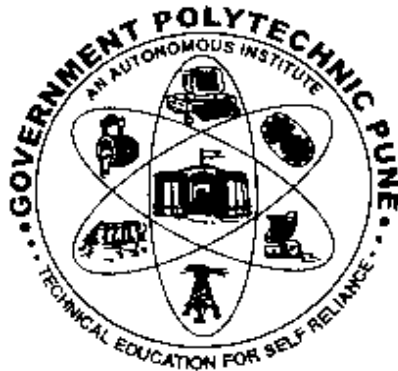# Government Polytechnic Pune

(An Autonomous Institute of Government of Maharashtra)

Curriculum Revision 2014-2015

(180S)

Department of Mechanical Engineering

Government Polytechnic, Pune

Vision

To develop self-reliant, versatile, innovative, quality conscious engineers for betterment of society.

Mission

- Imparting updated curriculum in association with stakeholders.
- Providing with the state of art infrastructure & facilities.
- Set up strategic alliance with industries.
- Enhancing e-governance.
- Continuous development of faculty & staff

Department of Mechanical Engineering

Vision

To develop skilled adaptable, creative, and quality conscious, Mechanical Engineers to serve the society.

Mission

1) Providing modern infrastructure and facilities so that students will gain hands on experience of using various equipment's, machinery and software's.
2) Developing strong interaction with industries, academic and research institutes to keep curricula updated.
3) Inculcate quality consciousness, self-learning attitude along with safety and environmental awareness in students.
4) Utilizing resources and expertise to organize training in emerging technologies for faculty, staff, students and industry employees.
5) Conducting various need based continuing education modular programmes in partnership with industries.

PROGRAMME EDUCATION OBJECTIVES (PEOs)

1) On the basis of his knowledge and skill diploma engineer will work effectively as a team leader in the industry or peruse higher education.
2) A diploma mechanical engineer will perform key role in quality improvement and solve real life problems in industry with social and environmental context.
3) A diploma mechanical engineer will easily adopt latest technologies.
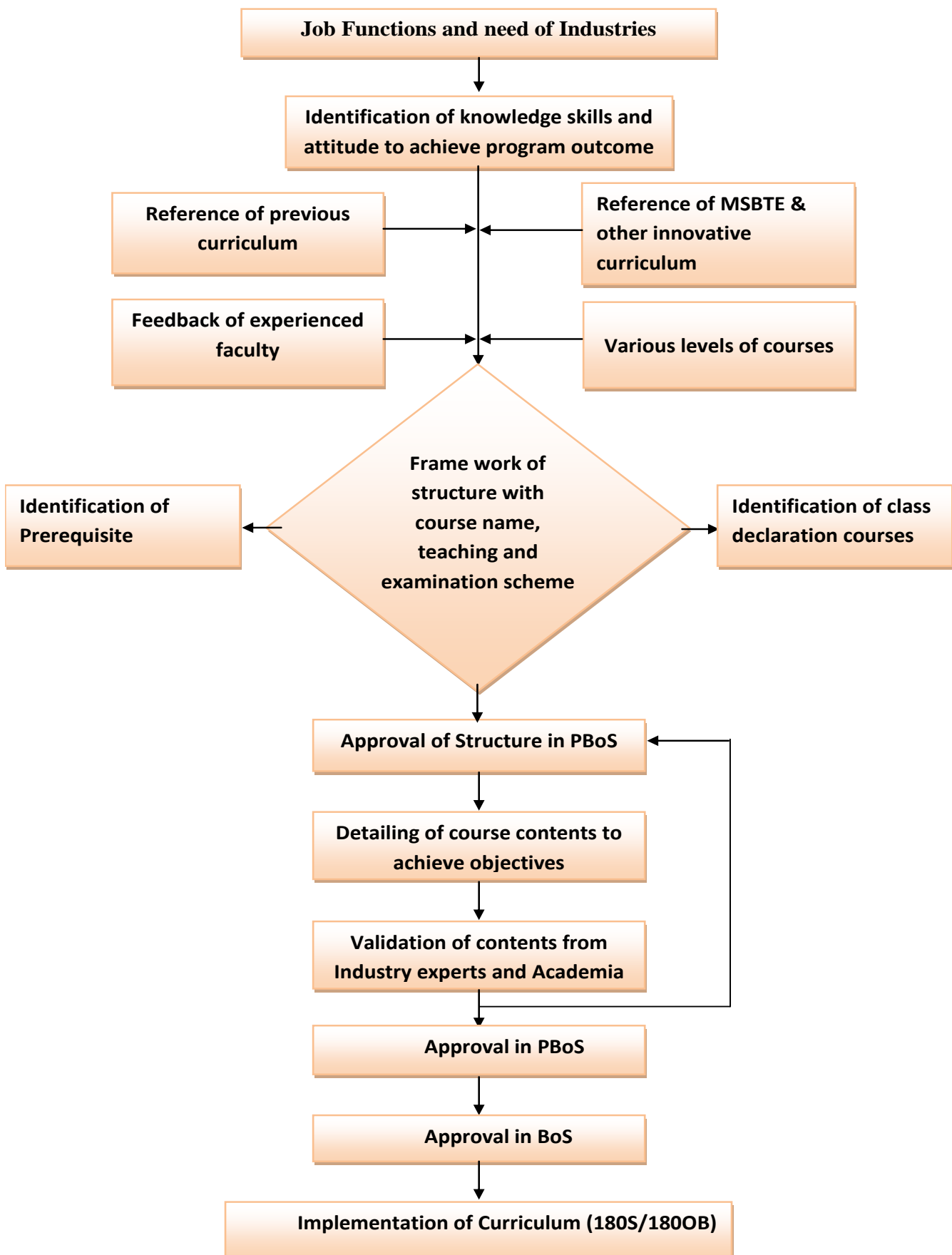
PROGRAM OUTCOMES (POs)

1. **Basic and Discipline specific knowledge:** Apply knowledge of basic mathematics, science and engineering fundamentals and engineering specialization to solve the mechanical engineering problems.

2. **Problem analysis:** Identify and analyse well-defined mechanical engineering problems using codified standard methods.

3. **Design/ development of solutions:** Design solutions for well-defined technical problems and assist with the design of systems components or processes to meet specified needs in mechanical engineering.

4. **Engineering Tools, Experimentation and Testing:** Apply modern mechanical engineering tools and appropriate technique to conduct standard tests and measurements.

5. **Engineering practices for society, sustainability and environment:** Apply appropriate technology in context of society, sustainability, environment and ethical practices.

6. **Project Management:** Use engineering management principles individually, as a team member or a leader to manage projects and effectively communicate about well-defined engineering activities in diverse and multidisciplinary fields.

7. **Life-long learning:** Ability to analyse individual needs and engage in updating in the context of technological changes in mechanical engineering.
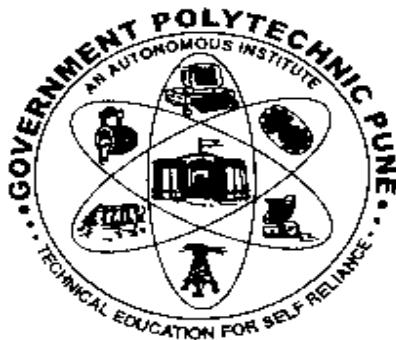
PROGRAM SPECIFIC OUTCOMES (PSOs)

PSO1 :- Use latest Mechanical Engineering related software's for simple design drafting and manufacturing.

PSO :2- Use and operate machine, equipment and instruments related to mechanical

engineering with more emphasis on automobile industry.

Flow diagram of Methodology for Curriculum Revision

```
                    ┌─────────────────────────────────┐
                    │  Job Functions and need of       │
                    │  Industries                      │
                    └─────────────────────────────────┘
                                  │
                    ┌─────────────────────────────────┐
                    │  Identification of knowledge     │
                    │  skills and attitude to achieve  │
                    │  program outcome                 │
                    └─────────────────────────────────┘
```

| Reference of previous curriculum | → ← | Reference of MSBTE & other innovative curriculum |

| Feedback of experienced faculty | → ← | Various levels of courses |

Frame work of structure with course name, teaching and examination scheme

| Identification of Prerequisite | ← | | → | Identification of class declaration courses |

Approval of Structure in PBoS

Detailing of course contents to achieve objectives

Validation of contents from Industry experts and Academia

Approval in PBoS

Approval in BoS

Implementation of Curriculum (180S/180OB)

	DIPLOMA IN MECHANICAL ENGINEERING														
	Level - I : Foundation Level Courses														
Sr. No	COURSE CODE	COURSE TITLE	PRE-REQUISITE	Compulsory / Optional	TEACHING SCHEME				EXAMINATION SCHEME						
					L	P	T	C	PA	TH	TW	OR	PR	C.D	T.M.
1	HU 181	English		Compulsory	2	2	0	4	20	80	25	--	--	--	125
2	HU 182	Communication Skills		Compulsory	2	2	0	4	20	80	--	25	--	--	125
3	SC 181	Applied Mathematics -I		Compulsory	3	0	1	4	20	80	--	--	--	--	100
4	SC 182	Applied Mathematics II		Compulsory	3	0	1	4	20	80	--	--	--	--	100
5	SC 183	Engineering Physics		Compulsory	3	2	0	5	20	80	--	--	50	--	150
6	SC 184	Engineering Chemistry		Compulsory	3	2	0	5	20	80		--	50	--	150
7	**6**	**TOTAL**		Compulsory	**16**	**8**	**2**	**26**	**120**	**480**	**25**	**25**	**100**	**--**	**750**

Sr. No	COURSE CODE	COURSE TITLE	PRE-REQUISITE	COMPULSORY / OPTIONAL	TEACHING SCHEME				EXAMINATION SCHEME						
					L	P	T	C	P A	T H	TW	O R	P R	C. D	T. M.
1	ME 281	Engineering Graphics		COMPULSORY	2	4	0	6	20	80	25	--	--	--	125
2	ME 282	Computer Aided Drafting		COMPULSORY	1	2	0	3	0	0	25	--	50	--	75
3	WS 281	Work Shop Practice		COMPULSORY	0	4	0	4	0	0	50	--	--	--	50
4	AM 281	Engineering Mechanics		COMPULSORY	4	2	0	6	20	80	25		--	--	125
5	EE 282	Electrical Technology		COMPULSORY	3	2	0	5	20	80	25	--	--	--	125
6	ET 285	Elements of Electronics Engineering		COMPULSORY	3	2	0	5	20	80	25	--	--	--	125
7	CM 286	Computer Fundamentals		COMPULSORY	1	2	0	3	0	0	25	--	50	--	75
	7	TOTAL			14	18	0	32	80	320	200	0	100		700

DIPLOMA IN MECHANICAL ENGINEERING

Level - II A : Core Technology Courses
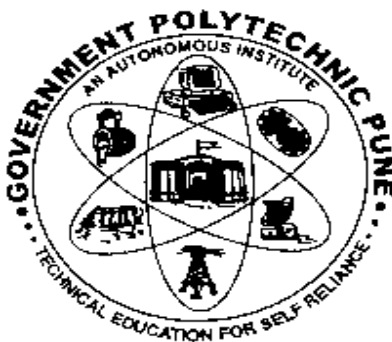
	DIPLOMA IN MECHANICAL ENGINEERING															
	Level - II B: Core Technology Courses															
Sr. No	COURSE CODE	COURSE TITLE	PRE-REQUISITE	COMPULSORY / OPTIONAL	TEACHING SCHEME				EXAMINATION SCHEME							
					L	P	T	C	P A	T H	TW	O R	P R	C. D	T. M.
1	SC 281	Applied Maths - III		Any one	2	0	1	3	20	80	--	--	--	--	100
2	ME 283	Programming in C			1	2	0	3	0	0	50	--	50	--	100
	1	**TOTAL**			**1**	**2**	**0**	**3**	**20**	**80**	**50**		**50**	**--**	**100**
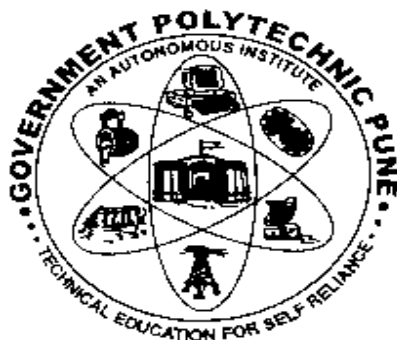
DIPLOMA IN MECHANICAL ENGINEERING

Level III – Basic Technology Courses

Sr. No	COURSE CODE	COURSE TITLE	PRE-REQUISITE	COMPULSORY / OPTIONAL	TEACHING SCHEME				EXAMINATION SCHEME						
					L	P	T	C	PA	TH	TW	OR	PR	C.D	T.M.
1	ME 381	Machine Drawing	ME 281	COMPULSORY	3	4	0	7	20	80	25	0	--	--	125
2	ME 382	Thermodynamics & Heat Enginess		COMPULSORY	3	2	0	5	20	80	25	25	--	--	150
3	ME 383	Fluid Mechanics & Fluid Machinery		COMPULSORY	3	2	0	5	20	80	25		25		150
4	ME 384	Mechanical Measurement		COMPULSORY	2	2	0	4	10	40	25	--	--		75
5	ME 385	Theory of Machines & Mechanisms		COMPULSORY	4	2	0	6	20	80	25	25	--	C.D	150
6	MT 388	Mechanical Engineering Materials	SC 184	COMPULSORY	2	0	2	4	20	80	25	--	--	--	125
7	WS 381	Manufacturing Processes		COMPULSORY	2	4	0	6	20	80	25		25	--	150
8	AM 384	Strength of Materials	AM 281	COMPULSORY	4	2	0	6	20	80	25	0	--	--	125
	8	TOTAL			23	18	2	43	150	600	200	50	50	--	1050
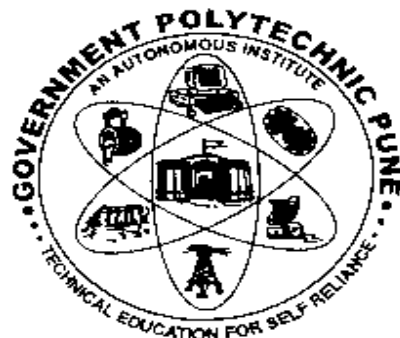
						TEACHING SCHEME				EXAMINATION SCHEME						
DIPLOMA IN MECHANICAL ENGINEERING																
Level IV – Applied Technology Courses																
LEVEL IV GROUP A																
Sr. No	COURSE CODE	COURSE TITLE	PRE-REQUISITE	COMPULSORY / OPTIONAL		L	P	T	C	PA	TH	TW	OR	PR	C.D	T.M.
1	AU 481	Environmental Science	--	Compulsory		0	2	0	2	0	0	50	0	0		50
2	AU 482	Comminity Development	Any One	Optional		2	0	0	2	20	80	0	0	0		100
3	AU 483	Renewable & sustainable energy		Optional		2	0	0	2	20	80	0	0	0		100
4	AU 484	Engineering Economics		Optional		2	0	0	2	20	80	--	--	--		100
	2	**Total**				**2**	**2**	**0**	**4**	**20**	**80**	**50**	**0**	**0**		**150**

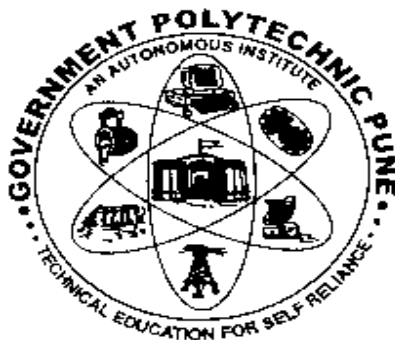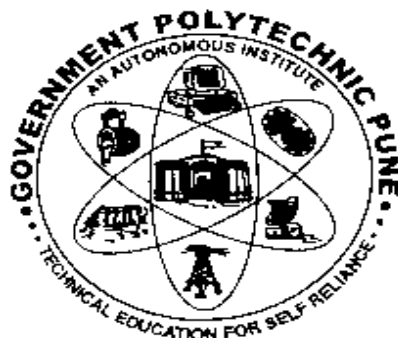|				TEACHING SCHEME				EXAMINATION SCHEME						

DIPLOMA IN MECHANICAL ENGINEERING

Level IV – Applied Technology Courses

LEVEL IV GROUP B

Sr. No	COURSE CODE	COURSE TITLE	PRE-REQUISITE	COMPULSORY / COMPULSORY	TEACHING SCHEME				EXAMINATION SCHEME						
					L	P	T	C	PA	TH	TW	OR	PR	C.D	T.M.
1	MA 481	Construction Mnagement		Optional	3	0	0	3	20	80	--	--	--		100
2	MA 482	Industrial Organisation& Mnagement		Optional	3	0	0	3	20	80	--	--	--		100
3	MA 483	Entrepreneurship Development	Any One	Optional	3	0	0	3	20	80	--	--	--		100
4	MA 484	Materials Management		Optional	3	0	0	3	20	80	--	--	--		100
5	MA 485	Superviosary Management		Optional	3	0	0	3	20	80	--	--	--		100
6	MA 486	Total Quality Management		Optional	3	0	0	3	20	80	--	--	--		100
7	MA 487	Management Information System		Optional	3	0	0	3	20	80	--	--	--		100
	1	Total			3	0	0	3	20	80					100

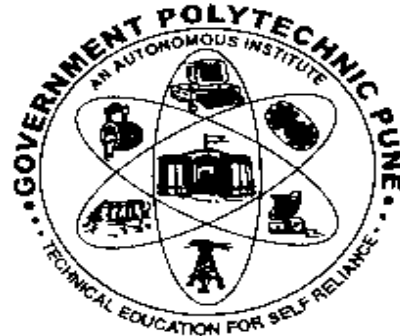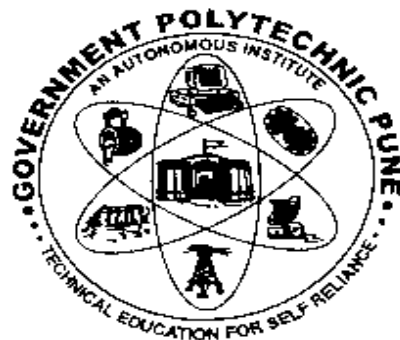|					TEACHING SCHEME				EXAMINATION SCHEME						

DIPLOMA IN MECHANICAL ENGINEERING

Level IV – Applied Technology Courses

LEVEL IV GROUP C

Sr. No	COURSE CODE	COURSE TITLE	PRE-REQUISITE	COMPULSORY / COMPULSORY	L	P	T	C	P A	T H	T W	O R	P R	C. D	T.M.
1	ME 481	Project & Seminar	90	COMPULSORY	0	8	0	8	50		50	50		C.D	150
2	ME 482	Power Engineering	ME 382	COMPULSORY	4	2	0	6	20	80	25	25		C.D	150
3	ME 483	Industrial Hyd. & Pneumatics.		COMPULSORY	4	2	0	6	20	80	25	25		C.D	150
4	ME 484	Prod. Planning and Control		COMPULSORY	3	2	0	5	20	80	25	25		--	150
5	ME 485	Design of Machine Elements	AM 384	COMPULSORY	4	2	0	6	20	80	25	25		C.D	150
6	ME 486	Metrology & Quality Control		COMPULSORY	4	2	0	6	20	80	25		25	C.D	150
7	WS 481	Production Technology		COMPULSORY	4	4	0	8	20	80	25		25	--	150
	7	**TOTAL**			**23**	**22**	**0**	**45**	**170**	**480**	**200**	**150**	**50**	**--**	**1050**

DIPLOMA IN MECHANICAL ENGINEERING																
Level IV – Applied Technology Courses																
LEVEL IV GROUP D																
Sr. No	COURSE CODE	COURSE TITLE	PRE-REQUISITE	COMPULSORY / COMPULSORY	TEACHING SCHEME				EXAMINATION SCHEME						
					L	P	T	C	PA	TH	TW	OR	PR	C.D	T.M.
1	NC 481	Development of Soft Skill-I		COMPULSORY	0	2	0	2			25				25
2	NC 482	Development of Soft Skill-II		COMPULSORY	0	2	0	2			25				25
	2	**TOTAL**			**0**	**4**	**0**	**4**			**50**				**50**

DIPLOMA IN MECHANICAL ENGINEERING

Level V – Diversified Courses

Sr. No	COURSE CODE	COURSE TITLE	PRE-REQUISITE	COMPULSORY / COMPULSORY	TEACHING SCHEME				EXAMINATION SCHEME						
					L	P	T	C	PA	TH	TW	OR	PR	C.D	T.M.
1	WS 581	CNC&Adva. Manufacturing	WS 381	COMPULSORY	3	3	0	6	20	80	25	25	--	C.D	150
2	ME 581	Refrigeration & Air conditioning		Any Three	4	2	0	6	20	80	25	25	--	C.D	150
3	ME 582	Instrumentation & Control			4	2	0	6	20	80	25	25	--	C.D	150
4	ME 583	Tool Engineering.			4	2	0	6	20	80	25	25	--	C.D	150
5	ME 584	Automobile Engineering			4	2	0	6	20	80	25	25	--	C.D	150
6	ME 585	Advanced welding Technology			4	2	0	6	20	80	25	25	--	C.D	150
7	ME 586	Mechatronics			4	2	0	6	20	80	25	25	--	C.D	150
8	ME 587	Computer aided 3D Modelling			2	4	0	6	50	--	50	--	50	C.D	150
	4	TOTAL			13	11	0	24	80	320	75	125	100	--	600

Total Credits	180
Total No. Courses	38
No. of Courses with Theory Examination	29-31
No.of Courses with Practical Examination	19
No. of Courses without Theory Examination	7-9
Total Marks	4500
Marks for Class Declaration	1500
Theory Paper Marks for Class Declaration	900
Theory : Practical Ratio	52/48
Class Declaration Courses	10

Level	Credits
I	26
II –A	32
II – B	3
III	43
IV A	4
IV – B	3
IV – C	45
IV – D	4
V	24
Total	**180**

Division-wise Sample Path

The institute follows multi-point entry credit system (MPECS). A student has to acquire 180 credits for the completion of the diploma programme.

In the present curriculum (180S), generally, a student admitted after 10th Std. (SSC) has to complete 38 courses whereas a laterally admitted student after 12th Std. (HSC) / ITI has to complete 25 courses.

The courses in the curriculum are grouped into five levels as indicated in structure.

As the department has three divisions, following parameters are taken into consideration while offering the courses to each of the divisions during each semester.

1. Opportunity to the students for completing pre-requisite courses before they can register for higher level courses

2. Opportunity of early completion of the programme for high achievers.

3. Optimum utilization of

a. Human resources – faculties in the institute

b. Laboratories

4. Opportunity for weak students to register the course in other than their parent division if at all they fail to get the term granted in first attempt.

Based on the above mentioned considerations, 'Paths' are defined for the students in three divisions, which are presented in tables below.

Mechanical Engineering Programme (Path Chart for Division 'D') .

I ODD TERM	II EVEN TERM	III ODD TERM	IV EVEN TERM	V ODD TERM	VI EVEN TERM
HU 181 English 2+2=4	HU 182 Communication Skill 2+2=4	Engineering Materials ME384 2+1T=3	ME 383 Fluid Mech & Machinery 3+2=5	ME 482 Power Engineering 4+2=6	ME 481 Industrial Project & Seminar II 0+4=4
SC 181 Applied Mathematics I 3+1T=4	SC 182 Applied Mathematics II 3+1T=4	ME 381 Machine Drawing 3+4=7	SC 282 Engineering Mathematics 2+1T=3	Ws 581 CNC & Advance Mfg 3+3=6	ME 484 Prod. Planning & Control 3+2=5
SC 183 Physics 3+2=5	SC 184 Chemistry 3+2=5	AM 384 Strength of Material 4+2=6	AU 481 Environmental Science 0+2=2	ME 485 Machine Design 4+2=6	AUTO ME584 4+2=6
ET 285 Elements of ETX 3+2=5	ME 281 Engineering Graphics 2+4=6	MT 388 Engineering Material 2+2T=4	ME 382 Thermodynamic & Heat Engine 3=2=5	ME 486 Metrology & Quality Control 4+2=6	RAC (ME581) 4+2=6
AM 281 Engineering Mechanics 4+2=6	ME 281 Computer Aided Drafting 1+2=3	AU 482/483/484 Community Development/Renewable & Sustainable energy management /Engineering Economics 2+0=2	ME 385 Theory of Machines & Mechanism 4+2=6	IHP ME483 4+2=6	3DM ME587) 2+4=6
CM 286 Computer Fundamentals 1+2=3	EE 282 Electrical Technology 3+2=5	WS 381 Manufacturing Process 2+4=6	WS 481 Production Technology & Cam 4+4=8	ME 481 Industrial Project & Seminar I 0+4=4	MA 486 Total Quality Management 3+0=3
	WS 281 Workshop Practice 0+4=4	NC 481 Development of soft Skill	NC 482 Development of Soft Skill - II		
27	31	28+2	30+2	33	31

Mechanical Engineering Programme (Path Chart for Division 'E')

I ODD	II EVEN TERM	III ODD TERM	IV EVEN	V ODD	VI EVEN

TERM			TERM	TERM	TERM
HU 181 English 2+2=4	HU 182 Communication Skill 2+2=4	SC 282 Engineering Mathematics 2+1T=3 ME 283 Programming in C 1+2=3	ME 383 Fluid Mech & Machinery 3+2=5	ME 385 Theory of Machines & Mechanism 4+2=6	ME 481 Industrial Project & Seminar II 0+4=4
SC 181 Applied Mathematics I 3+1T=4	SC 182 Applied Mathematics II 3+1T=4	ME 381 Machine Drawing 3+4=7	WS 381 Manufacturing Process 2+4=6	MA 486 Total Quality Management 3+0=3	Ws 581 CNC & Advance Mfg 3+3=6
ME 281 Engineering Graphics 2+4=6	SC 183 Physics 3+2=5	ME 382 Thermodynamic & Heat Engine 3=2=5	AM 384 Strength of Material 4+2=6	ME 485 Machine Design 4+2=6	AUTO ME584 4+2=6
SC 184 Chemistry 3+2=5	AM 281 Engineering Mechanics 4+2=6	MT 388 Engineering Material 2+2T=4	ME 482 Power Engineering 4+2=6	WS 481 Production Technology & Cam 4+4=8	RAC (ME581) 4+2=6
CM 286 Computer Fundamental 1+2=3	EE 282 Electrical Technology 3+2=5	AU 482/483/484 Community Development/Renewable & Sustainable energy management /Engineering Economics 2+0=2	ME 486 Metrology & Quality Control 4+2=6	3DM ME587) 2+4=6	MA 486 Total Quality Management 3+0=3
WS 281 Workshop Practice 0+4=4	ET 282 Elements of ETX 3+2=5	ME 384 Mechanical Measurement 2+2=4	NC 482 Development of Soft Skill - II	ME 481 Industrial Project & Seminar I 0+4=4	ME 484 Prod. Planning & Control 3+2=5
	ME 282 CAD 1+2=3	AU 481 Environmental Science 0+2=2		IHP ME483 4+2=6	
		NC 481 Development of soft Skill			
26	32	27+2	29+2	33	33

Mechanical Engineering Programme (Path Chart for Division 'M') .

