outcome in cognitive, psychomotor and affective domain to demonstrate following course outcomes as applicable to seminar:

1. Know and select seminar topic or problem statement in engineering field
2. Draft Problem statement or topic of seminar
3. Carry out literature survey from various resources
4. Write review of information search
5. Develop document preparation skills
6. Use of presentation skill for seminar delivery
7. Keep updated with latest trends in areas of engineering discipline

4.0 COURSE DETAILS:

Activity No	Activities
1	Briefing about selection for seminar topics in class: Discussion in class
2	Search seminar topics and approval of topic from guide from searched topics.
3	Collection of data and literature for seminar from: internet/ visit/Journals/Books/EBooks
4	Preparation of synopsis of seminar topic: print draft copy
5	Submission of seminar synopsis to guide (Printed copy)
6	Guidance about preparation of document by guide
7	Preparation of document by students
8	Editing document
9	Submission of Seminar and presentation document: Hard copy & Soft copy of power point
10	Submission of diary
11	Seminar Presentation

The activities mentioned above shall be monitored and guided by the guide every week during the contact hours provided for the same.

5.0 AREAS FOR SELECTION OF SEMINAR:

SN	Areas For Selection
1	Green Technology
2	Smart material / Advanced material
3	Economical fuels / alternative fuels
4	Safety
5	New emerging technologies / concepts and developments
6	Latest vehicle controls
7	Computerized vehicles
8	Automated parking
9	Comforts / Aesthetics
10	Development of new systems: automatic driving controls, accident analyzer and control.
11	parking comfort
12	Virtual manufacturing process
13	Any topic related to technological development
14	Mechatronics
15	Work study
16	Any other topic related to Automobile engineering
17	Robotics and artificial intelligence
18	Design for Excellence (DFX)
19	Advanced Manufacturing Process for Automobile

6.0 SUGGESTED INSTRUCTIONAL STRATEGIES:

1. Classroom Teaching, Library Assignment, Group Discussion, Case Studies

7.0 LEARNING RESOURCES:

Magazines, Journals, Papers: National & international Reference Books, Internet, Previous seminars, Text Books, Codes of Practices e. g. IS Codes, Video Cassettes, Audio Cassettes, Compact Discs, Charts, Transparencies, Software, Models, Industrial visits, expert lectures/workshops

8.0 GUIDELINES FOR SEMINAR:

1. Selection of topic for seminar:

a. The student shall search from various resources and get the topic approved.
b. Topic of seminar shall be based on curriculum with new developments.
c. Topic of seminar should not be from the project taken by the group or by individual.
d. Selection of topic should be finalised in consultation with teacher guide allotted for the seminar.

2. Submission of Seminar Document:

a. The student shall get the seminar draft approved from Guide and complete final document.
b. Each student shall prepare two hard copies of final seminar document and retain one copy with student and submit one hard copy along with soft copy for department.
c. The structure of the seminar document shall be as per the following format: Certificate / Acknowledgement / Index / Introduction / Detailed content / Conclusion / References.
d. The seminar report shall be of minimum 10 pages and max. 20 pages with 1.5 line spacing. Font: New Times Roman, left margin 3 cm, right margin 1.5 cm, top margin 2

cm, bottom margin 2 cm, header & footer 1.5 cm, page numbers, size of font 12 pt, paragraphs left and right justified. It should be certified by seminar Guide and Head of department.

3. Evaluation of Seminar:

Evaluation of seminar will consist of Progressive Assessment, Presentation

i. Progressing Assessment:

1. Progressive assessment will be based on attendance, searching of various seminar topics, selection of title, collection of data from internet, Journals, Literatures, organization of data and preparation of document.
2. The student has to get seminar document assessed from guide regularly.
3. The attendance of the student shall carry 05 marks as follows
   a. Below 75 % : 00 marks
   b. 75 % and below 80 % : 02 marks
   c. 80 % and below 85 % : 03 marks
   d. 85 % and below 90 % : 04 marks
   e. 90 % and above : 05 marks

ii. Presentation of Seminar:

1. The time for presentation shall be 7 to 10 minutes per student
2. The question answer session time shall be 2 to 3 minutes per student
3. Evaluation of presentation of seminar will be carried out by a panel of teaching staff from institute based on the following point
   a. Confidence and courage
   b. Technical knowledge acquired
   c. Presentation skill
   d. Use of presentation medium e.g. A/V aids, animation

iii. Marking scheme for Seminar.

Progressive assessment	Confidence and courage	Technical knowledge	Presentation skill	Use of media	Total
25	05	05	10	05	50

9.0 MAPPING MATRIX OF PO'S AND CO'S:

Course Outcomes	Programme Outcomes										
	a	**b**	**c**	**d**	**e**	**f**	**g**	**h**	**i**	**j**	**k**
CO1								H			
CO2								M		H	
CO3		H						M			
CO4			H		M					L	
CO5									H	M	
CO6											
CO7											H

H: High Relationship, M: Moderate Relationship, L: Low Relationship.

PROGRAMME : Diploma Programme in Automobile Engineering (AE)
COURSE : Project (PRO) **COURSE CODE** : 6412

TEACHING AND EXAMINATION SCHEME:

Teaching Scheme				Examination Scheme							
Hrs / week			Credits	TH Paper Hrs.	Marks						
TH	TU	PR				TH	TEST	TH+TEST	PR	OR	TW	TOTAL
--	--	04	04	--	Max.	--	--	--	--	50	50*	100
					Min.	--	--	--	--	20	20	--

* Indicates TW to be assessed by external & internal examiners.

1.0 RATIONALE:

An Engineer or technician has to work on various projects in profession or field work. The aim of project is to develop the ability of "learning to learn' on its own, work in team. This would go a long way helping the students in keeping pace with future changes in technology and acquisition of Knowledge and skills as and when needed.

The scientific way of solving the problems and ability to apply it to find alternative solutions for the problems will help a technician in his professional life. This course will help to inculcate leadership skills, decision making, participative learning, resource management, cost considerations, documentation and report writing skills with effective communication.

2.0 COURSE OBJECTIVES:

The student will be able to,

1. Integrate the knowledge of engineering programme
2. Develop the skill to identify the problem & define the problem statement
3. Develop scientific attitude for stepwise solutions to the problems
4. Develop attitude to work in team and act as leader of project
5. Develop planning & execution skills
6. Build multidisciplinary concept with cost considerations
7. Understand recent developments in engineering fields and prepare report

3.0 COURSE OUTCOMES:

The course content should be taught and learning imparted in such a manner that students are able to acquire required learning outcome in cognitive, psychomotor and affective domain to demonstrate some of course outcomes as applicable to project

1. Participate effectively in group work
2. Collect, analyse and synthesise the data
3. Conduct a survey and investigate the activities
4. Make appropriate decision
5. Act as leader for group task
6. Estimate cost consideration
7. Prepare technical project report as per given standard.

4.0 COURSE DETAILS:

Activity No	Activities
1	Formation of Group
2	Selection of Project: Individual/Group discussions topic group wise.
3	Define Problem statement for project work
5	Decide Strategies/Methodology to carry out project
6	Literature Survey/data survey
7	Submission of synopsis: by each group
8	Project activity plan-Defining activities, strategy, duration
9	Allocation of work responsibility to individual/team
10	Visits to Industries / Institutions / Market/field work/sites

Activity No	Activities
11	Collection of Data /Survey/Analysis
12	Design of Components, preparation of drawing, estimates wherever required, printed circuits design, its checking,
13	Fabrication, Assembling, Model/Prototype development, Testing as per project requirements
14	Progressive presentation of work and recording in diary
15	Consolidation of work allotted to individual or team
16	Presentation of initial draft: pre submission draft
17	Final Project Report: Printed: Submission: soft & Hard copy
18	Group presentation of project work at the time of final evaluation

The activities mentioned above shall be monitored and guided by Project Guide every week during the contact hours provided for the same.

The Project is also included with Seminar with the aim to develop certain set communication skills (preparation of report, writing survey report writing Lab. experiment results writing conclusions of the work done and physical phenomenon observed, participating in group discussions, verbally defending the project in the form of Seminar etc.)

5.0 AREA OF SELECTION FOR PROJECT

These are only guidelines; any project related to Automobile Engineering depending upon the availability of projects may be included. Preference should be given to practical oriented projects according to the local needs.

Sr.No.	Areas
1	Experimental analysis / verification
2	Development of design methods and verification
3	Design and fabrication of a model for an engineering project / Experimental setup
4	Design of automotive structures and preparation of working drawings
5	Developing a software for analysis and / or design or decision making during engineering and management practice
6	Technical and / or economic feasibility study like engine modification, use of alternate fuels etc.
7	Mechatronics (combined with Mechanical / Electrical / Electronic / Computer / Automobile / Latest Technology
8	Automation, Computerized programme for designing and / or drawing of machine / vehicle components, simulation of movement and operation, 3D modelling, pick and place robots
9	Analysis of performance testing (Composition of project model with conventional / existing systems
10	Development in the existing vehicles / mechanism / parts
11	Study and analysis of power plant using alternate fuels.
12	New invention in automotive sector.
13	Use of software like solid modelling / Crees analysis
14	Project on starting a small scale automotive industries
15	Design and Fabrication of automotive air conditioning system.
16	Quality Circles / Statistical Quality Control / Total Quality Management / ISO 9000 / Any other Quality Control Based Project
17	Cost and cost control, minimization of manufacturing cost of vehicles, consumption of fuels.
18	Material handling vehicles.
19	Brake down maintenance system of vehicles
20	Safety systems in automobile
21	System analysis and RTO related projects to minimize accidents.

Sr.No.	Areas
22	GPS tracker based vehicles.
23	Social base projects
24	Pollution: Environmental, Developing pollution free automobile vehicles.
25	Comfort in vehicles / Aerodynamic effect on vehicle body, its analysis and applications.

6.0 GUIDELINES FOR PROJECT:

A. Group Formation:

1. The department Head / Officer in Charge shall make sure that the project groups are formed within **one week** of the beginning of academic term and assign a faculty as project guide.
2. The students may be asked to work in groups of five students. The group size may be varied in accordance with the effective compliance of project work.
3. The group can decide the leader and distribute work and prepare the group management structure.

B. Finalization of Project Title:

1. The students are expected to take up a project with the guidance of a Project Guide from the institute/Industry Expert/Sponsored by industry, Institute, society, self.
2. Industrial project shall be encouraged.
3. The students can seek help from TPO/ HOD/Guide.
4. The group of students/Project guide/authority shall see the viability/ feasibility of project over the duration available with the students and capabilities and setup available.

C. Note:

1. The group / student shall prepare Project Diary with Name of Project, Name of Students in group, their attendance and progress and get assessed from guide from time to time during project hours.
2. The title of the project should be finalized within **two weeks** after the group formation and a synopsis of the project should be submitted to the guide.
3. An abstract (synopsis) not exceeding 100 words, indicating salient features of the work shall be submitted to guide.
4. Modify format suitably as per requirement of the project.

D. Project Execution:

1. Guide shall monitor the work and help the students from time to time.
2. The progress shall be presented before the guide every week during project hours.
3. The students shall design parts, prepare their drawing showing all details and manufacture within the institute / sponsoring industry / workshop in local areas.
4. The guide should maintain a record of progressive / continuous assessment of project work and observe the progress of each group member on weekly basis.
5. The same shall be kept ready for submission to the external examiner before the final examination.

E. Evaluation of Project:

1. The continuous evaluation of individual progress shall be followed
2. External examiner and guide shall jointly evaluate the project.
3. The project can be evaluated on site if it is difficult to bring or demonstrate the trials in the institute
4. The attendance of the student shall carry 05 marks as follows
   i. Below 75 % : 00 marks
   ii. 75 % and below 80 % : 02 marks
   iii. 80 % and below 85 % : 03 marks

iv. 85 % and below 90 % : 04 marks
v. 90 % and above : 05 marks

5. The details of project assessment are mentioned in Annexure II

F. Project Report:

1. The student shall get the initial draft copy of the project approved from the Project Guide.
2. Structure: It shall be as follows
   - Title page, Inner title page (white), Certificate, Certificate from Industry, Synopsis, Acknowledgment, Table of Contents, List of table & figures (optional), Introduction, Objectives of the Project, Methodology used, Design, Drawing of the part and assembly, Testing, Costing, Result, Conclusions & Scope for future, Merits, Demerits, Applications, Bibliography
   - Annexure consists of various designed parts and assembly drawings, photographs, charts, statistical data
   - CD of video clips /Power Point presentation
3. Each group has to submit one copy of project report to the library and one soft and hard copy to the department apart from the individual copy.
4. The project report will be of 40 to 50, A4 Size pages with 1.5 line spacing. Font: New Times Roman, left margin 3 cm, right margin 1.5 cm, top margin 2.5 cm, bottom margin 1.5 cm, header & footer 1.5 cm, page numbers, size of font 12 pt, paragraphs left and right justified.
5. Chapters (to be numbered in Arabic) containing Introduction-which usually specifies scope of work and the present developments. Main body of the report divided appropriately into chapters, sections and subsections. The chapters, sections and subsections may be numbered in the decimal form for e.g. Chapter 2, sections as 2.1, 2.2 etc. and subsections as 2.2.3, 2.5.1 etc.
6. The chapter must be left or right justified (font size 16). Followed by the title of chapter centered (font size 18), section/subsection numbers along with their headings must be left justified with section number and its heading in font size 16 and subsection and its heading in font size 14. The body or the text of the report should have font size 12.
7. The figures and tables must be numbered chapter wise.
8. The last chapter should contain the summary of the work carried, contributions if any, their utility along with the scope for further work.
9. Reference OR Bibliography:
   The references should be numbered serially in the order of their occurrence in the text and their numbers should be indicated within square brackets for e.g. [4]. The section on references should list them in serial order in the following format.
   a. For textbooks – Dr. V.L. Shah & Veena Gore, Limit State Design of Steel Structures, Structures Publications, 1 Edition, 2009.
   b. For papers - David, Insulation design to combat pollution problem, Proc of IEEE, PAS, Vol 71, Aug 1981, pp 1901-1907.
   c. Only SI units are to be used in the report. Important equations must be numbered in decimal form.
   d. All equation numbers should be right justified.
10. Each student from group shall have one copy with individual certificate only.
11. The project report and progressive assessment sheets are to be submitted before the end of term declared in the Academic Calendar of the institute.

7.0 MAPPING MATRIX OF PO'S AND CO'S:

Course Outcomes	Programme Outcomes										
	a	**b**	**c**	**d**	**e**	**f**	**g**	**h**	**i**	**j**	**k**
CO1	H										
CO2		H									
CO3							M				
CO4	M					L					
CO5				L			M				
CO6			H				H				
CO7			H								

H: High Relationship, M: Moderate Relationship, L: Low Relationship.

PROGRAMME : Diploma Programme in Mechanical Engineering(ME) / Automobile Engineering(AE)
COURSE : Metrology and Quality Control(MQC) **COURSE CODE :** 6413

TEACHING AND EXAMINATION SCHEME:

Teaching Scheme				Examination Scheme								
Hrs / week			Credits	TH Paper Hrs.	Marks							
TH	TU	PR				TH	TEST	TH+TEST	PR	OR	TW	TOTAL
04	--	02	06	03	Max.	80	20	100	25	--	25	150
					Min.	32	--	40	10	--	10	--

1.0 RATIONALE:

The diploma mechanical Engineer often come across measuring different parameters of machined components and the appropriate fitment of interchangeable components in the assemblies. For the above purpose he/she is also required to analyze the quantitative determination of physical magnitude and ensure the control of quality.

During previous semesters different systems of measurement and their units etc have been introduced in the course, basic physics. The different methods and instruments which can be used for linear and angular measurements, geometrical parameters (like surface finish, Squareness, Parallelism, Roundness etc) and the use of gauges and system of limits, Fits, Tolerances etc. are often required to be dealt in detail by diploma engineer on the shop floor. He/she is also required to analyze, Interpret and present the data collected, graphically and statistically for ensuring the quality.

The knowledge of the course also forms the basis for the design of mechanical measurements systems, design & drawing of mechanical components.

2.0 COURSE OBJECTIVES:

The student will be able to,

1. Understand and calculate the least count of all basic measuring instruments.
2. To acquaint with operation of precision measurement tools and equipments.
3. Select appropriate instruments for specific measurement.
4. Analyze and interpret the data obtained from the different measurement processes and present it in the statistical form.
5. Construct and draw the control chart and represent the data in graphical form.
6. Understand ISO certification procedure and quality system.
7. Understand the modern quality concepts and statistical techniques.

3.0 COURSE OUTCOMES:

The course content should be taught and learning imparted in such a manner that students are able to acquire required learning outcome in cognitive, psychomotor and affective domain to demonstrate following course outcomes:

1. Acquire knowledge of traditional and modern measuring methodology used in industry to measure actual product dimensions, shape and surface texture.
2. Illustrate working principle of measuring instruments, comparators and gauges for inspection purpose.
3. Identify and select proper measuring instrument for specific application.
4. Inculcate habits of handling the instruments and interpret measurement data, to estimate uncertainties.
5. Measure and compare dimensions of components by using various comparators.
6. Apply knowledge of various tools and techniques used to determine geometry and dimensions of machine tools in engineering applications.
7. Apply the recent quality control tools to obtain the process control.

4.0 COURSE DETAILS:

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics	Hours
Unit-I **Introduction to Metrology**	1a. Describe the basis of metrology. 1b. Explain various standards and comparators. 1c. State the different types of gauges. 1d. Explain the basics of angular measurement and measure angle using different instruments.	1.1 Metrology: Definition, Categories, Need of inspection, Precision and Accuracy, Sensitivity, Readability, Calibration, Traceability, Reproducibility, Sources of errors, Factors affecting on accuracy, Selection of instruments, Precautions while using instruments for getting higher precision and accuracy, 1.2 Introduction of CMM. 1.3 Standards: Definition, line and end standard, Wavelength standard. Slip gauges and its accessories, Length bars. 1.4 Comparators: Definition, Requirement of good comparator, Classification, uses, working principles. Relative advantages and disadvantages. 1.5 Interchangeability, Design of Plug and Ring Gauges, Taylor's Principle, IS919-1993 (Gauges IS 3477-1973) Concept of multi gauging and inspection. 1.6 Concept, Instruments for Angular Measurements, Working and use of Universal Bevel Protractor, Angle Gauges (With Numerical on Setting of Angle Gauges), Sine Bar, Spirit Level, Principle of Working of Autocollimator, Angle dekkor and Clinometers.	03 06 04 04
Unit-II **Threads and Gear Metrology**	2a. Explain the various methods of calculating thread elements and gear tooth elements. 2b. State the various types of errors in threads and gears. 2c. Discuss the terminology of thread and gear.	2.1 ISO grade and types of thread, Errors in threads, Pitch errors, Measurement of different elements such as major diameter, minor diameter, pitch,, Thread angle, effective diameter: One, Two and Three wire method, Working principle of floating carriage micrometer, profile projector and tool makers microscope. Interferometry. 2.2 Analytical and functional inspection, Rolling test bench, Errors in gears. Measurement of tooth thickness, (Constant chord method), gear tooth vernier calliper,	03 04
UNIT-III **Testing Techniques**	3a. Explain the techniques to measure surface finish of various components. 3b. Discuss the various machine tool test and alignment test. 3c. Understand the terminology of	3.1 Primary and secondary texture, terminology of surface texture as per IS 3073- 1967, CLA, Ra, RMS, Rz values and their interpretation, Symbol for designating surface finish on drawing, Various techniques of qualitative analysis, Working principle of stylus probe type instruments 3.2 Parallelism, Straightness, Squareness, roundness, run out, alignment tests of	04 04

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics	Hours
	surface finish.	Lathe and Drilling, machine tools as per IS.	
UNIT- IV **Quality Control**	4a. Explain the concept of Quality. 4b. Differentiate between quality and inspection. 4c. Discuss the principles of TQM. 4d. Explain the concept of quality audit. 4e. Describe the six sigma methodology. 4f. Explain the procedure of ISO certification.	4.1 Definitions, meaning of quality, Quality characteristics, Quality of design, conformance, performance, Concept of reliability, maintainability, Cost, Quality assurance, Quality and Inspection, Inspection stages. 4.2 Principles of Total Quantity Management. Continuous improvement– PDCA, Quality Circles, Employee empowerment (JIDOKA). 4.3 Quality Audit: Concept of audit practices, lead assessor certification. 4.4 Six sigma: Meaning, methodology of system Improvement. 4.5 Concept, ISO 9000 series quality standards, QS14000, necessity and procedure of ISO certification, TS 16949.	04 08 04
UNIT-V **Elementary Statistics & it's application in quality control**	5a. State the various types of data. 5b. Explain the various types of control charts. 5c. Discuss process capability of machine. 5d. Differentiate between acceptance sampling and 100% inspection. 5e. Explain various sampling plans. 5f. Describe OC curve.	5.1 Meaning and importance of SQC, Variable and attribute Measurement, inherent and assignable sources of variation, control charts for variables: X, σ and R charts, control charts for attributes: p, c, np charts, process capability, 5.2 Concept, Comparison with 100% inspection, Different types of sampling plans, with merits and demerits, OC curve.	10 06
		TOTAL	**64**

5.0 SUGGESTED SPECIFICATION TABLE WITH MARKS (THEORY):

Unit No.	Unit Title	Distribution of Theory Marks			
		R Level	U Level	A and above Levels	Total Marks
I	Metrology Basics	02	02	--	04
	Standards and comparators	02	02	04	08
	Gauges	02		04	06
	Angular Measurement		02	04	06
II	Screw thread Measurements	02	02	--	04
	Gear Measurement and Testing	02	02	--	04
III	Measurement of surface finish	-	02	02	04
	Machine tool testing	02	02	04	08
IV	Quality	02	02		04
	Total Quality Management	04	04	02	10

Unit No.	Unit Title	Distribution of Theory Marks			
		R Level	U Level	A and above Levels	Total Marks
	ISO 9000 Series & Other standards	02	02	--	04
V	Statistical quality control	02	02	08	12
	Acceptance Sampling	02	02	02	06
	TOTAL	**24**	**26**	**30**	**80**

Legends: R = Remembrance (Knowledge); U = Understanding; A = Application and above levels (Revised Bloom's taxonomy)

Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.

6.0 ASSIGNMENTS/PRACTICALS/TASKS:

The tutorial/practical/assignment/task should be properly designed and implemented with an attempt to develop different types of cognitive and practical skills **(Outcomes in cognitive, psychomotor and affective domain)** so that students are able to acquire the desired programme outcome/course outcome.