I ODD TERM	II EVEN TERM	III ODD TERM	IV EVEN TERM	V ODD TERM	VI EVEN TERM
HU 181 English 2+2=4	HU 182 Communication Skill 2+2=4	SC 282 Engineering Mathematics 2+1T=3 ME 283 Programming in C 1+2=3	ME 383 Fluid Mech & Machinery 3+2=5	ME 482 Power Engineering 4+2=6	ME 481 Industrial Project & Seminar II 0+4=4
SC 181 Applied Mathematics I 3+1T=4	SC 182 Applied Mathematics II 3+1T=4	ME 381 Machine Drawing 3+4=7	ME 384 Mechanical Measurement 2+2=4	Ws 581 CNC & Advance Mfg 3+3=6	AUTO ME584 4+2=6
SC 184 Chemistry 3+2=5	SC 183 Physics 3+2=5	AM 384 Strength of Material 4+2=6	AU 481 Environmental Science 0+2=2	ME 485 Machine Design 4+2=6	RAC (ME581) 4+2=6
AM 281 Engineering Mechanics 4+2=6	ME 281 Engineering Graphics 2+4=6	MT 388 Engineering Material 2+2T=4	ME 382 Thermodynamic & Heat Engine 3=2=5	ME 486 Metrology & Quality Control 4+2=6	3DM ME587) 2+4=6
ET 285 Elements of ETX 3+2=5	ME 281 Computer Aided Drafting 1+2=3	AU 482/483/484 Community Development/Renewable & Sustainable energy management /Engineering Economics 2+0=2	ME 385 Theory of Machines & Mechanism 4+2=6	IHP ME483 4+2=6	ME 484 Prod. Planning & Control 3+2=5
CM 286 Computer Fundamentals 1+2=3	EE 282 Electrical Technology 3+2=5	WS 381 Manufacturing Process 2+4=6	WS 481 Production Technology & Cam 4+4=8	ME 481 Industrial Project & Seminar I 0+4=4	MA 486 Total Quality Management 3+0=3
	WS 281 Workshop Practice 0+4=4	NC 481 Development of soft Skill	NC 482 Development of Soft Skill - II		
27	31	29+3	29+3	31	29

INDEX

35	Level IV – Applied Technology Courses	Group C	1	ME481	Project & Seminar	141
36			2	ME 482	Power Engineering	144
37			3	ME 483	Industrial Hyd. & Pneumatics.	148
38			4	ME 484	Production. Planning and Control	153
39			5	ME 485	Design of Machine Elements	157
40			6	ME 486	Metrology &Quality Control	161
41			7	WS 481	Production Technology	166
42	Level IV	Group D	1	NC 481	Development of Soft Skill-I	169
43			2	NC 482	Development of Soft Skill-II	172
44	Level V – Diversified Courses		1	WS 581	CNC & Advanced Manufacturing Processes	175
45			2	ME581	Refrigeration & Air Conditioning	179
46			3	ME 582	Instrumentation & Control	183
47			4	ME 583	Tool Engineering.	187
48			5	ME 584	Automobile Engineering	191
49			6	ME 585	Advanced welding Technology	196
50			7	ME 586	Mechatronics	200
51			8	ME 587	Computer aided 3D Modelling	204

Level	Credits
I	26
II – A	32
II – B	3
III	43
IV – A	4
IV – B	3
IV – C	45
IV – D	4
V	24
Total	**180**

Total Credits	**180**
Total No. Courses	38
No. of Courses with Theory Examination	29-31
No. of Courses with Practical Examination	19
No. of courses without Theory Examination	7-9
Total Marks	4500
Marks for Class Declaration	1500
Theory Paper Marks for Class Declaration	900
Theory :- Practical Ratio	52 / 48
Class Declaration Courses	10

Name of Programme : **Diploma in CE/EE/ET/ME/MT/CM/IT**
Programme Code : **01/02/03/04/05/06/07/18/24**
Name of Course : **English**
Course Code : **HU181**

Teaching Scheme :-

	Hours / Week	Total Hours
Theory	**02**	**32**
Practical	**02**	**32**

Evaluation Scheme :-

	Progressive Assessment	Semester End Examination			
		Theory	**Practical**	**Oral**	**Term Work**
Duration	Two Class Tests each of 60 Minutes	03 Hrs.	---	---	---
Marks	**20**	**80**	**---**	**---**	**25**

Course Rationale :-

This is been noticed that diploma pass outs lack in grammatically correct written and oral communication in English. It is also been noticed that communication is not a problem of students, communication in correct English is the basic problem of Diploma pass outs. Students will have to interact in this language so far as their career in industry is concerned. In order to enhance this ability in students English is introduced as a subject to groom their personality.

Course Outcomes :-

	After studying this course the student will be able to
1	Practice Grammar usage.
2	Interpret passages for preparing abstracts.
3	Express own ideas on a given topic.
4	Practice Jargon wise vocabulary.

Course Contents :-

Ch. No.		Name of Topic / Subtopic	Hrs	Weightage
		PART I : GRAMMAR		
1	1.1	Tenses : Past Perfect, Past Perfect Continuous	**12**	**20**
	1.2	Types of Sentences: Simple, Compound and Complex.		
	1.3	Verbs		
	1.4	Reported Speech : Complex Sentences		
	1.5	Uses of 'too' and 'enough' : Conversion and Synthesis		
	1.6	Modal Auxiliary : Will, shall, can, could		
	1.7	Articles		
	1.8	Preposition		
	1.9	Conjunctions Interjections		
	1.10	Affirmative and negative, interrogative		
	1.11	Question tag		
2		**PARAGRAPH WRITING**	**04**	**10**

	2.1	Types of paragraphs (Narrative, Descriptive, Technical)		
3		**COMPREHENSION**	**10**	**40**
	3.1	Unseen passages		
		VOCABULARY		
4	4.1	Homophones: To understand the difference between meaning and spelling of words	**04**	**06**
	4.2	Vocabulary : Understanding meaning of new words	**02**	**04**
		Total	**32**	**80**

List of Practicals / Experiments / Assignments :-

Sr. No.	Name of Practical / Experiment / Assignment	Hrs.
1	Building of Vocabulary – 2 assignments 25 new words for each assignment with sentence	**04**
2	Conversational Skills – Role play student will perform the role on any 6 situations. Dialogue writing for the given situations.	**04**
3	Grammar – 2 assignments	**04**
4	Write paragraphs on given topics. 2 assignments.	**04**
5	Errors in English 2 assignments. Find out the errors and rewrite the sentences given by the teacher.	**04**
6	Essay writing 2 assignments. Write 2 assays on topic given by the teacher.	**04**
7	Biography (Write a short biography on your role model approximately in 250-300 words)	**04**
8	Idioms and phrases. Use of idioms and phrases in sentences(20 examples)	**04**
	Total	**32**

The term work will consist of 10 assignments.

Instructional Strategy :-

Sr. No.	Topic	Instructional Strategy
1	Grammar	Class room Teaching
2	Paragraph Writing	Class room Teaching
3	Comprehension	Class room Teaching
4	Vocabulary	Class room Teaching

Reference Books :-

Sr. No.	Author	Title	Publication
1	J.D.O. Connors	Better English Pronunciation	London Cambridge University Press ELBS
2	Geofrey Leech	A communicative Grammar of English	Essex Longman Group Ltd. : ELBS
3	Randolf Quirk	University Grammar of English	Essex Longman Group Ltd. : ELBS

Learning Resources :- Books, Audio Visual aids.

Specification Table :-

Sr. No.	Topic	Cognitive Levels			Total
		Knowledge	Comprehension	Application	
1	Grammar	---	10	10	20
2	Paragraph Writing	---	05	05	10
3	Comprehension Of Unseen Passages	---	30	10	40
4	Vocabulary / Homophones	02	04	04	10
	Total	**02**	**49**	**29**	**80**

CO-PO Matrices of course

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
1	-	-	-	-	1	3	2
2	-	-	-	-	1	3	2
3	-	-	-	-	1	3	2
4	-	-	-	-	1	3	2

Table 3.12
Enter correlation levels 1, 2 or 3 as defined below:
1**: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)***If there is no correlation, put "-"*

CO-PSO Matrices of course

CO	PSO1	PSO2
1	-	-
2	-	-
3	-	-
4	-	-

Enter correlation levels 1, 2 or 3 as defined below:
1**: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)***If there is no correlation, put "-"*

(Prof. M.A. Surdikar)   (Prof. S. V. Chaudhary)   (Prof. M.S. Deshmukh)

Prepared By   Secretary, PBOS   Chairman, PBOS

Name of Programme	:	**Diploma in CE/EE/ET/ME/MT/CM/IT**
Programme Code	:	**01/02/03/04/05/06/07/18/24**
Name of Course	:	**Communication Skills**
Course Code	:	**HU182**

Teaching Scheme :-

	Hours / Week	Total Hours
Theory	02	32
Practical	02	32

Evaluation Scheme :-

	Progressive Assessment	Semester End Examination			
		Theory	**Practical**	**Oral**	**Term Work**
Duration	One Class Tests of 60 Minutes and an Oral	03 Hrs.	---	---	---
Marks	20	80	---	25	--

Course Rationale :-

Classified under human sciences this subject is intended to introduce students with the process of communication so that they can identify conditions favorable to effective communication. They will also be taught basic and applied language skills viz. listening, speaking, reading and writing – all useful for the study of a technical course and communication. Specifically, writing and oral presentation skills are two top ranking capabilities needed for professional careers and must be developed systematically.

Course Outcomes :-

	After studying this course, the student will be able to
1	Interpret basic concepts of communication for analyzing various communication events
2	Correlate organizational structure and flow of communication.
3	Interpret nonverbal codes for effective communication and oral communication.
4	Use various written communication tools for effective correspondence.

Course Content :-

Ch. No.			Name of Topic / Subtopic	Hrs	Marks
1			**Basic Concepts And Principles Of Communication**	**12**	**24**
	1.1		**The Communication Event** The Communication event : Definition The elements of communication : The sender, receiver, message, channel, feedback and context.		
	1.2		**The communication Process** The Communication Process : Definition Stages in the process : defining the context, knowing the audience, designing the message, encoding, selecting the proper channels, transmitting, receiving, decoding and giving feedback.		
	1.3		**Principles of Effective communication** Effective Communication : definition Communication Barriers and how to overcome them at each stage of communication process.		

		Developing effective message : Thinking about purpose, knowing the audience, structuring the message, selecting proper channels, minimizing barriers and facilitating feedback.		
		Organizational Communication		
2	2.1	What is an organization? Goal, structure, hierarchy. Pattern of communication : Upward, Downward, Horizontal and Grapevine	04	12
		Non-verbal Communication		
3	3.1	Non Verbal Codes : Kinesics (eye-contact, gesture, postures, body movements and facial expressions) Proxemics (using space), Haptics (touch), Vocalics (aspect of speech like tone, emphasis, volume, pauses etc.) Physical Appearance, Chronemics (manipulating time), Silence.	06	12
		Business Correspondence and Office Drafting		
4	4.1	Business Correspondence : Letter of Enquiry, Order letter, Complaint Letter and Adjustment letter.	10	32
	4.2	Report Writing : Feasibility report/ Survey Report, Accident Report and Progress Report		
	4.3	Office Drafting : Circular, Notice and Memo		
	4.4	Job Application with resume.		
		Total	32	80

List of Practicals / Experiments / Assignments :-

Sr. No.	Name of Practical / Experiment / Assignment	Hrs.
1	Self Introduction	02
2	Elocution	04
3	Extempore	04
4	Mock Interview	04
5	Debate	02
6	Variety Application/Reports	02
7	Writing Paragraphs on Technical Subjects	02
8	Business letter	02
9	Individual/Group Presentation on identified topics	02
10	Group discussion	02
11	Role play	06
	Total	**32**

Text Books :-

Sr. No.	Author	Title	Publication
1	MSBTE	Communication skills	MSBTE

Reference Books :-

Sr. No.	Author	Title	Publication
1	Joyeeta Bhatacharya	Communication skills	Macmillan Co.
2	Sarah Freeman	Written communication in English	Orient Longman Ltd.
3	Krishna Mohan and Meera Banerji	Developing Communication skills	Macmillan India Ltd.

Learning Resources :- Books, Audio Visual aids

Specification **Table :-**

Sr. No.	Topic	Cognitive Levels			Total
		Knowledge	Comprehension	Application	
1	Basic Concepts and Principles of communication	08	08	08	24
2	Organizational communication	04	04	04	12
3	Non Verbal communication	---	---	12	12
4	Business Correspondence and Office Drafting	---	---	32	32
	Total	**12**	**12**	**56**	**80**

CO-PO Matrices of course

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
1	-	-	-	-	-	3	2
2	-	-	-	-	--	2	3
3	-	-	-	-	-	2	3
4	-	-	-	-	-	3	3

Table 3.1.2
Enter correlation levels 1, 2 or 3 as defined below:
1**: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)***If there is no correlation, put "-"*

CO-PSO Matrices of course

CO	PSO1	PSO2
1	1	-
2	1	-
3	1	-
4	1	-

Enter correlation levels 1, 2 or 3 as defined below:
1**: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)***If there is no correlation, put "-"*

(Prof. M.A. Surdikar)   (Prof. S. V. Chaudhary)   (Prof. M.S. Deshmukh)

Prepared By   Secretary, PBOS   Chairman, PBOS

Government Polytechnic Pune

Name of Programme : **Diploma in CE/EE/ET/ME/MT/CM/IT**
Programme Code : **01/ 02/ 03/ 04 / 05/ 06/07/18/24**
Name of Course : **Applied Mathematics – I**
Course Code : **SC 181**

Teaching Scheme :-

	Hours / Week	**Total Hours**
Theory	03	48
Term Work / Tutorial	01	16

Evaluation Scheme :-

	Progressive Assessment	**Semester End Examination**			
		Theory	**Practical**	**Oral**	**Term Work**
Duration	Two Class Tests each of 60 Minutes	03 Hrs.	---	---	---
Marks	20	80	---	---	---

Course Rationale :-

The students of Diploma in Engineering and technology must acquire some essential competencies in Mathematics.

Course Outcomes :-

The students will be able to think logically and systematically. They will learn the importance of accuracy and develop attitude of problem solving with diligence and perseverance**.**

	Course outcome (CO)
1	Solve Mathematical Problem related to logarithm , partial fraction and Binomial theorem
2	Solve Mathematical Problem related to Determinants and Matrices
3	Solve trigonometric problems
4	Apply knowledge of Straight line for solving mathematical problems.
5	Apply knowledge of circle for solving mathematical engineering

Sr No		Name	Periods	Marks
01		**ALGEBRA**	**18**	**32**
	1.1	**Logarithms** Definition , Laws of Logarithms , Simple examples based on laws.	02	04
	1.2	**Determinants** Determinants of second and third orders, solution of simultaneous equations in two and three	03	06

		unknowns (Cramer's Method), Properties of determinants of order 3 and examples		
	1.3	**Partial fractions** Rational fractions, resolving given rational fraction into partial fraction (Type : Denominator containing non-repeated, repeated linear factors and non repeated quadratic factor)	03	06
	1.4	**Matrix Algebra** Definition of a matrix, types of matrices, Equal matrices, Addition, subtraction, multiplication of matrices. Scalar multiple of a matrix. Transpose of a matrix, Singular and Non singular matrix. Adjoint of a square matrix. Inverse of a matrix. Solution of simultaneous linear equations in 3 unknowns by Adjoint method.	06	10
	1.5	**Binomial Theorem** Definition of factorial notation, definition of permutation and combinations with formula, Binomial theorem for positive index, General term, Binomial theorem for negative index, Approximate value (only formula)	04	06
02		**TRIGONOMETRY**	**20**	**32**
	2.1	Trigonometric ratios and fundamental identities.	04	08
	2.2	Trigonometric ratios of allied angles, compound angles, multiple angles (2A, 3A), submultiples angle.	06	08
	2.3	Sum and product formulae.	06	08
	2.4	Inverse Circular functions. (definition and simple problems)	04	08
03		**COORDINATE GEOMETRY**	**10**	**16**
	3.1	**Straight Line** Slope and intercept of straight line. Equation of straight line in slope point form, slope-intercept form, two-point form, two-intercept form, normal form. General equation of line. Angle between two straight lines condition of parallel and perpendicular lines. Intersection of two lines. Length of perpendicular from a point on the line and perpendicular distance between parallel lines.	06	10
	3.2	**Circle** Equation of circle in standard form, Centre-radius form, Diameter form, two intercept form. General equation of a circle and its center& radius.	04	06
		Total	48	80

Reference Books :-

Author	Title	Publisher
Shri S.P. Deshpande	Mathematics for Polytechnic Students	Pune Vidyarthi Griha
Shri S.L. Loney	Plane Trigonometry	Macmillan and London
Shri H.K. Dass	Mathematics for Engineers (Vol.I)	S.Chand and Comp.
Shri Shantinarayan	Engg. Maths Vol.I and II	S. Chand and Comp.

Learning Resources :- Chalk, Board etc.

Specification Table :-

Sr. No.	Topic	Cognitive Levels			Total
		Knowledge	Comprehension	Application	
1	Algebra	08	16	08	32
2	Trigonometry	08	16	08	32
3	Co-ordinate Geometry	04	08	04	16
	Total	**20**	**40**	**20**	**80**

CO-PO Matrices of course

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
1	3	2	1	-	--	-	1
2	3	3	1	-	-	-	3
3	3	3	1	-	-	-	1
4	3	3	1	-	-	-	1
5	3	3	1	-	-	-	1

Table 3.12
Enter correlation levels 1, 2 or 3 as defined below:
1**: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)***If there is no correlation, put "-"*

CO-PSO Matrices of course

CO	PSO1	PSO2
1	-	-
2	1	-
3	-	-
4	-	-
5	1	-

Enter correlation levels 1, 2 or 3 as defined below:
1**: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)***If there is no correlation, put "-"*

(Prof. V. B. Shinde)　　　　　(Prof. S. V. Chaudhary)　　　　　(Prof. M.S. Deshmukh)

Prepared By　　　　　　Secretary, PBOS　　　　　　Chairman, PBOS

Name of Programme : **Diploma in CE/EE/ET/ME/MT/CM / IT**
Programme Code : **01/ 02/ 03/ 04 / 05/ 06 / 07/18/24**
Name of Course : **Applied Mathematics – II**
Course Code : **SC 182**

Teaching Scheme :-

	Hours / Week	**Total Hours**
Theory	**03**	**48**
Term Work / Tutorial	**01**	**16**

Evaluation Scheme :-

	Progressive Assessment	**Semester End Examination**			
		Theory	**Practical**	**Oral**	**Term Work**
Duration	Two Class Tests of 60 minutes duration	03 Hrs.	---	---	---
Marks	**20**	**80**	**---**	**---**	**----**

Course Rationale :-

This subject intends to teach students basic facts, concepts, principles and procedure of Mathematics as a tool to analyze Engineering problems and as such it lays down foundation for the understanding of engineering science and core technology subjects.

Course Outcomes :-

The students will be able to,	
1	Evaluate limits of different types of functions
2	Apply derivatives for various types of functions
3	Compute Maxima and Minima for given types of functions
4	Determine work done and moment of force using dot product and cross product
5	Apply numerical methods for solving algebraic and simultaneous equations.

Course Contents :-

Sr. No.		Name	Periods	Marks
1		**FUNCTIONS AND LIMITS**	13	18
	1.1	Functions: Concept of functions, Types of functions; (only definitions)	03	06
	1.2	Limits: Concept of limits and limits of functions. (algebraic, trigonometric, logarithmic and exponential.)	10	12
2		**DERIVATIVES**	**16**	**24**
	2.1	Definition of the derivative, derivatives of standard Functions.	03	04
	2.2	Differentiation of sum, difference, product and quotient of two or more functions	03	04
	2.3	Differentiation of composite, inverse, implicit functions.	04	06
	2.4	Differentiation of parametric exponential and logarithmic Functions.	04	06
	2.5	Successive differentiation.	02	04
3		**APPLICATIONS OF DERIVATIVES**	**05**	**08**

	3.1	Geometrical meaning of derivative (Equations of Tangents and Normals)	03	04
	3.2	Maxima and minima of functions.	02	04
4		**VECTORS**	**06**	**14**
	4.1	Definition of vector, position vector, Algebra of vectors (Equality, addition, subtraction and scalar multiplication)	01	02
	4.2	Dot (Scalar) product with properties.	02	04
	4.3	Vector (Cross) product with properties.	02	04
	4.4	Work done and moment of force about a point & line	01	04
5		**NUMERICAL METHODS**	**08**	**16**
	5.1	Solution of algebraic equations, Bisection method, Regular falsi method and Newton –Raphson method.	04	08
	5.2	Solution of simultaneous equations containing 2 and 3UnknownsGauss elimination method. Iterative methods- Gauss Seidal and Jacobi's method	04	08
		Total	**48**	**80**

Reference Books :-

Author	Title	Publisher
Vishwanath	Engineering Mathematics Vol.I	Satya Prakashan, New Delhi
S.P. Deshpande	Mathematic for polytechnic students I and II	Pune Vidyarthi Griha Prakashan
H.K. Dass	Mathematics for Engineering Vol	S.Chand and Company
Shantinaravan	Engineering Mathematics vol-I and II	S.Chand and Company

Learning Resources :- Chalk, Board etc.

Specification Table :-

Sr. No.	Topic	Cognitive Levels			Total
		Knowledge	Comprehension	Application	
1	Function And Limits	04	08	06	18
2	Derivatives	08	16	00	24
3	Applications Of Derivatives	00	00	08	08
4	Vectors	04	04	06	14
5	Numerical Methods	04	04	08	16
	Total	20	32	28	80

CO-PO Matrices of course

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
1	2	2	1	-	-	-	1
2	3	3	1	-	-	-	1
3	3	3	1	-	-	-	1
4	2	2	-	-	-	-	1
5	3	3	2	-	-	1	2

Table 3.12
Enter correlation levels 1, 2 or 3 as defined below:
1**: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)***If there is no correlation, put "-"*

CO-PSO Matrices of course

CO	PSO1	PSO2
1	-	-
2	-	-
3	-	-
4	1	-
5	2	-

Enter correlation levels 1, 2 or 3 as defined below:
1**: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)***If there is no correlation, put "-"*

(Prof. V. B. Shinde) (Prof. S. V. Chaudhary) (Prof. M.S. Deshmukh)

Prepared By Secretary, PBOS Chairman, PBOS

Government Polytechnic Pune

Name of Programme : **Diploma in CE/EE/ET/ME/ MT/CM/IT**
Programme Code : **01/02/03/04/05/06/0718/24**
Name of Course : **Engineering Physics**
Course Code : **SC183**

Teaching Scheme :-

	Hours / Week	Total Hours
Theory	03	48
Term Work / Tutorial	02	32

Evaluation Scheme :-

	Progressive Assessment	Semester End Examination			
		Theory	Practical	Oral	Term Work
Duration	Two Class Tests of 60 minutes duration	3 Hrs	2 Hrs	---	---
Marks	20	80	50	--	---

Course Rationale :-

1	To understand various phenomena, principles and concepts in physics.
2	To understand the applications in Engineering Physics.
3	To solve the applied numerical problems.

Course Objective :-

1	Interpret types of motion.
2	Calculate physical properties of different materials.
3	Apply principles of Heat, Sound and Light in Engineering .
4	Use electrical instruments for measuring different attributes.
5	Solve problems based on Modern physics.

Course Contents :-

Sr. No		Topic / Sub topic	Hrs	Weightage
1		**Motion**		
	1.1	**Introduction**		
	1.2	**Circular Motion**: UCM, angular displacement, angular velocity, angular acceleration, radial velocity, tangential velocity, periodic time, frequency, relation between linear and angular velocity, explanation of centripetal and centrifugal force, with application, relation between velocity frequency and wavelength.	06	08
	1.3	**SHM**: Definition, SHM as a projection of UCM on the diameter, Equation of SHM, displacement and graphical representation.		
2		**Properties of Matter**	08	12

	2.1	**Surface Tension: Molecular** theory of surface tension, Cohesive and adhesive forces, Angle of contact, shape of liquid surface in capillary tube, capillary action (Examples). Surface tension by capillary rise method, (no derivation), simple problem, effect of impurity and temperature on surface tension.		
	2.2	**Viscosity:** Definition, velocity gradient, Newton's & Strokes' law of viscosity, terminal velocity, coefficient of viscosity by stokes method(no derivation), type of flow of liquid - steam line flow, turbulent flow, Reynolds's number (significance), applications and simple problems.		
	2.3	**Elasticity:** Elastic, plastic and rigid bodies, stress and strain, Hook's law, types of elastic moduli with its relation, problems. Behavior of wire under continuously increasing load.		
3		**Sound**		
	3.1	Wave motion, Transverse and longitudinal waves, free and forced vibrations, Resonance - explanation and example absorption, reflection and transmission of sound.	03	06
4		**Heat**		
	4.1	Explanation of Gas laws, Boyle's law, Charles's law, Gay Lussac's law, General Gas Equation, problems on gas laws, units of temperature ^0C, ^0K with their conversion, absolute scale of temperature, modes of heat transfer, conduction, convection and radiation.	04	06
5		**Optics**	06	12
	5.1	Introduction to reflection and refraction of light, Snell's law, physical significance of refractive index, critical angle, total internal refraction of light.		
	5.2	**Fiber optics**: Propagation of light through optical fiber, numerical aperture, types of optical fibers, applications and comparison with electrical cable.		
	5.3	**LASER:** Definition, spontaneous and stimulated emission, population inversion, He-Ne laser-construction and working, applications and properties of LASER.		
6		**Electrostatics**		
	6.1	**Electric charge**, Coulomb's law of charges, unit charge, electric field, intensity of electric field, electric lines of forces(properties), electric flux, flux density.	06	10
	6.2	**Electric potential:** explanation, definition, potential due to a point charge, potential due to a charged sphere, absolute electric potential, simple problems.		
7		**Current Electricity**		
	7.1	**Current**, resistance, specific resistance, Whetstone's network, meter bridge, balancing condition of meter bridge, measurement of unknown resistance using meter bridge, problems.	06	10
	7.2	**Principle of potentiometer,** potential gradient, E.M.F., comparison of E.M.F. using potentiometer.		
	7.3	**Electric work**, electric power, energy, units and calculations of electric bill.		
8		**Electromagnetism**		
	8.1	**Magnetic effect of electric current**, Ampere's rule, intensity of magnetic field, magnetic induction, Biot- Savert's Law (Laplace's Law), Fleming's left hand rule, force experienced by current carrying straight conductor placed in magnetic field, problems.	03	06
9		**Modern Physics**		
	9.1	**X- ray's**, principle, production, properties and applications.	06	10
	9.2	**Photo electricity**: Planks quantum theory, photoelectric effect (circuit diagram and working), threshold frequency, stopping potential, work function, Einstein's photoelectric equation, photocell, problems.		
		Total	48	80

List of Practicals / Experiments / Assignments :-

Sr. No.	Name of Experiment
1	Use of vernier calliper to measure the dimensions of different objects.
2	To understand the concept of error in instrument and to measure the dimensions of different objects using micrometer screw gauge.
3	To determine the velocity of sound using resonance tube method.

4	To determine period of simple pendulum.
5	To determine surface tension by capillary rise method.
6	To determine the specific resistance using Ohm's law
7	To understand the concept of Whetstone's network and to determine the specific resistance using the meter bridge.
8	Comparison of EMF using single cell method.
9	To understand the concept of viscosity and hence to determine the coefficient of viscosity using Stokes' method.
10	Study of concept of total internal reflection.
11	Study of characteristics of photoelectric cell.
12	To determine permittivity of free space.

Reference Books :-

Authors	Title	Publisher
R.K. Gaur and S. L. Gupta	Engineering Physics	Dhanpat Rai and Sons Publications
Manikpure, Prakash Deshpande and Dagwar	Basic Applied Physics	S. Chand and Co. New Delhi.
Modern Physics	Text book in Physics for diploma Engg. Student.	Sony Publications Pvt. Ltd.
Applied Physics	Schum's Series.	
Kshirsagar, Avdhanalu-	Engineering Physics	

Learning Recourses :-

Sr. No	Recourses	Sr. No	Recourses
1	Chart	1	Educational
2	Black Board	2	Models
3	Television	3	Experimentation
4	Internet	4	Diagram Demonstration

Specification Table :-

Note: Figures in the bracket indicate the marks for which question will be set to account for internal options.

Sr. no.	Topic	Cognitive Level Knowledge	Comprehension	Applications	Total
1	General Physics	4 (4)	3 (2)	1 (2)	6 (8)
2	Properties of matter	4 (5)	2 (3)	2 (4)	8 (12)
3	Sound	1 (2)	1 (2)	1 (2)	3 (6)
4	Heat	2 (2)	1 (2)	1 (2)	4 (6)
5	Optics	3 (6)	2 (3)	1 (3)	6 (12)
6	Electrostatics	2 (4)	2 (4)	2 (2)	6 (10)
7	Current Electricity	3 (4)	1 (3)	2 (3)	6 (10)
8	Electromagnetism	1 (3)	1 (2)	1 (1)	3 (6)
9	Modern Physics	3 (5)	2 (3)	1 (2)	6(10)

CO-PO Matrices of course

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
1	3	2	-	1	-	1	1
2	3	2	-	1	-	1	1
3	3	2	-	1	1	1	1
4	3	-	-	1	-	-	1
5	3	-	-	1	1	1	1

Table 3.12
Enter correlation levels 1, 2 or 3 as defined below:
1**: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)***If there is no correlation, put "-"*

CO-PSO Matrices of course

CO	PSO1	PSO2
1	-	-
2	-	-
3	-	2
4	-	2
5	-	2

Enter correlation levels 1, 2 or 3 as defined below:
1**: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)***If there is no correlation, put "-"*

(Prof. Y.D. Bhide)   (Prof. S. V. Chaudhary)   (Prof. M.S. Deshmukh)

Prepared By   Secretary, PBOS   Chairman, PBOS

Name of Programme : **Diploma in CE/EE/ET/ME/MT**
Programme Code : **01/02/03/04/05/18/24**
Name of Course : **Engineering Chemistry**
Course Code : **SC184**

Teaching **Scheme :-**

	Hours / Week	Total Hours
Theory	03	48
Term Work / Practical	02	32

Evaluation **Scheme :-**

	Progressive Assessment	Semester End Examination			
		Theory	**Practical**	**Oral**	**Term Work**
Duration	Two class tests of 60 minutes duration	03 Hrs	02 Hrs	--	--
Marks	20	80	50	--	--

Course **Rationale :-**

Applications of Material Science and Chemical Principles have resulted into the Development of new materials used in modern medicines and automobiles, synthetic fibers polymers, alloys, new energy sources and many other important products and processes.

Hence, Material Science is an important and expanding branch in scientific engineering and economic field of our society. Thus the principles of Material Science have a wide application in all the branches of engineering and technologies. In this syllabus, the coverage of various topics will orient the students to appreciate the principles Material Science in the fields of engineering and Technology.

The topic atomic structure includes the basic structure of matter, which governs the Mechanical, Electrical and Magnetic properties of the matter. Steels, alloys, plastic and Elastomers are included considering their present extensive use in automobiles, chemicals and heavy engineering industries. The contents of this curriculum provide knowledge of cells and batteries, selection of appropriate materials for engineering applications and methods of protection by metallic and non-metallic coatings. This satisfies the need of the students to cope with the recent use of these materials and processes in their world of work.

Corrosion and methods of prevention will make students realize importance of care and maintenance of machines and equipments. Study of different polymers, insulators, adhesives and their chemical behavior will be useful in their applications in electrical appliances and electronics industries. Study of impurities and hardness in water and methods for water softening will help the students to make proper use of water. The knowledge of environmental pollution and its awareness is helpful to change the attitude towards society and development by caring approach.

Nanomateials are widely used in engineering field .It will help to understand the need of nonmaterial in different engineering fields.

Course **Outcomes :-**

The student will be able to	
1	Distinguish material on the basis of Atomic structure.
2	Solve the problems based on Faraday's Law
3	Select Metals and Non Metals for given applications.
4	Calculate hardness of given water sample.
5	Select appropriate Lubricants for different machines.

	6	Correlate Environmental effects with different fuels.		

Course Contents :-

Sr No		Name of the Topic	Hours	Marks
1		**ATOMIC STRUCTURE AND CHEMICAL BONDING**	04	08
	1.1	**Atomic Structure** Definition of atom, structure of modern atom, Characteristics of fundamental particles of an atom, definition of atomic number, atomic mass number and their difference, Orbits: Bohr's energy levels, sub-energy levels, s, p, d, f orbital, shapes and description of s and p orbital. Definition and significance of quantum numbers:, Aufbau's principle, Hund's rule, orbital electronic configurations (s, p, d, f) of elements having atomic number 1 to 30,		
	1.2	**Chemical Bonding** • Definitions of valence electrons, valency. • Definition of electrovalency, positive and negative electrovalency, formation of Electrovalent compounds- *NaCl, AlCl$_3$*, Definition of covalency, single, double and triple covalent bonds, formation of Covalent compounds H_2O, CO_2, N_2		
2		**Electrochemistry**	08	12
	2.1	**Introduction** Definition of an electrolyte, electrolysis ,ionization, Assumptions of Arrhenius theory of electrolytic dissociation degree of ionization ,factors affecting degree of ionization, Difference between atom and ion, Activity series ,Mechanism of electrolysis, of i)Cuso$_4$ solution by using platinum ,cu rods.		
	2.2	**Faraday's law of electrolysis.** Statements, explanation Numerical examples based on Faraday's laws of electrolysis.		
	2.3	**Cell and cell reactions** Concept of electrode potential, standard electrode potential (E^O), significance of oxidation –reduction potential, type of electrodes, reference electrode and indicator electrode. construction and working of hydrogen electrode and calomel electrode.EMF series and its application, constructions and working reactions of lead acid cell, Daniel cell with porous vessel and salt bridge. Applications of Electrolysis Electroplating and Electro refining		
3		**METAL AND ALLOYS**	06	08
	3.1	**Metals** Occurrence of metals, definitions of mineral, ore, flux, matrix, slag and metallurgy, mechanical properties of metal, flow chart showing different processes in metallurgy, classification, properties and application of carbon steel, heat treatment(definition, purposes and methods)		
	3.2	**Alloys** Definition of alloy, purposes of making alloys with examples, classification of alloys(ferrous and non-ferrous), effects of alloying elements on the properties of steel(Ni, Co, Si, Mn, V, W) composition, properties and uses of heat resisting steel, magnetic steel ,shock resistance steel, stainless steel ,high speed steel spring steel, tool steel, duralumin, woods metal, brass and monel metal.		
4	4.1	**PLASTIC AND RUBBER (POLYMER AND ELASTOMER)** Definition of monomer and polymer, types of polymer (Addition, and Condensation) Definition example-(formation of Polythene, PVC, Teflon, Bakelite) Thermo softening and thermosetting (definition and comparison), applications of Plastic based on its properties. Definition and applications of Conductive polymer, Definition of elastomer, isoprene unit. Natural rubber-drawbacks, vulcanization, properties of rubber and applications based on its properties. Difference between	05	08

		synthetic and natural rubber.		
	4.2	**ENGG.MATERIALS** Definition Properties and Applications of - **1)** Cement and lime **2)** Ceramics and composites **3)** Glass and Insulating materials **4)** Paint and adhesives.		
5	5.1	**WATER** Definition of hard water and soft water, causes of hardness, types of hardness, analysis of degree of hardness in calcium carbonate equivalent(numerical), bad effect of hard water in industries (paper, textile, dye, sugar), removal of hardness by lime soda method, zeolite, ion exchange method, reverse osmosis, PH scale, applications of PH in engineering. Numerical based on PH and hardness.	05	08
6	6.1	**CORROSION** Definition, causes of corrosion types of corrosion-definition (atmospheric and electro chemical) Types of oxide films , mechanism of atmospheric and electrochemical corrosion (evolution of hydrogen, absorption of oxygen), factors affecting rate of atmospheric corrosion and electrochemical corrosion. Protection Methods- Galvanization and tinning processes, sherardizing, metal spraying , metal cladding.	05	08
7	7.1	**LUBRICANT** Definition and functions of lubricant, mechanism of lubrication(fluid film, boundary, extreme pressure lubrication), classification of lubricant, properties of lubricating oils(physical and chemical), selection of lubricant for light machines, I.C.E., gears, cutting tools, high pressure and low speed machines, transformers, spindles in textile industry, for refrigeration system.	04	08
8.	8.1	**FUELS** Definition, classification of fuels, characteristics of good fuel, comparison between solid, liquid and gaseous fuel, types of coal, analysis of coal by proximate and ultimate analysis, refining of crude petroleum, fractions obtained by distillation of crude oil, gasoline, kerosene, diesel as a fuel(properties and uses)	04	08
9.	9.1	**MATERIAL SCIENCE AND ENGINEERING** Definition of material science, terminology and scales, properties of materials, (mechanical, electrical, magnetic, optical, thermal with example) structure depended properties (example of hardness versus structure of steel.)Types of materials- metals, semiconductor, polymer ceramic and composites (examples and properties and applications).Engineering nano material and its applications.	04	06
10	10.1	**ENVORNMENTAL EFFECT (AWARNESS LEVEL)** Definition, types of pollution, air, water, soil, sound, nuclear pollution. (Causes, effect, control method), E-waste (origin effect control) deforestation, ozone depletion, greenhouse effect, preventative environmental management activities.	03	06
		Total	**48**	**80**

List of Practicals / Experiments / Assignments :-

SR NO.	NAME OF THE EXPERIMENT	Hours
1	Write the electronic configuration of atoms (atomic no.1-30) Write the formation of compounds NaCl, $AlCl_3$, H_2O, CO_2, N_2.	04
2	Determine acidic and basic radical from unknown solution (any two)	04
3	Measure the voltage developed due to chemical reactions by setting up Daniel cell.	02
4	To determine the percentage of iron in given steel sample by redox titration.	02
5	To determine total hardness of sample of water by EDTA method.	02
6	To determine chloride content in given sample of water by Mohr's method	02
	REVISION /REPETATION (1 to 6)	02
7	To determine the percentage of Ca content in cement.	02
8	To determine electrode potential of various metals to study their tendency to corrosion	02
9	To determine the acid value of lubricant by using KOH	02
10	To determine coefficient of viscosity by using Ostwald's viscometer.	02
11	To determine percentage of ash or moisture in a given coal sample by proximate analysis.	02

12	To determine the strength of hydrochloric acid by titrating against sodium hydroxide solution by using PH meter.	02
	RIVISION/REPETATION (7 to 12)	O2

Reference Books :-

Author	Title	Publisher
V. P. Mehta	Polytechnic Chemistry	Jain Brothers, New Delhi.
P.C. Jain and Monica Jain	Applied Chemistry	Dhanpat Rai and sons, New Delhi
M.M. Uppal	Engineering Chemistry	Khanna Publisher, Delhi.
S.N. Narkhede, M.M. Thatte	Applied Chemistry	Nirali Prakashan, Pune.

Learning Resources :- Chalk, Board etc.

Specification Table :-

Sr. No.	Topic	Cognitive Levels			Total
		Knowledge	Comprehension	Application	
1	Atomic structure and chemical bonding.	04	2	2	08
2	Electrochemistry	04	06	02	12
3	Metal and alloys	04	02	02	08
4	Polymer, Elastomer and Engg materials	03	02	03	08
5	Water	02	03	03	08
6	Corrosion	04	02	02	08
7	Lubricant	03	03	02	08
8	Fuel	03	03	02	08
9	Material science and Engineering.	02	02	02	06
10	Environmental effects	02	02	02	06
	Total	**31**	**27**	**22**	**80**

CO-PO Matrices of course

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
1	3	-	-	-	-	-	1
2	3	2	-	-	-	1	1
3	3	-	-	-	-	-	1
4	3	3	-	2	2	1	1
5	3	2	-	2	1	1	1
6	**3**	**1**	**-**	**-**	**3**	**1**	**1**

Table 3.12

Enter correlation levels 1, 2 or 3 as defined below:

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)*If there is no correlation, put "-"*

CO-PSO Matrices of course

CO	PSO1	PSO2
1	-	1
2	-	1
3	-	1
4	-	2
5	-	2
6	-	2

Enter correlation levels 1, 2 or 3 as defined below:

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)*If there is no correlation, put "-"*

(Prof. K. V. Mankar)   (Prof. S. V. Chaudhary)   (Prof. M.S. Deshmukh)

Prepared By   Secretary, PBOS   Chairman, PBOS

<p style="text-align:center">Government Polytechnic Pune</p>

Name of Programme	:	**Diploma in CE/ME/ MT**
Programme Code	:	**01/04 /05/21/24/15/18/19**
Name of Course	:	**Engineering Graphics**
Course Code	:	**ME281**

Teaching Scheme :-

	Hours / Week	Total Hours
Theory	**02**	**32**
Practical	**04**	**64**

Evaluation Scheme :-

	Progressive Assessment	Semester End Examination			
		Theory	**Practical**	**Oral**	**Term Work**
Duration	Two class tests, each of 90 minutes	4 hrs.	--	--	--
Marks	**20**	**80**	--	--	**25**

Course Rationale :-

Engineering drawing is the graphical language. It is used by engineers, designers, planners, supervisors and also the workers to express their thoughts, ideas and concepts. The expression by drawing is very accurate precise and brief. At a glance one can understand detailed description of any part to be manufactured or a dam to be built or an electric circuit to be used. For all technicians through understanding of principles of engineering drawing (Graphic Skills) is essential.

Course Outcomes :-

	After studying this course, the student will be able to
1	Draw geometrical figures and engineering curves.
2	Draw views of a given object using principles of orthographic projections.
3	Draw isometric views of a given component from its orthographic projections.
4	Draw sectional views of an object.
5	Draw the projection of a line, plane and regular solids.
6	Draw freehand sketches of various engineering elements

Course Content :-

Chapter No.		Name of Topic / Sub topic	Hrs	Weightage
1.		**Introduction of Drawing Instruments, Lines, Letters etc.**		
	1.1	Use of different drawing equipments.	**02**	**--**
	1.2	Type of letters.		
	1.3	Conventions of lines.		
	1.4	Scales.		
2.		**Curve and Tangential Exercises**		
	2.1	Geometrical constructions and tangential exercises.	**04**	**12**

	2.2	To draw an ellipse by concentric circle method.		
	2.3	To draw a parabola by :- 1) Directrix focus method.		
	2.4	To draw a hyperbola by :- 1) Directrix focus method.		
	2.5	To draw involute of circle, Regular polygon such as pentagon		
	2.6	To draw a cylindrical helix (limited to two turns)		
	2.7	To draw cycloid, epicycloids and hypocycloid.		
3.		**Orthographic Projections**		
	3.1	Introduction to orthographic projections first and third angle method of projection. Conversion of simple pictorial view in to orthographic views. Dimensioning technique.	**05**	**12**
4.		**Sectional Orthographic Projections**		
	4.1	Introduction, converting the given pictorial view into sectional views.	**03**	**12**
5.		**Isometric Views**		
	5.1	Isometric scale and isometric views of simple objects. Isometric views of rectangular, cylindrical objects, Slots on sloping surface.	**04**	**14**
6.		**Projection of Line**		
	6.1	Line inclined to one plane and parallel to another plane using first angle method of projections.	**02**	**06**
7.		**Projection of Planes**		
	7.1	Surface planes inclined to one plane and perpendicular to another plane using first angle method of projections.	**04**	**08**
8.		**Projection of Solids**		
	8.1	Axis inclined to one plane only Concept of true length of regular solids such as Cylinder, Prism Cone and Pyramid, cube and tetra hard on use first angle and third angle method of projections.	**06**	**08**
9.		**Free Hand Sketches**		
	9.1	Fasteners, temporary threaded fasteners, locking arrangement, Foundation Bolts.	**02**	**08**
		Total	**32**	**80**

List of Practicals / Experiments / Assignments :-

Seven sheets on topics covered in the syllabus.		
Sr. No.	**Name of Experiment/Assignment**	**Hrs**
1.	Line letters and numbers. (Sheet No.1)	06
2.	Engineering curves and tangential exercises. Any four problems (Sheet No.2)	06
3.	Orthographic projection, Sectional views. One on each (Sheet No.3)	16
4.	Projection of lines, planes. Two problems on each (Sheet No.4)	10
5.	Projection of solids. Two problems (Sheet No. 5)	08
6.	One sheet on Isometric projection. Minimum Two Problems. (Sheet No.6)	10
7.	Free hand sketches. Any Eight elements (Sheet No.7)	08
	Total	**64**

Instructional Strategy :-

Sr. No.	Topic	Instructional Strategy
1.	Introduction to Drawing instruments lines letters etc.	Classroom teaching and Demonstration.
2.	Curves and tangential exercises	Demonstrations and classroom teaching.
3.	Orthographic projection	Use of models and classroom teaching.
4.	Sectional orthographic projection	Use of models, transparencies and classroom teaching.
5.	Isometric views	Classroom teaching, self study and assignments.
6.	Projection of lines.	Classroom teaching and assignments.

7.	Projection of planes.	Classroom teaching and use of models.
8.	Projection of solids	Classroom teaching and use of models.
8.	Free hand sketches	Classroom teaching and assignments & use of Models.

Text Books :-

Sr. No	Author	Title	Publication
1.	N.D. Bhatt	Elementary Engg. Drawing (Including plan and solid geometry)	Charotar Publication, Anand.
2.	Mali, Chaudhary	Engineering Drawing	Vrinda Prakashan, Jalgaon

Reference Books :-

Sr. No	Author	Title	Publication
1	N.D. Bhatt	Geometrical and Machine Drawing	Charotar Publication, Anand.
2	--	I.S. 696 Latest version	B.I.S.
3	Curriculum Development Centre, TTTI, Bhopal	A Workbook in Engineering Drawing	Somaiyya Publication Pvt. Ltd., Mumbai
4	--	SP 46 – 1988	B.I.S.
5	G.R. Nagpal	Machine Drawing	--
6	K. Venugopal	Engineering Drawing and Graphics + AutoCAD	New Age International Publishers.

Learning Resources :- Video cassettes No. 122, 123 of G.P.P. Library

Specification Table :-

Sr. No.	Topic	Cognitive Levels			Total
		Knowledge	Comprehension	Application	
1.	Introduction to Drawing instruments lines letters etc.	--	--	--	--
2.	Curve and Tangential exercises	12	--	--	12
3.	Orthographic Projection	--	12	--	12
4.	Sectional orthographic projection	--	12	--	12
5.	Isometric views	--	--	08	08
6.	Projection of lines.	--	12	--	12
7.	Projection of planes.	--	--	12	12
8.	Projection of solids	06	--	--	06
9.	Free hand sketches	06	--	--	06
	Total	**24**	**36**	**20**	**80**

CO-PO Matrices of course

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
1	3	2	1	-	-	1	-
2	3	3	1	-	-	1	-
3	3	3	1	-	-	1	-

4	2	3	1	-	-	1	-
5	3	2	1	-	-	1	-
6	2	-	-	-	-	1	-

Table 3.12

Enter correlation levels 1, 2 or 3 as defined below:

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)*If there is no correlation, put "-"*

CO-PSO Matrices of course

CO	PSO1	PSO2
1	--	1
2	--	1
3	--	1
4	--	1
5	--	1
6	--	1

Enter correlation levels 1, 2 or 3 as defined below:

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)*If there is no correlation, put "-"*

(Prof. D. P. Khadse)   (Prof. S. V. Chaudhary)   (Prof. M.S. Deshmukh)

Prepared By   Secretary, PBOS   Chairman, PBOS

Name of Programme : **Diploma in Mechanical Engineering**
Programme Code : **04/18/24**
Name of Course : **Computer Aided Drafting**
Course Code : **ME282**

Teaching **Scheme :-**

	Hours / Week	Total Hours
Theory	**01**	**16**
Term Work / Practical	**02**	**32**

Evaluation **Scheme :-**

	Progressive Assessment	Semester End Examination			
		Theory	Practical	Oral	Term Work
Duration	--	--	2 Hrs	--	--
Marks	**--**	**--**	**50**	**--**	**25**

Course **Rationale :-**

✓ Student should be familiar with the different drafting techniques.
✓ The student should know the features of AutoCAD software.
✓ The student should be able to use AutoCAD for drafting.

Course **Outcomes :-**

	After studying this course, the student will be able to
1	Use computer aided drafting software.
2	Draw 2D drawing using computer aided drafting software.
3	Use dimension and text commands for given 2D drawing.
4	Use layer, blocks and hatch commands.
5	Create 3D drawing using computer aided drafting software.
6	Plot existing drawing with desired plot parameters.

Course **Contents :-**

Sr. No.	Topic / Subtopic	Hrs
1	**Introduction:** ACAD as a drafting tool, Advantages, versions for ACAD, Hardware requirement, installation procedure. Opening an existing drawing file, Auto CAD's screen layout, Tool bars, Pull down menus, Dialog boxes, Command line and status bar.	**02**
2	**Initial Setting And Drawing Aids:** Drawing setup-controlling unit display, Sizing that drawing sheet, creating new drawing with Wizards and Templates. Co-ordinate entry methods, viewing the drawing, setting snap and grid, Object snap Settings, Getting information about object in drawing.	**02**
3	**Basic 2D Commands:** Draw commands- Line, Point, Arc, Circle, Polyline, Polygon, Doughnut, Ellipse, Text and Text styles. Modify commands- Move, Copy, Array, Rotate, Trim, Extend, Mirror, Offset, Stretch, Break, Fillet and Chamfer, Editing single line text, Entering multi-line text, Editing multi-line text.	**02**
4	**Dimensioning:** Dimensioning concept, types of dimensioning, Linear, Angular, Diameter and	**02**

	radius, Ordinate, Dimensions, Dimension styles and components of dimension style, Geometric Tolerances, Editing dimension text and variables.	
5	**Layer and Line Properties:** Layers- creating, Modifying, Deleting, Making a layer current. Line types-Line type Manager, Loading line types, making a line type as current, Scale for line type, Modifying properties of lines, color, Line weight.	**02**
6	**Blocks And Attributes:** Creating a new block, using a block in another drawing file, Blocks and layers, Retrieving blocks inserting more than one block. Nesting blocks, Editing a retrieved block. Attributes- Attribute modes, Defining attributes, Editing attributes.	**02**
7	**Hatching:** Hatch commands, b hatch commands- hatch pattern, Pattern properties, selecting a boundary, view selections, Inherit properties, Composition, Preview and Apply Hatch. Advance boundary selection methods of hatching, using b hatch command and using hatch command, Care in selecting boundary.	**02**
8	**Basic 3D Commands:** Drawing commands- Box, Cylinder, Wedge, Cone, Pyramid, Prism. Edit commands- Fillet, Chamfer, Subtract, Union, 3D Mirror, 3D array. Region, Extrusion, Sweep, Revolve.	**01**
9	**Plotting:** Plotting concept, Paper space, creating and working in plotting view port, Layers in view ports, Guide lines for using paper space. Print Command, Selecting plotter, paper size, setting up the parameters and batch plotting.	**01**
	Total	**16**

Laboratory Work :-

Sr. No.	Particulars	Hours
1	Drawing of circle, rectangle and simple parts	04
2	Sheet on orthographic projections	04
3	Sheet on sectional orthographic projections	06
4	Sheet on production drawing	06
5	Sheet on detailed drawing	06
6	Sheet on assembly drawing	06
	Total	**32**

(Sheet means print taken on A4/A3 size paper)

Instructional Strategy :-

Sr. No.	Topic	Instructional Strategy
1	Introduction	
2	Initial Setting and Drawing Aids	
3	Basic 2D Commands	
4	Dimensioning	
5	Layer and Line Properties	Computer Lab Teaching
6	Block And Attributes	
7	Hatching	
8	Basic 3D Commands	
9	Plotting	

Reference Books :-

Author	Title	Publisher
Miller	ABC' of Auto CAD	Technical Publication, Singapore
Ajit Sing	Working with Auto CAD	Tata McGraw Hill Publishing Company Ltd. New Delhi
David S. Cohn	Auto CAD 2002	Dreamtech, New Delhi

Learning Resources :- Instruction Manual of Auto CAD R-14,2000(or any available latest version)

Specification Table :- No Theory Exam hence not Applicable.

CO-PO Matrices of course

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
1	2	-	-	-	-	1	-
2	3	-	-	-	-	1	-
3	3	-	-	-	-	1	-
4	3	1	-	-	-	1	-
5	3	2	-	-	-	1	-
6	2	2	-	-	-	1	-

Table 3.12

Enter correlation levels 1, 2 or 3 as defined below:

1**: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)***If there is no correlation, put "-"*

CO-PSO Matrices of course

CO	PSO1	PSO2
1	2	-
2	3	-
3	3	-
4	3	-
5	3	-
6	3	1

Enter correlation levels 1, 2 or 3 as defined below:

1**: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)***If there is no correlation, put "-"*

(Prof. D. P. Khadse)　　　　(Prof. S. V. Chaudhary)　　　　(Prof. M.S. Deshmukh)

Prepared By　　　　　　Secretary, PBOS　　　　　　Chairman, PBOS

Name of Programme	:	**Diploma in CE/ME/MT/EE**
Programme Code	:	**01/21/15/04/18/24/05/19/02/22/16**
Name of Course	:	**Workshop Practice**
Course Code	:	**WS281**

Teaching Scheme :-

	Hours / Week	**Total Hours**
Theory	Nil	Nil
Practical	04	64

Evaluation Scheme :-

	Progressive Assessment	**Semester End Examination**			
		Theory	**Practical**	**Oral**	**Term Work**
Duration	--	--	--	--	--
Marks	--	--	--	--	**50**

 Course Rationale :- To make the students conversant with the use of various workshop tools used in smithy,

Carpentry, fitting, welding, plumbing and sheet metal shops.

 Course Outcome :-

	After studying this course, the student will be able to
1	Select tools and for smithy operation.
2	Prepare job according to drawing.
3	Use hand tools for making different carpentry and Fitting joints
4	Operate Welding Machine and equipment for joining given components..
5	Use Hand tools for Plumbing and Sheet metal working.