Note*: Here only outcomes in psychomotor domain are listed as practical/exercises. However, if these practical/exercises are completed appropriately, they would also lead to development of* ***Programme Outcomes/Course Outcomes in affective domain*** *as given in the mapping matrix for this course. Faculty should ensure that students also acquire Programme Outcomes/Course Outcomes related to affective domain.*

S. No.	Unit No.	Practical Exercises (Outcomes in Psychomotor Domain)	Hours
1	I	Measurement of all parameters of given part using linear measuring instruments.	04
2	I	Measurement of unknown angle of component using sine bar and angle dekkor.	02
3	I	Measurement of run-out, roundness using dial indicator.	02
4	II	Measurement of various screw thread elements.	04
5	II	Measurement of gear tooth elements by using gear tooth vernier calliper and verification of gear tooth profile using profile projector.	04
6	III	Interpretation of fringes using optical flat.	02
7	III	Machine tool alignment test for any machine tool like lathe, drilling.	04
8	V	Draw the frequency histogram, frequency polygon, normal distribution curve and ogive curve for given samples and find mean, mode, median, standard deviation, variance and range.	04
9	V	To draw and interpret the control limit for variable measurement (X and R chart). Or (P and C chart)	04
10	--	Industrial visit concerned with Metrology and Quality Control. Measurement of various products by using CMM	02
		TOTAL	**32**

7.0 STUDENT ACTIVITIES:

Following is the list of proposed student activities like

1. Identify actual machine parts/products/components in labs of mechanical department and workshop for measurements purpose.
2. Understand the quality characteristics of the products available in the market.
3. Visit the industries to collect the data for P, C, X and R chart.
4. Selection of comparators for the given dimensional data.
5. Study the quality management system tools by visiting different manufacturing industries.

8.0 SPECIAL INSTRUCTIONAL STRATEGIES (If any):

1. Show CAI computer software related to MQC.
2. Arrange an Industrial visit to understand the uses of various measuring instruments.
3. Arrange expert seminar of industry person in the area of metrology and quality control.

9.0 LEARNING RESOURCES:

A) Books

Sr.No.	Title of Book	Author	Publication
1	Engineering metrology	R. K. Jain	Khanna Publisher, Delhi.
2	Metrology for Engineers	J. F. W. Galyer and C. R. Shotbolt	ELBS
3	Engineering Metrology	K. J. Hume	Kalyani publishers
4	A text book of Engineering metrology	I. C. Gupta	Dhanpat Rai and Sons,
5	Metrology Lab. Manual	M. Adithan and R. Bahn	NITTTR Chandigarh.
6	Statistical Quality Control	M. Mahajan	Dhanpat Rai and Sons
7	Quality control	NITTTR Chennai	Tata McGraw Hill,
8	Quality planning and analysis	Juran U. M. and Gryna	Tata McGraw Hill,
9	Inspection and quality control	National productivity council	N. P. C., New Delhi.
10	Managing for Total Quality	N. Logothetis	Prentice – Hall, Delhi.
11	Statistical Process analysis	Lauth Alwan	Tata McGraw Hill.

B) Software/Learning Websites

1. http://www.creaform-metrology.com
2. www.en.wikipedia.org
3. www.jenoptik.com

C) Major Equipments/ Instruments with Broad Specifications.

1. Vernier Calliper-0-200mm.
2. Micrometer-0-25mm, 25-50mm.
3. Surface Plate-Granite.
4. Vernier Height Gauge and Depth Gauge.
5. Micrometer Depth Gauge.
6. Sine Bar with slip gauge box.
7. Angle gauges box.
8. Universal bevel protractor.
9. Angle dekkor.
10. Optical profile projector.
11. Screw pitch gauge.
12. Combination set box.
13. Floating Carriage Micrometer,
14. Monochromatic light unit.
15. Optical flat.
16. Gauges-plug, ring, snap.
17. Dial Indicator.
18. Gear tooth vernier caliper.
19. Spirit Level.
20. Coordinate Measuring Machine**.**

10.0 MAPPING MATRIX OF PO'S AND CO'S:

Course Outcomes	Programme Outcomes										
	a	**b**	**c**	**d**	**e**	**f**	**g**	**h**	**i**	**j**	**k**
CO1	H	M						L			
CO2		H	M								
CO3	H		M					L			
CO4				H		M					
CO5			H								
CO6				H							
CO7	H										H

H: High Relationship, M: Moderate Relationship, L: Low Relationship.

PROGRAMME : Diploma Programme in Automobile Engineering (AE)
COURSE : Vehicle Dynamics and Aerodynamics (VDA) **COURSE CODE :** 6446

TEACHING AND EXAMINATION SCHEME:

Teaching Scheme				Examination Scheme								
Hrs / week			Credits	TH Paper Hrs.	Marks							
TH	TU	PR				TH	TEST	TH+TEST	PR	OR	TW	TOTAL
04	--	02	06	03	Max.	80	20	100	--	25	25	150
					Min.	32	--	40	--	10	10	--

1.0 RATIONALE:

This course intends the student to apply the concept and working principle of the major assemblies of the vehicle and their construction / developments, performance of vehicle and its stability, dynamics for the safe riding, body construction and the modern trends in automobile.

2.0 COURSE OBJECTIVES:

The student will be able to,

1. Identify various forces and moments associated with aerodynamics.
2. Gain thorough understanding of different types of vehicles.
3. Understand physics of fluid flow over body.
4. State and illustrate application of ergonomics and safety in designing of vehicle body.
5. Select appropriate process for designing of vehicle body with aesthetic appearance.
6. Understand performance of the vehicle

3.0 COURSE OUTCOMES:

The course content should be taught and learning imparted in such a manner that students are able to acquire required learning outcome in cognitive, psychomotor and affective domain to demonstrate following course outcomes:

1. Select proper materials for two wheeler and four wheeler frame.
2. Differentiate between requirements of Driver, Child and Passenger seat.
3. List out various types of car bodies.
4. Take precaution while designing car components.
5. Develop driving skill require in cross wind and on slope.
6. Operate proper gear shift mechanism in different road condition.

4.0 COURSE DETAILS:

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics	Hours
Unit-I **Fundamentals of Aerodynamics**	1a. Classification & practical objectives of aerodynamics 1b. Explain aerodynamics forces and moments.	1.1 Introduction of aerodynamics: Historical Examples and future trends. 1.2 Classification & practical objectives of aerodynamics 1.3 Fundamental aerodynamic variables like Pressure, Density, Temperature, Flow velocity. 1.4 Aerodynamic forces & moments like Relative Wind, Free Stream, Lift and Drag. 1.5 Concept of airfoil and air dam.	09
Unit-II **PART A Ergonomic**	2a. Compare seat design requirement as per application 2b. Illustrate effects of	2.1 Concept of Visibility 2.2 Concept of Blind spot 2.3 Driver seat design requirement 2.4 Passenger seat design requirement	09

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics	Hours
consideration **PART B: Aerodynamics properties of basic shape**	aerodynamic properties	2.5 Child seat design requirement 2.6 Aerodynamic properties 2.7 Lift & pitching. 2.8 Side forces & yaw moment. 2.9 Rolling moment	
UNIT-III **Fundamentals of Aerodynamic Drag**	3a. Describe car bodies. 3b. Explain effects of external device of car on Aerodynamic 3c. Illustrate wind tunnel testing procedure.	3.1 Types of car bodies. 3.2 Flow field around the car -Air flow pattern, Pressure distribution 3.3 Local origins of flow field - Front end, windshield wiper, A pillar, Roof, Rear end 3.4 Water and dirt accumulation on the body -Safety, water flow, Dirt Deposits 3.5 Wind tunnels: ▪ Concept (no analytical treatment) ▪ Construction ▪ Existing wind tunnels: Large, Small full scale wind tunnel, Wind tunnel for scale model, Climatic tunnel, Climatic wind chamber 3.6 Wind noise: ▪ Wind noise sources: Leak noise, Cavity noise, Wind- rush noise; • Design features of A-pillar, outside rear view mirror, Wind shield wipers, Radio antenna, Roof racks, Doors.	24
UNIT-IV **Directional Stability**	4a. Define stability 4b. Formulate stability on slope and turns	4.1 Aerodynamic stability 4.2 Driving behaviour in cross wind 4.3 Driving with trailer 4.4 Stability of vehicle on slope (derivation & numerical problems) Stability of vehicle on turns (derivation & numerical problems)	11
UNIT-V **Vehicle Performance (numerical problems)**	5a. State effects of air resistance. 5b. Define terminology related with aerodynamic resistance. 5c. Solve problem on air resistance.	5.1 Various resistances faced by vehicle (air, rolling, gradient) 5.2 Power required to propel the vehicle 5.3 Maximum Drawbar pull 5.4 Tractive efforts, Traction, 5.5 Relation between vehicle & engine speed. 5.6 Acceleration and grade ability	11
		TOTAL	**64**

5.0 SUGGESTED SPECIFICATION TABLE WITH MARKS (THEORY):

Unit No.	Unit Title	Distribution of Theory Marks			
		R Level	U Level	A and above Levels	Total Marks
I	Aerodynamics	02	04	06	12
II	Ergonomic Consideration	02	04	06	12
III	Fundamental of Aerodynamics Drag	06	08	12	26

Unit No.	Unit Title	Distribution of Theory Marks			
		R Level	U Level	A and above Levels	Total Marks
IV	Directional Stability	04	04	08	16
V	Vehicle performance	02	04	08	14
	TOTAL	**16**	**24**	**40**	**80**

6.0 ASSIGNMENTS/PRACTICALS/TASKS:

S. No.	Unit No.	Practical Exercises	Approx. Hrs. required
1	II	Study of ergonomics of human body & hence the design of driver's and passenger's seat.	04
2	II	Comparison of visibility of different vehicles. Prepare a report.	04
3	III	Study of wind tunnel and procedure for wind load distribution on various body structures.	04
4	III	Procedure of measurement of air drag in wind tunnel.	04
5	III	Simple sketches of airflow patterns on various types of vehicle.	04
6	IV	Compile effect of stability of vehicle on slope and turning	04
7	--	Case study of an accidental vehicle, which took place due to improper body rework /body building.	04
8	--	Prepare aerodynamic shape with the help of Graphics Software.	04
		TOTAL	**32**

7.0 STUDENT ACTIVITIES:

Following is the list of proposed student activities like

1. Collect market rates for various vehicle components like clutch, gear box, brake shoes, wheels etc.
2. Form a chart of different car body shapes.
3. Collect different parts of Constant mesh gear box.
4. List out common trouble shooting in Brake system.

8.0 SPECIAL INSTRUCTIONAL STRATEGIES (If any):

1. Show video/Animation on working of chassis components.
2. Arrange a visit to ST Workshop or any other service centre, body building industry.
3. Arrange expert seminar of industry person in the area of Vehicle Body shop.

9.0 LEARNING RESOURCES:

A) Books

Sr.No.	Title of Book	Author	Publication
1	Mechanisms of Car	A. W. Judge, Lloyd S. R.	Pearsons
2	Automotive Mechanics	Joseph Heither	Bennett & McKnight
3	Automotive Mechanics	William Crouse	TTMGH
4	Automotive Engineering	G. B. S. Narang.	Tata McGraw Hill
5	Auto Engineering	Krupal Singh. Vol-I	Standard
6	The Automobile	Harbans Singth Royat.	S. Chand
7	Problem in Automobile Mechanics	Dr. N. K. Giri.	Khanna Publications
8	Theory of machines	D. L Ballaney.	Dhanpat Rai & Sons

B) Software/Learning Websites

1. http://www.auetocarindia.com

C) Major Equipments/ Instruments with Broad Specifications

1. Wheel drive chassis.
2. ABS simulator
3. Hydraulic Power steering system model

10.0 MAPPING MATRIX OF PO'S AND CO'S:

Course Outcomes	Programme Outcomes										
	a	**b**	**c**	**d**	**e**	**f**	**g**	**h**	**i**	**j**	**k**
CO1	H										
CO2		H									
CO3							M				
CO4	M					L					
CO5				L			M				
CO6			H				H				

H: High Relationship, M: Moderate Relationship, L: Low Relationship.

PROGRAMME : Diploma Programme in Automobile Engineering (AE)
COURSE : Automobile Engines – II (AUE) **COURSE CODE :** 6447

TEACHING AND EXAMINATION SCHEME:

Teaching Scheme				Examination Scheme							
Hrs / week			Credits	TH Paper Hrs.	Marks						
TH	TU	PR				TH	TEST	TH+TEST	PR	OR	TW	TOTAL
03	--	02	05	03	Max.	80	20	100	--	25	25	150
					Min.	32	--	40	--	10	10	--

*** Indicates TW to be assessed by external and internal examiners.**

1.0 RATIONALE:

The environmental pollution and fuel crisis are severe problems that world is facing today. To obtain the better fuel economy and to reduce air pollution the automobile technology has changed to a great extent. To be conversant with recent trend in engine management the automobile engineer should have adequate knowledge of latest techniques adopted in automobile engines.

2.0 COURSE OBJECTIVES:

The student will be able to,

1. Understand fuel air cycles
2. Know various fuels, their properties & alternate energy options for auto engines.
3. Understand mechanism of combustion
4. Understand computer controlled fuel-injection system
5. Understand various setting / parameter for fuel economy.
6. Understand air pollution from exhaust and its control.
7. Understand tune-up of engine

3.0 COURSE OUTCOMES:

The course content should be taught and learning imparted in such a manner that students are able to acquire required learning outcome in cognitive, psychomotor and affective domain to demonstrate following course outcomes:

1. Identify the different performance characteristics and variables of Engine
2. Sketch the P-V diagram for SI and CI Engine.
3. Distinguish different between in SI and CI Engine combustion.
4. Judge and Analyse different Engine tune-up process.
5. Evaluate different methods to control fuel injection and spark advance control system.
6. List out different fuel additives and their effects.

4.0 COURSE DETAILS:

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics	Hours
Unit-I **Fuel Air Cycles**	1a. Understand air standard cycle & fuel air cycle 1b. List out Advantages of a multi-cylinder engine. 1c. Compare performance Characteristics. 1d. Difference between SI and CI Engines.	1.1 Introduction 1.2 Fuel Air Cycle, Use of Fuel Air cycle 1.3 Comparison of air standard cycle & fuel air cycle. 1.4 Comparison of SI and CI engines. 1.5 Thermal efficiency and fuel consumption 1.6 Comparison of SI & CI engines on the basis of performance characteristics. 1.7 Reason for using multi-cylinder diesel engine for commercial vehicles.	06

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics	Hours
		1.8 Advantages of a multi-cylinder engine	
Unit-II **Theory of combustion**	2a. Ignition limits, explain stages of combustion in SI engine. 2b. Describe Abnormal combustion- Detonation, pre-ignition, supercharging, surface ignition, Effects of detonation, Diesel knock 2c. Describe Stages of combustion in CI engine, 2d. Types of SI & CI engine combustion chambers	2.1 Introduction 2.2 Combustion in SI engine, Ignition limit 2.3 Stages of combustion in SI engine 2.4 Effect of engine variables on Ignition lag. 2.5 Effects of engine variables on flame propagation 2.6 Abnormal combustion- Detonation, pre-ignition, scavenging, supercharging, surface ignition, Effects of detonation. 2.7 Control of detonation. 2.8 SI engine combustion Chambers 2.9 Stages of combustion in CI engine 2.10 Delay period and variables affecting delay period. 2.11 Diesel knock and its control. 2.12 CI engine combustion chambers	10
UNIT-III **Engine tune-up**	3a. Describe Equipment for engine tuning 3b. Compression test procedure, spark plug servicing.	3.1 Introduction 3.2 Equipment for engine tuning compression tester, vacuum gauge, dwell meter, timing light, colour tune, engine stethoscope, hydrometer. 3.3 Compression test, vacuum test 3.4 Spark plugs, cleaning and testing 3.5 Ignition Timing 3.6 Supplementary Tune-up services Carburettor Tune-up.	04
UNIT-IV **Fuel Economy Air pollution and Emission Control**	4a. Know the fuel economy standard 4b. State different causes and remedies for CI and SI engine emission 4c. Explain working of different emission control system. 4d. Know the different sources of pollutants in I.C. Engines.	4.1 Fuel Economy standards 4.2 Methods of improving fuel economy. 4.3 Pollutants from gasoline engines. 4.4 Effect of engine maintenance on exhaust emission 4.5 Gasoline engine emission control 4.6 Diesel emission 4.7 Diesel smoke and control 4.8 Comparison of diesel and gasoline emission 4.9 Exhaust Gas Recirculation (EGR). 4.10 Air Injection system 4.11 Early fuel evaporation system 4.12 Heated Air- Inlet system 4.13 Evaporation emission control system. 4.14 Positive crankcase ventilation (PCV) 4.15 Euro Norms and Bharat stage norms.	10
UNIT-V **Computer controlled Fuel-Injection**	5a. Types of fuel injection system 5b. Explain function of ECM in injection system	5.1 Introduction. 5.2 Throttle body injection (TBI) system. 5.3 Port fuel injection (PFI) system. 5.4 Multi-Point fuel Injection system (MPFI) 5.5 Electronic control module (ECM).	08

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics	Hours
System	5c. Differentiate TBI and MPFI. 5d. Explain Spark advance control and Fuel injection control 5e. Understand benefits of CRDI.	5.6 Inputs and outputs of electronic control module (ECM) 5.7 Fuel Injection control Idle speed control Exhaust gas re-circulation control and other controls. 5.8 Electronically controlled diesel Injection pump 5.9 Glow plug circuits. 5.10 Common Rail Direct Injection	
UNIT-VI **Fuels & Alternative Energy options for Auto Engines**	6a. Know the properties of fuels, fuel additives. 6b. Know the alternative fuels for vehicles. 6c. Explain working of Electric cars, hybrid vehicles.	6.1 Different types of fuels and their calorific values 6.2 Properties of S. I. Engine fuel, C. I. Engine fuels 6.3 Fuel additives and its effects 6.4 Alternative fuels for IC engines 6.5 LPG as SI engine fuels. 6.6 Alcohol as gasoline fuel. 6.7 Alcohol as diesel fuels. 6.8 Natural gas as a Transport fuel. 6.9 Hydrogen as a fuel. 6.10 Electric cars and hybrid vehicles. 6.11 Fuel Cells (Introduction)Biodiesel	06
UNIT-VII **Noise reduction and control**	7a. Sate the Sources of noise, Instrument used. 7b. Explain NVH	7.4 Sources of noise 7.5 Instrument used for its measurement 7.6 NVH: Noise, vibration & Harshness: Fundamentals & measurements, Resonance	04
		TOTAL	**48**

5.0 SUGGESTED SPECIFICATION TABLE WITH MARKS (THEORY):

Unit No.	Unit Title	Distribution of Theory Marks			
		R Level	U Level	A and above Levels	Total Marks
I	Fuel Air Cycles	02	02	06	10
II	Theory of combustion	02	04	06	12
III	Engine tune-up	02	04	04	10
IV	Fuel Economy Air pollution and Emission Control	02	06	08	16
V	Computer controlled Fuel-Injection System	02	06	08	16
VI	Fuels & Alternative Energy options for Auto Engines	02	02	08	12
VII	Noise reduction and control	--	--	04	04
	TOTAL	**12**	**24**	**44**	**80**

6.0 ASSIGNMENTS/PRACTICALS/TASKS:

Sr. No.	Unit No.	Practical Exercises (Outcomes in Psychomotor Domain)	Approx. Hrs. required
1	I	Remove the multi cylinder Petrol engine from a vehicle dismantles, clean, inspect, repair, replace and reassemble the engine.	08
2	I	Observe combustion chamber of multi cylinder S.I. and C. I. Engine	04

Sr. No.	Unit No.	Practical Exercises (Outcomes in Psychomotor Domain)	Approx. Hrs. required
		and single cylinder 2/4 stroke engine	
3	III	Identify, observe various sensors, actuators and ECM of MPFI engine. Draw a layout and write a report.	04
4	III	Spark Plug Tester and Cleaner	02
5	IV	Computerised Exhaust Gas analysis of Petrol engine, Diesel engine. Diagnose engine condition from Exhaust Gas analysis.	04
6	V	1. Service & diagnose Electronic Fuel Injection (EFI) system with Scan tool.	02
7	VI	Identify and observe the components of Common Rail Direct Injection (CRDI) System.	04
8	VII	Identify & observe the EGR & PCV system used in an engine and draw layout.	02
9	VIII	Noise level measurement by dB meter	02
10	--	Visit to a model service centre (Authorised).	--
		TOTAL	**32**

7.0 STUDENT ACTIVITIES:

Following is the list of proposed student activities like

1. Collect market rates for various engine components
2. Form chart of causes and remedies of various engine part
3. Collect information of types of fuels
4. List out common trouble shooting in engine.

8.0 SPECIAL INSTRUCTIONAL STRATEGIES (If any):

1. Show video/Animation on working of engine components.
2. Arrange a visit to ST Workshop or any other service centre.
3. Arrange expert seminar of industry person in the area of engine design.

9.0 LEARNING RESOURCES:

A) Books

Sr.No.	Title of Book	Author	Publication
1	A course in internal combustion engine	M. L Mathur	Danpat Rai & sons Delhi 1995
2	Internal combustion engines	V. Ganeshan	Tata McGraw Hill
3	Automobile Principles	Don Knowles	Prentice Hall Inc
4	Auto mechanics (Understanding new techniques)	Don Knowles	Prentice Hall Inc New Jersy 1988
5	Santro & Accent Basic training Book		Hyundai Motors India Ltd.
6	Automobile Engineering	Kirpal Singh(1, 2)	Standard Publication
7	Automotive Mechanics	William Crouse	T. M. G. H.

B) Software/Learning Websites

1. www.nptel.com
2. www.aera.org
3. www.autoshop101.com

C) Major Equipments/ Instruments with Broad Specifications

1. Noise level measurement by dB meter
2. Spark Plug Tester and Cleaner
3. Scan Tool
4. Compression test

10.0 MAPPING MATRIX OF PO'S AND CO'S:

Course Outcomes (Co's)	Programme Outcomes (Po's)										
	a	**b**	**c**	**d**	**e**	**f**	**g**	**h**	**i**	**j**	**k**
CO1	H	H	M							H	
CO2		H	H	M				H		M	
CO3	M	H	L	M	M	L					
CO4	L	H				M	H	M	M	H	
CO5	H	L	H	H	M	L	H	M	L	M	
CO6			H		M	H	L	H	M	H	

H: High Relationship, M: Moderate Relationship, L: Low Relationship.

PROGRAMME : Diploma Programme in Automobile Engineering (AE)
COURSE : Design of Auto Components (DAC) **COURSE CODE :** 6448

TEACHING AND EXAMINATION SCHEME:

Teaching Scheme				Examination Scheme								
Hrs. / week			Credits	TH Paper Hrs.	Marks							
TH	TU	PR				TH	TEST	TH+TEST	PR	OR	TW	TOTAL
04	--	02	06	04	Max.	80	20	100	--	25	25	150
					Min.	32	--	40	--	10	10	--

1.0 RATIONALE:

In automobile industry / and other related areas, the Diploma Engineers come across the situations involving design & drafting of machine components & assemblies incorporating various aspect of design such as strength, rigidity, functional design, Ergonomics considerations, Economy, Selecting appropriate materials & heat treatment for manufacturing the machine parts. Due to fast development / modifications in field of Automobile as per varying needs and competitions, there is a challenge in design sector to meet the requirement with minimum possible time and cost. Hence it is essential to have the design practice to an automobile engineer. This course is designed to initiate such practice in a diploma technician.

2.0 COURSE OBJECTIVES:

The student will be able to,

1. Identify, Define and List out the loads and Stresses on Automobile Components.
2. Read and Recognize post design aspects for Automobile Components.
3. Apply, Illustrate and Utilize procedure of design for Automobile Components.
4. Evaluate and Judge use of design data book and select various related standards in automobile.
5. Operate and Practice software used for design of automobile components.
6. Design Automobile engine and chassis components i.e. cylinder, piston, crankshaft, connecting rod, leaf spring etc.

3.0 COURSE OUTCOMES:

The course content should be taught and learning imparted in such a manner that students are able to acquire required learning outcome in cognitive, psychomotor and affective domain to demonstrate following course outcomes:

1. Read, Select and State loads and stresses on automobile components with their application.
2. Analyze and inspect design aspects for automobile components.
3. Formulate and propose procedure of design automobile components.
4. Integrate the information from design data book and relate the required specifications from standards in automobile.
5. Plan, Recommend and score the use of software for design of automobile components.
6. Distinguish, Generalize and Rank the design of cylinder, piston and crankshaft, leaf spring like automobile engine and chassis components.

4.0 COURSE DETAILS:

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics	Hours
Unit-I **Basic Concepts of Design and Drawing**	1a. Description of Standard Design procedure 1b. Description of Stress analysis on any component of Automobile engineering 1c. Read Stress – strain diagram for ductile & brittle material 1d. Write Variable stresses in machine parts. 1e. Classification of method of theories of failure	1.1 Introduction to design 1.2 Design procedure 1.3 Stress analysis: Types of external loads; Types of induced stresses: tensile, compressive, shear, Crushing and bearing pressure, bending, torsion, thermal stresses, creep, proof stresses, resilience, principal stresses 1.4 Stress – strain diagram for ductile & brittle material 1.5 Variable stresses in machine parts, fatigue & endurance limit, stress – time diagrams for variable stresses 1.6 Factor of safety, selection of factor of safety 1.7 Stress concentration causes and remedies 1.8 Introduction to theories of failure – Maximum principal stress theory, Maximum shear stress theory and Distortion energy theory	06
Unit-II **Standard Machine Elements**	2a. Select material and justifications for Automobile components. 2b. State Serial Number, model number in design practice. 2c. State common types of machine element 2d. State Design methods for any component	2.1 Selection of material and justifications for Automobile components. Advanced Materials for automotive components, commercial designation of material components 2.2 Concept of standardization, preferred numbers & interchange ability in design practice. 2.3 Common types of fasteners with their applications -Through Bolts, tap bolts, studs, cap screws and machine screws, designation of screw thread according to I. S., stresses in screw fasteners, Bolts of uniform strength. 2.4 Bearings - Classification, location in Automobiles systems & selection of bearings 2.5 Post design aspects - Ergonomic aspect, Aesthetic consideration (shape, colour, surface finish) for Automobile	08
Unit-III **Design of Machine Elements**	3a. Write Standard procedure of Design for different types of Joints. 3b. Write Standard procedure of Design of shaft and its failure theories 3c. State Types of	3.1 Design of socket & spigot type cotter joint, knuckle joint and Turn buckle 3.2 Applications of above machine elements in an automobile. 3.3 Design of shaft for torsion, rigidity, bending, combined Torsion & bending, Comparison of solid & hollow shafts. ASTM procedure 3.4 Types of keys and their applications, design of sunk rectangular key, Effect of keyways on shaft.	12

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics	Hours
	keys 3d. Explain Design of couplings.	▪ Concept of whirling and critical speed of shaft. ▪ Design of propeller shaft. 3.5 Design of couplings- flange and bush pin type flexible	
Unit-IV **Design of levers and Power screws**	4a. State Types of levers and its design procedure 4b. Description of Profiles of power screws 4c. Write design procedure of screw jack and C-clamps	4.1 Types of levers 4.2 Design of following levers for rectangular cross-section & fulcrum pin only, rocker arm, bell crank lever, hand lever 4.3 Profiles of power screws; self-locking and overhauling screws 4.4 Design of screw jack and C-clamps	12
Unit-V **Design of Chassis Component**	5a. State Standard procedure for design of clutch 5b. Calculate Teeth of gears for different gear box 5c. Write Standard Design procedure for spring. 5d. Tell Standard procedure for Design of Fully Floating Rear Axle	5.1 Design of clutch- Single plate & Multi plate using uniform pressure and wear condition. 5.2 Teeth calculation of gears for sliding mesh/constant mesh gear box for given data. 5.3 Concept of minimum Number of teeth on spur gear. 5.4 Design of semi elliptical leaf spring, helical spring – torsion & compression 5.5 Design of Fully Floating Rear Axle 5.6 Concept of nipping in springs.	16
Unit-VI **Design of engine components**	6a. Write Standard procedure of design of engine component	6.1 Data of engine specifications and calculations of cylinder dimensions for given power 6.2 Design of cylinder head thickness and bolts 6.3 Design of valve seat & valve lift 6.4 Design of piston crown by bending strength and thermal considerations 6.5 Design of piston rings and skirt length 6.6 Design of piston pin for bearing, bending & shear considerations 6.7 Design of connecting rod cross -section (I section) 6.8 Design of big end, cap and bolts 6.9 Design of overhung crank shaft	10
TOTAL			**64**

5.0 SUGGESTED SPECIFICATION TABLE WITH MARKS (THEORY):

Unit No.	Unit Title	Distribution of Theory Marks			
		R Level	U Level	A and above Levels	Total Marks
I	Basic Concepts of Design and Drawing	02	02	04	08
II	Standard Machine Elements	02	04	04	10

Unit No.	Unit Title	Distribution of Theory Marks			
		R Level	U Level	A and above Levels	Total Marks
III	Design of Machine Elements	02	02	10	14
IV	Design of levers and Power screws	02	04	06	12
V	Design of Chassis Component	06	08	10	24
VI	Design of engine components	04	04	04	12
	TOTAL	**18**	**24**	**38**	**80**

Legends: R = Remembrance (Knowledge); U = Understanding; A = Application and above levels (Revised Bloom's taxonomy)

Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.

6.0 ASSIGNMENTS/PRACTICALS/TASKS:

The tutorial/practical/assignments/tasks should be properly designed and implemented with an attempt to develop different types of cognitive and practical skills **(Outcomes in cognitive, psychomotor and affective domain)** so that students are able to acquire the competencies.

***Note**: Here only outcomes in psychomotor domain are listed as practical/exercises. However, if these practical/exercises are completed appropriately, they would also lead to development of **Programme Outcomes/Course Outcomes in affective domain** as given in a common list at the beginning of curriculum document for this Programme. Faculty should refer to that common list and should ensure that students also acquire those Programme Outcomes/Course Outcomes related to affective domain.*

Sr. No.	Unit No.	Practical Exercises (Outcomes in Psychomotor Domain)	Approx. Hrs. required
1	I,II	Assignment on selection of material for different machine parts, important material designations charts as per IS specification	02
2	I,II	Survey of different standard bearings available in the market along with specifications	02
3	III	Design and Draw a Sheet on Cotter joint / knuckle joint / turn buckle	04
4	III	Design and Draw a sheet on propeller shaft	04
5	IV	Design and Draw a sheet on flexible coupling	04
6	IV	Design and Draw a sheet on screw jack / C-clamp	04
7	V	Design and Draw a sheet on layout of Gear box	04
8	V	Design and Draw a sheet on fully floating rear axle	04
9	V	Design and Draw a sheet on semi-elliptical leaf spring	04
10	--	Prepare 2 models of the above designed parts in commercial modeling software like POR-E/ CATIA/UG-NX.	08
		TOTAL	**32**
(Note: Practical No. 1, 2 and 10 are compulsory and draw any 05 sheets from remaining)			

7.0 STUDENT ACTIVITIES:

Following is the list of proposed student activities like

1. Collect market rates for various automobile engineering materials and specific component list of automobile like bearing, shafts, lever and piston rings washers, nut, bolts or different tool list etc.
2. Collect the standard design procedure of any component of automobile engineering from Industry.
3. Collect Standard Valid drawing of Auto Cad or ProE or Catia for any component of automobile engineering.
4. Collect the application based images of any component of automobile engineering.

5. Collect application based, working based model or actual equipment based videos of any component of automobile engineering.

8.0 SPECIAL INSTRUCTIONAL STRATEGIES (If any):

1. Show Auto cad or Catia or PROE computer software related drawing of automobile components.
2. Arrange expert seminar of industry person in the area of design, drawing, cost estimation and validation of design procedure of any component.

9.0 LEARNING RESOURCES:

A) Books

Sr.No.	Title of Book	Author	Publication
1	Machine Design	R. K. Jain	Dhanpat Rai & Sons
2	Text Book of Machine Design	R. S. Khurmi & J. K. Gupta	Khanna
3	Machine Design	Pandxa & Shah	Charator
4	Motor Vehicle Design	Donkin	
5	Machine Design	Shigley	Tata McGraw Hill
6	Design data Book	P S G Coimbatore	PSG
7	Problems in Auto Engineering	N. K Giri.	Khanna

B) Software/Learning Websites

1. www.nptel.com
2. www.howdesign.com
3. www.machinedesign.com

C) Major Equipments/ Instruments with Broad Specifications

1. Different types of Bearing of actual model
2. Chart on types of load, types of failures theory
3. Different types of Fasteners, screw, nut, bolt, stud etc of actual model
4. Different types of actual model of coupling
5. Different types of actual model of levers
6. Different types of actual model of screw jack and C clamp
7. Different types of actual model of clutches
8. Different types of actual model of Gear Box
9. Different types of actual model of Leaf spring and Helical Spring
10. Different types of actual model of Full floating semi floating rear axle
11. Different types of actual model of engine component like piston, crank shaft and piston pins, connecting rod etc.

10.0 MAPPING MATRIX OF PO'S AND CO'S:

Course Outcomes (Co's)	Programme Outcomes (Po's)										
	a	b	c	d	e	f	g	h	i	j	k
CO1	M	H	L							H	
CO2		H	H	M				H		M	
CO3	L	H	H	M	M	H					
CO4	L	H				M	L	M	M	H	
CO5	H	L	H	H	M	L	L	M			
CO6			H	M	M	H	L	H	H	H	

H: High Relationship, M: Moderate Relationship, L: Low Relationship.

PROGRAMME : Diploma Programme in Automobile Engineering (AE)
COURSE : Automobile Manufacturing Processes-II(AMA) **COURSE CODE :** 6449

TEACHING AND EXAMINATION SCHEME:

Teaching Scheme				Examination Scheme								
Hrs. / week			Credits	TH Paper Hrs.	Marks							
TH	TU	PR				TH	TEST	TH+TEST	PR	OR	TW	TOTAL
04	--	04	08	03	Max.	80	20	100	--	--	50	150
					Min.	32	--	40	--	--	20	--

1.0 RATIONALE:

There are many advances in manufacturing processes and equipments. The knowledge of these advances is essential for a technician engaged in engineering organizations. He should also be proficient in writing CNC programmes and use it in manufacturing industry. This course is intended to develop these abilities.

2.0 COURSE OBJECTIVES:

The student will be able to,

1. Describe the forging process and its applications in manufacturing automobile parts and classify press tools and their operations.
2. Compare different welding process used in industry.
3. Selection and applications of different surface cleaning, coating process & explain different methods of surface finishing.
4. Identify plastic components with different manufacturing methods
5. Classify various heat treatment methods.
6. Write about CNC machines and to write CNC programming.

3.0 COURSE OUTCOMES:

The course content should be taught and learning imparted in such a manner that students are able to acquire required learning outcome in cognitive, psychomotor and affective domain to demonstrate following course outcomes:

1. Identify and Name the forging processes and apply it to produce automobile parts. Sketch the different press tools and Write their operations.
2. Distinguish different welding process used in industry.
3. Judge and Analyse different surface cleaning and coating process and evaluate different methods of surface finishing.
4. Select plastic components with different manufacturing methods.
5. Specify various heat treatment methods.
6. Write and test CNC programme.

4.0 COURSE DETAILS:

Unit No	Major Learning Outcomes	Topic & Subtopic	Hours
Unit-I **Forging**	1.a List Forgeable materials 1.b Tabulate Advantages and limitations of forging process. 1.c Classify various forging processes. 1.d Forging by open and close dies.	1.1 Forgeable materials and forge-ability. 1.2 Advantages and limitations of forging process. 1.3 Various forging operations. 1.4 Forging by open and close dies. 1.5 Forging sequences for connecting rods, crankshafts, camshafts, spanners and gear blanks.	08
Unit-II **Press and press work**	2.a Classify Materials used in press work. 2.b List the Major parts of mechanical press and their functions. 2.c Write Drive mechanisms used on presses. 2.d Collect Parts of standard die set. 2.e Describe Operations which can be performed on presses.	2.1 Materials used in press work. 2.2 Classification of presses. 2.3 Major parts of mechanical press and their functions. 2.4 Drive mechanisms used on presses. 2.5 Operations which can be performed on presses like - Punching, piercing, blanking, forming (Hydro-forming and Stretch forming), drawing. (Press components used in automobiles.) 2.6 Parts of standard die set and types of dies. 2.7 Die accessories- pilots, stops, strippers, types and construction of dies	10
Unit-III **Welding processes**	3.a Classify welding process. 3.b Explain Working principle of Gas welding 3.c Explain Resistance welding 3.d Brazing and soldering.	3.1 Classification of welding process. 3.2 Working principle of Gas welding and types of flames. 3.3 Arc welding process like metal arc, TIG. MIG. 3.4 Resistance welding (spot, projection, seam, butt) 3.5 Brazing and soldering. 3.6 Introduction to Plasma arc welding and electron beam welding.	10
Unit-IV **Surface Treatment and finishing processes**	4.a Select and write use of surface treatment and finishing process 4.b Describe Surface cleaning processes 4.c Describe Surface coating processes 4.d Describe Surface finishing processes	4.1 Selection and use of surface treatment and finishing process 4.2 Surface cleaning processes: Chemical and Mechanical (alkaline, acid and electrolytic cleaning, blasting and tumbling). 4.3 Surface coating processes: electroplating, galvanizing, Metal Spraying, painting. 4.4 Surface finishing processes:	10

Unit No	Major Learning Outcomes	Topic & Subtopic	Hours
		Lapping, honing, super finishing, buffing, burnishing. (Applications from auto industry to be given).	
Unit-V **Plastic Moulding Techniques**	5.a State Compression, transfer, injection, blow, extrusion moulding 5.b Write Calendaring 5.c State Vacuum forming 5.d State Extrusion moulding	5.1 Plastic Materials: Introduction to thermoplastic and thermosetting (concept). 5.2 Compression, transfer, injection, blow, extrusion moulding 5.3 Calendaring 5.4 Vacuum forming 5.5 Laminating,	08
Unit-VI **Heat treatment**	6.a Write need of Fe-C diagram, TTT curves. 6.b Explain Common Heat treatment processes. 6.c Describe Surface hardening methods.	6.1 Introduction (necessity, Fe-C diagram, TTT curves etc.). Concept of phase and phase transformations. 6.2 Common Heat treatment processes and their applications: annealing, normalizing, hardening, tempering, applications and selection of these process. 6.3 Surface hardening methods: Cyaniding, case Carburizing, induction and flame method, Nitriding.	08
Unit-VII **Introduction to CNC machines**	7.a Compare NC and CNC machines. 7.b Classify CNC machines. 7.c Tabulate Advantages and disadvantages of CNC machines. 7.d Describe Working principle of CNC machines. 7.e Write Part programming. a. CNC part programming b. Axes configuration c. Procedure for part programming d. ISO codes used in part programming.	7.1 NC and CNC machines. 7.2 Classifications of CNC machines. 7.3 Advantages and disadvantages of CNC machines. 7.4 Working principle of CNC machines. 7.5 Axes configuration. 7.6 Procedure for part program. 7.7 ISO codes used in part programming. 7.8 CNC part programming. 7.9 Part programming - Do loop, Subroutine, Canned cycle. 7.10 Principle of Computer aided part programming.	10
		TOTAL	**64**

5.0 SUGGESTED SPECIFICATION TABLE WITH MARKS (THEORY):

Unit No.	Unit Title	Distribution of Theory Marks			
		R Level	U Level	A and above Levels	Total Marks
I	Forging	02	04	04	10
II	Press and press work	02	04	06	12
III	Welding processes	02	04	06	12
IV	Surface Treatment and finishing processes	04	04	04	12
V	Plastic Moulding Techniques.	02	04	04	10
VI	Heat treatment	02	02	06	10
VII	Introduction to CNC machines	04	04	06	14
	TOTAL	**18**	**26**	**36**	**80**

Legends: R = Remembrance (Knowledge); U = Understanding; A = Application and above levels (Revised Bloom's taxonomy)

Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.

6.0 ASSIGNMENTS/PRACTICALS/TASKS:

The tutorial/practical/assignments/tasks should be properly designed and implemented with an attempt to develop different types of cognitive and practical skills **(Outcomes in cognitive, psychomotor and affective domain)** so that students are able to acquire the competencies.

***Note**: Here only outcomes in psychomotor domain are listed as practical/exercises. However, if these practical/exercises are completed appropriately, they would also lead to development of **Programme Outcomes/Course Outcomes in affective domain** as given in a common list at the beginning of curriculum document for this Programme. Faculty should refer to that common list and should ensure that students also acquire those Programme Outcomes/Course Outcomes related to affective domain.*

Sr. No.	Unit No.	Practical Exercises (Outcomes in Psychomotor Domain)	Hours
1	I,II	One composite job involving different machining operations: lathe, shaper, slotting, milling and drilling machine operations such as key way cutting, gear cutting by indexing etc. for the batch of 4 to 6 students.	12
2	II	Draw the production drawing for the given job pattern and its sand casting	08
3	VII	One simple part programming job on CNC machine.	08
4	III	One resistance welding job to show the working principle of resistance welding	08
5	II	Draw the sketches of the die components.	08
6	ALL	Visit to press shop to observe various operations and report on the industrial visit as a part of term work.	10
7	ALL	At least one industrial visit be arranged to show the different Milling machines, grinding machines, CNC machines, forging operations, Surface treatment and surface finishing processes.	10
		TOTAL	**64**

7.0 STUDENT ACTIVITIES:

Following is the list of proposed student activities like

1. Collect market rates for various automobile engineering materials and specific component list of forging, Press and Press work, Welding Process.
2. Collect the standard Manufacturing procedure of any component of automobile engineering from Surface treatment and finishing process, Heat Treatment Process and Plastic Manufacturing Process in Industry.

3. Collect Standard Valid drawing of Job or Programme of M code or G code for any component (which produced from NC, CNC Machine) of automobile engineering.
4. Collect the application based images of any component of NC, CNC Machine in automobile engineering.
5. Collect application based, working based model or actual equipment based videos of any component produced by NC, CNC Machine in automobile engineering.

8.0 SPECIAL INSTRUCTIONAL STRATEGIES (If any):

1. Show G Code, M Code computer software related programming for automobile components.
2. Arrange expert seminar of industry person in the area of design, drawing, cost estimation and validation of programming for manufacturing procedure of any component.

9.0 LEARNING RESOURCES:

A) Books

Sr.No.	Title of Book	Author	Publication
1	Elements of Workshop Technology. Vol. -I& II	S. K. Hajra Chaudhary. A. K. Hajra Chaudhary.	Media Promoters & Publishers Pvt. Ltd. Mumbai.
2	Workshop Technology Vol. - I & II.	H. S. Bawa	Tata McGraw-Hill Publishing Co. Ltd. New Delhi.
3	Workshop Technology Part- I, II & ill	Dr. W. A. J. Chapman	ELBS & Edward Arnold (Publishers) Ltd., London.
4	Manufacturing Processes	B. H. Amstead, Phillip Ostwald, Myron! Begeman.	John Wiley & Sons (Eighth Edition)
5	CNC machines programming & applications.	Aditan, Pabla	Willey Estam Ltd.
6	Production Technology	H. M. T.	H. M. T.

B) Software/Learning Websites

1. www.nptel.com

C) Major Equipments/ Instruments with Broad Specifications

1. Different types of Job or work piece of Forging, Welding, Heat Treatment of actual model
2. Chart on types of Forging, Welding and Heat Treatment methods
3. Images of different types jobs of Forging, Welding and Heat Treatment etc. of actual model and Images of CNC, NC Machines.
4. Different types of actual model of CNC, NC Machine, Drill Machine, Milling Machine

10.0 MAPPING MATRIX OF PO'S AND CO'S:

Course Outcomes (Co's)	Programme Outcomes (Po's)										
	a	b	c	d	e	f	g	h	i	j	k
CO1	H	M		L					M	H	H
CO2	M	H	H	M	H	M		M		M	H
CO3	M	H	H		M	L					L
CO4		L	L	M	M	M	L			H	M
CO5	L				L	L				M	H
CO6	H	H	H	H	L			H	M	H	H

H: High Relationship, M: Moderate Relationship, L: Low Relationship.

PROGRAMME : Diploma Programme in Automobile Engineering (AE)
COURSE : Automobile Electrical and Electronic Systems(AEE) **COURSE CODE :** 6450

TEACHING AND EXAMINATION SCHEME:

Teaching Scheme				Examination Scheme								
Hrs / week			Credits	TH Paper Hrs.	Marks							
TH	TU	PR				TH	TEST	TH+TEST	PR	OR	TW	TOTAL
04	--	02	06	03	Max.	80	20	100	--	25	25	150
					Min.	32	--	40	--	10	10	--

1.0 RATIONALE:

Electrical and Electronic system in an automobile as a part of rules and regulation and safety point of view is an important area, which is modified / re-engineered, needs knowledgeable engineer to look after such activities and its maintenance.

The microprocessor control is replacing other related controls in the automobile and is increasing at an outstanding rate and will be controlling most electrical and mechanical functions of the automobile. This courses aims at imparting the basic knowledge of automobile electrical and electronic circuits, microprocessor control technology used in modern vehicles.

2.0 COURSE OBJECTIVES:

The student will be able to,

1. Know construction and working of battery, its charging procedure, maintenance
2. Understand starting system, current drawn during starting.
3. Know electronics and computer ignition controlled system.
4. Understand various automotive sensors and Control technology used.
5. Understand mechanism used to generate electricity, its capacity.
6. Describe construction and working of various electric components.
7. Understand microprocessor controlled system.

3.0 COURSE OUTCOMES:

The course content should be taught and learning imparted in such a manner that students are able to acquire required learning outcome in cognitive, psychomotor and affective domain to demonstrate following course outcomes:

1. Apply the knowledge of electricity and magnetism to electrical equipments.
2. Identify the types of batteries and their working.
3. Understand the working of charging system.
4. Explain the working of starting system and various drives.
5. Identify Ignition systems of automobiles.
6. Understand the use and working of various sensors in automobiles.
7. Understand the working of lighting system of an automobile.