List of Practicals / Experiments / Assignments :-

Sr. No.	Name of Topic / Subtopic	Hrs.
1	Demonstration of black smithy job involving minimum three operations. e.g. Upsetting,	08
2	One carpentry job involving carpentry joints and wood turning.	14
3	One fitting job involving Marking, Filing, Sawing, Drilling, Tapping.	14
4	One welding job involving welding joints.	14
5	One job in plumbing of pipe threading and pipe joints.	06
6	One job in sheet metal	08
	Total	**64**

Instructional Strategy :-

Sr. No.	Topic	Instructional strategy
1	Smithy and forging	
2	Carpentry	Explanation, Demonstration, exhibition of Models/Samples pieces.
3	Fitting and filling	

4	Welding
5	Plumbing
6	Sheet Metal

Reference Books :-

Author	Title	Publisher
S. K. Hajara Chaudhari A.K. Hajara Chaudhari	Elements of workshop technology - Vol. I	Media Promoters and Publishers Pvt. Ltd., Mumbai-7
V. Kapoor	Workshop Practice Manual	Dhanpat Rai and Sons, New Delhi-32
B.S. Raghuwanshi	A course in workshop technology Vol.- I	Dhanpat Rai and Sons, New Delhi-32

Learning Resources :- Demonstration kit, charts, models/sample pieces and books.

Specification Table :-

No Theory Exam hence not Applicable.

CO-PO Matrices of course

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
1	2	-	-	1	1	1	2
2	2	-	-	1	-	1	1
3	3	-	-	2	-	1	1
4	3	-	-	2	1	1	1
5	3	-	-	2	-	1	1

Table 3.12
Enter correlation levels 1, 2 or 3 as defined below:
1**: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)***If there is no correlation, put "-"*

CO-PSO Matrices of course

CO	PSO1	PSO2
1	-	1
2	-	1
3	-	1
4	-	1
5	-	1

Enter correlation levels 1, 2 or 3 as defined below:
1**: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)***If there is no correlation, put "-"*

(Prof. C. S. Ashtekar)   (Prof. S. V. Chaudhary)   (Prof. M.S. Deshmukh)

Prepared By   Secretary, PBOS   Chairman, PBOS

Government Polytechnic Pune

Name of Programme : **Diploma in CE/ EE/ ME / MT**

Programme Code : **01/02/04/05/15/16/18/19/24**
Name of Course : **Engineering Mechanics**
Course Code : **AM281**

Teaching **Scheme** :-

	Hours / Week	Total Hours
Theory	04	64
Practical	02	32

Evaluation **Scheme** :-

	Progressive Assessment	Semester End Examination			
		Theory	**Practical**	**Oral**	**Term Work**
Duration	Two class tests, Each of 60 minutes	03 Hours	--	--	--
Marks	20	80	-	-	25

Course **Rationale** :-

To find solutions to various practical problems, it is essential for the student to study and get acquainted with the various aspects in Statics and Dynamics. The fundamental concepts to be studied in this course are required for study ofs, Mechanics of Structures and other course of Mechanical & Civil Engineering to be studied at higher level

Course **Outcomes** :-

After studying this course, the student will be able to	
1	Calculate resultants of forces acting on given components.
2	Evaluate various forces and reactions by drawing Free Body diagram on the body.
3	Calculate centroid and centre of gravity of given plane and solid.
4	Evaluate frictional forces on a given body
5	Calculate various properties of body in motion using Newton's law
6	Calculate velocity ratio and efficiencies of given machines.

Course **Content** :-

Sr. No.		Name of Topics / Sub Topic	Hrs	Weig htage
01		**Introduction**	**02**	**02**
	1.1	Fundamental Concepts such as Fundamental Units, Derived units, system of units, Scalars, Vectors.		

	1.2	Mechanics, Statics, Dynamics, Kinematics, Kinetics.		
	1.3	Gravity, Mass, Weight, Inertia, Newton's law of Gravitation and Newton's laws of motion.		
02	2.1	**Resolution and composition of Forces**	**08**	**12**
		Concept of force, unit force, graphical representation, Principle of transmissibility.		
	2.2	System of forces, coplanar, non coplanar, concurrent, non-concurrent, parallel systems.		
	2.3	Resolution of a force, resolved parts, orthogonal and non-orthogonal components of a force.		
	2.4	Concept of composition & resultant of forces		
	2.5	Law of Parallelogram of forces, Triangle law of forces, and Polygon law of forces.		
	2.6	Moment of a force, Varignon's Theorem, couple &Properties of couple		
	2.7	Composition of Coplanar forces- Concurrent, parallel (like and unlike), non concurrent forces by analytical method.		
03	3.1	**Equilibrium**	**08**	**12**
		Concepts of equilibrium, equilibrant, Relation between resultant &equilibrant. Analytical conditions.		
	3.2	Equilibrium of coplanar concurrent forces, Lami'stheorem and its application.		
	3.3	Equilibrium of coplanar- concurrent, parallel and non-concurrent forces.		
	3.4	Beams reaction - simply supported beams subjected to concentrated and distributed loads, beam supported on roller and hinge supports, overhanging beams.		
4	4.1	**Graphic Statics**	**06**	**08**
		Space diagram, Bow's notation, Vector diagram, Polar diagram, Fumicular diagram		
	4.2	Resolution of force by graphical method, Graphical resolution of composition of coplanar concurrent, non concurrent and parallel forces.		
	4.3	Equilibrium of coplanar parallel and non concurrent forces		
	4.4	Finding beam reactions using graphical method of simply supported beam subjected to concentrated loads, beam supported on roller and hinged support		
5	5.1	**Centroid and Centre of Gravity**	06	08
		Concept of Centre of Gravity & Centroid.		
	5.2	Centroid of regular plane areas and compound areas consisting of regular plane areas. Centroid of hollow solids such as hollow cylinder, hollow cone hollow sphere. (No numerical to be set in theory paper on compound/composite hollow sections)		
	5.3	Centre of gravity of simple solids-cylinder, cone, sphere etc. and C.G of compound solid objects made up of simple solids		
6	6.1	**Friction**	08	10
		Introduction to Friction.		
	6.2	Types of friction, laws of static friction, coefficient of friction, angle of friction and angle of repose.		
	6.3	Equilibrium of body on horizontal & inclined planes.		
	6.4	Ladder friction.		
7	7.1	**Kinetics**	**08**	**10**
		Concept of force, mass, acceleration, momentum, impulse,& impact.		
	7.2	Types of friction, laws of static friction, coefficient of friction, angle of friction and angle of repose.		
	7.3	Principle of conservation of momentum, principles - its application, recoil velocity of gun.		
8	8.1	**Work, Power, Energy**	**08**	**08**

9		Definition and units of work, graphical representation of work, work done by constant and variable force.		
	8.2	Energy, forms of energy, law of conservation of energy, work energy principle and its applications.		
	8.3	Power- Definition, units and problems.		
		Simple Lifting Machines	10	10
	9.1	Definition of simple machine, mechanical advantage, velocity ratio, efficiency. Relation between them, friction in machines.		
	9.2	Reversibility, law of machine, max MA and max efficiency.		
	9.3	Study of machine - Differential wheel and axle, Simple screw jack, worm & worm wheel, Single purchase crab.		
		Total	64	80

Specification Table :-

Sr. No.	Topic	Cognitive Levels			Total
		Knowledge	**Comprehension**	**Application**	
1	Introduction	2	…	…	2
2	Resolution & composition of forces	2	4	6	12
3	Equilibrium	2	2	8	12
4	Graphic Statics	4	4	…	8
5	Centroid and center of Gravity	2	2	4	8
6	Friction	2	2	6	10
7	Kinetics	2	2	6	10
8	Work, Power, energy	2	2	4	8
9	Simple Lifting Machines	2	4	4	10
	Total	**20**	**22**	**38**	**80**

List of Practicals / Experiments / Assisgnments :-

Sr. No	Name of Experiment / Assignment	Hrs.
1	Law of polygon of Forces.	2
2	Law of Moments.	2
3	Lami's Theorem.	2
4	Beam Reactions.	2
5	Graphic Statics Two problems each on composition of concurrent and parallel forces.	6
6	Graphic statics- Two problems on beam reactions.	4
7	Determination of coefficient of friction for different surfaces.	4
8	Performance test on :-Differential axle and wheel, Worm and worm wheel, simple screw jack, Single purchase crab, Double purchase crab.	10
	Total	**32**

Instructional Strategy :-

Sr. No	Topic	Instructional Strategy
1	Introduction	Lect. Method, demonstration
2	Resolution & composition of forces	Lect. Method, demonstration
3	Equilibrium	Lect. Method, Transparencies
4	Graphic statics	Lect. Method, Transparencies
5	Centroid and centre of Gravity	Lecture, Demonstration & Discussion.
6	Friction	Lect. Method, demonstration
7	Kinetics	Lect. Method, demonstration
8	Work, Power, Energy	Lect. Method, demonstration

9	Simple lifting machines	Lect. Method, demonstration

Text Books :-

Sr. No	Author	Title	Publication
1	Junnarkar, Adavi	Applied Mechanics	Charotar
2	Dadhe, Jamdar, Walawalkar	Applied Mechanics	SaritaPrakashan
3	Khurmi	Applied Mechanics	S.Chand

Reference Books :-

Sr. No	Author	Title	Publication
1	Beer &Johnson	Vector Mechanics For Engineers. (Statics and Dynamics)	Mc- Graw Hill Co., USA
2	McLean & Nelson(Schaum's series)	Engineering Mechanics	Mc- Graw Hill Co., USA
3	Timoshenko & Young	Engineering Mechanics	Mc- Graw Hill Co., USA

Learning Resources :- Books, Models.

CO-PO Matrices of course

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
1	3	2	-	-	-	-	2
2	3	3	-	-	-	-	2
3	3	2	-	-	-	-	2
4	2	3	-	-	-	-	2
5	3	3	-	-	-	-	2
6	3	3	-	-	-	-	2

Table 3.12
Enter correlation levels 1, 2 or 3 as defined below:
1**: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)***If there is no correlation, put "-"*

CO-PSO Matrices of course

CO	PSO1	PSO2
1	-	-
2	-	-
3	-	-
4	-	1
5	-	-
6	-	3

Enter correlation levels 1, 2 or 3 as defined below:
1**: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)***If there is no correlation, put "-"*

(Prof. Mrs. S.M. Kulkarni)   (Prof. S. V. Chaudhary)   (Prof. M.S. Deshmukh)

Prepared By   Secretary, PBOS   Chairman, PBOS

Name of Programme	:	**Diploma in ME/MT**
Programme Code	:	**04 /05/18 /19/24**
Name of Course	:	**Electrical Technology**
Course Code	:	**EE282**

Teaching Scheme :-

	Hours / Week	Total Hours
Theory	03	48
Practical	02	32

Evaluation Scheme :-

	Progressive Assessment	Semester End Examination			
		Theory	**Practical**	**Oral**	**Term work**
Duration	Two Class Tests each of 60 Min duration	03 Hrs	---	---	---
Marks	**20**	**80**	---	---	**25**

Course Rationale :-

Now a days various electronic circuits are used for different electrical equipment's. Hence it is necessary to study the electrical principles and working characteristics of electrical Machines.

Course Outcomes :-

	After studying this course, the student will be able to
1	Interpret AC and DC supply
2	Identify different Magnetic circuits
3	Apply Faradays law of Electromagnetic induction
4	Use different A.C Fundamentals for measuring different parameters of given Transformer.
5	Identify different components of D C Motor
6	Identify different components of A c Motor.

Course Content :-

Chapter No.		Name of Topic / Sub topic	Hrs	Weih tage
1.		**Electrical Circuits:**	**07**	**12**
	1.1	Introduction to electric power supply system, AC suppy –single phase and three phase, DC supply		
	1.2	Resistance, Effect of temperature on resistance (Pure metals, insulators, alloys), resistance temperature coefficient.		
	1.3	Resistances in series, Voltage division formula		
	1.4	Resistances in parallel, Voltage division formula		
2.		**Magnetic Circuit**	**04**	**06**
	2.1	Introduction to magnetic circuit, magneto motive force (MMF), absolute permeability, relative permeability, reluctance, relation between M.M.F. and reluctance		

	2.2	Comparison of magnetic & electrical circuits		
	2.3	Simple series magnetic circuits, concept of useful flux, leakage flux, total flux and fringing.		
	2.4	Magnetization curves, concept of hysteresis, hysteresis loop & loss.		
3.		**Electromagnetic Induction**	04	06
	3.1	Faradays laws of Electromagnetic Induction		
	3.2	Types of induced e.m.f. Dynamically induced e.m.f. and statically induced e.m.f. (Self and mutually)		
	3.3	Lenz's law, Fleming's right hand rule.		
	3.4	Self and mutual inductance, Coefficient of coupling		
4 (A&B)		**A.C. Fundamentals**		
4 (A)	4.1	Generation of single phase alternating voltage and current, Graphical representations of sinusoidal E.M.F. and current.	12	16
	4.2	General Equation of alternating quantity.		
	4.3	Definitions of instantaneous value, cycle, period, frequency, amplitude, Peak value, average value, R.M.S. value of an alternating sinusoidal voltage and current, peak factor and form factor.		
	4.4	Concept of phase and phase difference, Concept of lagging and leading		
	4.5	Representation of an alternating quantity by phasor		
	4.6	Waveforms and Phasor diagram for a Purely resistive AC circuit, Purely inductive AC circuit, Purely capacitive AC circuit. (Voltage, Current, Power, p.f. relations and phasor diagrams)		
4 (B)	4.1	Generation of 3-phase voltage and its waveform.		
	4.2	Phase sequence, star & delta connection		
	4.3	Concept of balanced load, Concept of balanced supply system.		
	4.4	Voltage, current, power relations in star & delta connected system & numerical, Vector diagram.		
	4.5	Advantages of poly phase circuits over 1-phase		
5.	4.6	Definition, principal of working, construction.	02	04
	4.7	Types of transformer on the basis of voltage, power & construction		
	4.8	E.M.F. equation (No derivation).		
	4.9	Voltage, current ratio of a transformer. Losses in transformer, efficiency & regulation of transformer. (No numericals)		
6.		**D.C. Motor**	09	18
	5.1	Construction and working principle of DC motor, significance of back E.M.F., Back E.M.F. equation, Torque equation.		
	5.2	Types of motors.		
	5.3	Characteristics of shunt and series motor & applications of DC motors.		
	5.4	Starting of DC motor-Necessity of a starter and Three point starter, Speed control of DC Motors- Armature voltage speed control method and Field control method.		
7.(A,B&C)		**A.C. Motors**		
7 (A)	6.1	Three Phase induction motor: Construction and working principle, Types, synchronous speed, slip, Torque-slip characteristics, Application	10	18
	6.2	Necessity of a starter, D.O.L. Starter and star delta starter.		
7 (B)	6.3	Single Phase Induction Motors- working principle and application of following Motors :- a)Split Phase :- i) Resistance ii) Capacitance. b) Capacitor start capacitor run, c) Shaded pole		
	6.4	Reversal of rotation of all above Motors.		
7 (C)	6.5	Working principle and applications of following Motors i) A.C. Servo Motor, ii) D.C. Servo Motor		
		Total	48	80

List of Practicals / Experiments / Assignments :-

Sr. No.	Name of Experiment/Assignment	Hrs
1	To determine temperature rise of resistance of metal	04
2	Verification of Right hand rule for solenoid.	02
3	Verification of Faradays laws of Electromagnetic Induction	02
4	To plot the B-H curve of a magnetic material	02
5	To verify the relation between line & phase values of current and voltage in a balanced star & delta connected three phase circuit	02
6	Study of three point starter and its connection to DC Motor	04
7	To perform speed control of D.C. shunt motor . • Armature voltage speed control method • Field control method of speed control	04
8	Reversal of rotation of following motor • D.C. Shunt Motor • Three phase Induction motor	04
9	Study of DOL starter and star delta starter.	04
10	To perform load test on three phase I.M. and plot the characteristics	04

Note :- All practical's are Compulsory.

Instructional Strategy :-

Sr. No.	Topic	Instructional Strategy
1	**Electrical Circuits**	Lecture, Problem solving ,practical
2	Magnetic Circuits	Lecture, Problem solving ,practical
3	Electromagnetic Induction	Lecture, Problem solving ,practical
4	AC Fundamentals	Lecture, Problem solving ,practical
5	Single phase Transformer	Lecture, Problem solving ,practical
6	D.C. Motor	Lecture, Demonstration and working models, PPTs
7	A.C. Motor	Lecture, Demonstration and working models,PPTs

Text Books :-

Sr. No	Author	Title	Publication
1	B.L. Theraja	Electrical Technology Vol. I & II	S. Chand & Co.
2	Jain & Jain	ABC of Electrical Engineering	Dhanpat Rai Publishing Company

Reference Books :-

Sr. No	Author	Title	Publication
1	Edvard Hughes	Electrical Technology	Pearson Education
2	H. Cotton	Electrical Technology	CBC, Delhi
3	V.N. Mittle	Basic Electrical Engineering	Tata Mc-Graw Hill

Specification Table :-

Sr. No.	Topic	Cognitive Levels			Total
		Knowledge	Comprehension	Application	
1.	Electrical Circuits	06	04	02	12
2.	Magnetic Circuits	04	00	02	06
3.	Electromagnetic	02	04	00	06

	Induction				
4.	AC Fundamentals	06	08	02	16
5.	Transformer	02	00	02	04
6.	D.C. Motor	08	04	06	18
7.	A.C. Motor	08	04	06	18
Total		**36**	**24**	**20**	**80**

CO-PO Matrices of course

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
1	3	1	-	-	-	1	2
2	3	1	-	-	1	2	2
3	3	1	-	-	1	2	2
4	3	1	-	1	1	2	2
5	3	1	-	1	2	1	2
6	**3**	**1**	**-**	**1**	**2**	**2**	**2**

Table 3.12
Enter correlation levels 1, 2 or 3 as defined below:
1**: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)***If there is no correlation, put "-"*

CO-PSO Matrices of course

CO	PSO1	PSO2
1	-	1
2	-	2
3	-	2
4	-	2
5	-	2
6	-	2

Enter correlation levels 1, 2 or 3 as defined below:
1**: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)***If there is no correlation, put "-"*

(Prof. V. L. Munde)   (Prof. S. V. Chaudhary)   (Prof. M.S. Deshmukh)

Prepared By   Secretary, PBOS   Chairman, PBOS

Name of Programme	**:**	**Diploma in ME / MT / CM / IT**
Programme Code	**:**	**04/ 05 /06 /07/18/19/24**
Name of Course	**:**	**Elements of Electronics Engineering**
Course Code	**:**	**ET 285**

Teaching Scheme :-

	Hours / Week	**Total Hours**
Theory	03	48
Practical	02	32

Evaluation Scheme :-

	Progressive Assessment	**Semester End Examination**			
		Theory	**Practical**	**Oral**	**Term work**
Duration	Two class tests, each of 60 minutes	3 hrs.	--	--	--
Marks	**20**	**80**	**--**	--	**25**

Course Rationale :-

This course will be useful in understanding of construction, working and applications of semiconductor devices and circuits.

Course Outcomes :-

After studying this course, the student will be able to	
1	Interpret concept of Semiconductor devices.
2	Use different types of oscillator for given application.
3	Apply principles of digital electronics to electro mechanical system.
4	Use Liners ICs for different electro mechanical applications.
5	Use CRO and Function generators for different electro mechanical applications.
6	Select different types of transducers for given applications.

Course Content :-

Chapter No.		Name of Topic / Sub topic	Hrs	Weightage
1.		**Semiconductor devices**		
	1.1	1 **Semiconductor theory** **Types** : 1] intrinsic Semiconductor 2]Extrinsic semiconductor- P – type and N - type semiconductor. **PN junction diode** : Diode symbol, Working, Barrier voltage, depletion region, Junction Capacitance, Forword & reverse Characteristics.	15	20

	1.2	**Zener diode :** Diode symbol, Working, Forword & reverse Characteristics Avalanche & Zener breakdown .		
	1.3	**Rectifier :** Defination, Classification Half wave and Full wave Rectifier :circuit diagram, working, comparison, merits and demerits. Filters, necessity, types , comparison, merits, demerits		
	1.4	**Transistor :** construction, symbol, operating principle, characteristics, configurations, comparison between CB, CE, CC ,applications		
	1.5	**FET:** Classification of FET : Construction, symbol, operating principle, characteristics, and applications of JFET.		
	1.6	**SCR :** Symbol, their construction, working, characteristics, applications		
2.	**Oscillator**			
	2.1	Block diagram, Barkhausan Criteria for sustained oscillations, Oscillations in LC tank circuit; Classification: LC and RC. Classification of RC Oscillator: Working of RC Phase shift and Wein Bridge Oscillator. Clasification of LC Oscillator: Working of Hartley , Colpitts , Crystal Oscillator.	**07**	**12**
3.	**Digital Fundamentals**			
	3.1	Number systems: Decimal, Binary, Hexadecimal, Octal.		
	3.2	Basic logic gates: AND, OR, NOT, NAND, NOR, EXOR symbols, IC numbers and Truth Table.	**07**	**12**
	3.3	Boolean Algebra: Fundamentals of Boolean algebra, Basic laws De Morgan`s theorem,		
4.	**Linear ICs,**			
	4.1	OP AMP. IC 741, symbol, pin diagram, ideal and typical characteristics, Applications such as Inverting , Non Inverting amplifier, Difference amplifier, adder, substractor, Integrator, differentiator. (using closed loop system)	**07**	**12**
5.	**Instrumentation**			
	5.1	CRO: Cathode Ray Tube, Oscilloscope Block diagram, operation, oscilloscope specifications, Applications.	**05**	**12**
	5.2	Function generator, Block diagram, operation, specifications, applications		
6.	**Transducer**			
	6.1	Definition, Selection criteria of Transducer. **Classification:** Active, Passive, Primary, Secondary, Mechanical, Electronic, Analog, Digital, Resistive, Capacitive, Inductive Transducers. **Construction, Operation, Applications :** LVDT, RTD, Thermocouple , Photoelectric, Piezoelectric Transducers,	**07**	**12**
		Total	**48**	**80**

Lsit of Practicals / Experiments / Assignments :-

Sr. No.	Name of Practical / Experiment / Assignment	Hours
1.	Plot V-I characteristics of P-N junction diode.	02
2.	Study of Half wave and Full wave rectifier with and without filter.	02
3.	Plot the i/p and o/p characteristics in CE configurations.	02
4.	Plot the characteristics of FET.	02
5.	Plot the characteristics of SCR.	02
6.	Study of Hartley and Colpitts oscillator.	02
7.	Study of RC phase shift and Wein Bridge.	02
8.	Study of logic gates and verifications of logic gates.	02

9.	Verification of De Morgan`s theorem.	02
10.	Study of Inverting and Non Inverting Amplifier.	02
11.	Study of Adder, Substractor.	02
12.	Study of Integrator and Differentiator.	04
13.	Study of C.R.O.	02
14.	Study of Function generator.	02
15.	Study of Transducers.	02
	Total	**32**

Instructional Strategy :-

Sr. No.	Topic	Instructional Strategy
1.	Semiconductor devices.	Classroom teaching and laboratory work.
2.	Digital fundamentals.	Classroom teaching and laboratory work.
3.	Linear IC`s.	Classroom teaching and laboratory work.
4.	Oscillator.	Classroom teaching and laboratory work.
5.	Instrumentation.	Classroom teaching and laboratory work.
6.	Transducer.	Classroom teaching and laboratory work.

Text Books :-

Sr. No	Author	Title	Publication
1.	V.K. Mehata	Principle of Electronics	TMH.
2.	R.S.Sedha	Applied Electronics	TMH.
3.	B.L.Theraja.	Basic Electronics.	S.Chand.
4.	Ramakant Gaikwad	Linear Integrated Circuits	PHI
5.	R P Jain	Modern Digital Electronics	TMH
6.	H.S. Kalsi	Electronics Instrumentation	TMH

Reference Books :-

Sr. No	Author	Title	Publication
1.	Mottershed	Electronics Devices and Circuits.	PHI
2.	MilmannHalkies	Electronics Devices and Circuits.	TMH

Learning Resources :- Reference Books, Data Manual

Specification Table :-

Sr. No.	Topic	Cognitive Levels			Total
		Knowledge	Comprehension	Application	
1.	Semiconductor Devices	10	06	04	20
2.	Oscillators	04	06	02	12
3.	Digital Fundamentals	06	04	02	12
4.	Linear I C 's	06	04	02	12
5.	Instrumentation	06	04	02	12
6.	Transducers	06	04	02	12
	Total	**38**	**28**	**14**	**80**

CO-PO Matrices of course

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
1	3	-	-	1	1	1	2
2	3	-	-	1	1	1	2
3	3	-	-	1	1	1	2
4	3	1	-	-	1	1	2
5	3	2	-	1	1	1	2
6	3	-	-	1	1	1	2

Table 3.12
Enter correlation levels 1, 2 or 3 as defined below:
1**: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)***If there is no correlation, put "-"*

CO-PSO Matrices of course

CO	PSO1	PSO2
1	-	1
2	-	1
3	-	2
4	-	1
5	-	2
6	-	1

Enter correlation levels 1, 2 or 3 as defined below:
1**: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)***If there is no correlation, put "-"*

(Prof. N.S. Bakade)	(Prof. R.P. More)	(Prof. S. V. Chaudhary)	(Prof. M.S. Deshmukh)
Prepared By	Prepared By	Secretary, PBOS	Chairman, PBOS

<h1 style="text-align:center;">Government Polytechnic Pune</h1>

Name of Programme : **Diploma in CE/ EE/ET/ME/MT/DDGM**
Programme Code : **01/02/03/04/05/08/21/22/23/24/15/16/17/18/19**
Name of Course : **Computer Fundamentals**
Course Code : **CM 286**

Teaching Scheme :-

	Hours / Week	Total Hours
Theory	1	16
Practical	2	32

Evaluation Scheme :-

	Progressive Assessment	Semester End Examination			
		Theory	**Practical**	**Oral**	**Term Work**
Duration	--	--	2 hours	--	2 hours
Marks	--	--	50	--	25

Course Rationale :-

In this world of high speed computing it is essential for diploma in computer engineering students to know about device of computers, its operation and graphical base applications and latest technologies in the market. This course is designed for basic perspective for first year diploma students.

Course Outcomes :-

	After studying this course, the student will be able to
1	Interpret Computer peripherals of a given computer
2	Use of computer and printer
3	Operate different M.S Office tools.
4	Use of internet for Communication.

Course Content :-

Chapter No.		Name of Topic / Sub topic	Hrs
1	1.1	**Introduction to computer peripherals**	03
		Hardware: Input-output devices, CPU and general PC layout	
	1.2	Data storage devices :- RAM, ROM, External storage – magnetic & USB	
2		**Introduction to system software**	03
	2.1	Operating systems: Introduction to various operating systems like DOS, Windows, Android, Unix, Linux.	
	2.2	Windows: working with Windows operating system Utility software: Application and working of various utility	
	2.3	Softwares like Antiviruses, Internet browsers, Adobe reader, office suite, media players etc	
3	3.1	**GUI Based Editing, Spreadsheets, Tables & Presentation**	08
		Application Software Common Features	
		3.2 Word Processors: Working with word processor for creating documents & drafts	
	3.3	Spreadsheets : Features Creating and Working with spread sheets	

	3.4	Presentation Graphics : Features .Working with Presentation Graphics to create presentations	
	3.5	Software suites	
4		**Communication & Connectivity**	02
	4.1	Introduction to communication systems: Telephone, fax, e-mails, messengers (chatting), voice messaging system(voice mail), video-conferencing system .	