4.0 COURSE DETAILS:

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics	Hours
Unit-I **Magnetism and Electricity**	1a. Understand Magnetism and Electricity 1b. Identify types of circuits 1c. Colour coding of wires	1.1 Electricity and Ohm's law 1.2 Electrical Measurement 1.3 Types of electric circuits: Series and Parallel 1.4 Magnetism, Electromagnetism 1.5 Semi Conductor, Diodes, Transistors and microprocessors 1.6 Colour coding of wires, wire harness, cable connectors and symbols used for electrical and electronic devices.	06

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics	Hours
Unit-II **Battery**	2a. Working of battery 2b. Battery Rating charging and testing of battery	2.1 Battery: Function, Types & Design 2.2 Battery Operation 2.3 Lead Acid Battery 2.4 Maintenance Free Batteries and Dry Charged Batteries 2.5 Battery Capacity 2.6 Battery Rating 2.7 Battery Charging 2.8 Battery Testing 2.9 Battery Troubles & Maintenance	08
Unit-III **Charging System**	3a. Identify components of Charging System 3b. Maintenance and troubleshooting of charging system	3.1 Generator: Principle and Construction. 3.2 Generator Output Control 3.3 Testing Troubleshooting & Maintenance of Generator 3.4 Alternator components, operation. 3.5 Alternator Regulation 3.6 Alternator Tests and servicing 3.7 Charging system for two / four wheelers 3.8 Electronic charging system 3.9 Comparison of Alternator & DC Generator	08
Unit-IV **Starting System**	4a. Working of Starting System 4b. Various drives of starting system	4.1 Starting motor design and operation 4.2 Starter Drives: Bendix, Overrunning Clutch, Dyer 4.3 Starting motor switches and control circuit 4.4 Electronic starter Control 4.5 Testing of Starting system 4.6 Starting system troubleshooting	10
Unit-V **Electronics and Computer Ignition Controlled System**	5a. Ignition system of an IC engine 5b. Electronic ignition system 5c. CDI ignition system	5.1 Introduction to Electronic Ignition system, its components and operation 5.2 High-energy Ignition system (HEI) 5.3 Computer controlled coil ignition system. 5.4 Electronic spark advance 5.5 Capacitor Discharge Ignition(CDI) system 5.6 Distributor less Ignition Systems 5.7 Hall-Effect Switch 5.8 Detonation Sensor (Knocking Sensor) 5.9 Comparison of electronic / computer ignition system with conventional ignition system	10
Unit-VI **Automotive sensors and Actuator**	6a. Working of various automotive sensors and actuator 6b. Compare sensors and actuators.	6.1 Introduction to Automotive Sensors 6.2 Types of sensors: Resistive, Voltage generating and Switch type 6.3 Actuator and its function 6.4 Types of Actuators: Stepper motor and Solenoid 6.5 Comparison of Sensor and Actuator	08

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics	Hours
Unit-VII **Lighting system**	7a. Working of lighting system of an automobile	7.1 Introduction 7.2 Circuit diagrams 7.3 Wire 7.4 Head lights and Aiming of head lights 7.5 Lighting Switches 7.6 Application of lighting system in automobile: Head lamp, Tail lamp, Brake lamp, Parking lamp, Indicating lights, Fog lamps, Upper, Dipper, Blinkers	08
Unit-VIII **Accessories**	8a. Accessories	8.1 Direction Indicator and Hazard Flashers 8.2 Speedometer and Odometer 8.3 Tachometer 8.4 Horn 8.5 Windscreen Wiper and Washer 8.6 Power Windows and Door locking system	06
		TOTAL	**64**

5.0 SUGGESTED SPECIFICATION TABLE WITH MARKS (THEORY):

Unit No.	Unit Title	Distribution of Theory Marks			
		R Level	**U Level**	**A and above Levels**	**Total Marks**
I	Magnetism and Electricity	02	02	02	06
II	Battery	02	02	02	06
III	Charging System	06	02	02	10
IV	Starting System	04	06	08	18
V	Electronics and Computer Ignition Controlled System	04	04	08	16
VI	Automotive sensors and Actuator	04	02	02	08
VII	Lighting system	02	02	04	08
VIII	Accessories	02	02	04	08
	TOTAL	**26**	**22**	**32**	**80**

Legends: R = Remembrance (Knowledge); U = Understanding; A = Application and above levels (Revised Bloom's taxonomy)

Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.

6.0 ASSIGNMENTS/PRACTICALS/TASKS:

The tutorial/practical/assignment/task should be properly designed and implemented with an attempt to develop different types of cognitive and practical skills **(Outcomes in cognitive, psychomotor and affective domain)** so that students are able to acquire the desired programme outcome/course outcome.

Note*: Here only outcomes in psychomotor domain are listed as practical/exercises. However, if these practical/exercises are completed appropriately, they would also lead to development of* ***Programme Outcomes/Course Outcomes in affective domain*** *as given in the mapping matrix for this course. Faculty should ensure that students also acquire Programme Outcomes/Course Outcomes related to affective domain.*

Sr. No.	Unit No.	Practical Exercises (Outcomes in Psychomotor Domain)	Hours.
1	I	Study of Basic electrical parameters, types of cables and colour coding of wires and electric circuit, ohms law(From Electrical Wiring Simulator)	04
2	II	Check the specific gravity of an electrolyte of given battery with hydrometer & report the condition of the battery.	02
3	III	Connect battery for charging and observe electrical parameters OR Write down reconditioning procedure of battery. OR Conduct the load test on given battery / alternator output test.	04
4	IV	Study of Charging System (For two or Four Wheeler)	04
5	IV	Study of Starting System OR Visually inspect starter components such as bushing, bearing, brushes and drives and determine their serviceability.	04
6	IV	Study of Electronic Ignition System	02
7	V	Study of Different Sensor and Actuator	02
8	VI	Testing of head beam: instrument head beam aligner	04
9	VII	Study of Ignition System(From Experimental Setup/Simulator)	02
10	VII	Study of Automatic Power Window Trainer	02
11	VIII	Study of Automatic Door Lock System	02
		TOTAL	**32**

7.0 STUDENT ACTIVITIES:

Following is the list of proposed student activities like

1. Prepare small circuits for sound and lighting applications
2. Fault finding in the given circuits

8.0 SPECIAL INSTRUCTIONAL STRATEGIES (If any):

1. Use videos for correct understanding of concepts.
2. Use of PowerPoint presentations and animations

9.0 LEARNING RESOURCES:

A) Books

Sr.No.	Title of Book	Author	Publication
1.	Auto mechanics guide to Electronic Instrumentation	Lynn Mosher	Prentice – Hall Inc New Jersey 1987
2.	Automotive Electronics & Compression controlled lighting system	Don Knowles	Prentice Hall Inc New Jersey 1988
3.	Advanced Electronics Diagnosis of Automobile	Don Knowles	Prentice Hall Inc New Jersey 1988
4.	Auto mechanics Understanding New Technology	Don Knowles	Prentice Hall Inc New Jersey 1988
5.	Santro & Accent Basic training Book	--	Hyundai motors Ltd.
6.	Service manuals of all Euro-II cars	--	Maruti Udyog India Ltd.
7.	Automobile Electrical & Electronic equipment	Young & Griffiths Revised by G. E Fardin	The English Language Book society & Newness – Butterworth London
8.	Automobile Engineering vol. 1 & 2	Kripal Singh	Standard Publishers Distributors
9.	Automotive Mechanics	Crouse-Anglin	Tata McGraw-hill Publication
10.	Automobile Electrical Equipments	PL Kohli	TMM

B) Software/Learning Websites

1. http://www.lukas-TVS.com
2. http://www.iav.com/Home/Engineering/Light-Vehicles/VehicleElectronics
3. http://www.automotive-online.com
4. http://www.howcarworks.com/basics.html
5. http://www.firestonecompleteautocare.com/

C) Major Equipments/ Instruments with Broad Specifications

1. Fault finding kits for electrical and electronics systems.
2. Wires, switches and batteries
3. Demonstration kits for lighting systems

10.0 MAPPING MATRIX OF PO'S AND CO'S:

Course Outcomes	Programme Outcomes										
	a	**b**	**c**	**d**	**e**	**f**	**g**	**h**	**i**	**j**	**k**
CO1	L	L					L	L	H		M
CO2	L	L			L			L	H		M
CO3	M	L		L		M	L	L			
CO4	L				M			L	H		M
CO5		L					L	L			M
CO6	L	M			L			L	H		L
CO7	M	L					L	L	H		M

H: High Relationship, M: Moderate Relationship, L: Low Relationship.

PROGRAMME : Diploma Programme in Automobile Engineering (AE)
COURSE : Transport Management and Motor Industry (TMI) **COURSE CODE :** 6451

TEACHING AND EXAMINATION SCHEME:

Teaching Scheme				Examination Scheme								
Hrs / week			Credits	TH Paper Hrs.	Marks							
TH	TU	PR				TH	TEST	TH+TEST	PR	OR	TW	TOTAL
04	--	02	06	03	Max.	80	20	100	--	25	25	150
					Min.	32	--	40	--	10	10	--

1.0 RATIONALE:

The industrial growth and various requirements and needs at various levels in India and abroad has brought a great revolution in manufacturing of automobiles which makes an automobile engineer is to know how Transport Management and Motor Industry function in a country. The reputation, quality of service, convenience of scheduling, economics, safety depends up on the true knowledge of motor vehicle act, working of different transport organizations, standard methods of record keeping / use of computers, taxation / insurance / valuation of vehicles and driving skills. By keeping some of the objectives in mind, the course Transport Management and Motor Industry is essential to learn.

2.0 COURSE OBJECTIVES:

The student will be able to,

1. Prepare small project reports of bus / goods transport organization enabling him to work in different organizations like MSRTC, private organization.
2. Start SSI unit or may be able to work as service provider.
3. Understand and prepare the different documents used in transport organization.
4. Modify the ideas of documentation, if necessary,.
5. Enter in the business of buying and selling of old & new vehicles.
6. Create awareness of ideal driving which includes safety, legal aspects.
7. Understand the purpose of research institutes in India, which are working on advancements of automobiles rather than adopting the idea of reverse engineering

3.0 COURSE OUTCOMES:

The course content should be taught and learning imparted in such a manner that students are able to acquire required learning outcome in cognitive, psychomotor and affective domain to demonstrate following course outcomes:

1. Understand registration of vehicle & licensing procedure.
2. Understand procedure of settlement of claim, Insurance & Assurance.
3. Understand and describe proper Record keeping Procedure.
4. Understand procedure of Taxation.
5. Understand bus Transport Organization, Goods Transport Operation, Motor Industry
6. Study & fill up the forms required as per Motor Vehicle Act.

4.0 COURSE DETAILS:

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics	Hours
Unit-I **Transport Management**	1a. Study of MVA 1b. Understand Licensing, Registration and Taxation procedure. 1c. Functioning of	1.1 Motor Vehicle Act: Short titles used in MVA; Definitions, Terms regarding vehicle. 1.2 Licensing of Drivers of Motor Vehicle: Necessity, Age limit, Responsibility of owners, Restriction on holding a driving license, General, Preliminary test and	16

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics	Hours
	transport authorities.	driving test	
		1.3 Conductor's license: Necessity, Eligibility, Documents required and rules for conductors 1.4 Registration of Vehicles: Necessity, Where to be made, How to be made, Temporary registration, Production of vehicle at the time of registration, Form and manner of display of registration mark, Size of letters and numerals of registration mark, Transfer of Ownership of Motor Vehicle 1.5 Control of Transport: Transport authorities, Difference between STA & RTA, Necessity of Permit, All types of Permit, Transfer of permit, Temporary permit, Tourist permit, National permit. Speed limits 1.6 Construction of Motor Vehicle: Overall dimensions, General provision regarding construction and maintenance of motor vehicle. Power of central government to make rules 1.7 Taxation: Objectives, Basis of taxation for various vehicles, Methods of levying tax, Tax exemption. Refund of tax, recovery of tax arrears. BMV Tax act 1958 1.8 Insurance: Motor Vehicle Insurance, No-fault liability, Procedure for accident claim	
Unit-II **Transportation Industry**	2a. Understanding various terms in transport 2b. Requirement and control of transport. 2c. Fare and freight calculations 2d. Basic elements in transport management. 2e. Record Keeping.	2.1 Terms used in transportation: Road transport service, Transport vehicle, Public service vehicle, Goods vehicle, Public place, Depot, Route, Trip, Time table, Vehicle schedule, Fare. 2.2 Comparison of Modes of transport. 2.3 Requirements of goods and passenger transport: on the basis of-Volume, type, weight of material; class of passenger. 2.4 Basic elements in Transport Management: 2.5 Market potential: Type of goods/ passengers, Period of use, Probable competition. 2.6 Selection of vehicle: Type of load, Class of passenger, Type of service. 2.7 Organization setup: Govt., Semi Govt., Public, Private. 2.8 Legal compliance: Documents required as per MV A, Registration.	10

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics	Hours
		2.9 Policies of transport organization: Policies towards passenger, employees, like Long distance service, Express service, Night service and others. 2.10 Layout of organization: Location, elements considered in location, Passenger amenities, infrastructural facilities. 2.11 Scheduling: Basic factors in bus, crew (staff) and maintenance scheduling, calculation of number of buses. 2.12 Freight calculation: Time base, Distance base, Contract, per passenger, cubic feet tone method. Structure of fare, fixed cost- Maintenance cost, depreciation cost, insurance, interest on capital, variable cost, Hiring of trucks, Toll, staff wages, Miscellaneous cost 2.13 Record keeping: Log book, Trip operational sheet, Vehicle ledger, Truck history card, Monthly operational sheet, Goods consignment note, various types of bookings, Use of Computer.	
UNIT-III **Estimation and Valuation of Vehicle**	3a. Role of surveyor and accident survey report. 3b. Factors to be considered while Buying and selling of new vehicles and used vehicles.	3.1 Role of surveyor. 3.2 Procedure of survey and valuation of vehicle. Accident survey report. 3.3 Importance of warranty system and protection of law: How to deal with defects, benefits of warranty system. Protection of law. 3.4 Buying a new vehicle: Factors to be considered: Ex -showroom price and on road price, use of vehicle, when and where to buy, Closing the deal, Running in. inspecting the vehicle, Points to check: test drive, Controls, Bonnet, Suspension, Switches, Seat, Noise, Ventilation, Safety, Boot, Interior Storage. 3.5 Buying a used vehicle: When & where to buy: Dealers, used car firms, Private sellers, Garages, Auctions. Factors to be considered-- Depreciation, Model and year, Oil leak, Oil Pressure, Exhaust, Battery, Odometer, Bonnet, Crash damage, Rust, Suspension damage, Tyres, Switches & accessories, Lights, Chrome, Wiring, Steering, Hydraulic System, Structural corrosion, Floor, Test drive. 3.6 Preparations for selling: When to sell, How to sell, Auctions,	10

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics	Hours
		Garages, Private sale, Preparing the car, Documentation, Selling price, Safeguards. Disposal / write off of scrap / unusable vehicle:	
UNIT- IV **Driving Skills**	4a. Understanding the driving skills 4b. Understanding various traffic signs 4c. Measures to avoid accidents	4.1 Instructions in driving of motor vehicle: Driving theory, traffic education, light vehicle driving practice, Vehicle mechanism & repair, Public relations for drivers, Fire hazards, vehicle maintenance, first aid. 4.2 Traffic signs: Mandatory signs, Cautionary signs, Informatory signs. Traffic signals. Causes of accident and remedies. 4.3 Measures to avoid accidents Defensive driving: Rain and flood, fog and mist, snow and ice 4.4 Fitness to drive: Driving and age, stress due to traffic jam, night driving	10
UNIT-V **Motor Industry**	5a. Various automobile manufacturing industries in India. 5b. Various State transport organisations	5.1 The Automobile Industry In India: Organization, Marketing, Servicing: (Collection of Data of various companies) 5.2 Importance of Automobile Engineer 5.3 Working of Various State / Corporation Transport Organizations. (MSRTC, BEST, PMT)	10
UNIT-VI **Functions and Role in Automobile Industry**	6a. Various research organizations in automobile sector.	Various Research Organizations: 6.1 CRRI: Central Road Research Institute. 6.2 PCRA: Petroleum Conservation & Research Association 6.3 CIRT: Central Institute of Road Transport. 6.4 ARAI: Automotive Research Association of India. 6.5 VRDE: Vehicle Research & Development Establishment.	08
		TOTAL	**64**

5.0 SUGGESTED SPECIFICATION TABLE WITH MARKS (THEORY):

Unit No.	Unit Title	Distribution of Theory Marks			
		R Level	U Level	A and above Levels	Total Marks
I	Transport Management	12	08	04	22
II	Transportation Industry	04	04	02	10
III	Estimation and Valuation of Vehicle	06	06	04	16
IV	Driving skills	06	04	04	14
V	Motor Industry	04	04	02	10
VI	Functions and Role in Automobile Industry	04	02	02	08
	TOTAL	**36**	**28**	**18**	**80**

Legends: R = Remembrance (Knowledge); U = Understanding; A = Application and above levels (Revised Bloom's taxonomy)

Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.

6.0 ASSIGNMENTS/PRACTICALS/TASKS:

The tutorial/practical/assignment/task should be properly designed and implemented with an attempt to develop different types of cognitive and practical skills **(Outcomes in cognitive, psychomotor and affective domain)** so that students are able to acquire the desired programme outcome/course outcome.

***Note**: Here only outcomes in psychomotor domain are listed as practical/exercises. However, if these practical/exercises are completed appropriately, they would also lead to development of **Programme Outcomes/Course Outcomes in affective domain** as given in the mapping matrix for this course. Faculty should ensure that students also acquire Programme Outcomes/Course Outcomes related to affective domain.*

Sr. No.	Unit No.	Practical Exercises (Outcomes in Psychomotor Domain)	Hours.
1	I	Different types of forms used in MVA.	04
2	II	Applying for driving license (Learning), Appearing Computerized test, Collecting learning license, Applying for permanent license, Giving trials within six month, collection of permanent license (Explain the procedure. The student has to invest his own time for this activity) **In case of minor all steps to be carried out in presence of father or mother.**	04
3	III	Filling up various forms	04
4	IV	Prepare a report on buying of a new vehicle	04
5	V	Prepare a report on buying /selling an old vehicle	04
6	IV	Prepare a report showing different road signs and signals.	04
7	V	Prepare a report showing different activities carried out by transport agency	04
8	VI	Conduct activity for creating awareness about road safety	04
		TOTAL	**32**

7.0 STUDENT ACTIVITIES:

Following is the list of proposed student activities like

1. The assignments may be completed by a group of 5 students.
2. It is recommended that the eligible student as per M. V. Act should seek permanent license up to LMV.

8.0 SPECIAL INSTRUCTIONAL STRATEGIES (If any):

1. Lecture method, Use of teaching aids, Demonstrations, Assignments, Industrial / RTO visits, Case studies, web sites

9.0 LEARNING RESOURCES:

A) Books

Sr.No.	Title of Book	Author	Publication
1.	Passenger Amenities in STU	Dr. P. Sudarsanam.	CIRT, Pune
2.	Fare structure in STU	Dr. P. Sudarsanam.	CIRT, Pune
3.	Bus station Management	Dr. P. Sudarsanam.	CIRT, Pune.
4.	Bus & Crew scheduling	Dr. P. Sudarsanam	CIRT, Pune.
5.	Industrial Organization & Management	O. P. Khanna.	Dhanpat Rai & Sons
6.	Compendium of Transport Terms	Dr. P. G. Patankar	CIRT, Pune
7.	Motor Vehicle Act, 1988	M. V. Acts:	Home Department (M. S.)
8.	Central M. V. Rules 1989	M. V. Acts:	Home Department (M. S.)

B) Software/Learning Websites

1. http://www.cirtindia.com
2. http://www.pcra.org
3. http://www.araiindia.com
4. http://www.crridom.gov.in
5. http://www.mahatranscom.gov.in/

C) Major Equipments/ Instruments with Broad Specifications

Not Applicable

10.0 MAPPING MATRIX OF PO'S AND CO'S:

Course Outcomes	Programme Outcomes										
	a	**b**	**c**	**d**	**e**	**f**	**g**	**h**	**i**	**j**	**k**
CO1	L	L					L	L	H		M
CO2	L	L			L			L	H		M
CO3	M	L		L		M	L	L			
CO4	L				M			L	H		M
CO5		L					L	L			M
CO6	L	M			L			L	H		L

H: High Relationship, M: Moderate Relationship, L: Low Relationship.

PROGRAMME : Diploma Programme in Automobile Engineering (AE)
COURSE : Vehicle Maintenance and Garage Practice (VGP) **COURSE CODE :** 6564

TEACHING AND EXAMINATION SCHEME:

Teaching Scheme				Examination Scheme								
Hrs / week			Credits	TH Paper Hrs.	Marks							
TH	TU	PR				TH	TEST	TH+TEST	PR	OR	TW	TOTAL
03	--	04	07	03	Max.	80	20	100	25	--	25	150
					Min.	32	--	40	10	--	10	--

1.0 RATIONALE:

Scientific maintenance of automobile-vehicles in India is biggest sector of job opportunity. This course intends to develop the skill of maintenance of automobile vehicle by adopting various modern methods for repair, test and replace the assemblies, sub-assemblies, parts of automobile in their fleets, workshops and garages.

2.0 COURSE OBJECTIVES:

The student will be able to,

1. Identify importance of management and maintenance of record for vehicle
2. Enlist procedure of automobile vehicle maintenance, test, repairs / replace
3. Apply and choose Standard component retrieval.
4. Describe requirements of auto workshop layouts.
5. Analyze maintenance and repair of car air conditioning.
6. Recognize maintenance of MPFI

3.0 COURSE OUTCOMES:

The course content should taught and learning imparted in such a manner that students are able to acquire specific learning outcomes in cognitive, psychomotor and affective domain to demonstrate the following course outcomes:

1. Explain significance of management and maintenance of record for vehicle
2. Participate in automobile vehicle maintenance, test, repair and replace.
3. Evaluate Standard component retrieval.
4. Judge requirement of auto workshop layouts.
5. Rate maintenance and repair of car air conditioning.
6. Plan maintenance of MPFI.