List of Practicals / Experiments / Assignments :-

Sr. No.	Name of Practical / Experiment / Assignment	Hrs
1	Understanding computer layout and its peripherals.	**2**
2	Study of printing and scanning devices	2
3	Working with operating systems like windows XP and understanding the working environment (Desktop, My Computer, My Documents, Recycle bin, Programme files & control panel.)	2
4	Working with MS world (at least four programs including use of pictures/ clipart, word art, shapes, tables, mail merging options)	6
5	Working with MS Excel (at least three programs including creating spreadsheets, performing arithmetic operations, creating charts & graphs).	6
6	Working with MS Power point (at least three programs including creating simple presentation, use of hyperlinks, use of animation).	6
7	Page setting, page layout and printing Word, Excel & power point documents.	2
8	Study of different types of networks and communication devices.	2
9	Internet practices: i)Getting started with internet, ii) Use of search engines iii)creating an email account, iv)E-travel & E-trading	2
10	Assignment on cyber laws and ethics.	2
	Total	**32**

Text Books :-

Sr. No.	Author	Title	Publication
1	Timothy J. O. Leary	Computing Essentials	TMH
2	Vikas Gupta	Comdex Computer Course Kit	Dreamtech

Reference Books :-

Sr. No.	Author	Title	Publication
1	P.K. Sinha	Computer Fundamentals	BPB
2	Henry C. Lucas, Jr.	Information Technology for Management	Tata McGraw Hill
3		Windows XP/2000/2003/ Vista Users Guide	Manuals

Specification Table :-

No Theory Exam hence not Applicable.

CO-PO Matrices of course

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
1	3	-	-	1	1	1	3
2	2	-	-	2	1	1	3
3	2	-	-	2	1	1	3
4	2	-	-	2	2	1	3

Table 3.12

Enter correlation levels 1, 2 or 3 as defined below:
1**: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)***If there is no correlation, put "-"*

CO-PSO Matrices of course

CO	PSO1	PSO2
1	-	-
2	3	3
3	3	1
4	3	2

Enter correlation levels 1, 2 or 3 as defined below:
1**: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)***If there is no correlation, put "-"*

(Prof. Seema Kolhe)   (Prof. S. S. Pathak)   (Prof. S. V. Chaudhary)   (Prof. M.S. Deshmukh)

Prepared By   Prepared By   Secretary, PBOS   Chairman, PBOS

Government Polytechnic Pune

Name of Programme : **Diploma in CE/ME/MT**
Programme Code : **01/04/ 05/24/18/19**
Name of Course : **Applied Mathematics III**
Course Code : **SC 281**

Teaching Scheme :-

	Hours / Week	Total Hours
Theory	2	32
Term Work / Tutorials	1	16

Evaluation Scheme :-

	Progressive Assessment	Semester End Examination			
		Theory	Practical	Oral	Term Work
Duration	Two class tests of 60 Min. duration	3 Hours	--	--	--
Marks	20	80	--	--	--

Course Rationale :-

The student shall learn various techniques in integration and differential equations and use these techniques to their related Engineering problems.

Course Outcomes :-

At the end of the course student will be able to	
1	Use different methods for solving given Integration problems
2	Apply different properties for solving given definite integral problems.
3	Calculate area and Volume of given component using definite integral
4	Solve mechanical engineering problems of first degree –first order.
5	Use statistical principles for solving given Mechanical Problems.
6	Solve problems using probability process.

Course Content :-

Sr. No	Name of Topic / Sub topic	Hrs	Marks
1	**INTEGRATION** Definitions, standard formulae, integration of algebraic sum of two or more functions, integration by substitutions and by trigonometric transformations, integration of $\sqrt{ax^2+bx+c}$, $1/\sqrt{ax^2+bx+c}$, integration by parts, integration by partial fractions.	10	24
2	**Definite integrals** Definition and properties of definite integrals Example based on these properties	04	08
3	**APPLICATION OF INTEGRATION** Area under the curve and area between two curves. Volume of solid of revolution.	04	08
4	**Differential Equations** Definition, order and degree of differential equations. Formation of differential equations. Solution of differential equations : (using following methods) i) Variable separable (ii)	05	16

	Reducible to variable separable. (iii) Homogeneous differential equations. (iv) Exact diff. equations. (v) Linear differential equations		
5	**Statistics** Measures of central tendency :(a)Mean (b) Median (c) Mode Measures of dispersion :a) Standard deviation (b) Co-efficient of variance	05	12
6	**Probability** Definition of Random experiment, sample space, event, occurrence of events and types of events-(impossible, mutually exclusive, exhaustive equally likely) Definition of probability ,addition and multiplication theorems of probability.	04	12
	Total	32	80

Reference Books :-

Author	Title	Publisher
Grewal B.S.	Higher Engineering Mathematics	Khanna Publishers, New Delhi
Grewal B.S.	Engineering Mathematics Vol. II	Satya Prakashan, New Delhi
S.P. Deshpande	Mathematics for Polytechnic students	Pune Vidyarthi Griha Prakashan
H.K. Dass	Engineering Mathematics Part II	S. Chand & Co. Ltd. Delhi

Learning Resources :- Chock Board etc.

Specification Table :-

Sr. No.	Topic / subtopic	Cognitive Levels			Total
		Knowledge	Comprehension	Application	
1	Integration	08	16	00	24
2	Definite Integration	04	04	00	08
3	Application of integration	00	00	08	08
4	Differential Equations	04	08	04	16
5	Statistics	04	04	04	12
6	Probabilily	04	04	04	12
	Total	**24**	**36**	**20**	**80**

CO-PO Matrices of course

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
1	3	3	-	--	-	--	1
2	3	3	-	-	-	-	1
3	3	3	1	-	-	-	1
4	3	3	-	-	-	-	1
5	3	3	1	-	-	2	2
6	3	3	1	-	-	2	2

Table 3.12
Enter correlation levels 1, 2 or 3 as defined below:
1**: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)***If there is no correlation, put "-"*

CO-PSO Matrices of course

CO	PSO1	PSO2
1	1	-
2	1	-
3	1	-
4	1	-
5	1	1
6	1	-

Enter correlation levels 1, 2 or 3 as defined below:
1**: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)**_If there is no correlation, put "-"_

(Prof. V. B. Shinde)   (Prof. S. V. Chaudhary)   (Prof. M.S. Deshmukh)

Prepared By   Secretary, PBOS   Chairman, PBOS

Name of Programme   :   **Diploma in Mechanical Engineering**
Programme Code   :   **04/24/18**
Name of Course   :   **Programming in 'C'**
Course Code   :   **ME283**

<u>Teaching</u> <u>Scheme</u> :-

	Hours / Week	Total Hours
Theory	1	16
Practical	2	32

<u>Evaluation</u> <u>Scheme</u> :-

	Progressive Assessment	Semester End Examination			
		Theory	Practical	Oral	Term Work
Duration	--	--	2 Hours	--	--
Marks	--	--	50	--	50

<u>Course</u> <u>Rationale</u> :-

In this era of high speed computing, it is necessary to program computers with the help of structured & dynamic languages like „C" to study programming is useful in solving problems/tasks related to various domains. Now days almost every setup in software engineering domain chooses „C" as a basic tool to develop software.

<u>Course</u> <u>Outcomes</u> :-

	After studying this course, the student will be able to
1	Analyze given programs for C" programme.
2	Interpret different data, operators and characters for development of c Programme
3	Write c Programme for given statement
4	Execute C- Programme

<u>Course</u> <u>Content</u> :-

Chapter No.		Name of Topic / Sub topic	Hrs
1	1.1	**Overview of 'C'** Problem, definition and analysis, Algorithm, Flow charts	**2**
	1.2	History of Programming Languages, Development of C	
	1.3	Basic structure of 'C' program, Programming style, Simple 'C' programs	
2	2.1	**'C' Fundamentals** Data Types & Character set: C tokens, keywords & identifiers, constants, variables, Declaration of variables, assigning values to variables, defining symbolic constants	**2**
	2.2	Operators: Arithmetic, relational, logical, increment & decrement, conditional, bit-wise special.	
	2.3	Expressions: Arithmetic expressions, evaluation of expressions, procedure of arithmetic operators, type conversions in expressions, operator precedence & associatively, mathematical functions.	
	2.4	Managing input & output operators: Introduction, reading a character, writing a character, formatted input, formatted output, viz. use of printf(), scanf(), getch(), clrscr(), \n etc.	
3	3.1	**Decision making in 'C'** Decision making and branching: if statement (if, if-else, nested if-else).	**4**
	3.2	Decision making and looping: while, do, do-while, for loop, continue statement, break statement.	
	3.2	Decision making using switch & go to statement	
4	4.1	**Functions & Pointers**	**4**

		Functions: Need of user defined functions, scope, defining functions, calling a function(call by value & call by reference)	
	4.2	Pointers: Introduction to pointers, declaring pointer variable, initialization of pointer variable, accessing address of a variable, pointer expressions.	
5	5.1	**Arrays and Strings** Arrays: Defining and declaring one and two dimensional arrays, reading and writing.	**4**
	5.2	Strings: Declaration and initialization of string variables, string handling functions From standard library like strlen (),strlwr(), strupr(), strcpy(), strcat(), strcmp() etc.	
		Total	**16**

List of Practicals / Experiments / Assignments :-

Sr. No.	Name of Practical / Experiment / Assignment	Hrs
1	To understand concept of algorithm and flowchart in 'C' with example.	2
2	Simple 'C' programs based on declaring variables & assigning values to variables. (Minimum 4)	4
3	'C' Programs using if, if-else & nested if-else statement (two of each)	5
4	'C' Programs using while, do, do-while, for loop statements (two of each)	6
5	'C' Programs using switch &goto statement	2
6	'C' Programs illustrating use of continue and break statements	2
7	'C' Programs illustrating use of user defined functions	3
8	'C' Programs illustrating use of pointers	3
9	'C' Programs illustrating use of arrays	3
10	'C' Programs illustrating use of strings	2
	Total	**32**

Text Books :-

Sr. No.	Author	Title	Publication
1	Yashwant Kanitkar	Let us 'C'	BPB Publication
2	E. Balguru swami	Programming in 'C'	Tata McGraw Hill

Reference Books :-

Sr. No.	Author	Title	Publication
1	Madhusudhan Mothe	'C' for beginners	SPD Publications
2	Denis Ritchie and Kerninghan	Introduction to 'C' programming	Prantice Hall Publications

Specification Table :-

No Theory Exam hence not Applicable.

CO-PO Matrices of course

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
1	3	2	-	-	2	2	1
2	2	-	-	1	-	-	1
3	2	-	-	-	3	-	2
4	3	2	1	2	-	2	1

Table 3.12
Enter correlation levels 1, 2 or 3 as defined below:
1**: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)***If there is no correlation, put "-"*

CO-PSO Matrices of course

CO	PSO1	PSO2
1	-	2
2	-	-
3	-	-
4	-	2

Enter correlation levels 1, 2 or 3 as defined below:
1**: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)***If there is no correlation, put "-"*

(Prof.P. U. Garge)   (Prof. S. V. Chaudhary)   (Prof. M.S. Deshmukh)

Prepared By   Secretary, PBOS   Chairman, PBOS

Name of Programme	:	**Diploma in Mechanical Engineering**
Programme Code	:	**04/18/24**
Name of Course	:	**Machine Drawing**
Course Code	:	**ME381**
Prerequisite	:	**ME 281**

Teaching Scheme :-

Theory / Practical	Hours / Week	Total Hours
Theory	03	48
Practical	04	64

Evaluation Scheme :-

	Progressive Assessment	**Semester End Examination**			
		Theory	**Practical**	**Oral**	**Term Work**
Duration	Two class tests each of 90 minutes	4 Hrs	--	--	--
Marks	20	80	--	--	25

Course Rationale :-

With the Science & Technology advancing at a rapid pace, the type of man power required by the industry and society is becoming more & more specific. Industry requires among other things a workforce having a technological bent of mind and the much desired temper and competencies to maintain high quality standards & productivity. The quality & productivity depends mainly on the ability of Technician to communicate through drawing. Mechanical Technicians are able to read the drawing correctly. The drawing prepared must be clear and it should not have any scope for different interpretations. Machine drawing is more of a performance based rather than knowledge based.

Course Outcomes :-

	After studying this course the student will be able to
1	Draw development and sections of right regular solids.
2	Draw intersection curves of given solids.
3	Use various drawing codes , conventions and symbols as per IS SP-46..
4	Draw production drawing of given component.
5	Draw assembly and detail drawings of given product

Course Content :-

Chapter			Name of Topics / Sub topics	Hours	Marks
1	1.1		**Sections of Solids** Sectional representation of solids. Prism, Pyramid, Cone, Cylinder, Tetrahedron, Cube with their axes inclined to one reference plane and parallel to other & when the section plane is perpendicular one reference plane and inclined to other, drawing of true shape of section.	**06**	**08**
2	2.1		**Development of surfaces of solids** Development of lateral surfaces of cube, Prism, Cylinder Pyramid, Cone and their applications such as tray, Funnel, Chimney, Pipe bends etc…	**06**	**08**
3	3.1		**Intersections of solids**	**06**	**08**
			Curves of intersection of surfaces of the solids in the following cases		
		a)	Prism with prism, Cylinder with cylinder, Prism with cylinder, when		
			1	The axes are 90^0 and intersecting		

		2	The axes are 90^0 and offset		
	b)	Cylinder with cone When the axis of cylinder is parallel to both the reference plane and cone resting on base on HP. and with axis intersecting & at 90^0& offset from the axis of cylinder.			
4	4.1	**Auxiliary views** Study of auxiliary planes, projection of objects on auxiliary planes. Completing the regular view with the help of given auxiliary views.		**06**	**08**
5	5.1	**Conventional Representation** **Standard conventions using sp – 46(1988)**		**02**	**08**
		a	Materials C.I., M.S., Brass, Bronze, Aluminium, Wood, Glass, Concrete & rubber.		
		b	Long & short break in pipe, rod & shaft.		
		c	Ball & roller bearings, Pipe joints, cocks, valves, internal / External threads.		
		d	Various sections - Half, removed, revolved, off-set, partial and aligned section.		
		e	Knurling, serrated shaft, splined shaft and chain wheels.		
		f	Springs with square and flat ends, Gears, sprocket wheel.		
		g	Counter sunk, counter bore.		
		h	Tapers.		
6	6.1	**Limits, fits and Tolerances**		**04**	**04**
		a	Characteristics of surface roughness – Indication of machining symbol, showing direction of lay, roughness grades, machining allowances, manufacturing methods		
		b	Introduction to ISO system of tolerance, dimensional tolerances, and elements of interchangeable system, hole & shaft based system, limit, fits & allowances, Selection of fits.		
		c	Geometrical tolerances, tolerances of form and position and its geometrical representation		
		d	General welding symbols, sectional representation and symbols used in engineering practice		
7	7.1	**Free hand sketching** Free hand sketching of the following component: Keys, Sunk. Saddle, Taper, Gib headed feather keys, Splined shaft, Woodruff key, Cone key **Joints & couplings.-** cotter joint, knuckle joint, turn buckle, muff, flanged, flexible, universal &Oldham's couplings. **I.C. Engine parts –** piston (two stroke, four stroke) Connecting rod, crank (disc & overhung)Bearings, journal, pedestal (Plummer block) foot step bearing Spur & helical gears, Bevel gears, worm& worm wheel.		**06**	**16**
8	8.1	**Details to assembly & Assembly to details**		**12**	**20**
		1	Introduction		
		2	Couplings – Universal coupling & old ham's coupling		
		3	Bearings – foot step bearing & Pedestal bearing		
		4	Lathe tool post		
		5	Lathe tailstock		
		6	Screw jack		
		7	Drilling jigs		
		8	Piston & connecting rod of an IC engine		
		9	Gland & stuffing box assembly		
		10	Valve (not more than eight parts) or any other assembly not more than eight parts.		
		Total		**48**	**80**

A) Each student will draw 7 half imperial size drawing sheets and will submit at the end of term.
B) A sketch book containing home assignments on each topics to be submitted by each student at the end of term.

Sheet No.	Particulars	Hours
01	Sections of solids – 2 problems	08
02	Development of solids – 2 problems	08
03	Intersection of solids – 2 problems	08
04	Auxiliary views -- 2 problems	08
05	Conventional representation, tolerance and fits symbols.	04
06	Free hand sketching (min 6 objects)	08
07	Assembly to details – one sheet	08
08	Details to assembly – one sheet	12
	Total	**64**

Text Books :

Sr. No	Author	Title	Publication
1.	N.D. Bhatt	Engineering Drawing	Charotar Publishing House, Anand
2.	N.D. Bhatt	Machine Drawing	Charotar Publishing House, Anand
3.	Mali. Chaudhary	Machine Drawing	Vrinda Publication
4.	Kannaiah, Narayan & K. vekanta Reddy	Machine Drawing (II edition)	New Age International Limited.
5.	R.B. Gupta	Engineering Drawing	SatyaPrakashana, New Delhi
6.	Kamat, Rao	Machine Drawing	JeavandeepPrakashan, Mumbai
7.	Pandya Shah	Machine Drawing	Charotar Publishing House, Anand
8.	Mandke	Machine Drawing	NiraliPrakashan, Pune
9.	Khurmi, Gupta	Machine Drawing	Eurasia Publ. Hs. (Pvt.) Ltd., New Delhi.

Reference Books :-

Sr. No	Author	Title	Publication
1.	--	S.P. 46 – 1988 Code of Engg. Drawing for Schools & Colleges	Bureau of Indian Standards, New Delhi
2.	--	I.S. 813 – 1988 Code of welding symbols	Bureau of Indian Standards, New Delhi
3.	--	C.M.T.I. Hand Book	C.M.T.I., Banglore

Learning Resources :-

S.P. 46 – 1988, I.S. 813 – 1988, Text Books, Actual working assemblies eg. Bench vice, pipe vice, screw jack, tool post, tail stock piston, cylinder connecting rod, crank and models of keys, cotter joints knuckle joints, Pulleys, plumbing material used.

CO-PO Matrices of course

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
1	3	3	2	-	-	1	-
2	2	3	2	-	-	1	-
3	2	3	2	-	-	1	-
4	3	3	3	-	-	1	1
5	2	3	3	2	-	1	1

Table 3.12
Enter correlation levels 1, 2 or 3 as defined below:
1**: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)***If there is no correlation, put "-"*

CO-PSO Matrices of course

CO	PSO1	PSO2
1	-	1
2	-	1
3	-	1
4	-	1
5	-	2

Enter correlation levels 1, 2 or 3 as defined below:
1**: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)***If there is no correlation, put "-"*

(Prof.D. P. Khadse)   (Prof. S. V. Chaudhary)   (Prof. M.S. Deshmukh)

Prepared By   Secretary, PBOS   Chairman, PBOS

Name of Programme : **Diploma in Mechanical Engineering**
Programme Code : **04/18/24**
Name of Course : **Thermodynamics & Heat Engines**
Course Code : **ME 382**

Teaching Scheme :-

Theory / Practical	Hours / Week	Total Hours
Theory	03	48
Practical	02	32

Evaluation Scheme :-

	Progressive Assessment	Semester End Examination			
		Theory	**Practical**	**Oral**	**Term Work**
Duration	Two class tests each of 60 minutes	3 Hrs	--	--	--
Marks	20	80	--	25	25

Course Rationale :-

Power engineering incorporating basic principles of the thermodynamics and heat transfer forms an essential element of any mechanical engineering course these days. In this core area, students will be able to solve many problems related to this and inter areas, because the principles involved have universal applications. Keeping this in mind, the present course lays more emphasis on understanding the basic principles of thermodynamics and heat transfer and applying these to practical thermodynamics practical problems. The understanding of fundamentals will also be of direct relevance later when power engineering is studied.

Steam power plants are being established in the country in a big way to cater for the spurt in power demand. It is expected that a large number of mechanical technicians will be associated with planning erecting, running and maintain steam power plant. The present course includes the study of important components of such plants so that these technicians do not find themselves stranger if called upon to perform these jobs

Course Outcomes :-

	After studying this course, the student will be able to
1	Use thermodynamic principles for solving Mechanical Engineering problems
2	Calculate thermodynamic properties of gases and Steam.
3	Use Heat transfer principles for analysing Mechanical system.
4	Identify different components of Steam Power Plant.
5	Select relevant Fuel for given application with justification.

Course Content :-

Chapter No.		Name of Topic / Sub topic	Hrs	Weightage
		Thermodynamic Principles		
	1.1	Defination and units of force, Pressure, Volume, Temperature, Work, torque, Power (Linear & Rotary). (S.I. units).		
	1.2	Basic concepts – Thermodynamic systems, boundary, surroundings. Types of system closed and open, point function and path function. Define property, Intensive and extensive property, properties like specific volume, density, pressure, temperature. Process, work, thermodynamic definitions, work done at the moving boundary, heat thermodynamic definition, difference between heat and work.	08	16
	1.3	First law of thermodynamics: First law for closed system, internal energy, first law for open system, potential energy, kinetic energy, flow energy, steady flow energy equation, enthalpy. Application of first law to the close system, application of first law to open system like boiler, turbine, engine, nozzle, condenser, pump, compressor, throttling. Definition of specific heat Cp and Cv.		
	1.4	Second law of thermodynamics : Heat engine, thermal efficiency, second law of thermodynamics, Kelvin Plank and Clausius statement, equivalence of two statements, reversible process, factors making process irreversible, entropy, property of system entropy change in reversible processing.		
2	2.1	**Ideal gases and ideal gas processes** Definition of an ideal gas, ideal gas laws equation of state or characteristic of gas equation, specific and universal gas constant, specific heat, internal energy and enthalpy analysis of ideal gas processes assuming constant specific heats.		
	2.2	Process like constant volume (isochoric), constant pressure (isobaric), adiabatic (isentropic), irreversible adiabatic, polytropic, throttling etc. may be considered. In each case change in internal energy, enthalpy, entropy and determination of heat and work may be considered, and processes plotted on pressure volume (P-V) and temperature entropy (T-S) diagrams	12	20
	2.3	Two phase system: Properties and property changes for vapour like steam, P-S, T-S diagrams, Mollier diagrams (H-S diagrams).Numerical using steam table to determine dryness fraction, enthalpy.		
3	3.1	**Heat Transfer Principles** Modes of heat transfer, conduction, convection, Radiation		
	3.2	Fourier's law of heat conduction, thermal conductivity, Thermal resistance, electrical analogy, numerical	06	08
	3.3	Free and forced convection		
	3.4	Black body, absorptivity, transmitivity, emissivity, Stefan Boltzman's law		
4	4.1	**Steam power plant** Introduction to Rankine cycle, Steam boilers : Classification, description and working of common boiler (this may be included in laboratory work only and should be as a demonstration in laboratory with available models, charts)		
	4.2	Maintenance and inspection boilers.		
	4.3	Principles of steam generation in modern steam power with particular reference to (**1**) Lamont (**2**) Loeffler (**3**) Velox (**4**) Benson boiler.	08	12
	4.4	Boiler mountings and accessories, study of various boiler mountings such as safety valve, water level indicators, pressure gauge, feed check valve, blow off cock,fusible plug (this should be done in laboratory with available models and charts). Study of various boiler accessories such as feed water injector, economiser, super heater, air preheater, (this should be done in laboratory with available models and charts).		

	4.5	Boiler draught – natural and artificial draught, relative merits and demerits (No analytical treatment).		
5	5.1	**Steam nozzles and steam turbines** Steam nozzles, continuity equation, steady flow energy equation.	**04**	**08**
	5.2	Impulse Turbine, Reaction Turbine compounding and various methods of compounding of turbines their relative comparison.		
6	6.1	**Condensers and cooling tower** Vacuum, function of condensers, classification of condensers	**05**	**08**
	6.2	Jet and surface condensers. "Dalton's law of partial pressure",		
	6.3	sources of air leakage into condenser,		
	6.4	effects of air leakage, definitions of vacuum efficiency, condenser efficiency		
	6.5	cooling towers, description		
7	7.1	**Fuels and fuel combustion** Calorific value of fuels (higher and lower), flash point and fire point, calculation of minimum air requirement for complete combustion, fuel gas analysis	**05**	**08**
	7.2	Alternative fuels like LPG, CNG, Hydrogen, advantages and disadvantages. Volumetric analysis of exhaust gas, conversion of one into other.		
		Total	**48**	**80**

List of Practicals / Experiments / Assignments :-

Sr. No.		Name of Practical / Experiment / Assignment	Hrs
1		**Experiments to measure the following situations**.	04
	a	Pressure above and below atmosphere.	
	b	Temperature(temperature of following fluid & surface temperature)	
	c	Flow measurement of fluids (cooling, water, steam, Refrigerant)	
	d	Speed	
	e	Power (brakes and dynamometer Indicators)	
2		Study by models, charts and actual units of the following : common types of fire tube and water tube boilers (one example of each type in details)	04
3		Boiler mountings and accessories (any four mountings and any two accessories in details)	04
4		Steam turbine	04
5		Surface condenser	04
6		Cooling tower	04
7		Bomb calorimeter & Boys gas calorimeter	04
8		Analysis of exhaust gas with the use of orsat apparatus	02
9		Extended work- Searching and collecting latest information on any of the above experiments from internet.	02
		Total	**32**

Instructional Strategy :-

Sr. No.	Topic	Instructional Strategy
1	Thermodynamic principles	Lecture, Demonstration & Discussion
2	Ideal gases and ideal gas processes	Lecture method, Demonstration
3	Heat transfer principles	Lecture, Discussion
4	Steam power plant subsystems	Lecture, Demonstration & Discussion
5	Steam nozzles and steam turbines	Lecture method, Demonstration
6	Condensers and cooling tower	Lecture, Demonstration & Discussion
7	Fuels and fuel combustion	Lecture method, Demonstration

Text Books :-

Sr. No	Author	Title	Publication
1	P.K. Nag	Thermodynamics and Heat Engines	TATA McGraw Hills, New Delhi
2	Patel and Karamchandani	Elements of heat engines Vol I, II and III	Acharya Publication, Vadodara
3	P.L. Ballaney	Thermal Engineering	Khanna Publishers Delhi,

Reference Books :-

Sr. No	Author	Title	Publication
1	Roy and Chaudhari	Engineering thermodynamics	TATA McGraw Hills, New Delhi
2	Pandya and Shah	Element of heat engines	Charotar Book Stall, Anand
3	D.A. Low	Element of heat engines	Longman Publication, London
4	Mathur	Thermodynamics	
5	R.S. Thetty	Power Engineering	Tata International Publishing, Delhi -6
6	Domkundwar, Kothand Ram, Khajuria Aurora	Thermal Engineering	Dhanpatrai and Sons, Delhi 6
7	S.Domkundwar	Course in heat and mass transfer	Dhanpatrai and Sons, Delhi 6
8	C.P. Aurora	Heat and mass transfer	Khanna Publication
9	Sukhatme S.P.	Heat Transfer	Orient Longman Publication,
10	Lewitt	Thermodynamics and applied to heat engines	Sir Issac Publication Ltd.
11	P.B. Joshi, V.S.Tumane	Engineering thermodynamics	Pune VidyarthiGrihaPrakashan,Pune30
12	A.S. Sarao	Thermal engineering	Satyaprakashan, New Delhi
13	Kumar, Vasandani	Heat Engineering	Metropolitan book company (p) Ltd. Delhi-6

Learning Resources :- Books, Models

Specification Table :-

Sr. No.	Topic	Cognitive Levels			Total
		Knowledge	Comprehension	Application	
1	Thermodynamic principles	06	02	08	16
2	Ideal gases and ideal gas processes	06	02	12	20
3	Heat Transfer Principles	02	--	06	08
4	Steam power plant subsystems	06	02	04	12
5	Steam nozzles and steam turbines	04	02	02	08
6	Condensers and cooling tower	04	02	02	08
7	Fuels and fuel combustion	02	02	04	08
	Total	**30**	**12**	**38**	**80**

CO-PO Matrices of course

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
1	3	1	-	-	-	-	2
2	3	2	1	1	-	1	2
3	3	2	-	1	-	1	2
4	3	-	-	-	-	-	2
5	2	-	-	1	3	1	3

Table 3.12
Enter correlation levels 1, 2 or 3 as defined below:
1**: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)***If there is no correlation, put "-"*

CO-PSO Matrices of course

CO	PSO1	PSO2
1	-	-
2	-	1
3	-	1
4	-	1
5	-	2

Enter correlation levels 1, 2 or 3 as defined below:
1**: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)***If there is no correlation, put "-"*

(Prof. S. S. Nagawade)   (Prof. S. V. Chaudhary)   (Prof. M.S. Deshmukh)

Prepared By   Secretary, PBOS   Chairman, PBOS

<p style="text-align:center">Government Polytechnic Pune</p>

Name of Programme : **Diploma in Mechanical Engineering**
Programme Code : **04/18/24**
Name of Course : **Fluid Mechanics & Fluid Machinery**
Course Code : **ME383**

Teaching Scheme :-

Theory / Practical	Hours / Week	Total Hours
Theory	03	48
Practical	02	32

Evaluation Scheme :-

	Progressive Assessment	Semester End Examination			
		Theory	Practical	Oral	Term Work
Duration	Two class tests each of 60 minutes	3 Hrs	--	--	--
Marks	20	80	25	--	25

Course Rationale :-

Knowledge of fluid pressure, fluid flow and related machinery is essential in all fields of engineering.