4.0 COURSE DETAILS:

Unit No.	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics	Hours
Unit-I **Auto Workshop Layout and Equipments Specific Objectives:**	1a. Understand the use of different general purpose and special purpose tools and equipments required in workshops. 1b. Know safety precautions and procedures. 1c. Draw layouts of 2 and 4 wheeler service centre, garage, modern	1.1 Shop Equipments and Safety precautions: General safety precautions and procedures. Functions of General shop equipments, gauges and tools with safety precautions while using: Cylinder bore gauge, Inside and outside micrometer, dial indicator gauge, Straight edge and Feeler gauge, Torque wrench, Depth gauge, Wheel balancer, Wheel aligner, Crankshaft aligner and straighter, Engine analyzer, Arbor press, Tyre changer, FIP calibration machine,	06

Unit No.	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics	Hours
	workshop - carrying specialized repairs and list out required tools and equipments.	Head light aligner, Valve grinder, Cylinder boring, Honing machine. 1.2 Workshop Layouts:- ▪ Layout with equipments required for dealers of two wheeler, four wheelers- cars and commercial vehicles and for road- side garage. ▪ Layout of modern workshop for specialized job work like crankshaft repair, engine cylinder re-boring, F.I.P testing and repair, brake drum boring. Wheel balancing and alignment, dent and paint shop etc.	
Unit-II **Maintenance Management and Record Keeping**	2a. Understand necessity and types of maintenance, write maintenance schedule 2b. Keep the maintenance records.	2.1 Maintenance Management ▪ Necessity of maintenance. ▪ Types of maintenance and their applications - Preventive maintenance system, Scheduled maintenance system, Break down maintenance system ▪ General maintenance schedule – on time/day basis or kilometres travelled basis for Two wheelers, Light Motor Vehicle, Heavy Motor Vehicle ▪ General servicing procedure. Decision to repair or replace. 2.2 Record Keeping Workshop records and their importance, History sheet, Work orders and activity file only.	04
UNIT-III **Engine maintenance : diagnosis, Servicing and trouble shooting**	3a. Identify the complaints, write their causes, remedies of engine and engine systems. 3b. Know and perform engine tune up.	3.1 Engine Diagnosis- Engine Smoke, oil level and condition, coolant level and condition, oil pressure testing, compression test, vacuum test, Cylinder Leakage test. 3.2 Engine Servicing-Checking and Servicing of engine components: cylinder head, cylinder Block, cylinder liners, piston, piston ring, crank-shaft, Connecting rod and valves. 3.3 Tuning of engine. 3.4 Troubles, Causes and remedies in fuel, cooling, lubrication system and MPFI Engine, charging and starting system.	08
UNIT-IV **Fuel, Lubrication and**	4.a Identify the complaints, write their causes, remedies of cooling	4.1 Fuel feed system service, ▪ Carburettor - dismantling, cleaning and tuning. ▪ Injector cleaning and testing,	08

Unit No.	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics	Hours
Cooling systems servicing	systems. 4.b Know and perform Lubrication system service. 4.c Perform the servicing of fuel, lubrication and cooling system	▪ FIP phasing and calibration, ▪ CRDI injector servicing, ▪ MPFI -injector testing and cleaning. 4.2 Lubrication system service. – change oil filter, check oil pump and diagnose causes for excessive oil consumption, external oil leakage and low oil pressure in an engine. 4.3 Cooling system servicing - refilling of radiator, Pressure testing, thermostat Checking, Leakage testing, Fan belt tension checking and adjusting.	
UNIT-V **Transmission System Maintenance**	5a. Identify faults in transmission system. 5b. Carry-out maintenance to rectify the faults	5.1 Maintenance of Clutch and Gearbox - Checking clutch plate for thickness, run out, rivet depth, slackness of torsion spring, Pressure plate surface and thickness, axial spring height. ▪ Clutch adjustment – types and procedure. ▪ Clutch troubleshooting – causes and remedies ▪ Checking gearbox for run out of main shaft and lay shaft, oil seals, bearings, gears and synchromesh unit. ▪ Gearbox Troubleshooting- causes and remedies. 5.2 Maintenance of Final drive, Propeller shaft and rear axle. ▪ Checking and adjusting differential for ring gear run-out, backlash in ring gear, tooth contact between ring gear and pinion, bearing preload – necessity and procedure. ▪ Troubles, Causes and remedies of propeller shaft, differential and rear axle.	08
UNIT-VI **System and Body Maintenance**	6a. Identify faults in suspension, steering and braking system. 6b. Carry-out maintenance to rectify the faults 6c. Describe repair methods of body and repainting. 6d. Identify painting defects and describe their causes and remedies.	6.1 Maintenance of Brakes: ▪ Inspection of master cylinder, wheel cylinder, brake drum, brake Linings, brake disc and brake pads. ▪ Adjustment of hydraulic brakes – shoe clearance, brake pedal free travel, pedal to floor clearance, parking brake adjustment. ▪ Procedure of bleeding of hydraulic brakes. Types of brake bleeding. ▪ Troubles, Causes and remedies of Hydraulic and Air brake system. 6.2 Troubleshooting of suspension and Steering system ▪ Troubles, causes and remedies of	07

Unit No.	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics	Hours
		suspension system, ▪ Troubles, causes and remedies of steering System. 6.3 Maintenance of wheels and tyres ▪ Care of wheels and tyres, ▪ Procedure of tyre retreading and vulcanizing. ▪ Procedure of wheel alignment by wheel alignment gauges and procedure of wheel balancing. 6.4 Frame and Body repair ▪ Frame repairs (for cracks, loose rivets and skewness in frames) and Alignments. ▪ Body repairs- Procedure to remove dent, denting tools and equipments. ▪ Adjustment of doors and locks. ▪ Repainting procedure, patch work. Painting defects.	
Unit-VII **Car Heating Ventilation and Air Conditioning System (HVAC)**	7a. Understand the basic principles of HVAC system. 7b. Know the comfort conditions of the occupants.	7.1 Fundamentals of Refrigeration and air conditioning. 7.2 Description of vapour compression cycle with components in the circuit. 7.3 Layout and operation of HVAC. 7.4 Type of refrigerants used in car air conditioning and their properties. 7.5 Human comfort conditions. 7.6 Temperature control system, humidity control.	04
Unit VIII **Maintenance of MPFI**	8a. Describe Testing tools and Equipment for MPFI system Servicing	8.1 Testing tools and Equipment for MPFI system Servicing - OBD I, OBD II, OBD III – Concept /structures 8.2 Trouble Code Identifications / Manual DTC(Diagnostic Trouble Code) 8.3 Testing tools and Equipment for MPFI system Servicing	03
		TOTAL	**48**

5.0 SUGGESTED SPECIFICATION TABLE WITH MARKS (THEORY):

Unit No.	Unit Title	Distribution of Theory Marks			
		R Level	U Level	A and above Levels	Total Marks
I	Auto Workshop Layout and Equipments Specific Objectives	02	04	06	12
II	Maintenance Management and Record Keeping	02	02	02	06
III	Engine diagnosis, Servicing and trouble shooting	02	06	08	16
IV	Fuel, Lubrication and Cooling systems servicing	02	04	06	12
V	Transmission System Maintenance	02	04	06	12

Unit No.	Unit Title	Distribution of Theory Marks			
		R Level	U Level	A and above Levels	Total Marks
VI	System and Body Maintenance	02	04	04	10
VII	Car Heating Ventilation and Air Conditioning System (HVAC)	02	02	04	08
VIII	Maintenance of MPFI	--	02	02	04
	TOTAL	**14**	**28**	**38**	**80**

6.0 ASSIGNMENTS/PRACTICALS/TASKS:

Sr. No.	Unit No.	Practical Exercises (Outcomes in Psychomotor Domain)	Approx. Hrs. required
1.	I	Observe and list various tools, machine equipments used in garage / workshops - write their function and precautions while handling.	04
2.	IV	**Gear Box:** Overhauling: dismantling, inspection of gear shaft bearing of synchromesh unit, shifting ring forks etc. repairing, replacement of components and reassembling of the gear box, adjustment of shifting mechanism.	08
3.	VI	Adjustment of mechanical and hydraulic brakes and renewal of brake liners, repairing of master cylinder, wheel cylinder, brake chamber, break bleeding, skinning scored brake drum.	08
4.	V	Clutch: To study the Adjustment of clutches, Servicing and maintenance, Types of adjustment, Maintenance of friction plate and pressure plate, Repairing of genuine	04
5.	I,IV	Wheel Alignment testing- Measurement, testing & adjustment and Wheel Balance Testing - Measurement/adjustment	04
6.	IV	Servicing lubrication system- change oil filter, check oil pump, diagnose causes for excessive consumption, external oil leakage and low oil pressure in an automobile engine.	04
7.	III	Remove multi-cylinder engine from a vehicle, dismantle, clean, inspects and write causes and repair procedure of following components. a) Cylinder head for war page and cracks, refacing by grinding or cutting, straightening cylinder heads b) Cylinder block for measurement of ovality and taper, cylinder boring, honing process, changing of liners. c) Piston and piston rings for wear, appearance and piston head for signs of deposits, over size piston, ring groove clearance, piston ring end gap, removing and refitting rings.	04
8.	III	Dismantle and do maintenance of Diesel fuel injection pump and fuel injector.	08
9.	V	Tuning of carburettor and Dismantle the propeller shaft and differential. Check wear in universal joint and slip joint, Straightness in propeller shaft, remove bushes and bearing and reassemble it. Check the differential gears for wear, run out, backlash and tooth contact. Write procedure to adjust the final drive for obtaining even tooth contact.	06
10.	III	To Overhaul (Remove, Inspect, Observe, Repair, Replace) Test if suspension system of automobile (shock absorber and leaf springs)	06
11.	VI	Remove and refit the steering linkage and gearbox. Removing and installing of ball joints. Adjust backlash in steering gears. Adjust steering column end play and write procedure.	04
12	VII	Trouble shooting of refrigeration system in sufficient refrigerant, excessive refrigerant, air in system, moisture in system, no	02

Sr. No.	Unit No.	Practical Exercises (Outcomes in Psychomotor Domain)	Approx. Hrs. required
		refrigerant circulation, faulty compressor and expansion valve	
13	VIII	Demonstration of EFI System. – (Petrol/ Diesel) - Construction & working - Testing and trouble code identification. Repair & Replacement.	02
		TOTAL	**64**

7.0 STUDENT ACTIVITIES:

Following is the list of proposed student activities like

1. Collect market rates for various vehicle components like clutch, gear box, brake shoes, wheels etc
2. Form chart of clutch, gear box, types of treads pattern on tyre.
3. Collect different parts of synchromesh gear box.
4. List out common trouble shooting in Brake system.
5. List out Tyre pressure require to different vehicle.

8.0 SPECIAL INSTRUCTIONAL STRATEGIES (If any):

1. Show video/Animation on working of chassis components.
2. Arrange a visit to ST Workshop or any other service centre.
3. Arrange expert seminar of industry person in the area of Vehicle Body shop.

9.0 LEARNING RESOURCES:

A) Books

Sr.No.	Title of Book	Author	Publication
1	Mechanisms of Car	A. W. Judge, Lloyd S. R.	Pearsons
2	Automotive Service	Tim Gills	Delmar Publisher Inc.
3	Automobile Mechanics	Crouse/ Anglin	TATA McGraw HILL
4	Automotive Engines – Theory and Servicing	James Halderman	Pearson
5	Automotive Engine Performance	Ken Layne	Prentice Hall Career Technology
6	Heavy Duty Truck System	Ian Norman, Robert Scharff, John Corinchoke	Delmer Publisher Inc.
7	Santro and Accent Basic Training Book	--	Hyundai Motors India Ltd.
8	Service Manuals of Euro- II Vehicles	--	Maruti Motors India Ltd.
9	Automotive Mechanics	Joseph Heither	Bennett & McKnight
10	Automotive Mechanics	William Crouse	TTMGH
11	Automotive Engineering	G. B. S. Narang.	Tata McGraw Hill
12	Auto Engineering	Krupal Singh. Vol-I	Standard
13	The Automobile	Harbans Singth Royat.	S. Chand
14	Problem in Automobile Mechanics	Dr. N. K. Giri.	Khanna Publications
15	Theory of machines	D. L Ballaney.	Dhanpat Rai & Sons

B) Software/Learning Websites

1. www.nptel.com
2. www.howstuffworks.com
3. www.aera.org
4. www.autoshop101.com

C) Major Equipments/ Instruments with Broad Specifications

1. Hydraulic lifter
2. Wheel alignment machine
3. Tyre removal equipment
4. Wheel Balancing Machine

10.0 MAPPING MATRIX OF PO'S AND CO'S:

Course Outcomes	Programme Outcomes										
	a	**b**	**c**	**d**	**e**	**f**	**g**	**h**	**i**	**j**	**k**
CO1	L	L	H				L	L	H		M
CO2	L	L	H		L			L	H		M
CO3	M	L	H	L		M	L	L			
CO4	L		H		M			L	H		M
CO5		L	H				L	L			M
CO6	L	M	H		L			L	H		L

H: High Relationship, M: Moderate Relationship, L: Low Relationship.

PROGRAMME : Diploma Programme in Automobile Engineering (AE)
COURSE : Two-Wheeler Technology (TWT) **COURSE CODE** : 6565

TEACHING AND EXAMINATION SCHEME:

Teaching Scheme				Examination Scheme							
Hrs / week			Credits	TH Paper Hrs.	Marks						
TH	TU	PR				TH	TEST	TH+TEST	PR	OR	TW	TOTAL
02	--	02	04	--	Max.	--	--	--	25	--	25	50
					Min.	--	--	--	10	--	10	--

1.0 RATIONALE:

There is an increased need of public transport. The public transport systems in cities and in rural area do not meet the requirement effectively. This has led to huge demand of two wheelers. Presently the two wheelers are used by a large section of society as personalized transport. In view of the growth, large employment potential in this field and the manpower required to cater to the same, this course is included as an elective course.

2.0 COURSE OBJECTIVES:

The student will be able to,

1. Carry out the recommended procedures of the servicing using a service manual.
2. Select a suitable two wheeler for specific requirements of user.
3. Understand various mechanical, electrical and electronic systems and modern features used in two wheelers.

3.0 COURSE OUTCOMES:

The course content should taught and learning imparted in such a manner that students are able to acquire specific learning outcomes in cognitive, psychomotor and affective domain to demonstrate the following course outcomes:

1. Observe, compare and describe two wheelers on basis of Aerodynamics, Aesthetics and Ergonomic considerations for their merits and demerits.
2. Understand the functions of various parts of a two wheeler body.
3. Understand various systems of a two wheeler. Use various facilities available in an advanced two wheeler
4. Adjust the idling speed of two wheeler engine. Perform clutch and brake adjustment.
5. Check parameters like tyre inflation, battery voltage, charging voltage of a two wheeler.

4.0 COURSE DETAILS:

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics	Hours
Unit-I **Frames, Body and Transmission system**	1a. Know various types of frames, bodies, select a suitable type of frame for particular application. 1b. Compare types of clutches, gearboxes and their applications	1.1 Type of frames • Single cradle frame, Double cradle frame, Tubular frame (Single Down-tube frame using the engine as a stressed member) • Body- Monocoque Construction 1.2 Selection of Transmission system components • Cable Actuated Wet Multi-disc clutch, Centrifugal clutch • Chain drive, Belt drives with variator mechanism, Gear drive 1.3 Working of Gear box, its comparison with four wheelers	04

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics	Hours
		• Gear ratios in scooter and motorcycle. • Working of Constant mesh gear box	
Unit-II **Engines, Fuel Supply System, Lubrication System and Emission Control System**	2a. Understand engine features and its working 2b. Understand working of Induction system, Exhaust System, Fuel 2c. Supply System, Lubrication System and Emission Control System	2.1 Induction and Exhaust system ■ Induction System • Air filter/ Air Cleaner: construction and function - Washable oiled sponge element, washable Dual foam wet type • Two Stroke Engines - Arrangement of Ports in the cylinder, Decompression Valve arrangement. • Four Stroke Engines - Overhead Valve and Overhead cam arrangements. Advantages of Multiple valves • Fuel supply system • Gravity feed and vacuum operated system. • Down draught and horizontal/ Side draught carburetor • Carburetor functions and working under various Engine operating conditions like – Idling, Starting, accelerating, normal running. • Advantages of electronic fuel injection system ■ Exhaust system ▪ Construction and function of Exhaust system: Header pipe, Muffler Types and their application, Tail Pipe arrangement and location 2.2 Lubrication and Emission Control Systems Lubrication system, Petroil Lubrication with Separate Oil Pump for Two stroke engines. ■ Wet sump Pressurized Lubrication in four stroke engines • Block diagram and working of pollution control measures • Catalytic convertor, Exhaust Gas Recirculation, Positive Crankcase • Ventilation	10
UNIT-III **Steering and Suspension System**	3a. Know types of front and rear suspension system and steering System.	3.1 Handle Bar arrangement, Steering fork, Purpose of providing Caster angle 3.2 Use of Dampers/ Double acting type of shock absorbers 3.3 Use of Variable Rate coil spring, Coil in coil spring arrangement 3.4 Advantages of Mono-shock suspension system 3.5 Advantage of Gas filled shock absorber for rear end suspension	04
UNIT-IV	4a. Understand types of	4.1 Drum (Mechanical Expanding Shoe type) and disc Brakes (Fixed Caliper and Floating Caliper	02

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics	Hours
Brakes, Wheels and Tyre.	braking system, types of wheels and modern tyre	types) 4.2 Mechanical and Hydraulic brakes 4.3 Lever operated and pedal operated brakes 4.4 Application and criteria for selection of wheels and tyre, their specification for motorcycles, scooters, sports bike	
UNIT-V **Electrical System**	5a. Know types of ignition and other electrical systems	5.1 Ignition System • Working of Condenser Discharge Ignition (CDI) system • Microprocessor controlled Ignition system block diagram and working • Benefits of Twin Spark Ignition system 5.2 Starting system and Charging System • Kick Start and Button Start arrangements. Components of starting system and their functions: D C motor, Battery, Battery Rating for use in Button start vehicles • Schematic circuit and working of charging system. Schematic diagram showing AC and DC circuits 5.3 Lighting System and accessories • Specifications and Application of Head Lamp, Tail and number plate Lamp, Purpose of using LED lights in tail lamp, Turn Signal Lamp, Side Stand Indicator Lamp, High Beam Indicator Lamp, Neutral Indicator Lamp, Speedometer Lamp • Horn, Mobile Charger point, Head lamp and tail lamp Reflectors used in two wheelers • Dash units • Use of Speedometer (Analog and digital), Trip meter • Use of Engine Speed indicator/ Tachometer	08
UNIT-VI **Aerodynamics, Ergonomics, Aesthetics and Safety Aspects**	6a. Understand Aerodynamics, Aesthetics and Ergonomic aspects of a two wheeler	6.1 Aerodynamic Aspects • Head lamp shape (Sealed beam and conventional) • Tail lamp and indicator light arrangements-body enclosed and • Separate • Shape of Fuel Tank in Motorcycles 6.2 Ergonomic and Aesthetic Aspects ▪ Ergonomic Aspects • Seat Arrangement for rider and pillion rider • Handle bar position • Floor/ Foot rest for driver and pillion rider ▪ Aesthetic Aspects • Head lamp fairing of motorcycles. • Side panels for scooter/ scooterette and motorcycle • Ground clearance.	04

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics	Hours
		• Mud guard shape and position. 6.3 Safety Aspects ■ Crash bar, Saree guard ■ Driving Habits • Drive gear – Jacket, Helmet, Day night goggle	
		TOTAL	**32**

5.0 SUGGESTED SPECIFICATION TABLE WITH MARKS (THEORY):

Unit No.	Unit Title	Distribution of Theory Marks			
		R Level	U Level	A and above Levels	Total Marks
I	Frames, Body and Transmission system	02	02	06	10
II	Engines, Fuel Supply System, Lubrication System and Emission Control System	06	06	10	22
III	Steering and Suspension System	02	02	06	10
IV	Brakes, Wheels and Tyre	02	02	04	08
V	Electrical System	02	06	08	16
VI	Aerodynamics, Ergonomics, Aesthetics and Safety Aspects	02	06	06	14
	TOTAL	**16**	**24**	**40**	**80**

6.0 ASSIGNMENTS /PRACTICALS/TASKS

Sr. No.	Unit No.	Practical Exercises (Outcomes in Psychomotor Domain)	Approx. Hrs. required
1	I	1. Observe and sketch the layout of a two wheeler transmission system	04
2	V	2. Check the following electrical / electronic components, parameters of a two wheeler • CDI system components, • Charging System components, • Voltage at battery, specific gravity and high discharge test • Use service/ operators manual for specifications.	04
3	II	3. Adjust idle speed of a two wheeler engine using the specified procedure. Check the Idling Emission using Exhaust Gas Analyzer and do necessary carburetor adjustments for better performance	04
4	V	4. Check the Ignition Timing of a two-wheeler and compare it with the Workshop/ Operators Manual Specification. Remove, observe, clean the Spark plug and adjust the gap and refit	04
5	IV	5. Remove and refit rear wheel of a two wheeler - check the conditions of brake shoes, brake drum, bearings etc. Perform brake adjustment. Replace brake cables, brake shoes/ pads	04
6	---	6. Visit a Two wheeler Dealer Showroom/ Company showroom to obtain Chassis specification of a Scooter/ Motorcycle or scooterette. Share and Compare the data collected for two wheeler vehicles in the same category of vehicles (on the basis of Ground clearance, wheel base, engine power, spare wheel, claimed fuel efficiency, load carrying capacity) Prepare a report to identify the better one in the category	04
7	I	7. Dismantle and assemble a motorcycle clutch and perform clutch	04

Sr. No.	Unit No.	Practical Exercises (Outcomes in Psychomotor Domain)	Approx. Hrs. required
		adjustments. Replace clutch cable, if required	
8	II	8. Carry out lubrication and greasing of a vehicle. • Engine, brake linkage, clutch linkage, fork, axle, chain and levers	04
		TOTAL	**32**

7.0 STUDENT ACTIVITIES:

Following is the list of proposed student activities like

1. Collect market rates for various vehicle components like clutch, gear box, brake shoes, wheels etc.
2. Form chart of clutch, gear box, types of treads pattern on tyre.
3. List out common trouble shooting in Brake system.
4. List out Tyre pressure require to different vehicle.
5. Report all the salient feature of a latest two wheeler. Describe the technical and ergonomic features, if information is available. Comment on the aesthetic of the vehicle. Separate models should be considered by a group of four students.
6. Prepare troubleshooting chart for failure of a two wheeler system(Symptoms, causes and remedies)

8.0 SPECIAL INSTRUCTIONAL STRATEGIES (If any):

1. Show video/Animation on working of two wheeler components.
2. Arrange a visit to two wheeler service centre or dealership.
3. Arrange expert seminar of industry person in the area of two wheeler industry.

9.0 LEARNING RESOURCES:

A) Books

Sr.No.	Title of Book	Author	Publication
1	Service manuals of popular Indian Two Wheeler Vehicles.	---	---
2	Two wheelers	K.K. Ramalingam	SCITECH-I
3	Automobile Engineering	R.B. Gupta	Satya Prakashan
4	Automobile Engineering	K.K. Ramalingam	SCITECH-I

B) Software/Learning Websites

1. http://www.autocarindia.com
2. Any other two wheeler industry website.

C) Major Equipments/ Instruments with Broad Specifications

1. Two wheeler hydraulic post.
2. Pneumatic Line setup with tools

10.0 MAPPING MATRIX OF PO'S AND CO'S:

Course Outcomes	Programme Outcomes										
	a	b	c	d	e	f	g	h	i	j	k
CO1		H									
CO2				M							
CO3	M										
CO4					H						
CO5		H									

H: High Relationship, M: Moderate Relationship, L: Low Relationship.