Hydraulic machines and hydraulic devices have important role in power generation, power transmission, water supply, irrigation and other engineering segments.

This subject requires the knowledge of basic engineering science, applied mechanics and mathematics etc. The fundamentals of this subject are essential for the subject Industrial Hydraulics to be taught in higher semesters.

Course Outcomes :-

	After studying this course, the student will be able to
1	Define different properties of fluid
2	Identify the flow of fluids
3	Calculate pressure head losses in pipes due to friction
4	Identify different components of turbine
5	Explain the working of Centrifugal pumps
6	Use of different hydraulic devices

Course Content :-

Ch. No.		Name of Topic / Sub topic	Hrs	Weightage
1		**Fluids, Fluid Pressure & Measurement of Pressure**	**10**	**14**
	1.1	Fluid, types of fluids, properties of fluids::mass density, weight density, specific volume, specific gravity, viscosity, kinematic viscosity, Newton's law of viscosity and units. Compressibility &bulk Modulus, surface tension, Capillary action, vapour pressure, cavitation. Types of fluids: Ideal, Real, Newtonion, Non- Newtonion, Plastic.		
	1.2	Pascal's Law, concept of static pressure, pressure head, centre of pressure and total pressure for rectangular, circular and triangular plane surfaces.		
	1.3	Concept of atmospheric pressure, Gauge pressure and vacuum pressure. Pressure head measurement by Piezometer, U-tube manometer, inverted U-tube manometer, micro manometer and Bourdon's pressure gauge.		
2		**Flow of Fluids**	**07**	**12**
	2.1	Types of flows: Steady-unsteady, uniform-non uniform, Laminar-turbulant, compressible-incompressible, rotational-irrotational, 1,2,3 Dimesional. Rate of flow (discharge).law of continuity, Reynolds's number.		
	2.2	Energies possessed by flowing liquids like pressure, kinetic and potential energy,		

		total energy equation		
	2.3	Bernoulli's theorem with proof and its application to venturimeter and Pitot tube		
	2.4	Derivation for discharge through Venturimeter		
	2.5	Hydraulic coefficients, determination of coefficient of velocity by trajectory method		
	2.6	Flow through small circular orifice, rectangular and V- notches.		
3		**Flow through Pipes**	**05**	**12**
	3.1	Laws of fluid friction for laminar and turbulent flow. Darcy's equation for frictional loss. Different types of head losses in pipes. Minor losses: sudden expansion, sudden contraction, bend, pipe fittings, entry, exit. Equivalent pipe.		
	3.2	Hydraulic gradient line, total energy line.		
	3.3	Power transmitted thorough pipes, transmission efficiency, water hammer and its effects (numerical based of connected reservoirs are not expected)		
4		**Impact of Jet and Water turbines**	**12**	**16**
	4.1	Impact of jet and generation of force on stationary and moving flat plate, stationary and moving curved vanes.		
	4.2	Tangential entry on the moving vanes mounted on wheel, calculation of work done and efficiency.		
	4.3	Simple layout of hydro-electric power plant showing dam, reservoir pen stock, surge tank pressure relief valves turbine pen stock and tail race.		
	4.4	Classification of turbines, principles of working and construction of Pelton, Francis, and Kaplan Turbines.		
	4.5	Construction and working of Pelton wheel and Francis turbine, calculation of work done, power developed losses and different efficiencies. (excluding velocity diagrams)		
	4.6	Methods of governing, performance characteristics,		
	4.7	Principles of similarity, calculations and model testing.		
5		**Centrifugal Pumps**	**10**	**16**
	5.1	Classification and applications of pumps, main components, construction, and working. Priming, different heads, velocity diagrams, calculation of power required to drive the pump, manometric efficiency and overall efficiency. NPSH and performance characteristic curves. (numerical based on velocity diagrams are expected)		
	5.2	Multistage pumps, submersible pumps, jet pumps, maintenance and fault finding, their remedies. Installation and testing of centrifugal pumps and pump selection		
6		**Reciprocating pumps and Hydraulic devices**	**04**	**10**
	6.1	Construction and working of single acting and double acting pumps, indicator diagram. Positive and negative slip, calculation of power required. Air vessels, functions and advantages.		
	6.2	Working principle, construction & applications of hydraulic intensifier, hydraulic accumulator, hydraulic press and hydraulic lift.		
		Total	**48**	**80**

List of Practicals / Experiments / Assignments :-

Sr. No.	Name of Practical / Experiment / Assignment	Hrs
1	Determination of coefficient of discharge of rectangular notch or circular orifice.	4
2	Determination of coefficient of discharge of Venturimeter.	4
3	Determination of coefficient of friction for flow through pipes.	4
4	Determination of loss of head due to sudden enlargement and sudden contraction in pipes.	4
5	Observe construction, working and find power and efficiency of Pelton wheel or Francis turbine.	4
6	Observe construction working & find power & efficiency of centrifugal pump.	4
7	Observe construction, working find power & efficiency of reciprocating pump.	4
8	Seminar on any one topic in group of two/three from the batch. Use projector.	4
	Total	**32**

Topics for seminars (Not limited to)

Modern centrifugal pumps, modern reciprocating pumps, turbines, intensifiers, hydraulic accumulators, hydraulic press, lifts, cranes, submersible pumps, turbine pumps, jet pumps. Collect the catalogues of equipment manufacturers. Visit industry and prepare presentation: municipal corporation water purifying plant, pumping station, diary plant, sewage water treatment plants, effluent treatment plants, hydraulic power stations. Hydro Power projects in Maharashtra, each state, India, other countries. Small- Medium, Mega Projects in India.

Instructional Strategy :-

Sr. No.	Topic	Instructional Strategy
1.	Fluid, Fluid Pressure and Measurement of pressure	Lecture method, Demonstration, Projectors, videos, animations
2.	Flow of Fluids	Lecture method, Demonstration, Projectors, videos, animations
3.	Flow through Pipes	Lecture method, Transparencies, Projectors, videos, animations,
4.	Impact of Jet and Water turbines	Lecture method, Transparencies, Projectors, videos, animations
5.	Centrifugal Pumps.	Lecture, Demonstration &Discussion, Projectors, videos, animations
6.	Reciprocating pumps and hydraulic devices	Lecture method, Demonstration, Projectors, videos, animations

Text Books :-

Sr. No	Author	Title	Publication
1	R.S. Khurmi	Fluid mechanics and Hydraulic machines	S. Chand and Co. Ltd.
2	R.K. Bansal	Fluid Mechanics & Hyd. Machines	Laxmi Pub. Pvt. Ltd. 9 the ed. 2010

Reference Books :-

Sr. No	Author	Title	Publication
1	Jagdishlal	Hydraulic machines and Fluid mechanics- Vol I & II	Metropolitand Book Ltd.
2	Modi Seth	Fluid mechanics and Hydraulic machines	Std. Book House, New Delhi

Learning Resources :- Books, Models, Laboratory equipment, Videos on Net .

Specification Table :-

Sr. No.	Topic	Cognitive Levels			Total
		Knowledge	Comprehension	Application	
1.	Fluid, Fluid Pressure and Measurement of pressure	06	04	06	16
2.	Flow of Fluids	08	02	02	12
3.	Flow through Pipes	06	02	04	12
4.	Impact of Jet and Water turbines	04	04	08	16
5.	Centrifugal Pumps	04	04	06	14
6.	Reciprocating pumps and hydraulic devices	04	04	02	08
Total		**32**	**20**	**28**	**80**

CO-PO Matrices of course

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
1	3	1	-	-	-	-	2
2	3	2	1	1	-	1	2
3	3	2	-	1	-	1	2
4	3	-	-	-	-	-	2
5	2	-	-	1	3	1	3

Table 3.12

Enter correlation levels 1, 2 or 3 as defined below:

1**: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)***If there is no correlation, put "-"*

CO-PSO Matrices of course

CO	PSO1	PSO2
1	-	-
2	-	1
3	-	1
4	-	1
5	-	2

Enter correlation levels 1, 2 or 3 as defined below:

1**: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)***If there is no correlation, put "-"*

(Prof.S.S. Deshpande)   (Prof. S. V. Chaudhary)   (Prof. M.S. Deshmukh)

Prepared By   Secretary, PBOS   Chairman, PBOS

Government Polytechnic Pune

Name of Programme : **Diploma in Mechanical Engineering**
Programme Code : **04/18/24**
Name of Course : **Mechanical Measurements**
Course Code : **ME384**

Teaching Scheme :-

Theory / Practical	Hours / Week	Total Hours
Theory	02	32
Practical	02	32

Evaluation Scheme :-

	Progressive Assessment	Semester End Examination			
		Theory	**Practical**	**Oral**	**Term Work**
Duration	Two class tests each of 30 minutes	2 Hrs	--	--	--
Marks	**10**	**40**	**--**	**--**	**25**

Course Rational :-

Methods and techniques of measurements are becoming increasingly important in engineering in recent years laboratory programmes have been modernized, sophisticated electronic instrumentation has been incorporated into the programme and newer techniques have been developed, The course aims at making a Mechanical Engineering student familiar with the principles of instrumentation, transducers & measurements electrical parameters like temperature, pressure, flow, speed, force and stress, Sound knowledge of measurement of various quantities associated with particular engineering application/process/ equipment is very necessary. Considering vital importance of measurement and associated measurement techniques/equipment it is essential that diploma engineer should have good proficiency of mechanical measurement.

Course Outcomes :-

	After studying this course, the student will be able to
1	Generalize Measuring System as per their characteristics.
2	Select transducers as per given application.
3	Use different Displacement Measuring Instruments.
4	Select temperature Measuring Instruments for given Application.
5	Use different Flow and Strain Measuring Instruments.
6	Use different Acoustic, Humidity, Force and level Measuring Instruments

Course Content :-

Chapter No.		Name of Topic / Sub topic	Hrs	Weightage
1		**Significance of measurement**		
	1.1	Classification of instruments, Generalized measuring system and its components, static terms and characteristics- range and span, accuracy and precision, reliability, calibration, hysteresis and dead zone, drift, sensitivity, threshold and resolution, repeatability and reproducibility, linearity. Dynamic characteristics- speed of	07	08

		response, fidelity and dynamic errors, overshoot.		
	1.2	Measurement of error- classification of errors, environmental errors, signal transmission errors, observation errors, operational errors.		
2	2.1	Transducers: Classification of transducers- active and passive, Mechanical, Electrical and Piezo-resistive type transducers. Application of transducers for measurement process such as displacement, pressure, strain, humidity etc.	**05**	**08**
	2.2	Block diagram of automatic control system, closed loop system, open loop system, feedback control system, feed forward control system, servomotor mechanism. Applications of control systems for boiler and air conditioners.		
3	3.1	**Displacement measurement** Potentiometer, LVDT, Eddy current generation type, Tachometer, incremental and absolute type. Speed measurement - Mechanical Tachometers, Revolution counter & timer, Slipping Clutch Tachometer, Electrical Tachometers, Eddy current Drag Cup Tachometer, Magnetic and photoelectric pulse counting methods, Contact less Electrical tachometer, Inductive Pick Up, Capacitive Pick Up, Stroboscope	**05**	**06**
4	4.1	**Temperature measurements** Non-electrical methods- bimetal and liquid in glass thermometer, pressure thermometer	**05**	**06**
	4.2	Electrical methods- RTD, platinum resistance thermometer, thermostat		
	4.3	Thermoelectric methods-elements of thermocouple, law of intermediate temperature, law of intermediate metals, thermo emf measurement.		
5	5.1	**Flow measurements** Variable area meter-rota meter, turbine meter, anemometer- hot wire and hot film, electromagnetic flow meter, ultrasonic flow meter.	**05**	**06**
	5.2	Strain Measurement-Stress-strain relation, types of strain gauges, strain gauge materials, resistance strain gauge- bonded and unbounded, types (foil, semiconductor, wire wound gauges),selection and installation of strain gauges load cells, rosettes.		
6	6.1	**Miscellaneous measurement** Acoustics measurement- sound characteristics - intensity, frequency, pressure, power - sound level meter, piezoelectric crystal type. Humidity measurement -hair hygrometer, Liquid level measurement - direct and indirect methods Force measurement -Tool Dynamometer (Mechanical Type) Shaft Power Measurement - Eddy Current Dynamometer, Strain Gauge Transmission Dynamometer.	**05**	**06**
		Total	**32**	**40**

List of Practicals / Experiments / Assignments :-

Sr. No.	Name of Practical / Experiment / Assignment	Hrs
1	Study of generalized measurement & identification of components	04
2	Study & detection of different types of errors in any one measurement system	04
3	Calibration of pressure gauge using Dead weight Tester	04
4	Temperature Measurement using thermocouples & Thermistors.	04
5	Temperature measurement using Radiation / Optical pyrometer.	04
6	Displacement measurement using Linear variable differential transducer.	04
7	Force measurement on load cell demonstrator	04
8	Speed measurement with Magnetic pickup transducer/ Stroboscope	04
	Total	**32**

Instructional Strategy :-

Sr. No.	Topic	Instructional Strategy
1	Significance of measurement	Lecture method, Demonstration
2	Transducers and Control systems	Lecture method, Demonstration
3	Displacement measurement	Lecture method, Transparencies
4	Temperature measurements	Lecture method, Transparencies
5	Flow measurements	Lecture, Demonstration & Discussion
6	Miscellaneous measurement	Lecture method, Demonstration

Reference Books :-

Sr. No	Author	Title	Publication
1	A.K. Sawhney	Mechanical Measurements & Instrumentation	Dhanpat Rai & Sons, New Delhi.
2	R.V. Jalgaonkar	Mechanical Measurement & Control	Everest Publishing House, Pune
3	D.S. Kumar	Mechanical Measurements & Control	Metropolitan Publications, New Delhi
4	C.S. Narang	Instrumentation Devices & Systems	Tata McGraw Hill Publications
5	R.K. Jain	Mechanical & Industrial Measurements	Khanna Publications, New Delhi
6	B.C. Nakra and K.K. Chaudhry	Instrumentation, Measurement and Analysis	Tata Me Graw Hill Publication

Learning Resources :-

Chalk, Board etc, Animations, Power point presentations, Industrial Automation Magazine and Models

Specification Table :-

Sr. No.	Topic	Cognitive Levels			Total
		Knowledge	Comprehension	Application	
1.	Significance of measurement	04	02	02	08
2.	Transducers and Control systems	02	02	04	08
3.	Displacement measurement	02	02	02	06
4.	Temperature measurements	02	02	02	06
5.	Flow measurements	02	02	02	06
6.	Miscellaneous measurement	02	02	02	06
	Total	**14**	**12**	**14**	**40**

CO-PO Matrices of course

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
1	3	-	-	-	-	1	1
2	1	-	-	2	-	2	2
3	1	-	-	2	-	2	2
4	1	-	-	2	2	2	2
5	1	-	-	2	2	2	2
6	2	-	-	2	2	2	2

Table 3.12
Enter correlation levels 1, 2 or 3 as defined below:

1**: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)***If there is no correlation, put "-"*

CO-PSO Matrices of course

CO	PSO1	PSO2
1	-	-
2	-	2
3	-	2
4	-	2
5	-	2
6	-	2

Enter correlation levels 1, 2 or 3 as defined below:

1**: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)***If there is no correlation, put "-"*

(Prof. V.S. Jadhav)   (Prof. S. V. Chaudhary)   (Prof. M.S. Deshmukh)

Prepared By   Secretary, PBOS   Chairman, PBOS

Name of Programme	:	**Diploma in Mechanical Engineering**
Programme Code	:	**04/18/24**
Name of Course	:	**Theory of Machines and Mechanisms**
Course Code	:	**ME 385 (Class Declaration)**

Teaching **Scheme :-**

Theory / Practical	Hours / Week	Total Hours
Theory	04	64
Practical	02	32

Evaluation **Scheme :-**

	Progressive Assessment	**Semester End Examination**			
		Theory	**Practical**	**Oral**	**Term Work**
Duration	Two class tests each of 60 minutes	3 Hrs	--	--	--
Marks	**20**	**80**	**--**	**25**	**25**

Course **Rational :-**

In this machine age it is necessary to know the mechanism of machines to understand its functioning. A number of links transmitting the forces and motion will comprise mechanism, The subject deals with geometry of mechanism as well as the forces acting, acceleration of links, inversion of mechanisms different power drives, power transmitting equipment.

The scope of subject is kinematics and dynamics of machines, role of friction, power transmission and application of cams in machines.

Course **Outcomes :-**

	After studying this course, the student will be able to
1	Identify inversions of mechanism using basic definitions.
2	Draw Velocity and acceleration diagram of given mechanism.
3	Explain functions of flywheel and governor.
4	Determine frictional power in mechanical component.
5	Draw cam profile for given follower
6	Calculate velocity ratio and power transmitted in Mechanical Drives.

Course **Content :-**

Chapter No.		Name of Topic / Sub topic	Hrs	Weig-htage
		SECTION - I		
1		**Kinematics**		
	1.1	Definition of kinematics, machines, dynamics, statics, kinematics link, kinematics pair, constrained motion, kinematic chain, mechanism inversion,	**06**	**08**

		machine.		
	1.2	Single slider, double slider mechanism, four bar mechanism, their inversions.		
2		**Velocity and acceleration**	**14**	**12**
	2.1	Types of motion, concept of displacement, velocity and acceleration.		
	2.2	Concept of relative velocity and relative acceleration of point on link, angular velocity and angular acceleration, inter-relation between linear and angular velocity.		
	2.3	Drawing of velocity and acceleration diagram of given configuration diagram of simple mechanisms limited to four links. Determination of velocity and acceleration of a point on link (exclude coriolis components) ratio of cutting to return time in quick return mechanism. Klien's construction for reciprocating engine mechanism(limited to uniform angular velocity of crank)		
3		**Flywheel & Governors**	**04**	**08**
	3.1	Flywheel – Functions and application of flywheel with help of turning moment diagram for reciprocating I.C. engines.		
	3.2	Governors – Types, function and application of centrifugal governor. Its comparison with Flywheel. Governor terminology.		
4		**Friction**		
	4.1	Uniform pressure and uniform wear assumptions.	**08**	**12**
	4.2	Derivation and numerical problems to determine power absorbed in friction for flat collared and pivot bearings.		
	4.3	Study of single plate, multi plate and cone clutch, Centrifugal clutch. Derivation to find torque to over come thread friction. Numerical problems to determine power transmitted in single plate, multi plate, cone clutch.		
		SECTION - II		
5		**Brakes and dynamometers**		
	5.1	Definition, classification and comparison between brakes and dynamometers.	**08**	**12**
	5.2	Construction and working of i) Block brake, ii) Band brake, Internal expanding shoe brake and line diagrams for hydraulic, vacuum and air brake systems.		
	5.3	Construction and working of i) Rope brake, ii) Hydraulic, iii) Belt – Transmission, iv) Epicyclic gear train dynamometer (No numerical problems on dynamometers).		
6		**Cams and followers**	**12**	**12**
	6.1	Definition of cam and follower, types of cam and followers, Cam terminology.		
	6.2	Drawing of profile of cams with knife edge follower and roller follower (with and without offset).Motion imparted to follower: i) Uniform velocity, ii) S.H.M., iii) Uniform acceleration and retardation.		
7		**Power Transmission**	**10**	**12**
	7.1	Materials, cross section, Comparison of ropes, belts, chains, gears and types of belt drives, angle of lap, belt length.		
	7.2	Determination of velocity ratio, ratio of tight side to slack side tensions, centrifugal tensions, condition for maximum power transmitted, calculation to find power transmitted, belt cross section.		
	7.3	Gear terminology, types of gear and gear trains, their selection for different application, train value for simple, compound and epicyclic gear trains.		
8		**Balancing**	**02**	**04**
	8.1	Balancing of co-planner masses, static balancing and dynamic balancing.		

		Total	64	80

List of Practicals / Experiments / Assignments :-

Sr. No.	Name of Practical / Experiment / Assignment	Hrs
1.	Study of inversions of four bar, single slider crank and double slider crank mechanisms	04
2.	Construction of velocity and acceleration diagrams.	04
3.	Study and demonstration of different types of governors.	04
4.	Demonstration of clutches.	04
5.	Study of different types of brakes and dynamometers.	04
6.	Construction of profiles of cam with different followers.	04
7.	Study of gear box of an automobile.	04
8.	Mini project on working model in group of 4-5 student.	04
	Total	32

Instructional Strategy :-

Sr. No.	Topic	Instructional Strategy
1.	Kinematics of machine elements	Classroom teaching and illustration with charts and models.
2.	Velocity and acceleration.	Classroom teaching / Practice in drawing Hall.
3.	Flywheel and Governors	Classroom / Lab. teaching and illustration with models
4.	Friction	Illustration with charts and models transparencies / Problem practice in classroom
5.	Brakes and dynamometers	Classroom teaching, transparencies and actual demo on different engines in P.E. Lab.
6.	Cam and followers	Classroom teaching, models, Practice in drawing Hall.
7.	Power transmission	Classroom teaching, charts and transparencies, models in Lab.
8.	Balancing	Classroom teaching

Text Books :-

Sr. No	Author	Title	Publication
1	R.S. Khurmi	Theory of machines	(S.I. Unit) Eurasia Pub. House (Pvt.) Ltd., New Delhi
2	Pandya and Shah	Theory of machines	Charotar Book stall, Mumbai
3	M.S. Mahajan, N.J. Pandey	Mechanisms	Vrinda Publications.

Reference Books :-

Sr. No	Author	Title	Publication
1	P.L. Balaney	Theory of machines	Khanna Publishers

2	Beven	Theory of machines	Orient Longmans Ltd. London/ New Delhi
3	Abdulla Sheriff	Theory of machines	Engg. Book Co. Mumbai / Aflies Book stall Pune.
4	S.S. Ratan	Theory of machines	Tata McGraw-Hill

Learning Resources :- Books, Models.

Specification Table :-

Sr. No.	Topic	Cognitive Levels			Total
		Knowledge	Comprehension	Application	
1	Kinematics of machine elements	08	04	--	12
2	Velocity and acceleration.	04	02	06	12
3	Flywheel and Governors	04	04	--	08
4	Friction	04	04	04	12
5	Brakes and dynamometers	06	06	--	12
6	Cam and followers	04	06	--	10
7	Power transmission	04	06	--	10
8	Balancing	04	--	--	04
	Total	**38**	**32**	**10**	**80**

CO-PO Matrices of course

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
1	3	-	-	-	-	-	2
2	3	3	1	-	-	2	2
3	2	-	-	-	-	-	2
4	3	3	3	2	-	2	2
5	3	3	3	2	-	2	2
6	3	3	3	1	-	2	2

Table 3.12
Enter correlation levels 1, 2 or 3 as defined below:
1**: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)***If there is no correlation, put "-"*

CO-PSO Matrices of course

CO	PSO1	PSO2
1	-	2
2	-	2
3	-	1
4	-	2
5	-	2
6	-	2

Enter correlation levels 1, 2 or 3 as defined below:
1**: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)***If there is no correlation, put "-"*

(Prof. D. P. Khadse)   (Prof. S. V. Chaudhary)   (Prof. M.S. Deshmukh)

Prepared By   Secretary, PBOS   Chairman, PBOS

Government Polytechnic Pune

Name of Programme	:	**Diploma in Mechanical Engineering**
Programme Code	:	**04/18/24**
Name of Course	:	**Mechanical Engineering Materials**
Course Code	:	**MT 388**
Pre-requisite	:	**SC 184**

Teaching Scheme :-

Theory / Practical	Hours / Week	Total Hours
Theory	02	32
Practical	--	--
Tutorial	**02**	**32**

Evaluation Scheme :-

	Progressive Assessment	**Semester End Examination**			
		Theory	**Practical**	**Oral**	**Term Work**
Duration	Two class tests each of 60 minutes	3 Hrs	--	--	--
Marks	**20**	**80**	**--**	**--**	**25**

Course Rationale :-

This course in engineering materials is a part of acquiring basic and essential knowledge about materials being used in engineering products and industry.

The course is useful for mechanical engineering to understand metallurgical aspects of materials, processes and related problems encounter in industry. Course deals with classification, properties and application of materials with processes carried on them as well as testing of materials.