PROGRAMME : Diploma Programme in Automobile Engineering (AE)
COURSE : Automobile Mechatronics (AMX) **COURSE CODE** : 6566

TEACHING AND EXAMINATION SCHEME:

Teaching Scheme				Examination Scheme								
Hrs / week			Credits	TH Paper Hrs.	Marks							
TH	TU	PR				TH	TEST	TH+TEST	PR	OR	TW	TOTAL
03	--	02	05	03	Max.	80	20	100	--	--	50	150
					Min.	32	--	40	--	--	20	--

1.0 RATIONALE:

The integration of Electrical engineering, electronics engineering, Telecommunication, computer technology and control engineering in Automobile Engineering is on the rise. Automobile electronics plays a vital role in functioning of various systems of vehicle. It is desirable to have knowledge of various interdisciplinary areas by a diploma engineer, who plays a role of a technician in the Automobile Industry.

2.0 COURSE OBJECTIVES:

The student will be able to,

1. Understand Construction, working and output signals of the sensors and actuators
2. Understand digital visual display and analog visual display and Binary number system.
3. Carry out the recommended procedures of the testing sensors/ actuators using a service manual.
4. Know various types of Computer memories and use of the same.
5. Describe various types of control systems.

3.0 COURSE OUTCOMES:

The course content should taught and learning imparted in such a manner that students are able to acquire specific learning outcomes in cognitive, psychomotor and affective domain to demonstrate the following course outcomes:

1. Explain various electronic components used in Automobiles.
2. Describe signal conditioning.
3. Develop block diagram for Ignition timing control and ABS.
4. Understand functions of various actuators and sensors.
5. Understand OBD.

4.0 COURSE DETAILS:

UNIT	Major Learning Outcomes (in cognitive domain)	Topic & Subtopic	Hours
Unit-I. **Automobile Electronic Components**	1a. Describe photo diode and LED 1b. Explain Power Diode – Alternator	1.1 Introduction to Automobile Electronics. 1.2 Use of Diode • Semi conductor diode - Voltage regulator in charging system. • Photo Diode and LED - Ignition and display system. • Power Diode – Alternator (Charging System) 1.3 Introduction to digital visual display and analog visual display. 1.4 Introduction to Binary number system.	06
Unit-II. **Automotive**	2a. Explain computer basics with parts 2b. Describe signal	2.1 Computer Basics and control systems • Block diagram of basic computer • Types of computer memory: (i)	10

UNIT	Major Learning Outcomes (in cognitive domain)	Topic & Subtopic	Hours
Computer Technology	conditioning 2c. Explain CAN Bus, LIN Bus.	Primary memory: - Read only memory (ROM), Read/Write (R/W), PROM, EPROM, EEPROM. (ii) Volatile memory - RAM (Random Access Memory), KAM (Keep Alive Memory) • Open loop and closed loop control systems 2.2 Signal conditioning • Conversion of signals- Analog to Digital and Digital to Analog • Types of communication systems in automobile - CAN Bus, LIN Bus, Wi-Fi, Bluetooth, Ethernet, Optic Fibers, GSM networks.	
Unit-III. **Sensors**	3a. Explain various Sensors	3.1 Sensors • Construction, working and output signals of the following sensors - Crank shaft position, Oxygen, Air flow measurement, Temperature, Pressure, Camshaft position, Speed, position sensors	04
Unit-IV. **Actuators**	4a. Explain Actuators 4b. Explain purge control valve	4.1 Actuators • Construction, working of the following Actuators - Idle speed actuator, Fuel pump, Unit injector, EGR Valve, Purge control Valve	04
Unit-V. **Vehicle Control Systems**	5a. Describe Vehicle control systems 5b. Explain Electronic power steering	5.1 Vehicle control systems • Power train control system: Electronic control system used in MPFI, GDI and CRDI system. • Motion Control System: Introduction to ABS, ESP. Electronic suspension, Electronic power steering. • Safety systems: (Need and working only) Air bags, Collision avoidance, Low pressure warning system, Park assists.	10
Unit-VI: **System Diagnosis**	6a. Describe On board diagnosis (OBD) of MPFI/ CRDI system. 6b. Explain Six step approach for Component Testing	6.1 On board diagnosis (OBD) of MPFI/ CRDI system. • Stand alone diagnosis of electronic components: Diodes, sensors and actuators of the control systems. 6.2 Six step approach for Component Testing. 6.3 Types of measuring instruments and its application while checking signals and sensors. • Digital multi-meters,, Oscilloscope, Thermometers, Battery testers, Lux meters, Frequency meters	07

UNIT	Major Learning Outcomes (in cognitive domain)	Topic & Subtopic	Hours
Unit-VII: **Vehicle Instrumentation**	7a. Describe Vehicle Instrumentation 7b. Explain use of GPS in Automobiles.	7.1 Instrumentation • Vehicle instrumentation and measurement of parameters –time, speed, temperature, distance and level • Error analysis - types of errors and error compensation. 7.2 Navigation system - Global positioning system (GPS)	07
		TOTAL	**48**

5.0 SUGGESTED SPECIFICATION TABLE WITH MARKS (THEORY):

Unit No.	Unit Title	Distribution of Theory Marks			
		R Level	U Level	A and above Levels	Total Marks
I	Automobile Electronic Components	02	02	04	08
II	Automotive Computer Technology	02	04	04	10
III	Sensors	04	04	02	10
IV	Actuators	04	04	02	10
V	Vehicle Control Systems	04	06	10	20
VI	System Diagnosis	02	02	08	12
VII	Vehicle Instrumentation	04	04	02	10
	TOTAL	**22**	**26**	**32**	**80**

Legends: R = Remembrance (Knowledge); U = Understanding; A = Application and above levels (Revised Bloom's taxonomy)

Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.

6.0 ASSIGNMENTS/PRACTICALS/TASKS:

The tutorial/practical/assignments/tasks should be properly designed and implemented with an attempt to develop different types of cognitive and practical skills **(Outcomes in cognitive, psychomotor and affective domain)** so that students are able to acquire the competencies.

***Note**: Here only outcomes in psychomotor domain are listed as practical/exercises. However, if these practical/exercises are completed appropriately, they would also lead to development of **Programme Outcomes/Course Outcomes in affective domain** as given in a common list at the beginning of curriculum document for this Programme. Faculty should refer to that common list and should ensure that students also acquire those Programme Outcomes/Course Outcomes related to affective domain.*

Sr. No.	Unit No.	Practical Exercises (Outcomes in Psychomotor Domain)	Hours
1	I	Check a given Diode type and comment on the condition of the same. Convert the given Decimal numbers into Binary numbers and Binary numbers into Decimal numbers.	02
2	III	Identify and diagnose a sensor and comment on condition of the same.	02
3	IV	Identify and diagnose an actuator and comment on condition of the same Using Autotronics trainer kit, simulate the circuit for idle air control valve or any other autotronics application.	04
4	V	Collect specifications and features of control systems of any modern	04

Sr. No.	Unit No.	Practical Exercises (Outcomes in Psychomotor Domain)	Hours
		Automobile with reference to any system such as MPFI or GDI and prepare a report of the same.	
5	V	Collect specifications and features of control systems of any modern Automobile with reference to any system such as TDI and CRDI system used in a vehicle and prepare a report of the same.	04
6	V	Collect specifications and features of control systems of a vehicle, such as: ABS, ESP, Electronic Power Steering system and prepare a report of the same.	04
7	V	Visit a modern Service Station for observing Automobile Electronic and Computer controlled systems and prepare a report of the same.	04
8	V	Prepare one block diagram for Detonation control using microprocessor and detonation sensor. Similar controls like Fuel Injection Control, Ignition timing Control, Lambda Control, Antilock Braking System and Electronic Stability Programme may be shown using a block diagram.	04
9	VII	Collect specifications and features of control systems of a vehicle, such as: Electronic Suspension and Navigation Systems and prepare a report of the same.	04
		TOTAL	**32**

7.0 STUDENT ACTIVITIES:

Following is the list of proposed student activities like

1. Collect technical specifications of sensors and actuators used in automobiles.
2. Collect the standard manufacturing procedure of different Sensors and actuators.
3. Collect technical specifications of safety systems used in automobiles

8.0 SPECIAL INSTRUCTIONAL STRATEGIES (If any):

1. Show working based model or actual equipment based videos of different sensors and actuators of automobile engineering.
2. Arrange expert seminar of industry person in the area of design, drawing, cost estimation and validation of manufacturing procedure of working based model or actual equipment based videos of different sensors and actuators of automobile engineering.

9.0 LEARNING RESOURCES:

A) Books

Sr.No.	Title of Book	Author	Publication
1	Automotive Computer Controlled System.	Allan W.M. Bonnick	Butter worth Heinemann
2	Understanding Automotive Electronics. Fifth Edition.	William B. Ribbens	Newnes.
3	Auto mechanic's Guide to Electronic Instrumentation And Microprocessor.	Lynn Mosher	Prentice – Hall, Inc.
4	Automotive Handbook	Bosch	Bosch

B) Software/Learning Websites

Not Applicable

C) Major Equipments/ Instruments with Broad Specifications

Not Applicable

10.0 MAPPING MATRIX OF PO'S AND CO'S:

Course Outcomes	Programme Outcomes										
	a	**b**	**c**	**d**	**e**	**f**	**g**	**h**	**i**	**j**	**k**
CO1	L	L	H				L	L	H		M
CO2	L	L	H		L			L	H		M
CO3	M	L	H	L		M	L	L			
CO4	L		H		M			L	H		M
CO5	L		L		L	M	L	L			M

H: High Relationship, M: Moderate Relationship, L: Low Relationship.

PROGRAMME : Diploma Programme in Automobile Engineering (AE)
COURSE : Automobile Design with CAD/CAM (ADC) **COURSE CODE :** 6567

TEACHING AND EXAMINATION SCHEME:

Teaching Scheme				Examination Scheme								
Hrs. / week			Credits	TH Paper Hrs.	Marks							
TH	TU	PR				TH	TEST	TH+TEST	PR	OR	TW	TOTAL
03	--	02	05	03	Max.	80	20	100	--	--	50	150
					Min.	32	--	40	--	--	20	--

1.0 RATIONALE:

Diploma engineer has to work on shop floor, tool room and automated plants to supervise the machining process. Diploma engineers may come across CNC machines, robots. This course imparts knowledge of solid modelling, computer aided part programming, CNC programming, robotics & automation. It will help diploma engineer to carry out solid modelling, CNC programming, computer aided part programming, work on CNC machines, work in automated plants.

2.0 COURSE OBJECTIVES:-

The student will be able to,

1. Indicate and name the requirement of computer hardware for cad / cam applications in automobile
2. Predict and explain solid modelling, & surface modelling for automobile components.
3. Schedule and create the part programming & computer aided part programming.
4. Plan, Produce and rate to write programme using functions and commands.
5. Experiment and test optimum design process for design of automobile components.
6. Review, rate and Grade the flexible manufacturing system and to handle the product data and various software used for manufacturing.

3.0 COURSE OUTCOMES:

The course content should taught and learning imparted in such a manner that students are able to acquire specific learning outcomes in cognitive, psychomotor and affective domain to demonstrate the following course outcomes:

1. Tabulate and tell the requirement of computer hardware for cad / cam applications in automobile.
2. Apply and compose solid modelling, & surface modelling for automobile components.
3. Construct and manage the part programming & computer aided part programming.
4. Debate and determine for to write programme using functions and commands.
5. Generalize and judge optimum design process for design of automobile components.
6. Specify and test the flexible manufacturing system and to handle the product data and various software used for manufacturing.

4.0 COURSE DETAILS:

Unit No	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics	Hours
Unit-I **Introduction to CAD/ CAM**	1a. State definition of CAD/CAM 1b. Description of Product cycle & automation of CAD/CAM.	1.1 CAD/CAM definitions 1.2 The Product cycle & CAD/CAM 1.3 Automation & CAD/CAM	06
Unit-II **Fundamentals**	2a. Design and drawing in the CAD	2.1 The design process 2.2 The Application of computers for designing	10

Unit No	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics	Hours
of CAD		2.3 Implementations of CAD 2.4 Benefits of CAD 2.5 Transformation Computer graphics software	
Unit-III **Geometric Modelling**	3a. Design and drawing of Solid modelling software	3.2 Wire frame modelling 3.3 Solid modelling 3.4 Surface modelling 3.5 Modelling tools 3.6 Salient features of solid modelling 3.7 various command used for modelling	10
Unit-IV **Conventional Numerical Control**	4a. Description of NC System	4.1 Basic components of an NC system 4.2 The NC Procedure 4.3 NC Coordinate System 4.4 NC Motion Control System 4.5 Applications of Numerical Controls	08
Unit-V **NC Part Programming**	5a. Programming and APT Language in NC System	5.1 The Punched Tape in NC 5.2 Tape coding and Format 5.3 Manual Part Programming 5.4 APT Language	08
Unit-VI **Computer Controls in NC**	6a. Problems in NC System 6b. Comparison of DNC/CNC System 6c. Description of Adaptive Control Machining Systems	6.1 Introduction 6.2 Problems with Conventional NC 6.3 NC Controller Technology 6.4 Computer Numerical Control 6.5 Direct Numerical Control 6.6 Combined DNC/CNC System 6.7 Adaptive Control Machining Systems 6.8 Trends and New Developments in NC	06
TOTAL			**48**

5.0 SUGGESTED SPECIFICATION TABLE WITH MARKS (THEORY):

Unit No.	Unit Title	Distribution of Theory Marks			
		R Level	**U Level**	**A and above Levels**	**Total Marks**
I	Introduction to CAD/ CAM	04	04	02	10
II	Fundamentals of CAD	04	04	08	16
III	Geometric Modelling	02	04	04	10
IV	Conventional Numerical Control	04	04	08	16
V	NC Part Programming	06	04	06	16
VI	Computer Controls in NC	02	04	06	12
	TOTAL	**22**	**24**	**34**	**80**

Legends: R = Remembrance (Knowledge); U = Understanding; A = Application and above levels (Revised Bloom's taxonomy)

Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.

6.0 ASSIGNMENTS/PRACTICALS/TASKS:

The tutorial/practical/assignments/tasks should be properly designed and implemented with an attempt to develop different types of cognitive and practical skills **(Outcomes in cognitive, psychomotor and affective domain)** so that students are able to acquire the competencies.

***Note**: Here only outcomes in psychomotor domain are listed as practical/exercises. However, if these practical/exercises are completed appropriately, they would also lead to development of **Programme Outcomes/Course Outcomes in affective domain** as given in a common list at the beginning of curriculum document for this programme. Faculty should refer to that common list and should ensure that students also acquire those Programme Outcomes/Course Outcomes related to affective domain.*

SR. No.	Unit No.	Practical Exercises (Outcomes in Psychomotor Domain)	Approx. Hrs. required
1	I	Two assignments on CAD for 2 D drafting.	02
2	II	One assignment on CAD for 3 D modelling. (Solid modelling)	02
3	II	One assignment on CAD for 3 D modelling. (Surface modelling)	02
4	III	One assignment on CAD for 3 D modelling. (Wireframe modelling)	04
5	II	One assignment on CAD for 3 D Assembly	04
6	II, III	One assignment on CAD for Drafting	04
7	IV	Two assignment on CAM for computer aided part programming (CNC milling machine).	04
8	V	Two assignments on part programming on CNC turning machine.	02
9	V	Two assignments on part programming on CNC Lathe machine.	02
10	V	Two assignments on APT Programming. s	02
11	III	Report writing based on visit to industries having automation in manufacturing.	02
12	IV	Report writing based on visit to industries having CNC machines.	02
		TOTAL	**32**

7.0 STUDENT ACTIVITIES:

Following is the list of proposed student activities like

1. Collect market rates for various automobile engineering CNC Machines and specific component list of components related too it.
2. Collect the standard design procedure or programming data of any component of automobile engineering in CNC System from Industry.
3. Collect Standard Valid drawing of any component of automobile engineering for NC, CNC and DNC System.
4. Collect the application based images of any component of automobile engineering in NC, CNC and DNC System.
5. Collect application based, working based model or actual equipment based videos of any component of automobile engineering from or in NC, CNC and DNC System.

8.0 SPECIAL INSTRUCTIONAL STRATEGIES (If any):

1. Show programming of NC, CNC and DNC System for computer software related drawing of automobile components.
2. Arrange expert seminar of industry person in the area of design, drawing, cost estimation and validation of design procedure of any component.

9.0 LEARNING RESOURCES:

A) Books

Sr.No.	Title of Book	Author	Publication
1	Cad/ Cam Principles & Applications	P. N. Rao.	Tata McGraw Hill
2	CAD/ CAM /CIM	Radhakrishna P. & Subramanyam	Wiley Eastern Ltd.
3	CNC Machine	B. S. Pabla & M. Adinathan	New Age International (p) Ltd.
4	Computer Aided Design & Manufacturing	Groover M. P. & Zimmers Jr	Prentice Hall of India

B) Software/Learning Websites

1. www.nptel.com
2. www.howdesign.com
3. www.machinedesign.com
4. www.howstuffworks.com

C) Major Equipments/ Instruments with Broad Specifications

1. Different type of automobile components in surface modelling
2. Chart on types of CNC, NC, DNC Machine
3. Different types of drafting
4. Different types of 2D and 3D modelling object list in software

10.0 MAPPING MATRIX OF PO'S AND CO'S:

Course Outcomes (Cos)	Programme Outcomes (Pos)										
	a	b	c	d	e	f	g	h	i	j	k
CO1	H	M	L	L							
CO2		H	H	M	L		L	M	M	L	
CO3	H	H	H	M		L					
CO4	H	M	H	M	M		L		M		
CO5	H	M	M	L	H	L	L				
CO6			H	H	L	M		H	H	H	

H: High Relationship, M: Moderate Relationship, L: Low Relationship.

PROGRAMME : Diploma Programme in Automobile Engineering (AE)
COURSE : Industrial Fluid Power(IFP) **COURSE CODE :** 6568

TEACHING AND EXAMINATION SCHEME:

Teaching Scheme				Examination Scheme								
Hrs. / week			Credits	TH Paper Hrs.	Marks							
TH	TU	PR				TH	TEST	TH+TEST	PR	OR	TW	TOTAL
03	--	02	05	--	Max.	80	20	100	--	--	50	150
					Min.	32	--	40	--	--	20	--

1.0 RATIONALE:

In any automobile industry the hydraulic and pneumatic controls systems are widely used for automation.

This course is introduced to impart knowledge of hydraulic and pneumatic circuits, their elements so that he will built up ability to carry out maintenance, erection of modern machine tools.

2.0 COURSE OBJECTIVES:

The student will be able to,

1. Know different hydraulic & pneumatic systems component.
2. Understand working of hydraulic & pneumatic systems.
3. Understand and interpret hydraulic & pneumatic systems.
4. Design hydraulic and pneumatic systems circuits.
5. Find faults and maintain hydraulic and pneumatic systems.

3.0 COURSE OUTCOMES:

The course content should taught and learning imparted in such a manner that students are able to acquire specific learning outcomes in cognitive, psychomotor and affective domain to demonstrate the following course outcomes:

1. Identify and draw symbols of hydraulic & pneumatic components.
2. Select and identify hydraulic & pneumatic components.
3. Interpret hydraulic & pneumatic circuits.
4. Draw and design hydraulic & pneumatic system for particular application.
5. Find faults and take remedial action.

4.0 COURSE DETAILS:

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics	Hours
Unit-I **Introduction to Hydraulics & Pneumatic system**	1a. Identify components of hydraulic and pneumatic system. 1b. List components of hydraulic and pneumatic system.	1.1 Layout of Hydraulic system & Pneumatics system 1.2 Required properties of Hydraulic fluid 1.3 Functions of hydraulic fluid 1.4 Components of Hydraulic system & Pneumatics system 1.5 FRL circuit 1.6 Actuator 1.7 Classification of actuator 1.8 Rotating cylinder 1.9 Non rotating cylinder	04

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics	Hours
Unit-II **Hydraulic & Pneumatic power devices**	2a. Select pump, valves, accessories.	2.1 Introduction of Pumps, 2.2 Types of pumps, 2.3 Classification of pumps, gear pump, lobe pump, generator pump, screw pump, vane pump, piston pump.	06
Unit-III **Conventional representation of Hydraulic & Pneumatic components**	3a. Draw circuit 3b. Explain working 3c. Develop hydraulic & Pneumatic system	3.1 Pumps & compressors 3.2 Hydraulic motor & pneumatic motor 3.3 Cylinder 3.4 Valves (Directional control valve, flow control valve, pressure control valve)	08
Unit-IV **Power controlling devices**	4a. Identify controlling valves. 4b. Classify control valves.	4.1 Introduction of Control valve, 4.2 Classification of control valve, pressure control valve, pressure relief valve, pressure reducing valve, sequence valve 4.3 Directional control valve • 2/2 valve • Check valve • 3/2 valve • 5/2 valve • 4/2 valve 4.4 Flow control valve 4.5 Variable flow control valve 4.6 Pressure compensated valve 4.7 Temperature compensated valve	08
Unit-V **Accessories for Pneumatics & Hydraulic system**	5a. Draw pneumatic circuits 5b. Sketch Hydraulic Circuits	5.1 Filter, 5.2 Types of separator, 5.3 Tubing & hoses	06
Unit-VI **Basic Hydraulic & Pneumatic circuits**	6a. Explain Hydro pneumatics 6b. Compare circuit 6c. Sketch circuit	6.1 Meter in 6.2 Meter out 6.3 Bleed off 6.4 Sequencing circuit 6.5 Regenerative circuit 6.6 Speed control circuit by using bidirectional motor or two cylinders	06
Unit-VII **Industrial circuit**	7.1 Describe the circuits 7.2 Distinguish between the circuits 7.3 Draw the Circuits	7.1 Hydraulic & pneumatic circuits for ▪ Milling machine ▪ Lathe machine ▪ Grinding machine • 7.1.4 Drilling machine	06
Unit-VIII **Maintenance of Hydraulic & Pneumatic circuits**	8a. Observe the process 8b. Analyse the circuits	8.1 Safety and cleanliness fault finding instrument and process 8.2 Preventative maintenance	04
		TOTAL	**48**

5.0 SUGGESTED SPECIFICATION TABLE WITH MARKS (THEAORY)

Unit No.	Unit Title	Distribution of Theory Marks			
		R Level	U Level	A and above Levels	Total Marks
I	Introduction to Hydraulics & Pneumatic system	02	02	04	08
II	Hydraulic & Pneumatic power devices	02	04	04	10
III	Conventional representation of Hydraulic & Pneumatic components	02	04	04	10
IV	Power controlling devices	02	04	06	12
V	Accessories for Pneumatics & Hydraulic system	02	02	04	08
VI	Basic Hydraulic & Pneumatic circuits	04	04	06	14
VII	Industrial circuit	04	04	04	12
VIII	Maintenance of Hydraulic & Pneumatic circuits	02	02	02	06
	TOTAL	**20**	**26**	**34**	**80**

6.0 ASSIGNMENTS/PRACTICALS/TASKS:

The tutorial/practical/assignments/tasks should be properly designed and implemented with an attempt to develop different types of cognitive and practical skills **(Outcomes in cognitive, psychomotor and affective domain)** so that students are able to acquire the competencies.