Course Outcomes :-

	After studying this course, the student will be able to
1	Identify properties of materials.
2	Select material for mechanical components.
3	Select relevant heat treatment process to obtain desired properties.
4	Suggest alternative materials.
5	Select alternative method for precision product forming
6	Selectsuitable destructive and non-destructive testing method for the given material

Course Content :-

Chapter No.		Name of Topic / Sub topic	Hrs	Weightage
1		**Classification & properties of materials**	**04**	**10**
	1.1	Classification: Metals, non-metals, ceramics and glasses, polymers, composites and semiconductors (example and application)		
	1.2	Mechanical properties: Strength, elasticity, ductility, malleability, plasticity, toughness, hardness, hardenability, brittleness, fatigue, thermal conductivity, electrical conductivity, thermal coefficient of linear expansion		
	1.3	Bonding in metals: Metallic bond crystal structures (BCC, FCC and HCP)and allotropy of metals		
	1.4	Solid solution: types and their condition		
2		**Ferrous Metal**	**10**	**24**
	2.1	Characteristics and application of ferrous metals Phase equilibrium diagram for Iron and Iron Carbide.		
	2.2	Alloy Steels: - Low alloy steel, high alloy steel, tools steel & stainless steel. Effect of various alloying elements such as – Chromium, nickel, manganese, molybdenum,		

		tungsten, vanadium. Tool Steels: - High speed Steels (HSS), Hot & cold Working dies, shear, punches etc., properties & applications. Special Cutting Tool Materials – Diamond, Stelites & Tungsten Carbide		
	2.3	Cast iron types: White GCI, FG, SG, Malleable Alloy CI, Concept of castability & suitable production methods.		
3		**Heat Treatment Process**	**04**	**12**
	31	Introduction to Heat treatment processes such as Annealing, subcritical annealing, Normalizing, Hardening, Tempering (Austempering & Martempering) - Principle, Advantages, limitations and applications.		
	32	Surface Hardening - Methods of surface hardening, i) case hardening ii) Flame Hardening, iii) Induction Hardening, iv) Nitriding, v) Carburizing - Principle, advantages, limitations and applications		
	33	Heat Treatments on cast iron materials and its application		
4		**Non Ferrous Metals and Alloys**	**04**	**12**
	4.1	Properties, applications & chemical compositions of Copper alloys (naval brass, muntz metal, Gun metal & bronzes), Aluminium alloys (Y-alloy & duralumin) & bearing materials like white metals, leaded bronzes & copper lead alloys.		
5		**Other Engineering Materials**	**06**	**12**
	5.1	Polymeric Materials – Introduction to Polymers- types, characteristics, properties and uses of Thermoplastics, Thermosetting Plastics & Rubbers. Thermoplastic Plastics - characteristics and uses of ABS, Acrylics, Nylons and Vinyls, Thermosetting Plastics - Characteristics and uses of polyesters, Epoxies, Melamines & Bakelites, Rubbers – Neoprene, Butadiene, Buna & Silicons – Properties & applications. Properties and applications of following Engineering Materials – Ceramics, Abrasive, Adhesive and Insulating materials such as Cork, Asbestos, Thermocole and Glass Wool		
	5.2	Composites: Fiber reinforced plastics, Metalmetrix composites, Nano materials.		
	5.3	Advantages, limitations and applications of Powder Metallurgy for engineering products. Brief Description of Process of Powder Metallurgy – Powder making, blending, compacting, sintering, infiltration & impregnation. Applications of Powder metallurgy for tungsten carbide tip tools & porous bearing.		
6		**Testing, Inspection and Examination of materials**	**04**	**10**
	6.1	NDT: Advantages of NDT, Dye penetrant, eddy curve, Ultrasonic, X-ray. Inspection: Visual, Optical. Destructive Testing: On UTM, Hardness, Wear.		
		Total	**32**	**80**

List of Practicals / Experiments / Assignments :-

Sr. No.	Name of Assignment	Hrs
1	Assignment based on properties of materials.	04
2	Assignment on Iron carbon diagram and Study of micro structure diagram	06
3	Minimum two industrial visit report to heat treatment shop (various heat treatments are to be observed and a report is to be prepared by students)	06
4	One assignment on micro structures and heat treatment of cast iron.	04
5	Assignment on copper, aluminum alloys, bearing materials.	02
6	Assignment based on topic no. 5 and 6	04
7	Industrial visit report for different NDT testing	06
	Total	**32**

Instructional Strategy :-

Sr. No.	Topic	Instructional Strategy

1	Classification & properties of materials	Lecture, Demonstration.
2	Steels	Lecture, Demonstration.
3	Heat Treatment of Steels	Lecture, Demonstration.
4	Cast Irons	Lecture, field visit.
5	Engineering Non Ferrous Metals and Alloys	Lecture, field visit.
6	Other Engineering Materials	Lecture, Demonstration, Group Discussion, Seminar, Video film.
7	Testing, Inspection and Examination of materials	Lecture, Demonstration, Group Discussion, Seminar, Video film

Text Books :-

Sr. No	Author	Title	Publication
	NIL	NIL	NIL

Reference Books :-

Sr. No	Author	Title	Publication
1.	O.P. Khanna, M. Lal	Workshop Technology / Production Tech.	DhanpatRai& Sons, Delhi
2.	O.P. Khanna	A Text Book Of Material Science And Metallurgy	DhanpatRai& Sons, Delhi
3.	Dr. Kodgire	Material Science And Metallurgy	Everest Publishing House
4.	R.K. Rajput	Material Science And Engineering	S.K. Kataria and Sons
5.	S.K. HazraChaudhary	Material Science And Processes	Indian Book Distribution Company
6.	Kenneth G. Budinski And Micheal K. Budinski	Engineering Materials Properties And Selection	Printice Hall of India Pvt. Ltd.
7.	C.P. Sharma	Engineering Materials	Printice Hall of India Pvt. Ltd.

Learning Resources :- Books, Models

Specification Table :-

Sr.No	Topic	Cognitive Levels			Total
		Knowledge	Comprehension	Application	
1	Classification & properties of materials	10	--	--	10
2	Steels	12	12	--	24
3	Heat Treatment of Steels	06	06	--	12
4	Engineering Non Ferrous Metals and Alloys	08	--	04	12
5	Other Engineering Materials	06	04	--	10
6	Testing, Inspection and Examination of materials	04	04	04	12
	Total	**46**	**26**	**08**	**80**

CO-PO Matrices of course

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
1	3	--	1	1	--	--	1
2	3	2	1	--	1	--	2
3	2	1	1	--	--	--	2
4	3	2	1	--	1	--	3
5	2	--	3	--	1	--	2
6	3	3	--	2	--	--	3

Table 3.12
Enter correlation levels 1, 2 or 3 as defined below:
1**: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)***If there is no correlation, put "-"*

CO-PSO Matrices of course

CO	PSO1	PSO2
1	--	--
2	--	--
3	--	1
4	--	--
5	--	1
6	--	2

Enter correlation levels 1, 2 or 3 as defined below:
1**: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)***If there is no correlation, put "-"*

(Prof.A.V. Mhetre)　　　　(Prof. S. V. Chaudhary)　　　　(Prof. M.S. Deshmukh)

Prepared By　　　　　　　Secretary, PBOS　　　　　　Chairman, PBOS

Name of Programme : **Diploma in Mechanical Engineering**
Programme Code : **04/18/24**
Name of Course : **Manufacturing Processes**
Course Code : **WS381**

Teaching Scheme :-

Theory / Practical	Hours / Week	Total Hours
Theory	02	32
Practical	04	64

Evaluation Scheme :-

	Progressive Assessment	Semester End Examination			
		Theory	**Practical**	**Oral**	**Term Work**
Duration	Two class tests each of 60 minutes	3 Hrs	--	--	--
Marks	**20**	**80**	**25**	--	**25**

Course Rationale :-

- To enable the students to :-
  1) Understand construction and working of various conventional machine tools
  2) Understand various manufacturing processes performed by them, Use of various cutting tools

Course Outcomes :-

	After studying this course, the student will be able to
1	Interpret various parameters of cutting tool
2	Use of lathe and shaping machine for given Job.
3	Select dies and Punches for Press work operation for a given job.
4	Select Hot and cold working operations for a given job.
5	Interpret Pattern making and Molding principles for a given job.
6	Use of different welding machines for a given Job.

Course Content :-

Chapter No.		Name of Topic / Sub topic	Hrs	Weightage
1.		**Metal cutting**	06	14
	1.1	Basic element of machining, orthogonal and oblique cutting,		
	1.2	Classification of cutting tools, geometry of a single point cutting tools		
	1.3	Chip formation, types of chips, tool wear, tool life, tool failure, cutting tool materials, cutting fluids, machinability index.		
2.		**Lathe and lathe work**	06	14
	2.1	Introduction, working principles, types, specifications, parts, accessories, attachments, operations.		
	2.2	Taper turning methods, lathe tools speed, feed, depth of cut, estimation of		

		machine time.		
3.	3.1	**Shaper, Planner and Slotting machine**	06	14
		Introduction, working principle parts, specification classification, construction, operations performed,		
4.	4.1	**Press and Press work**	03	10
		Introduction, types of press, parts, specifications, power pressed driving mechanisms, Press Tools,		
	4.2	Die accessories, Types of dies and their operations.		
5.	5.1	**Mechanical Working of Metal**	03	08
		Introduction, Hot Working, Hot Rolling, Piercing or seamless tubing, Drawing, Deep Drawing, Hot Spinning, Extrusion.		
	5.2	Cold working, Cold rolling, Cold Drawing, Cold bending, Cold spinning, Cold Extrusion, Squeezing, Peening, Sizing, Coining, hobbing, Electro-hydraulic forming, Metallurgical aspects.		
6.	6.1	**Foundry Technology**	04	14
		Introduction, Pattern-Materials, Tools, Types, Allowances, Core Prints, Core boxes, Colour Code,		
	6.2	Moulding – Processes – Green Sand moulding, moulding machines. Casting – Die casting.		
	6.3	Furnaces		
7.	7.1	**Welding and related processes**	04	06
		Introduction, Weld ability, Types of welding, Metallurgy of welding ,Gas Welding, Oxy-acetylene welding, Air-acetylene welding, Oxy-hydrogen welding, ARC welding, Metal transfer in arc welding, Arc welding equipment, Arc welding methods, Resistance welding, Resistance welding methods, Thermit welding, Solid state welding, Solid state welding method, Newer welding methods, Newer types of welding.		
	7.2	Related processes, Oxygen cutting, Hard facing, Bronze welding, Soldering, Brazing, Welding of various metals, Inspection and testing of welds, Welding joints and edge preparation, Welding of pipes, Represenation of welds(Indian Standard),Safety in welding.		
		Total	**32**	**80**

List of Practicals / Experiments / Assignments :-

Sr. No.	Name of Practical / Experiment / Assignment	Hrs
1.	One job involving plain turning , step turning, taper turning and threading (v).	18
2.	Demonstration of simple job involving various operations on shaping machine	08
3.	One job of thermocole pattern and wooden pattern in group.	18
4.	One job in welding involving different operations/- spot welding,TIG and MIG welding	20
	Total	**64**

Practical Exam : Practical exam in Pattern making of 4 Hr. durations

Instructional Strategy :-

Sr. No.	Topic	Instructional Strategy
1.	Metal cutting	Lecture, Demonstration, Group Discussion, Seminar, Video film.
2.	Lathe and lathe work	
3.	Shaper, Planner and Slotting machine	
4.	Press and Press work	
5.	Sheet metal work	
6.	Foundry Technology	
7.	Powder Metallurgy	

Text Books :-

Sr. No	Author	Title	Publication
1.	Hajra and Chowdhary	A book of shop technology	Media Promotary – Publisher Pvt. Ltd., Mumbai
2.	R.S. Raghuwanshi	A Course in workshop technology	DhanpatRai Sons, Delhi
3.	H.S. Bawa	Workshop technology	Tata McGraw Hill, Delhi.

Reference Books :-

Sr. No	Author	Title	Publication
1.	O.P. Khanna, M. Lal	Workshop Technology / Production Tech.	DhanpatRai& Sons, Delhi

Learning Resources :- Books, Handbooks, Catalogues, Video cassettes. no. 129, 130, 135 ,136, 154, 155, 156, 199, 253 to 258 of G.P.P. library, Transparency Set no. 201

Specification Table :-

Sr. No.	Topic	Cognitive Levels			Total
		Knowledge	Comprehension	Application	
1.	Metal cutting	06	04	04	14
2.	Lathe and lathe work	06	04	04	14
3.	Shaper, Planner and Slotting machine	06	04	04	14
4.	Press and Press working	02	04	04	10
5.	Sheet metal work	02	04	02	08
6.	Foundry Technology	06	04	04	14
7.	Powder Metallurgy	02	02	02	06
	Total	**30**	**26**	**24**	**80**

CO-PO Matrices of course

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
1	3	-	-	1	-	-	1
2	3	-	-	2	-	2	1
3	3	-	-	1	-	-	1
4	2	-	-	1	-	1	1
5	2	-	-	1	-	-	1
6	**2**	**-**	**-**	**2**	**1**	**2**	**2**

Table 3.12

Enter correlation levels 1, 2 or 3 as defined below:

1**: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)***If there is no correlation, put "-"*

CO-PSO Matrices of course

CO	PSO1	PSO2
1	-	-
2	-	2
3	-	1
4	-	-
5	-	1
6	-	2

Enter correlation levels 1, 2 or 3 as defined below:

1**: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)***If there is no correlation, put "-"*

(Prof. S. S. Panpatil)   (Prof. S. V. Chaudhary)   (Prof. M.S. Deshmukh)

Prepared By   Secretary, PBOS   Chairman, PBOS

Government Polytechnic Pune

Name of Programme	:	**Diploma in Mechanical Engineering**
Programme Code	:	**04/18/24**
Name of Course	:	**Strength of Materials**
Course Code	:	**AM384**
Pre-requisite	:	**AM281**

Teaching Scheme :-

Theory / Practical	Hours / Week	Total Hours
Theory	04	64
Practical	02	32

Evaluation Scheme :-

	Progressive Assessment	Semester End Examination			
		Theory	**Practical**	**Oral**	**Term Work**
Duration	Two class tests each of 60 minutes	3 Hrs	--	--	--
Marks	**20**	**80**	--	--	**25**

Course Rationale :- Analysis of forces on the members of structures & machines.
Determination of various stresses induced in the materials due to different types of forces.

Course Outcomes :-

	After studying this course, the student will be able to
1	Evaluate different properties of Materials.
2	Evaluate different stresses on Machine components using Hook's Law
3	Compute SF and BM in beams under different types of loads
4	Calculate Moment of inertia in symmetric and Asymmetric structural sections.
5	Evaluate slope and deflection in beam
6	Calculate Buckling load for Columns using Euler's formula

Course Content :-

Chapter No.		Name of Topic / Sub topic	Hrs	Weightage
1		**Introduction**	**01**	**--**
	1.1	Elastic, plastic & rigid bodies, Mechanical properties of materials – ductility, malleability, brittleness, hardness, strength and toughness.		
2		**Stress & Strain**	**14**	**16**
	2.1	Stress & Strain – concept & Definitions,. Hookes' law, elastic limits; Modulus of elasticity, permanent set, stress – strain curve for ductile, brittle metals.		
	2.2	Poisson's ratio, Changes in dimensions of a body under Uni-axial, biaxial & triaxial stresses.		
		Shear stress- single and double shear, punching shear, Shear modulus Bulk modulus, Relationship between the three modulii (No derivations , Numerical		

		problems only)		
	2.3	Temperature stresses in homogeneous sections – concept and simple problems on thermal stresses in homogeneous, fixed bars only.		
	2.4	Strain energy – Introduction and concept. Work done by external forces – Gradually applied, Suddenly applied & impact load. Stresses developed due to gradually applied, Suddenly applied & impact loadings. Resilience, Proof resilience and modulus of resilience		
3		**Shear force & Bending Moment**		
	3.1	Concept & definition of SF & BM. Sign conventions of SF & BM. Plotting of SF & BM diagrams for simply supported beams with over hangs and cantilever beam subjected to point loads & U.D.L.	**10**	**10**
	3.2	Points of zero shear and point of contra flexure and their significance		
4		**Moment of Inertia**		
	4.1	Concept of moment of inertia. MI of simple geometrical figures such as rectangle, circle and triangle.	**05**	**08**
	4.2	Parallel axis theorem and its applications. Perpendicular axis theorem. Radius of gyration. MI of I, T and C sections.		
5		**Bending Stresses**		
	5.1	Concept of Pure bending. Assumptions in theory of pure bending Equation of bending, Moment of Resistance.	**06**	**08**
	5.2	Bending stress diagram, Flexural Rigidity. Problems on bending stresses in circular, Rectangular, T, I and C sections.		
6		**Direct and Bending Stresses**		
	6.1	Concept of eccentric load, Stresses due to eccentric load with eccentricity about one principle axis. stress distribution diagrams. Condition for no tension, limiting eccentricity, core of section.	**06**	**08**
	6.2	Problems on direct and bending stresses related to Mechanical Engineering.		
7		**Slope and Deflection**		
	7.1	Concept of slope & deflection. Slope and deflection of cantilever and simply supported beams due to point load and uniformly distributed loads only using standard formulae.	**03**	**04**
8		**Principal Planes & Principal Stresses**		
	8.1	Normal stress, Shear stress & resultant stress on oblique planes, angle of obliquity. Concept of principal planes and principal stresses.	**08**	**10**
	8.2	To locate Principal planes, to calculate principal stresses, plane of max. shear analytically and graphically using Mohr's Circle Method.		
9		**Columns & Struts**		
	9.1	Short columns and long columns, Effective length and end conditions of columns. Slenderness ratio.	**05**	**08**
	9.2	Euler's theory & its limitations. Rankine's crippling load, Safe load on column, simple problems on Euler's and Rankine's formulae		
10		**Torsion**		
	10.1	Theory of pure torsion, Assumptions in theory of torsion, Equation of Torsion, Strength of shaft.	**06**	**08**
	10.2	Shear stresses in hollow & solid shafts, angle of twist, torsional rigidity. Power transmitted by shaft, simple problems based on pure torsion		
		Total	**64**	**80**

List of Practicals / Experiments / Assignments :-

Sr. No.	Name of Practical / Experiment / Assignment	Hrs
1.	Study of UTM and extensometer..	4
2.	Tension test on M.S. specimen	4
3.	Compression test on metals.	2
4.	Shear test on metals.	2
5.	Impact tests on metals.	4
6.	Hardness Test on metals	2
7.	To plot SFD & BMD for simply supported beams, cantilever and overhanging beams. (Two problems each)	6
8.	Bending test on timber beam.	4
	To locate Principal planes, to calculate principal stresses using Mohr's circle method.(Two problems)	4
	Total	32

Instructional Strategy :-

Sr. No.	Topic	Instructional Strategy
1.	Introduction	Lecture method
2.	Stresses and strains	Lectures & Demonstrations
3.	Shear force & Bending moment	Lecture method.
4.	Moment of inertia	Lecture method.
5.	Bending Stresses	Lecture method.
6.	Direct & Bending stresses	Lecture method
7.	Slope & Deflection	Lecture method.
8.	Principal planes & stresses	Lecture method.
9.	Columns & Struts	Lecture method.
10.	Torsion	Lecture & Demonstration method.

Text Books :-

Sr. No	Author	Title	Publication
1.	Y.N. Walawalkar	Strength of Materials	Everest Publishing House.
2.	M.N. Panchanadikar	Strength of Materials	Pune VidyarthiGriha
3.	R.S. Khurmi	Strength of Materials	S. Chand & Company Ltd., New Delhi.

Reference Books :-

Sr. No	Author	Title	Publication
1	Dr. V.L. Shah	Strength of Material	Structures Publishers, Pune
2	Singer & Patel	Strength of Materials	Harper & Row (N.Delhi)
3	S. Ramamrutham	Strength of Materials	Dhanpatrai& Sons (N.D.)

Learning Resources :- Books, Models

Specification Table :-

Sr. No.	Topic	Knowledge	Comprehension	Application	Total
1.	Introduction	--	--	--	--
2.	Stresses and strains	04	06	06	16
3.	Shear force & Bending moment	04	06	--	10

4.	Moment of inertia	02	02	04	08
5.	Bending Stresses	02	02	04	08
6.	Direct & Bending stresses	--	04	04	08
7.	Slope & Deflection	02	02	--	04
8.	Principal plans & stresses	02	04	04	10
9.	Columns & Struts	02	02	04	08
10.	Torsion	02	02	04	08
Total		**20**	**30**	**30**	**80**

CO-PO Matrices of course

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
1	3	1	1	3	-	-	2
2	3	-	2	2	-	-	2
3	3	3	1	-	-	-	2
4	3	3	-	-	-	-	2
5	3	-	-	-	-	-	2
6	3	3	-	-	-	-	2

Table 3.12
Enter correlation levels 1, 2 or 3 as defined below:
1**: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)**If there is no correlation, put "-"

CO-PSO Matrices of course

CO	PSO1	PSO2
1	-	-
2	-	-
3	-	-
4	-	-
5	-	-
6	-	-

Enter correlation levels 1, 2 or 3 as defined below:
1**: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)**If there is no correlation, put "-"

(Prof. S.M. Kulkarni)   (Prof. S. V. Chaudhary)   (Prof. M.S. Deshmukh)

Prepared By   Secretary, PBOS   Chairman, PBOS

Government Polytechnic Pune

Name of Programme : **Diploma in CE/ EE/ET/ME/MT/CM/IT/DDGM**
Programme Code : **01/02/03/04/05/08/21/22/23/24/15/16/17/18/19**
Name of Course : **Environmental Science**
Course Code : **AU481**

Teaching Scheme :-

Theory / Practical	Hours / Week	Total Hours
Theory	--	--
Term work / Practical	2	32

Evaluation Scheme :-

	Progressive Assessment	Semester End Examination			
		Theory	Practical	Oral	Term Work
Duration	--	--	--	--	--
Marks	--	--	--	--	50

Course outcomes

1	Identify the sources in engineering domain responsible for global warming and ozone depletion
2	Use the equipment/methods for air and water pollution control due to mechanical devices/processes/products.
3	Use the relevant renewable energy sources in mechanical engineering related domain.
4	Use land fill and incineration methods for treatment of industrial solid waste related to mechanical engineering domain.

Course Content :-

Ch. No		Topic / Subtopic	Practical Hrs	Weightage
1.		**Introduction**	04	--
	1.1	Need of the study of environmental science, definition scope and importance of environmental studies.		
	1.2	Environment & its component need of public awareness, effect of human activities on technological environment.		
	1.3	Depleting Nature of environmental sources such as soil, water, minerals & forests. Need of conserving natural resources preserving the environment.		
2		**Sustainable Development**	04	--
	2.1	Concept of sustainable development.		
	2.2	Social, Economical & Environmental aspect of sustainable development.		
	2.3	Control measure: 3 R (Reuse, Recovery, and Recycle). Appropriate Technology, Environmental education.		
3		**Environmental Pollution:**	16	--
	3.1	Introduction.		
	3.2	Water Pollution: Sources of water pollution-Sewage, Industrial waste, Agriculture chemicals, Thermal & radioactive waste, Heavy metals. Effects of water pollution. Control of water pollution.		
	3.3	Air pollution: Introduction, sources of air pollution, types of air pollution, effects of air pollution, control measures of air pollution.		
	3.4	Concept of Global Warming, Ozone Layer Depletion, Acid rain, Greenhouse effects.		
	3.5	Noise Pollution: Definition, Classification of noise pollution, effects of noise pollution, control of noise pollution.		

	3.6	Land Pollution: Causes, effects and remedies.		
	3.7	E-Pollution: Definition, Causes and effects and remedies measures.		
	3.8	Introduction to solid waste management.		
	3.9	Water Conversation: Rainwater harvesting, Watershed Management		
4		**Renewable sources of Energy:**	04	--
		Biomass, Biogas, Solar Energy, Nuclear Power, Hydropower, Wind Energy, Ocean (Tidal Energy), Geothermal Energy.		
5	5.1	**Environmental Legislation:**	04	--
		Introduction		
	5.2	Ministry of Environment and Forest. (MOEF) Organizational Structure of MOEF.		
	5.3	Functions & Powers of Control Pollution Control Board.		
	5.4	Functions & Powers of State Pollution Control Board.		
	5.5	Environment Protection Act.		
		Total	**32**	**--**

Assignments :-

1. Study of air quality of Pune city.
2. Study of noise pollution in Pune city.
3. Study of solid waste management of Pune city.
4. Study of E-waste management of Pune city.

5. Study of Environmental Status Report of Pune city prepared by Pune Municipal Corporation.

Text Books :-

Sr. No.	Author	Title	Publication
1	S.P. Nisture, D. A. Joshi, G.S. Chhawsaria	Basic Civil and Environmental Engineering	Pearson
2	Anindita Basak, D.L. Manjunath	Basics of Environmental Studies	Pearson
3	L.D. Danny Harvey	Global Warming The Hard Science	Pearson
4	Benny Joseph	Environmental Studies	Tata Mc Graw Hill
5	Godfrey Boyle	Renewable Energy	Oxford Publications
6	R. Rajagopalan	Environmental studies	Oxford University Press

Websites :-
1. **http://www.mpcb.gov.in/**
2. **http://www.cpcb.nic.in/**
3. http://www.envfor.nic.in/
4. **http://www.neeri.res.in/**

Specification Table :-

No Theory Exam hence not Applicable.

CO-PO Matrices of course

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
1	2	-	-	1	3	1	2
2	2	-	-	1	3	2	2
3	2	-	-	2	3	2	3
4	2	-	-	1	3	3	3

Table 3.12

Enter correlation levels 1, 2 or 3 as defined below:

1**: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)***If there is no correlation, put "-"*

CO-PSO Matrices of course

CO	PSO1	PSO2
1	-	1
2	-	3
3	-	3
4	-	2

Enter correlation levels 1, 2 or 3 as defined below:

1**: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)***If there is no correlation, put "-"*

(Prof. R.M.Aghav)   (Prof. V.M. Kolhe)   (Prof. D.K. Fad)   (Prof. S. V.   (Prof. A.S.
                                                                   Chaudhary)   Zanpure)

Prepared By   Prepared By   Prepared By   Secretary, PBOS   Chairman, PBOS

Government Polytechnic Pune

Name of Programme	:	**Diploma in CE/EE/ ET/ ME/MT/ CM/ IT**
Programme Code	:	**01/02/03/04/05/06/07/21/24/26/15/16/17/18/19**
Name of Course	:	**Community Development**
Course Code	:	**AU482**

Teaching Scheme :-

Theory / Practical	Hours / Week	Total Hours
Theory	2	32
Practical	--	--

Evaluation Scheme :-

	Progressive Assessment	Semester End Examination			
		Theory	**Practical**	**Oral**	**Term Work**
Duration	Two class tests of 60 min Duration	3 Hrs	---	---	---
Marks	20	80	---	---	---

Course Rationale :-

The course has been introduced to make young Engineers especially aware of the present status of Villages &to motivate them to make improvement in villages when they start their Engineering carrier.