***Note**: Here only outcomes in psychomotor domain are listed as practical/exercises. However, if these practical/exercises are completed appropriately, they would also lead to development of **Programme Outcomes/Course Outcomes in affective domain** as given in a common list at the beginning of curriculum document for this Programme. Faculty should refer to that common list and should ensure that students also acquire those Programme Outcomes/Course Outcomes related to affective domain.*

Sr. No.	Unit No.	Exercises	Approx. Hrs. Required
1	I	Drawing of various ISO symbols used in hydraulic and pneumatic system.	04
2	III	Assemble meter in, meter out circuit and sequencing circuit. Compare working.	04
3	III	Observe any one stationary hydraulic system, like in any machine/ machine tool. Draw circuit diagram.(write a report)	04
4	V	Assemble pneumatic circuit for speed control of double acting cylinders/air motors.	04
5	VI	Demonstration of hydro pneumatic circuit. Draw circuits.	04
6	II & V	Select components for given applications. (hydraulic and pneumatic circuits-one each)	04
7	V	Fault finding and taking remedial/corrective action for hydraulic/pneumatic system.	04
8	III	Observe any one mobile hydraulic system like in earth moving equipments. Identify components (write a report)	04
		TOTAL	**32**

7.0 STUDENT ACTIVITIES:

Following is the list of proposed student activities like

1. Survey of oil used for hydraulic systems -specifications, manufacturer's names, costs, packing sizes etc.
2. Survey of air filters and oil filters used in hydraulic and pneumatic systems.
3. Prepare cutout/model/chart of pumps and motors. (Any one)
4. Prepare cutout/model/chart of pressure, direction and flow control valves.

8.0 SPECIAL INSTRUCTIONAL STRATEGIES (If any):

1. Arrange expert lecture
2. Arrange industrial visit

9.0 LEARNING RESOURCES:

A) Reference Books

Sr.No.	Title of Book	Author	Publication
1	Hydraulics & Pneumatics	Andrew Parr	Jaico Publication house
2	Pneumatic system – Principle and maintenance	Majumdar S R	Tata McGraw Hill
3	Oil Hydraulic system- Principle and maintenance	Majumdar S. R	Tata McGraw Hill
4	Industrial Hydraulics manual	Vickers Perry	
5	Maintenance engineering handbook	L. R. Higgins	Tata McGraw Hill
6	Hydraulics and Pneumatics	Stewart	Tata McGraw Hill
7	Industrial Hydraulics	John Pippenger Tyler Hicks	Tata McGraw Hill
8	Industrial Hydraulics	D. D. Bank & D. S. Bank	Himalaya

B) Software/Learning Websites

1. Simulators, Simulator, Hydraulics, hydro motion, pneumo motion
2. CD's: CDs developed by various system components' manufacturers.
3. Manufacturers catalogue

C) Major Equipments/ Instruments with Broad Specifications

1. Hydraulic Trainer
2. Pneumatic Trainer

10.0 MAPPING MATRIX OF PO'S AND CO'S:

Course Outcomes (Cos)	Programme Outcomes (Pos)										
	a	b	c	d	e	f	g	h	i	j	k
CO1	H	M	L		M						H
CO2		H	L	M	M						
CO3		L	H	H	M	H		H			
CO4			M	L	L		H	L		H	M
CO5				H	H		L	M		L	H

H: High Relationship, M: Moderate Relationship, L: Low Relationship.

PROGRAMME : Diploma Programme in Automobile Engineering (AE)
COURSE : Automobile Air Conditioning(AAC) **COURSE CODE :** 6569

TEACHING AND EXAMINATION SCHEME:

Teaching Scheme				Examination Scheme							
Hrs. / week			Credits	TH Paper Hrs.	Marks						
TH	TU	PR				TH	TEST	TH+TEST	PR	OR	TW	TOTAL
03	--	02	05	03	Max.	80	20	100	--	--	50	150
					Min.	32	--	40	--	--	20	--

1.0 RATIONALE:

Modern cars, Multi-utility vehicles, heavy passenger and goods vehicles are equipped with "heating ventilation and air conditioning (HVAC) system". Air Conditioning system not only provides comfort but also ultimately results in road safety. Air Conditioning servicing, therefore offers good job opportunities for diploma engineers. The prerequisite for this course is Heat Power engineering and Hydraulics and Pneumatics in earlier semester. This course will make student to understand and apply the knowledge in servicing various systems and subsystems of Air Conditioning.

2.0 COURSE OBJECTIVES:

The student will be able to,

1. Identify various HVAC systems and sub systems.
2. Understand working and construction of Air Conditioning Systems and sub systems.
3. Carry out repair and maintenance of Air Conditioning Systems and sub systems.
4. Know environmental aspects related to HVAC Systems.

3.0 COURSE OUTCOMES:

The course content should taught and learning imparted in such a manner that students are able to acquire specific learning outcomes in cognitive, psychomotor and affective domain to demonstrate the following course outcomes:

1. State and Write the refrigeration cycle and methods of refrigeration used in Automobiles.
2. Compare and Order refrigerants with their applications.
3. Examine and Distinguish components of refrigeration system in automobile
4. Create and Prepare load estimation for vehicles in Automobile Engineering
5. Test and rate Car air conditioning and air distribution.
6. Design and Recommend the refrigeration system for vehicle in automobile Engineering

4.0 COURSE DETAILS:

Unit	Major Learning Topic & Subtopic	Topic & Subtopic	Hours
Unit-I. **Introduction**	1a. Explain environmental and safety aspects in air Conditioning. 1b. Explain Human comfort.	1.1 Introduction- • Environmental and safety aspects in heating, Ventilation and air conditioning systems. • Human comfort control - comfort zone, air movement, wind chill factor, odour problems and effects of humidity. • Heat transfer fundamentals-convection, radiation, evaporation and conduction. 1.2 Requirements of heating, ventilation and air conditioning system • light motor vehicle • Heavy goods vehicle • Heavy passenger vehicle	06

Unit	Major Learning Topic & Subtopic	Topic & Subtopic	Hours
		1.3 Controlled and uncontrolled ventilation - working, application and comparison.	
Unit-II. **Case and Duct System**	2a. Describe Air intake section. 2b. Describe Downstream, upstream, split and hybrid. 2c. Describe rear heating and cooling system.	2.1 Construction and working of Air intake section, core section and distribution section. 2.2 Construction and working of Downstream, upstream, split and hybrid. 2.3 Construction and working of rear heating and cooling system	06
Unit-III. **Air Conditioning System**	3a. Explain automotive Air Conditioning system 3b. Explain refrigeration sub system. 3c. Explain expansion devices. 3d. Explain compressors. 3e. Compare refrigerants. 3f. Explain metering devices.	Part A 3.1 Layout and Sub systems- • General layout of Automotive Air conditioning system. • Construction and working of following refrigeration sub systems • Thermostatic expansion valve, fixed orifice tube and rotary vane air cycle system. 3.2 Construction and working of evaporator, condenser, accumulator, Receiver, driers and accumulator 3.3 Construction and working of reciprocating, scroll and rotary vane compressors. Drive systems for compressors. 3.4 Refrigerant- • Properties • types • Packaging and storage • Colour code and purity test Part B 3.5 Construction and working of electromagnetic clutch 3.6 Metering devices- • Comparison of thermostatic Expansion valve and fixed orifice tube. • Types, working and comparison of thermostatic Expansion valves i.e. H valve, block type, internally equalized and externally equalized. 3.7 Functions of thermostatic expansion valve i.e. Throttling action, modulating action and controlling action. Construction and working of remote bulb.	16
Unit-IV. **System Control Devices**	4a. Explain various control devices use in automobile refrigeration systems. 4b. Explain switches. 4c. Explain electronic	4.1 System controls - Construction and working of Typical vacuum system and electronic temperature control system 4.2 Construction and working of vacuum operated devices i.e. vacuum reserve tank, vacuum restrictor, vacuum motor, check valve and check relays.	10

Unit	Major Learning Topic & Subtopic	Topic & Subtopic	Hours
	climate control system.	4.3 Switches - Construction and working of high- Side temperature switch, low-side temperature switch, high pressure switch, low- pressure switch, pressure regulator, ambient switch and superheat switch. 4.4 Sensors- Construction and working of sun load sensor, outside temperature sensor and in car temperature sensors. 4.5 Controls- • Concept of Aspirator, blower clutch control, heater control and time delay relay for heater control. • Block diagram of climate control system and Electronic climate control system.	
Unit-V **Repairs and Maintenance of Air Conditioning System**	5a. Carry out maintenance of AC 5b. Explain service equipments and tools used I maintenance of AC 5c. Find out Symptoms, Faults, causes and remedies	5.1 Maintenance Of AC Systems- • Visual and acoustic check, side glass, leak test, Temperature test, • Procedure of charging and discharging. • Moisture removal procedure. • Service equipments and tools- Vacuum pump, Manifold and gauge i.e. Low side and high side, gauge calibration recovery unit and recycling unit, Halide (Freon) and Fluorescent leak detector, nitrogen leak tester 5.2 Symptoms, Faults, causes and remedies • Compressor • Electromagnetic clutch 5.3 Hoses and connectors - construction of system hoses, charging hose with shut off valve and connectors.	07
Unit-VI **Comfort Heating System**	6a. Explain comfort heating system.	6.1 Comfort heating system • Function • Construction and working • Maintenance • general faults and their remedies	03
		TOTAL	**48**

5.0 SUGGESTED SPECIFICATION TABLE WITH MARKS (THEORY):

Unit No.	Unit Title	Distribution of Theory Marks			
		R Level	U Level	A and above Levels	Total Marks
I	Introduction	02	04	04	10
II	Case and Duct System	02	02	02	06
III	Air Conditioning System	08	08	14	30
IV	System Control Devices	04	06	08	18
V	Repairs and Maintenance of Air Conditioning System	02	04	04	10
VI	Comfort Heating System	02	02	02	06
	TOTAL	**20**	**26**	**34**	**80**

Legends: R = Remembrance (Knowledge); U = Understanding; A = Application and above levels (Revised Bloom's taxonomy)

Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.

6.0 ASSIGNMENTS/PRACTICALS/TASKS:

The tutorial/practical/assignments/tasks should be properly designed and implemented with an attempt to develop different types of cognitive and practical skills **(Outcomes in cognitive, psychomotor and affective domain)** so that students are able to acquire the competencies.

***Note**: Here only outcomes in psychomotor domain are listed as practical/exercises. However, if these practical/exercises are completed appropriately, they would also lead to development of **Programme Outcomes/Course Outcomes in affective domain** as given in a common list at the beginning of curriculum document for this Programme. Faculty should refer to that common list and should ensure that students also acquire those Programme Outcomes/Course Outcomes related to affective domain.*

PRACTICALS:
Select minimum any 8 practical's from the below list.

Sr. No.	Unit No	Practical Exercises	Hours
1	I	Observe and draw layout of Automobile Air Conditioning System and sub systems.	02
2	II	Observe and Sketch of all types of Duct system.	04
3	III	Perform trial on AC test rig and report the performance.	04
4	IV	Diagnosis of control systems faults and write causes and remedies.	04
5	V	Identification and use of tools, gauges and equipment for servicing of AC system.	02
6	V	Observe and write the procedure of evacuation and charging of refrigerant from AC system.	04
7	V	Observe and write the procedure of leakage test of AC system.	04
8	--	Diagnosis of various running faults in car HVAC and write causes and remedies.	04
9	--	Visit to modern garage for servicing of HVAC system. Write a report on the same.	04
TOTAL			**32**

7.0 STUDENT ACTIVITIES:

Following is the list of proposed student activities like

1. Collect technical specifications of AC used in automobiles from internet.
2. Collect technical data of Eco- friendly refrigerants.
3. Collect application based, working based model or actual equipment based videos of any refrigerator component of automobile engineering.

8.0 SPECIAL INSTRUCTIONAL STRATEGIES (If any):

1. Arrange expert seminar of industry person in the area of design, drawing, cost estimation, load distribution, Automobile air conditioning and validation of design procedure of any component.

9.0 LEARNING RESOURCES:

A) Books

Sr.No.	Title of Book	Author	Publication
1	Principles of Refrigeration	Roy /J. Dosat	Wiley eastern
2	Refrigeration & Air conditioning	P. N. Ananth Narayan	TMH
3	Practical Refrigeration & Air	M. Adithon & S. C. Laroiya	Wiley Eastern

Sr.No.	Title of Book	Author	Publication
	Conditioning.		
4	Principles of Air conditioning	V. Paull Lang.	C. B. S.
5	Basic Air conditioning	Gerald Schweitzer & A. Ebling vol. 1 & 2	D. B. Tarapurwala.
6	Practical Air conditioning & Refrigeration	Audel	D. B. Tarapurwala
7	Refrigeration & Air conditioning	S. Domkundwar	Dhanpatrai
	Refrigeration & Air conditioning	C. P. Aurora	TMH
	Auto air Conditions (Vol 6)	Anil Chikara	Satya Prakashan

B) Software/Learning Websites

1. www.nptel.com

C) Major Equipments/ Instruments with Broad Specifications

1. Different types of refrigerator of actual model
2. Chart on types of air conditioning and refrigerator system
3. Images of different types of evaporators, condensers, compressor etc. of actual Model
4. Different types of actual model of condenser
5. Different types of actual model of compressor
6. Different types of layout of air conditioning system

10.0 MAPPIG TABLE

Course Outcomes (Co's)	Programme Outcomes (Po's)										
	a	**b**	**c**	**d**	**e**	**f**	**g**	**h**	**i**	**j**	**k**
CO1	H	H	L							H	
CO2	H	H	H	M				H		L	
CO3	H	H	L	M	M	H					
CO4	L	H				M	L	M	M	H	
CO5	H	L	H	H	M	L	L	M			
CO6			H	M	M	H	L	H	H	H	

H: High Relationship M: Moderate Relationship L: Low Relationship

PROGRAMME : Diploma Programme in Automobile Engineering (AE)
COURSE : Automobile Pollution (AUP) **COURSE CODE :** 6570

TEACHING AND EXAMINATION SCHEME:

Teaching Scheme				Examination Scheme							
Hrs. / week			Credits	TH Paper Hrs.	Marks						
TH	TU	PR				TH	TEST	TH+TEST	PR	OR	TW	TOTAL
03	--	02	05	03	Max.	80	20	100	--	--	50	150
					Min.	32	--	40	--	--	20	--

1.0 RATIONALE:

Due to industrial growth and utilization of automobile vehicle in almost all areas which are realizing poisoning agents in surrounding. This course intends to develop the skill of identifying causes of pollution, their compositions, effects on environment and members of environments and remedies to overcome and reduce the effects.

2.0 COURSE OBJECTIVES:

The student will be able to,

1. Know effects of air pollution on physical and economic systems
2. Identify effects of various elements on human being and their control.
3. Describe sources of pollutants and basic constituents of the exhaust.
4. Evaluate method to control engine emissions and its analysis
5. Observe reasons of noise, its reduction and control

3.0 COURSE OUTCOMES:

The course content should taught and learning imparted in such a manner that students are able to acquire specific learning outcomes in cognitive, psychomotor and affective domain to demonstrate the following course outcomes:

1. Explain the effect of air pollution on physical and economic systems
2. Evaluate the effects of various elements on human being and their control
3. Describe the sources of pollutants and basic constituents of the exhaust
4. Judge the method to control engine emissions and its analysis
5. Solve the problems of noise, with reduction / control

4.0 COURSE DETAILS: :

Unit	Major Learning Outcomes (In cognitive domain)	Topic & Subtopic	Hours
Unit-I **Introduction of Pollution**	1.a Define pollution 1.b Explain types of pollution 1.c Evaluate the reason of pollutions	1.1 The atmosphere and atmospheric pollution, pure air, 1.2 Sources of pollution, constituents of pure air, constituents of polluted air, 1.3 Atmospheric interaction and processes, 1.4 Acid rain, reason for acid rain and its effects.	04
Unit-II **Air Pollution Effects on Physical and Economic System**	2a Define effects on visibility 2b Explain effects on economic materials and structure 2c Describe effects on indoor air quality	2.1 Effects on visibility. 2.2 Effects on economic materials and structure. 2.3 Effects on indoor air quality.	04
Unit-III	3.a Identify the elements of pollutions	3.1 Sulphur oxide and black suspended particulate matter.	06

Unit	Major Learning Outcomes (In cognitive domain)	Topic & Subtopic	Hours
Effects of Following Elements on Human Being and Their Control Concepts	3.b Explain its effects on human 3.c Evaluate the control process	3.2 Ozone and Oxidants. Oxides of nitrogen. Carbon monoxide. 3.3 Un-burnt hydro-Carbon. Lead. 3.4 Global warning, greenhouse effect.	
Unit-IV **Sources of Pollutants and Basic Constituents of the Exhaust in I. C. engine**	4.a State the losses due to pollutants 4.b Explain basic constituents 4.c Describe the methods of measurements of vehicle emissions	4.1 Evaporative losses, crank case blow by, exhaust emissions. 4.2 Constituents: carbon monoxide, un-burnt hydrocarbon, Oxides of nitrogen, particulate matter. 4.3 Methods of measurement of vehicle emissions C. V. S., driving cycles, 4.4 Details of the measurement of CO, HC & (NO)x by infrared. 4.5 FID and chemiluminescence's methods.	08
Unit-V **Control of Engine Emissions**	5.a Explain the control of engine emissions 5.b State causes, effects and remedies 5.c Describe the construction and performance of EGR	5.1 By injection parameter, lubricating oil, Compression Ratio, Crankcase Ventilation, Fuel Composition, 5.2 Injection / Ignition timing, 5.3 Charcoal canister, 5.4 Exhaust Gas Recalculation (EGR), Load, Air injection 5.5 Thermal reactors, 5.6 Catalytic converter. 5.7 Euro norms, Bharat stage I / II, exhaust emission, 5.8 causes, effects, remedies, knocks & reasons and control, 5.9 EGR two way, three way, construction and performance	08
Unit-VI **Exhaust Gas Analysis**	6.a Determine the constituents of exhaust by mass basis and by volume basis 6.b Explain and sketch the different apparatus measurements	6.1 Numerical calculations to determine constituents of exhaust by mass basis and by volume basis. 6.2 Smoke meter, Exhaust Gas analyser, Orsat Apparatus. 6.3 Total Hydrocarbon measurements / analysis by Flame Ionization Detector (FID). Carbon dioxide / Carbon monoxide measurement / analysis by non-depressive infrared analyser and (NO) x measurements.	10
Unit-VII **Noise Reduction and Control**	7.a Define the sources of noise 7.b Explain instrument used for measurement for noise	7.1 Sources of noise 7.2 Instrument used for its measurement	08
		TOTAL	**48**

5.0 SUGGESTED SPECIFICATION TABLE WITH MARKS (THEORY):

Unit No.	Unit Title	Distribution of Theory Marks			
		R Level	U Level	A and above Levels	Total Marks
I	Introduction Of Pollution	02	04	02	08
II	Air pollution effects on physical and economic system	02	04	04	10
III	Effects of following elements on human being and their control concepts	02	04	06	12
IV	Sources of pollutants and basic constituents of the exhaust in I. C. engine	04	06	06	16
V	Control of engine emissions	04	06	06	16
VI	Exhaust gas analysis	04	04	04	12
VII	Noise reduction and control	02	02	02	06
	TOTAL	**20**	**30**	**30**	**80**

Legends: R = Remembrance (Knowledge); U = Understanding; A = Application and above levels (Revised Bloom's taxonomy)

Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.

6.0 ASSIGNMENTS/PRACTICALS/TASKS:

The tutorial/practical/assignments/tasks should be properly designed and implemented with an attempt to develop different types of cognitive and practical skills **(Outcomes in cognitive, psychomotor and affective domain)** so that students are able to acquire the competencies.

***Note**: Here only outcomes in psychomotor domain are listed as practical/exercises. However, if these practical/exercises are completed appropriately, they would also lead to development of **Programme Outcomes/Course Outcomes in affective domain** as given in a common list at the beginning of curriculum document for this Programme. Faculty should refer to that common list and should ensure that students also acquire those Programme Outcomes/Course Outcomes related to affective domain.*

Sr. No.	Unit No.	Practical Exercises (Outcome in Psychomotor Domain)	Hours
1	I	Exhaust gas analysis of 4-stroke petrol engine by using exhaust gas analyser.	04
2	I	Exhaust gas analysis of 4-stroke diesel engine by using exhaust gas analyser.	04
3	II	Exhaust gas analysis of 4-stroke petrol engine by using Orsat Apparatus.	02
4	II	Exhaust gas analysis of 4-stroke diesel engine by using Orsat Apparatus.	02
5	III	Evaporative emission measurements.	04
6	III	Catalytic converters.	04
7	IV	Particular traps.	02
8	V	Particulate measurements.	02
9	VI	Exhaust gas mass emission equipment	02
10	VII	Noise level measurement by dB meter	02
11	VII	Exhaust gas analysis of 2-stroke petrol engine by using exhaust gas analyser.	04
		TOTAL	**32**

7.0 STUDENT ACTIVITIES:

Following is the list of proposed student activities like

1. Collect market rates for various catalytic converters.

2. Collect the standard Manufacturing procedure of any exhaust gas mass emission equipment of automobile engineering from Industry.
3. Observe pollution under control certificate, Enlist parameters on which basis certificate is given

8.0 SPECIAL INSTRUCTIONAL STRATEGIES (If any):

1. Show images, videos related to sources of pollution as well as reduction and control treatment of pollution of automobile components.
2. Arrange expert seminar of industry person in the area of how to handle the exhaust gas analyzer, Noise level measurement, Evaporative emission measurement

9.0 LEARNING RESOURES:

A) Reference Books

Sr.No.	Title of Book	Author	Publication
1	Internal combustion Engines	Mathur and P. L. Sharma	S. Chand
2	Pollution control and Conservation	Dr. M. Kovacs.	Bennett & McKnight
3	Air Pollution	Henry C. Perkins.	Pearson
4	I. C. Engines Fundamentals	J. B. Heywood.	Tata McGraw Hill

B) Software/Learning Websites

Not Applicable

C) Major Equipments/ Instruments with Broad Specifications

Not Applicable

10.0 MAPPING MATRIX OF PO'S AND CO'S:

Course Outcomes	Programme Outcomes										
	a	b	c	d	e	f	g	h	i	j	k
CO1	H	M			M	H			M		M
CO2	H	M		L	M	H	L				M
CO3	H	M			M	H					M
CO4	H	M	M		M	H			M		M
CO5	H	M		M	M	H		M		M	M

H: High Relationship, M: Moderate Relationship, L: Low Relationship.

PROGRAMME : Diploma Programme in Automobile Engineering (AE)
COURSE : Alternate Fuels (AFL) **COURSE CODE :** 6571

TEACHING AND EXAMINATION SCHEME:

Teaching Scheme				Examination Scheme								
Hrs / week			Credits	TH Paper Hrs.	Marks							
TH	TU	PR				TH	TEST	TH+TEST	PR	OR	TW	TOTAL
03	--	02	05	03	Max.	80	20	100	--	--	50	150
					Min.	32	--	40	--	--	20	--

1.0 RATIONALE:

The crises of conventional energy sources, compelling the human being to find and use alternate energy sources. This course intends to know various known non conventional sources of energy, their conversions, & uses.

2.0 COURSE OBJECTIVES:

The student will be able to,

1. Specify various resources of non conventional energy, ways of their utilization.
2. Search solar energy different pattern with its importance
3. Compare biodiesel with diesel vehicle
4. Explain importance of Ethanol/ Alcohol type vehicle engine
5. Explain the importance of Hydrogen vehicle
6. Explain the layout of Electric/ Hybrid Vehicle

3.0 COURSE OUTCOMES:

The course content should taught and learning imparted in such a manner that students are able to acquire specific learning outcomes in cognitive, psychomotor and affective domain to demonstrate the following course outcomes:

1. Enlist various resources of non conventional energy, ways of their utilization.
2. Compare solar energy different pattern with its importance
3. Distinguish between biodiesel with diesel vehicle
4. Evaluate importance of Ethanol/ Alcohol type vehicle engine
5. Judge the importance of Hydrogen vehicle
6. Analyse the layout of Electric/ Hybrid Vehicle

4.0 COURSE DETAILS:

Unit	Major Learning Outcomes (in cognitive domain)	Topic & Subtopic	Hours
Unit-I **Energy requirement of India and World**	1a. Explain present energy scenario. 1b. Describe need for alternative energy sources.	1.1 Present energy scenario. Conventional energy sources – World's production and reserves, India's production and reserves. 1.2 Global energy crises. Short-comings and limitations to the existing energy sources. 1.3 Need for alternative energy sources.	04
Unit-II **Solar energy**	2a. Explain Solar Radiation 2b. Types of collectors. 2c. Application of solar energy.	2.1 Solar radiation – Terrestrial and extra terrestrial. Solar instruments, Energy potential of Sun, Simple flat plate collector, Parabolic collector. 2.2 Flat plate collector, parabolic collector Selective coatings, 2.3 Concentrating collectors, Solar ponds, Solar distillatory, Solar satellite power	10

Unit	Major Learning Outcomes (in cognitive domain)	Topic & Subtopic	Hours
		system, Solar cooker, Solar air heaters, Solar dryers, 2.4 Photovoltaic direct energy conversion, Solar cells, solar thermal power system, solar energy storage.	
Unit-III **Bio-Diesel**	3a. Explain Sources of Biodiesel 3b. Distinguish between Biodiesel vehicle and Diesel vehicle	3.1 Sources 3.2 Formation Process 3.3 Comparison of Bio-Diesel Vehicle with Diesel Vehicle 3.4 Advantages and Disadvantages of Bio-Diesel	06
Unit-IV **Ethanol / Alcohol**	4a. Specify the sources and types of Ethanol and Alcohol for SI Engine and CI Engine	4.1 Sources And Types: E10, E85, E100 4.2 Alcohol for SI Engine 4.3 Alcohol for CI Engine 4.4 Surface-Ignition Alcohol CI Engine 4.5 Application 4.6 Merits and Demerits	10
Unit-V **Hydrogen**	5a. Hydrogen gas as an IC Engine Fuel. 5b. Distinguish between CNG and LPG	5.1 Hydrogen as a IC engine Fuel 5.2 Hydrogen Engines 5.3 Natural Gas, Advantages and Disadvantages of Natural Gas 5.4 Compressed Natural Gas(CNG), Advantages and Disadvantages of CNG 5.5 Liquefied Petroleum Gas(LPG), Advantages and Disadvantages of LPG	10
Unit-VI **Electric and Hybrid Vehicles**	6a. Draw layout of Electric vehicle 6b. Explain Hybrid Drive	6.1 Layout of Electric Vehicle 6.2 Hybrid Vehicle 6.3 IC engine as a Power source 6.4 Hybrid Drive 6.5 Hybrid Drive Train 6.6 Examples of Hybrid and Electric Vehicles	04
Unit-VII **Modern Concepts In Alternative Fuels**	7a. Explain Fuel Cell 7b. Define Air powered car.	7.1 Fuel Cell 7.2 Turmeric Leaf Oil 7.3 Air Powered Car 7.4 Biogas	04
		TOTAL	**48**

5.0 SUGGESTED SPECIFICATION TABLE WITH MARKS (THEORY):

Unit No.	Unit Title	Distribution of Theory Marks			
		R Level	U Level	A and above Levels	Total Marks
I	Energy requirement of India and World	02	02	04	08
II	Solar energy	05	06	07	18
III	Bio-Diesel	04	04	04	12
IV	Ethanol/Alcohol	05	05	08	18
V	Hydrogen	03	03	06	12
VI	Electric and Hybrid Vehicles	02	01	03	06
VII	Modern Concepts In Alternative Fuels	02	02	02	06
	TOTAL	**23**	**23**	**34**	**80**

Legends: R = Remembrance (Knowledge); U = Understanding; A = Application and above levels (Revised Bloom's taxonomy)

Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.

6.0 ASSIGNMENTS/PRACTICALS/TASKS:

The tutorial/practical/assignments/tasks should be properly designed and implemented with an attempt to develop different types of cognitive and practical skills **(Outcomes in cognitive, psychomotor and affective domain)** so that students are able to acquire the competencies.

***Note**: Here only outcomes in psychomotor domain are listed as practical/exercises. However, if these practical/exercises are completed appropriately, they would also lead to development of **Programme Outcomes/Course Outcomes in affective domain** as given in a common list at the beginning of curriculum document for this Programme. Faculty should refer to that common list and should ensure that students also acquire those Programme Outcomes/Course Outcomes related to affective domain.*

Sr. No.	Unit-No.	Practical Exercises (Outcomes in Psychomotor Domain)	Hours
1	I	Demonstration of various solar appliances on site	06
2	II	Demonstration of CNG/LPG kit	04
3	III	Demonstration of Hybrid Vehicles	06
4	IV	Working of Fuel Cell	06
5	V	Demonstration of Electric car	06
6	VI, VII	Formation process of Bio-Diesel	04
7	--	Industrial Visit	—
	TOTAL		**32**

7.0 STUDENT ACTIVITIES:

Not Applicable

8.0 SPECIAL INSTRUCTIONAL STRATEGIES:

Not Applicable

9.0 LEARNING RESOURCES:

A) Books

Sr.No.	Title of Book	Author	Publication
1	Non conventional sources of energy	G. D. Rai	Khanna Publication
2	Automobile Engineering	K. K. Ram lingam	Scit6ech Publication
3	Internal Combustion Engine	V Ganesan	Tata McGraw Hill
4	Automobile Engineering Vol. 1 Engine System	Anil Chikara	Satya Prakashan

B) Software/Learning Websites

1. Petroleum Conservation and Research Association (PCRA),
2. www.nptel.com
3. www.afdc.energy.gov,
4. www.auto.howstuffworks.com

C) Major Equipments/ Instruments with Broad Specifications

Not Applicable

10.0 MAPPING MATRIX OF PO'S AND CO'S:

Course Outcomes	Programme Outcomes										
	a	**b**	**c**	**d**	**e**	**f**	**g**	**h**	**i**	**j**	**k**
CO1	L	L	H				L	L	H		M
CO2	L	L	H		L			L	H		M
CO3	M	L	H	L		M	L	L			
CO4	L		H		M			L	H		M
CO5		L	H				L	L			M
CO6	L	M	H		L			L	H		L

H: High Relationship, M: Moderate Relationship, L: Low Relationship.

Annexure : I

Rules for Registration and Examination

Important Rules of Registration for courses.

1. An eligible student must register to minimum three courses and maximum seven courses during each term.
2. While registering for a course at the beginning of a term, a student shouldn't have backlog of more than seven courses of any term as carried over due to failure or any other reason.
3. A student can register for a Project work only after acquiring minimum 100 credits.
4. A student will have to re - register for a course/s if he / she is detained from the course/s for any reason.

Important Rules regarding Registration for Examination

1. A student can register for examination of only those courses for which he has registered and kept term.
2. A student can register for examination for not more than 10 courses in one examination.
3. A student will have to re-register for examination of theory or Practical / oral of a course if he / she fails in examination.
4. A student will be allowed to re-register for examination in accordance with rules if he / she was eligible to appear for last Examination but he/ she failed to appear last examination for any reason.
5. A student will not be able to cancel his registration after he / she is Registered for examination

Other Important Rules

1. A candidate will be eligible for the award of diploma when he / she acquires the required number of credits for a Programme.
2. No candidate will be allowed to appear for examination of any course unless the Head of the Department certifies that
   2.1 Attended at least 75% of the prescribed lecture hours, tutorial hours, practical hours or any other kind of work and or assignment for the course as the case may be in conformity with the provision laid down in the course contents.
   2.2 Satisfactorily completed specified laboratory practical, term work prescribed in curriculum for the course.
3. No candidate will be permitted to reappear to any course of any examination in which he has once passed.

Standard of Passing

1. Theory, total of theory and periodic test, practical, oral and termwork examination shall be separate head of passing.
2. To pass examination of any course, a candidate must obtain a minimum of 40% marks in each head of passing prescribed for that course taken separately.

Periodic Test

1. Two periodic tests will be conducted during each term for the courses as per their examination scheme.
2. Average marks of the two period tests will be considered for each course separately.
3. Reappearing for the periodic test for improvement of marks is not allowed.

Term Work

1. Term work is a document submitted by the candidate consisting of report of site / field visit and / or laboratory work and / or drawing sheets / sketch books / jobs / model. Such term work shall be submitted before the end of academic term and it shall be satisfactory in the opinion of concern faculty member, Head of the Department and Principal of Institute.

Grace Marks

1. Grace marks shall be applicable if the rules of "standards of passing" are fulfilled.
2. The grace of maximum three marks will be given in either in "Theory marks", or "Periodic test" or "total of theory and periodic test marks", if it falls short by maximum three marks to pass a course.
3. The grace of maximum three marks shall not be applicable twice for the same course. i.e. for "theory" and "total of theory and periodic test" of same course.
4. The grace marks are not applicable to practical, oral, term work examination.

Award of Class

First Class with Distinction	:	70% or more
First Class	:	60% and above but less than 70%
Second Class	:	50 % and above but less than 60%
Pass Class	:	40% and above but less than 50 %

Annexure : II

Evaluation Scheme for Project

Term Work : Max. Marks : 50 Min. Marks : 20.
Oral : Max. Marks : 50 Min. Marks : 20.

Progressive Assessment

Name of the student: Enrolment No.:
Term : II / III ODD / EVEN
Programme: Automobile Engineering
Course : Project **Code :** 6412 **Project Guide :**

Title of Project :

SN	Project Activities	Date / Week	Leader ship	Understanding	Observation &Accuracy	Contribution	Timely Completion	Total	Signature of Student	Signature of Guide	Signature of HOD
			5	5	5	5	5	25			
1	Formation of team & finalization of project	1									
2	Submission of synopsis : by each group	2									
3	Project activity plan	3									
4	Maintenance Project Diary	6									
5	Visits to Industries / Institutions / Market	7									
6	Collection of Data / Survey	9									
7	Analysis and Presentation of data.	10									
8	Pre submission seminar	13									
9	Presentation of Rough Work : hand written	14									
10	Final Project Report : Submission	15									
	Total by Internal : out of 250										

The Term Work : Convert the total given by internal to "out off 25".

Signature of Project Guide

Project assessment :

Term Work			**Oral**		
Internal	External	Total	Internal	External	Total
25	25	50	25	25	50

Annexure : III

Committees

1. Governing Body (GB)

Sr. No	Name & Office Address	Governing Body Designation
1	**Shri. Pramod Naik** Joint Director, Directorate of Technical Education, M.S. Mumbai	Chairman
2	**Shri. Mahendra Kothari** Chairman, Maharashtra State Pipe & Allied Industry, D-5, MIDC Satpur, Nashik.	Member
3	**Shri. Ashok Katariya** Chairman, Ashoka Group of Companies, Ashoka House, Ashoka Marg, Nashik.	Member
4	**Dr. Ramesh Unnikrishnan** Regional Officer and Director, Regional Office, (AICTE) Regional Office, Western Region, Mumbai.	Member
5	**Shri. B. S. Joshi** The Joint Director, Industries, Regional Office, Nashik	Member
6	**Shri. V. D. Patil** Coordinator, NITTR-Bhopal Extension Center, Pune.	Member
7	**Shri. S. P. Wagh** Chairman, Consumer Grievances Redressal M.S.E. Dist. Co. Ltd, Nashik	Member
8	**Shri. Kishor Patil** Institute Of Career & Skills, 3, Adgaonkar plaza basement, ABB circle, Mahatma Nagar, Nashik-422007	Member
9	**Shri. Harishankar Banerjee** President, NIMA, MIDC, Satpur, Nashik.	Member
10	**Shri. F. A. Khan** Principal, Govt. Polytechnic, Aurangabad.	Member
11	**Shri. Manish Kothari** Chairman, Institution of Engineers Nashik Local Centre, Nahik.	Member
12	**Prof. Dnyandeo P. Nathe** Principal, Government Polytechnic, Nashik	Member Secretary

2. Board of Studies (BOS)

Sr. No.	Name & Office address	BOS Designation
1	**Shri. S. P. Wagh** Chairman, Consumer Grievances Redressal M.S.E. Dist.Co.Ltd, Nashik	Chairman
2	**Shri. Sunil Bhor** Project Management Consultant, 659/A wing second floor market, Shopping complex Dindori Road, Nashik.	Member
3	**Shri. Bhalchandra R. Patwardhan** Plot No.24, Atharva Raw House, Bhavik Nagar, Gangapur Road, Nashik-13.	Member
4	**Shri. Kishor T. Patil** Institute Of Career & Skills, 3, Adgaonkar plaza basement, ABB circle, Mahatma Nagar, Nashik-422007.	Member
5	**Shri. Kishor Vyas** Digilog System Pvt. Ltd., 15, Shriram sankul, Opp. Hotel Panchavati, Vakilwadi, Nashik.	Member
6	**Shri. Chandrashekhar. B. Dahale** F1, Computer Service, No. 2, Sukhraj, Near Parijatnagar bus stop,Nashik 422005	Member
7	**Shri. M. M. Dube** Sr. Executive, Systems, M & Q, C-1, MIDC, Ambad, Nashik-10	Member
8	**Shri. Anant Tagare** Principal Engineer, Validation, Mahindra & Mahindra Ltd., R & D Centre, 89, MIDC, Satpur, Nashik-422007	Member
9	**Shri. Aaush Potdar** Director, Poddar Clothing Industries, Nashik.	Member
10	**Shri. Vijay Sanap** Architect & Consultant, Soham Constructions, Nashik.	Member
11	**Shri. Pramod U. Wayse** Deputy Secretary (T), MSBTE, Regional Office, Osmanpura, Aurangabad-431005.	Member
12	**Shri. P. T. Kadve** Principal, K.K. Wagh Polytechnic, Nashik.	Member
13	**Shri. R. N. Vaidya** HOD, Civil Engg., Govt. Polytechnic, Nashik.	Member
14	**Shri. S. R. Deshkukh** HOD, Civil Engg (II Shift), Govt. Polytechnic, Nashik	Member
15	**Dr. C. Y. Seemikeri** HOD, Mechanical Engg., Govt. Polytechnic, Nashik.	Member
16	**Dr. Sanjay Ingole** HOD, Mechanical Engg (II Shift), Govt. Polytechnic, Nashik	Member
17	**Shri. J. B. Modak** I/C, HOD, Plastic Engg., Govt. Polytechnic, Nashik.	Member
18	**Shri. L. S. Patil** I/C, HOD, Elect. Engg., Govt. Polytechnic, Nashik.	Member

Sr. No.	Name & Office address	BOS Designation
19	**Shri. Yogesh Sanap** I/C, HOD, Info. Tech. & Comp. Tech., Govt. Polytechnic, Nashik.	Member
20	**Shri. A. S. Laturkar** HOD, Electronics and Telecommunication Engg., Govt. Polytechnic, Nashik.	Member
21	**Dr. S. D. Pable** HOD, Electronics and Telecommunication Engg (II Shift), Govt. Polytechnic, Nashik	Member
22	**Shri. T. G. Chavan** I/C, HOD Automobile Engg., Govt. Polytechnic, Nashik.	Member
23	**Ms. T. J. Mithari** I/C, HOD, Dress Design & Garment Manufacturing, Govt. Polytechnic, Nashik	Member
24	**Prof. N. P. Adke** I/C, HOD, Interior Design & Decoration, Govt. Polytechnic, Nashik	Member
25	**Prof. V. H. Chaudhari** I/C, Training & Placement Officer, Govt. Polytechnic, Nashik	Member
26	**Shri. G. G. Wankhede** Controller of Examination, Govt. Polytechnic, Nashik.	Member
27	**Shri. S. P. Dikshit** Lecturer in Civil Engg., I/C CDC, Govt. Polytechnic, Nashik	Member Secretary

3. Programme wise committee(PWC)

Sr. No.	Name & Office address	PWC Designation
1	**Shri. T. G. Chavan** I/C HOD Automobile Engg. Dept. , Govt. Polytechnic, Nashik	Chairman
2	**Shri. A. P. Tagare** Sr. Manager, R & D Dept., M & M, Satpur, Nashik.	Member
3	**Shri. A. P. Wadnere** HOD in Mechanical Engg., MET Institute of polytechnic Adgoan Nashik.	Member
4	**Shri. P. S. Sonar** Director, Intercon Industries, MIDC, Ambad, Nashik.	Member
5	**Shri. A. N .Pawar** Lecturer in Automobile Engg., Govt. Polytechnic, Nashik.	Member
6	**Shri. D. S. Rawal** Lecturer in Automobile Engg., Govt. Polytechnic, Nashik.	Member
7	**Shri. S. P. Borkar** Lecturer in Automobile Engg., Govt. Polytechnic, Nashik.	Member
8	**Shri. Pramod U. Wayse** Deputy Secretary (T), MSBTE, Regional Office, Osmanpura, Aurangabad-431005.	Member
9	**Shri. S. P. Dikshit** Lect., Civil Engg. Dept., Incharge CDC, Govt. Polytechnic, Nashik.	Member secretary

4. PROGRAMME CURRICULUM DEVELOPMENT COMMITTEE

Institute Level Curriculum Development Cell

Sr. No.	Name of the Faculty	Designation
1	Prof. D. P. Nathe	Principal, Government Polytechnic, Nashik
2	Shri. R. N. Vaidya	Head of Civil Engineering Department and Academic co-ordinator, Government Polytechnic Nashik
3	Shri. S. P. Dikshit	CDC Incharge, Lecturer in Civil Engineering, Government Polytechnic, Nashik
4	Dr. N. L. Patil	Lecturer in Civil Engineering, Government Polytechnic, Nashik.
5	Dr. S. V. Bhangale	Lecturer in Electrical Engineering, Government Polytechnic, Nashik.
6	Dr. S. J. Gorane	Lecturer in Mechanical Engineering, Government Polytechnic, Nashik.
7	Shri. N. N. Thakare	Lecturer in Plastic Engineering, Government Polytechnic, Nashik.

Department Level Committee

Sr. No.	Name of the Faculty	Designation
1	Dr. K. B. Nemade	I/C HOD Automobile Engg. Dept. , Govt. Polytechnic, Nashik
2	Shri. S. D. Dere	Lecturer in Automobile Engg., Govt. Polytechnic, Nashik.
3	Shri. D. S. Rawal	Lecturer in Automobile Engg., Govt. Polytechnic, Nashik.

NITTTR Committee

Sr. No.	Name of the Faculty	Designation
1	Prof. R. G. Chouksey	Dean Student Welfare, Department of Vocational Education and Entrepreneurship Development, NITTTR, Bhopal.
2	Dr. Nishith Dubey	Professor, Department of Vocational Education and Entrepreneurship Development, NITTTR, Bhopal.

5. Contributors to Course Curriculum Development

Sr. No.	Name of the Faculty	Designation
1	Dr. A. R. Thete	Consultant. Director Center For Development of Leadership in Education Pvt. Ltd. Aurangabad.

Sr. No.	Name of the Faculty	Designation
2	**Automobile Engineering Department, Government Polytechnic Nashik**	
	Dr. K. B. Nemade	I/C HOD Automobile Engg. Dept. , Govt. Polytechnic, Nashik
	Shri. T. G. Chavan	Lecturer in Automobile Engineering
	Shri. S. D. Dere	Lecturer in Automobile Engineering
	Shri. D. S. Rawal.	Lecturer in Automobile Engineering
	Shri. A.N. Pawar	Lecturer in Automobile Engineering
	Shri. S. P. Borkar	Lecturer in Automobile Engineering
3	**Applied Mechanics Department, Government Polytechnic Nashik**	
	Shri. R. G. Sonone	Co-ordinator and Lecturer in Applied Mechanics
	Shri. V. R. Gaikwad	Lecturer in Applied Mechanics
4	**Mechanical Engineering Department, Government Polytechnic Nashik**	
	Shri. S. P. Muley	I/C Head of Department
	Shri. R. V. Rupavate	I/C Head of Department (Second Shift)
	Shri. P. S. Kulkarni	Lecturer In Mechanical Engineering
	Shri. Y. S. Kokate	Lecturer In Mechanical Engineering
	Shri. A.G. Waghulde	Lecturer In Mechanical Engineering
	Shri. K. A. Jagtap	Lecturer In Mechanical Engineering
5	**Other Departments, Government Polytechnic Nashik**	
	Shri. P. G. Kochure	Workshop Superintendent
	Dr. D. D. Lulekar	Lecturer in Electrical Engineering
	Dr. S. V. Bhangale	Lecturer in Electrical Engineering
	Ms. S. S. Chaudhari	Lecturer in E & TC Engineering
6	**Science and Humanities Department, Government Polytechnic Nashik**	
	Shri. S. M. Shinde	Lecturer in Mathematics
	Mrs. A. S. Salunkhe	Lecturer in Mathematics
	Shri. C. N. Pagare	Lecturer in Chemistry
	Shri. S. A. Padwal	Lecturer in Physics
	Shri. R. P. Landage	Lecturer in English
	Mrs. A. N. Patil	Lecturer in Chemistry
	Mrs. Y. S. Patil	Lecturer in Physics
	Mrs. P. S. Joshi	Lecturer in English
	Mrs. K. S. Shinde	Lecturer in Chemistry
	Dr. Mrs. K. D. Talele	Lecturer in Physics

Certificate

The curriculum of the programme has been revised in the year 2016, as per the provision made in curriculum development process of Government Polytechnic, Nashik. This is **outcome based curriculum of Diploma in Automobile Engineering programme**, which shall be implemented from academic year 2016-17.

Verified by

Department Level CDC Representative
Government Polytechnic, Nashik

Head of Department
Automobile Engineering
Government Polytechnic, Nashik

Incharge, Curriculum Development Cell
Government Polytechnic, Nashik.

Principal
Government Polytechnic, Nashik.