Course Outcomes :-

After studying this course, the student will be able to

1	Understand present situation in villages and realize the gravity of the village development.
2	Identify area of development by collecting data
3	Identify the available natural resources for betterment of villages.
4	Collect the useful information for starting probable new industries in villages.
5	Demonstrate the procedure of building low cost durable houses to the people .
6	Tell the benefits of good habits regarding health and hygiene. to the people

Chapter No.		Name of Topic / Sub topic	Hrs	Weightage
1.		**Introduction**		
	1.1	Present status of rural and urban community.	**02**	**04**
	1.2	Necessity of community development.		
	1.3	Identifying needs of community, Ways to develop community.		
2.		**Human Power Development**		
	2.1	Present scenario of Human power in India,	**04**	**08**
	2.2	Socioeconomic survey to ascertain requirement of human requirements.		
	2.3	Methodology for training the human power		
	2.4	Wage employment and self employment,		
	2.5	Support from financial institutions for self employment.		
3.		**Appropriate Technology and Technology Transfer**		
	3.1	Technological development of India, Additional needs of community due to technology development,	**04**	**12**
	3.2	Classification of rural industries,		
	3.3	Areas of appropriate technology,		
	3.4	Use of locally available materials,		
	3.5	Methods of transfer of technology, Project reports preparation.		
4.		**Industrialization**		
	4.1	Present status of rural traditional industries,	**04**	**12**

	4.2	Renewal of old industries in villages- Manufacturing new commodities such as plastic utensils, nylon ropes, ceramics Repairing – agricultural implements, tractors, automobiles, electrical or diesel pump sets, domestic appliances Food processing – Papad, jam, jelly, pickles, preservation, spices, syrups, ketchups Utilization of waste product – Gobar gas, fuel cake, Construction–Brick clamp, stone quarry, sand supply, & crusher. Miscellaneous – Handlooms, power looms, Ginning mills, Jaggery making Service Industry –House keeping Public facility centre (suvidha Kendra-setu) Net café, Bachat Gat concept and working. Housing support to industrialization.		
5.		**Non Conventional Energy Sources**		
	5.1	Availability of energy sources in India,		
	5.2	Needs of use of non conventional energy sources.		
	5.3	Availability of such sources in India.	**06**	**20**
	5.4	Various types of non conventional energy sources. Solar energy – Solar water heater and solar cooker, wind energy, wind mill and wind turbines, bio-gas-generation.		
6.		**Community Services**		
	6.1	Health and Hygiene awareness,		
	6.2	Health services,		
	6.3	Educating the community for good habits of health and hygiene, Potable drinking water, purifying well water, low cost latrines, drainage system and soak pits Tree plantation programmes, roads and communications.	**04**	**08**
7.		**Waste Management**		
	7.1	Generation of waste, causes		
	7.2	Types of waste – domestic, commercial, industrial, E-waste, hazardous waste.		
	7.3	Waste separation of domestic waste e.g. wet, dry, reusable, recyclable,	**04**	**08**
	7.4	Waste disposal – methods, treatments, etc.		
	7.5	Reduce, Reuse, and Recycle, 3Rs in Waste Management.		
8.		**Developments**		
	8.1	Programmes for all round development of		
	8.2	Community, Various government schemes, IRDP – Integrated Rural Development Programme.	**04**	**08**
	8.3	Active participation of community in development programmes		
	8.4	Motivation for participation.		
		Total	**32**	**80**

Instructional Strategy :-

Sr. No.	Topic	Instructional Strategy
1	Introduction	Class rooms teaching
2	Man power developments	Class rooms teaching, data collection
3	Appropriate technology & technology transfer	Class rooms teaching
4	Industrialization	Class rooms teaching
5	Non-conventional energy sources	Class rooms teaching
6	Community services	Class rooms teaching
7	Waste Management	Class rooms teaching
8	Developments	Class rooms teaching

Text Books :-

Sr. No	Author	Title	Publication
1	Katav Sing	Rural Development Principles, Policies and management.	---
2	S.P. Sukhatme	Solar Energy	---

| 3 | G.P. Rai | Non-Conventional Sources of Energy | --- |
| 4 | Debendra K. Das | Dynamics of rural development, perspectives | Deep &Deep Publications Delhi |

Reference Books :-

Sr. No	Author	Title	Publication
1	T.T.T.I. Madras	Environmental Engg.	Tata McGraw Hill Publishing Co. Ltd. New Delhi.

Learning Resources :- Internet, Daily News papers

Specification Table :-

Sr. No.	Topic	Cognitive Levels			Total
		Knowledge	Comprehension	Application	
1	Introduction	04	--	--	04
2	Man-power development	04	04	--	08
3	Appropriate technology & its transfer	04	04	04	12
4	Industrialization	04	04	04	12
5	Non-conventional Energy Sources	08	06	06	20
6	Community Services	04	04	--	08
7	Waste Management	--	04	04	08
8	Developments	04	04	--	08
	Total	**32**	**30**	**18**	**80**

CO-PO Matrices of course

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
1	2	-	-	1	3	1	3
2	2	-	-	1	3	2	3
3	2	-	-	2	3	2	3
4	2	-	-	1	3	3	3
5	2	-	-	1	2	2	2
6	2	-	-	1	2	2	2

Table 3.12
Enter correlation levels 1, 2 or 3 as defined below:
1**: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)***If there is no correlation, put "-"*

CO-PSO Matrices of course

CO	PSO1	PSO2
1	-	1
2	-	3
3	-	3
4	-	2
5	2	3
6	2	3

Enter correlation levels 1, 2 or 3 as defined below:
1**: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)***If there is no correlation, put "-"*

(Prof. J. N. Thorat-Shingte)   (Prof. S. V. Chaudhary)   (Prof. A.S. Zanpure)

Name of Programme : **Diploma in CE/EE/ET/ME/MT/CM/IT**

Programme Code : **01/02/03/04/05/06/07/15/16/17/18/19/24**
Name of Course : **Renewable & Sustainable Energy Management**
Course Code : **AU483**

Teaching Scheme :-

Theory / Practical	Hours / Week	Total Hours
Theory	02	32
Practical	--	--

Evaluation Scheme :-

	Progressive Assessment	Semester End Examination			
		Theory	Practical	Oral	Term Work
Duration	Two class tests each of 60 minutes	3 Hrs	--	--	--
Marks	20	80	--	--	--

Course Rationale :-

Energy is an important aspect in all sectors of country's economy. The energy crisis is mainly caused due to increased population and enhanced standard of living and life style of people. The conventional sources of energy are insufficient to meet these demands. Hence alternative energy sources are utilized for power production. The use of alternative energy source is increasing day by day. Diploma Engineers are to develop, operate and maintain these systems therefore essential to know basics of energy conversion, conservation, energy audit and waste heat recovery techniques.

Course Outcomes :-

After studying this course, the student will be able to	
1	Select conventional and Non Conventional energy sources considering environmental impact.
2	Apply Solar Energy principal for given applications with justification.
3	Select principles of Wind energy for given Applications.
4	Utilise Bio mass energy from Agriculture waste.
5	Explain the working of Geothermal and tidal power plant.
6	Apply energy conservation principle to the organization.

Course Content :-

Chapter	Name of Topic / Sub topic	Hrs	Marks

No.					
1.		**Review of conventional sources of energy**		**03**	**06**
	1.1	Types of conventional energy sources, availability and important power plants in India			
	1.2	India's production and reserves for fossil fuels, waterpower, nuclear power.			
	1.3	Need for non-conventional energy sources.			
	1.4	Environmental impact of various energy sources. Green building, sustainable development. Carbon credits and its signifcance			
2.		**Solar Energy**		**04**	**10**
	2.1	Principle of conversion of solar energy into heat and electricity. Solar radiation. Solar radiations at earth's surface			
	2.2	Solar radiation geometry- declination, hour Angle, altitude angle, incident angle, zenith angle, solar azimuth angle			
	2.3	Solar collectors and their types, application, advantages and limitations			
3.		**Applications of Solar Energy**		**04**	**10**
	3.1	Solar electric power generation : Solar photovoltaic cell, solar cell principle and working, its application, advantages and disadvantages.			
	3.2	Solar water heating, solar distillation, solar cooking and furnace,			
	3.3	Solar pumping and Green house, Agriculture and industrial process heat.			
	3.4	Space heating, space colling,			
4.		**Wind Energy**		**05**	**16**
	4.1	Basic principles of wind energy conversion, power in wing, available wind power formulation, power coefficient, and maximum power			
	4.2	Main considerations in selecting a site for wind mills, advantages and limitations of wind energy conversion			
	4.3	Classification of windmills, construction and working of horizontal And vertical axis wind mills, their comparison.			
	4.4	Main applications of wind energy for power generation and pumping.			
5.		**Energy From Biomass**		**05**	**12**
	5.1	Common species recommended for biomass, methods for obtaining energy from biomass.			
	5.2	Classification of biomass- gasified, fixed bed and fluidized			
	5.3	Application of gasifier			
	5.4	Biodiesel production and application			
	5.5	Agricultural waste as biomass, biomass digester, comparison of biomass with conventional fuels.			
6.		**Geothermal Energy and Tidal Energy**		**06**	**16**
	6.1	Availability, forms of geothermal energy- Dry steam, wet steam, hot dry rock, magnetic chamber system			
	6.2	Different power plants available.			
	6.3	Tidal power, factors for selection of tidal power plant			
	6.4	Classification- Single basin, double basin type			
	6.5	Tidal power plants in world, ocean thermal plants.			
7.		**Energy Conservation and management**		**05**	**10**
	7.1	Energy conservation and management, need and importance of energy conservation and management			
	7.2	Concept of payback period, return on investment, life cycle cost, Sankey diagrams, specific energy consumption. Distribution of energy consumption.			

	7.3	Energy audit, types of audit, methods of energy conservation		
	7.4	Cogeneration and its application.		
Total			**32**	**80**

List of Practicals / Experiments / Assignments :-

Sr. No.	Name of Assignment
1.	To collect information about global and Indian energy market
2.	One field visit to be conducted to demonstrate application of Solar Energy
3.	One field visit to be conducted to Wind Mill
4.	To visit a biomass/ biogas plant of municipal waste or elsewhere.
5.	Perform energy audit for workshop/Office/Home/SSI unit.

Instructional Strategy :-

Sr. No.	Topic	Instructional Strategy
1	Review of conventional sources of energy	Classroom teaching and Internet browsing
2	Solar Energy	Classroom teaching and field visits, use of charts
3	Wind Energy	Classroom teaching, field visit & use of charts
4	Energy From Biomass	Classroom teaching, field visit & use of charts
5	Geothermal Energy	Classroom teaching and Internet browsing
6	Tidal Energy	Classroom teaching and Internet browsing
7	Energy Conservation	Classroom teaching
8	Energy Conservation Techniques	Classroom teaching and case study

Text Books :-

Sr. No	Author	Title	Publication
1	Non conventional energy resources	Dr B.H.Khan	Tata McGraw Hill
2	Non conventional energy Resources	G. D. Rai	Khanna publication

Reference Books :-

Sr. No	Author	Title	Publication
1.	Solar energy	S. P. Sukhatme	Tata McGraw Hill
2.	Solar energy	H. P. Garg	Tata McGraw Hill
3.	Power plant engineering	Arrora Domkundwar	Dhanpat Rai & co.
4.	India- The energy sector	P.H. Henderson	Oxford University Press

5.	Industrial energy conservation	D. A. Ray	Pergaman Press
6.	Non-conventional energy source	K. M. Mittal	---
7.	Energy resource management	Krupal Singh Jogi	---
8.	Website for Akshay Urja News Bulletin. (www.mnes.nic.in)	---	---

Learning Resources :- Charts of solar water heater and cooker, Models of solar water heater and cooker, Photovoltaic

cells etc., video cassette no.131, 365 of G.P.P. library

Specification Table :-

Sr. No.	Topic	Cognitive Levels			Total
		Knowledge	Comprehension	Application	
1.	Review of conventional sources of energy	06	--	--	06
2.	Solar Energy	04	06	--	10
3.	Application of Solar Energy	--	04	06	10
4.	Wind Energy	04	04	08	16
5.	Energy From Biomass	04	02	06	12
6.	Geothermal & Tidal Energy	06	04	06	16
7.	Energy Conservation Management	04	06	--	10
	Total	**28**	**26**	**26**	**80**

CO-PO Matrices of course

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
1	2	-	-	1	2	1	2
2	3	-	-	1	3	2	2
3	3	-	-	1	3	2	2
4	2	-	-	1	3	1	3
5	2	-	-	1	3	1	1
6	**2**	**-**	**-**	**1**	**3**	**2**	**3**

Table 3.12
Enter correlation levels 1, 2 or 3 as defined below:
1**: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)***If there is no correlation, put "-"*
CO-PSO Matrices of course

CO	PSO1	PSO2
1	-	-
2	-	2
3	-	2
4	-	-
5	-	-
6	2	2

Enter correlation levels 1, 2 or 3 as defined below:
1**: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)***If there is no correlation, put "-"*

Prof.E. C. Dhembare)   (Prof. S. V. Chaudhary)   (Prof. A.S. Zanpure)

Prepared By   Secretary, PBOS   Chairman, PBOS

Government Polytechnic Pune

Name of Programme	:	**Diploma in CE/EE/ET/ME/MT/CM/IT**
Programme Code	:	**01/02/03/04/05/06/07/15/16/17/18/19**
Name of Course	:	**Engineering Economics**
Course Code	:	**AU484**

Teaching Scheme :-

Theory / Practical	Hours / Week	Total Hours
Theory	2	32
Practical	--	--

Evaluation Scheme :-

	Progressive Assessment	**Semester End Examination**			
		Theory	**Practical**	**Oral**	**Term Work**
Duration	Two class tests of 60 min Duration	3 Hrs	---	---	---
Marks	20	80	---	---	---

Course Rationale :-

Diploma Engineers working in middle level management are no longer confined to the role of professional technicians. They often have to take business decisions, for which they are required to apply economic concepts, logic, tools of analysis and economic theories as they advance in their carrier. It is for this reason that diploma students are required to posses some working knowledge of economic concepts, economic policy of our country, also the effects of globalization, GATT, WTO etc.

Course Outcomes :-

	After studying this course, the student will be able to
1	Interpret Various concepts of Micro Economics and macro economics for Engineering business .
2	Apply Techniques used for forecasting the demand.
3	Calculate fixed and Variable cost using Break even analysis.
4	Calculate depreciation cost using different methods.
5	Interpret concept of GNP and GDP
6	Use Banking systems effectively for New Economic Environment.

Course Content :-

Chapter No.		Name of Topic / Sub topic	Hrs	Weightage
1		**Introduction to Economics**	**04**	**10**
	1.1	Definitions of economics, Outcomes, Importance, concept of engineering economics.		
	1.2	General concepts on micro & macro economics-Market economy, Command economy, Mixed economy.		
2		**Demand Analysis**	**07**	**20**
	2.1	Utility related demand- total and marginal utility, law of diminishing marginal utility, cardinal and ordinal utility.		
	2.2	Law of demand, Determinants of demand, Elasticity of demand, Factors governing the elasticity of demand.		
	2.3	Techniques and methods for forecasting of demand.		
3		**Supply, Production and Cost analysis**	**06**	**14**

	3.1	Law of supply, Determinants of supply, Elasticity of supply and factors governing elasticity.		
	3.2	Theory of production, Laws of production.		
	3.3	Cost concepts, Elements of costs, Preparation of cost sheet, Segregation of costs into fixed and variable costs. Break-even analysis-Linear approach. (Simple numerical problems to be solved)		
4		**Time value of money**	08	16
	4.1	Simple and compound interest.		
	4.2	Principle of economic equivalence. Evaluation of engineering projects, Cost-benefit analysis in public projects.		
	4.3	Depreciation- Causes of depreciation, Methods of calculating depreciation- Straight line method and declining balance method.		
5		**National Income and Inflation**	03	08
	5.1	Concepts and measurement of national income, Gross domestic and national production (GNP, GDP).		
	5.2	Inflation and deflation, measures, kinds and effects.		
	5.3	Unemployment causes, kinds, effects and remedies.		
6		**Finance, Money and Banking and New Economic Environment**	04	12
	6.1	Financial statements i.e. Profit & Loss (Income) Statement, Balance sheet, Book – Keeping, Financial reporting.		
	6.2	Money- Kinds and functions, significance.		
	6.3	Banking- Meaning and functions of commercial banks and Reserve Bank of India.		
	6.4	Liberalization- merits and demerits, GATT and W.T.O.		
		Total	32	80

Instructional Strategy :-

Sr. No.	Topic	Instructional Strategy
1	Introduction to Economics	Lecture method, discussion
2	Demand Analysis	Lecture method, Assignment, surveys, case study, discussion
3	Supply Production and cost analysis	Lecture method, Assignment, surveys, case study, discussion
4	Time value of money	Lecture method, Assignment, surveys, case study, discussion
5	National income and inflation	Lecture method, Literature survey, discussion.
6	Finance, money and banking and New economic environment	Lecture method, visits journals review, discussion.

Text Books :-

Sr. No	Author	Title	Publication
1	D.N. Dwivedi and Abhishek Dwivedi	Engineering Economics	Vikas publishing House Pvt. Ltd., New Delhi,
2	Maheshwari	Managerial Economics (2nd ed)	Prentice Hall of India Pvt. Ltd. New Delhi

Reference Books :-

Sr. No	Author	Title	Publication
1	Pannerselvam	Engineering Economics	Prentice Hall of India Pvt. Ltd. New Delhi
2	Sasmita Mishra	Engineering economics & Costing	Prentice Hall of India Pvt. Ltd. New Delhi
3	Newnan, Eschenbach, and Lavelle,	Engineering Economic Analysis, 9th Edition,	Oxford **Reference Books :-**University Press, 2004.
4	Eschenbach, Ted G.	Engineering Economy - Applying Theory t Practice	Irwin, 1995
5	Newnan and Wheeler,	Study Guide for Engineering Economic Analysis, 9th Edition,	Oxford University Press, 2004.
6	Anthony J. Tarquin	Engineering Economy	Mc Graw-Hill, 1989

Learning Resources :- Books, Journals, and Reports etc.

Specification Table :-

Sr. No.	Topic	Cognitive Levels			Total
		Knowledge	Comprehension	Application	
1	Introduction to Economics	04	06	--	10
2	Demand Analysis	06	08	06	20
3	Supply Production and cost analysis	06	04	04	14
4	Time value of money	06	06	04	16
5	National Income and Inflation	04	04	--	08
6	Finance, Money and Banking and New economic environment	06	04	02	12
Total		**32**	**32**	**16**	**80**

(Prof. S.S. Aaglave)   (Prof. S. V. Chaudhary)   (Prof. A.S. Zanpure)

Prepared By   Secretary, PBOS   Chairman, PBOS

Government Polytechnic Pune

Name of Programme	:	**Diploma in Civil Engineering**
Programme Code	:	**01/21/15**
Name of Course	:	**Construction Management**
Course Code	:	**MA481**

Teaching Scheme :-

Theory / Practical	Hours / Week	Total Hours
Theory	03	48
Practical	--	--

Evaluation Scheme :-

	Progressive Assessment	**Semester End Examination**			
		Theory	**Practical**	**Oral**	**Term Work**
Duration	Two class tests of 60 min Duration	3 Hrs	---	---	---
Marks	**20**	**80**	---	---	---

Course Rationale :-

The Civil Engineer has to plan, Manage and execute Civil Engineering works. He has to manage different resources. He should have knowledge of basic management of basic management processes related to Civil engineering field.

Course Outcomes :-

	After studying this course, the student will be able to
1	Understand management techniques
2	Plan, Monitor and execute various types of construction work
3	Manage different resources (Men, Material, Money, Machines)
4	Read, draw & update bar charts, CPM and PERT.
5	Inspect l quality control of construction.

Course Content :-

Topic No.	Sr. No.	Topic & Subtopic	Hrs	Marks
		Construction Industry		
	1.1	Importance of construction industry in National Development.		
	1.2	Special characteristics of Civil engineering works.		
	1.3	Classification and types of construction works.		
1	1.4	Agencies associated with construction works.	05	06
	1.5	Resources of construction industry, Material, Manpower, Money,		
	1.6	Machinery.		
	1.7	Stages in construction – Planning stage execution stage.		
	1.8	Outcomes of Construction Management.		
		Scientific Management		
	2.1	Definition of Management.		
	2.2	Necessity Of Scientific management.		
2	2.3	Principles of Management.	06	08
	2.4	Functions of Management.		
	2.5	Application of Principal and function of management to Civil Engineering works.		
3		**Leadership and human relationship**	05	08

	3.1	Leadership – styles of leadership		
	3.2	Desirable qualities of leadership of effective Execution of construction work.		
	3.3	Functions of leadership		
	3.4	Human relation, Human needs		
	3.5	Motivation and its importance and need, functions of Motivation, Hygiene and motivation factors.		
4		**Planning and scheduling of construction works**	10	18
	4.1	Levels and stages of planning –(pre & post tenders)		
	4.2	Necessity and Importance of planning.		
	4.3	Planning for owner/client and planning for contractor.		
	4.4	Site selection and orientation of building.		
	4.5	Study of drawing, Design, Raw materials Equipment sand human resources required.		
	4.6	Methods of scheduling, Advantages of scheduling.		
	4.7	Bar chart. Preparing construction schedule. Advantages and limitations of bar charts.		
	4.8	Planning and scheduling by Network Construction, Logic, Determine of various timings EST, EFT, LST, LFT. Total float preparation of activity table, Example on developing Critical path, Introduction to PERT. Terms used.		
	4.9	Comparison between CPM and PERT.		
	4.10	Preparing Construction schedule comprising of items of work and duration.		
	4.11	Resource Aggregation for labour.		
5	5.1	**Communication at site**	04	06
		Importance of communication at construction site.		
	5.2	Types of communication.		
	5.3	Barriers to effective communication.		
	5.4	Techniques to overcome barriers of effective communication.		
6		**Safely in Civil Engineering**	04	08
	6.1	Importance of safely in construction works.		
	6.2	Common Causes of accidents, types of accidents, Remedial measures.		
	6.3	Terms used- Injury frequency rate(IFR), Injury Severity rate (ISR), Injury Index (II), Accident cost.		
	6.4	Effective safety Programme.		
7		**Site layout**	05	08
	7.1	Storing and stacking of material site.		
	7.2	Location of Machinery and equipment.		
	7.3	Factors on which site layout depend.		
	7.4	Preparation of site layout.		
8		**Inspection and quality**	05	08
	8.1	Concept of quality.		
	8.2	Supervision techniques to establish dimensional control such as line, Level Gradient, Slope, Plumb Camber.		
	8.3	Functions of Inspection Department.		
	8.4	Quality assurance and quality control.		
	8.5	Sampling Techniques.		
9		**Application of Computer in Construction Management.**	02	04
	9.1	Types of software		
	9.2	Application of software & Areas.		
	9.3	Merits and Demerits of software.		
10		**Entrepreneurship in Construction Management**	02	06
	10.1	Concept of Entrepreneur and Entrepreneurship		
	10.2	Merits of Entrepreneurship and employment.		
	10.3	Types of Construction Management.		
		Total	48	80

Suggested Instructional Strategies :- Lecture Method, Use of teaching aids, Demonstration, Case Study.

Learning Resources :-Books, Journals.

Reference Book :-

Sr. No.	Author	Title	Publisher
1	M.L.Dhir, Gehlot	Construction Planning & Management	Wiley New Delhi
2	Harpal Singh	Construction Management & Accounts	Tata McGraw Hill
3	B.Sengupta & Guha	Construction management & planning	Tata McGraw Hill
4	R.L.Peurifoy	Construction Planning equipment and methods	McGraw-Hill Co. Ltd.
5	Banga & Shoral	Origination of Management	McGraw-Hill Co. Ltd.

(Prof. N.G.Waykole)   (Prof. S. V. Chaudhary)   (Prof. A.S. Zanpure)

Prepared By   Secretary, PBOS   Chairman, PBOS

Government Polytechnic Pune

Name of Programme	:	**Diploma in Civil Engineering**
Programme Code	:	**01/21/15**
Name of Course	:	**Industrial Organization Management**
Course Code	:	**MA482**

Teaching Scheme :-

Theory / Practical	Hours / Week	Total Hours
Theory	03	48
Practical	--	--

Evaluation Scheme :-

	Progressive Assessment	Semester End Examination			
		Theory	**Practical**	**Oral**	**Term Work**
Duration	Two class tests of 60 min Duration	3 Hrs	---	---	---
Marks	**20**	**80**	---	---	---

Course Rationale :-

	At the end of course, student will be able to
1	Classify different types of business
2	Explain the principle of organization
3	List the functions of management
4	Explain the concept of budget and accounting
5	Select the modern techniques of Material management.
6	Apply industrial legislation effectively
7	Apply modern techniques of quality management

Course Outcomes :-

	After studying this course, the student will be able to
1	The basic knowledge about entrepreneurship.
2	Fundamentals of accounting finance, marketing.
3	Various aspects of management, Taylor's principle.
4	Management techniques.
5	Different acts used in factories.

Course Content :-

Topic No.	Sr. No.	Topic & Subtopic	Hrs	Marks
		Overview of Business and Entrepreneurship		
1	1.1	Type of Business : Service, Manufacturing, Trade. Industrial sectors introduction to : Engineering Industry, IT Industry, Banking, insurance, Retail. Globalization : Introduction, Advantages and Disadvantages with respect to India.	**05**	**08**
2		**Organizational Management**		

	2.1	Organization : Defination, Steps in organization, Types of Organization : Line, Functional, Line and Staff, Project. Departmentation : By product, by process by function. Principles of Organization : Authority and responsibility, Span of control, Effective delegation, Communication. Forms of Ownership : Proprietorship, Partnership, Joint stock, Co-operative society, Government sector.	08	14
3		**Management Process**		
	3.1	What is management : Evolution, Various definition of management, concept of management, Levels of management, administration of management, scientific management by F.W. Taylor. Principle of management : Function of management : Planning, organizing, directing, coordinating, controlling.	08	14
4		**Financial Management and Accounting**		
	4.1	Financial management objective and function. Capital generation and management : type of capital-fixed and working, sources of raising capital, feature of short term, medium term and long term sources. Budget and account : types of budget, production budget-sample format, fixed and variable budget-concept, profit and loss account, important accounting terminology, types of account : rules for debit and credits, systems of book keeping, book keeping, books of accounts. Balance sheet : meaning, sample format, meaning of different terms involved.	07	12
5		**Material Management**		
	5.1	Inventory concept, its classification, functions of inventory : ABC analysis-necessity and steps : Economic order quantity concept, graphical representation, determination of EOQ Standard steps in purchasing Modern technique of material management : material resources planning (MRP)-function of MRP, input to MRP, benefits of MRP. Enterprise resource planning (ERP)-concepts, list of modules, advantages and disadvantages of ERP.	07	12
6		**Marketing**		
	6.1	Market survey, definition, modern concept of marketing orientation, project report preparation, utility, project report preparation of utility for evaluation, market oriented report, product costing, project costing, format, evaluation of project report, costing and pricing, classification of costs, calculation of break even point, packing and advertising.	05	08
7		**Industrial Safety and legislative acts**		
	7.1	Safety management : cause of accident, types of industrial accident, preventive measure, safety procedure. Industrial legislation – necessity of acts : important definition and main provision of following act – workman compensation act, minimum wages act, Indian factory act.	04	06
8		**Quality management and ISO**		
	8.1	Meaning of quality : quality management system - activities, benefits, Quality control-objective, function, advantages, quality circle-concepts, characteristics and outcomes, quality assurance-concepts, quality assurance system. Meaning of total quality and TQM components of TQM-concept, element of TQM benefits, Modern technique and system of quality management like-Kaizen, 5S, Six Sigma. ISO 9001 :2000: benefits, Main clauses.	04	06
		Total	48	80

Instructional Strategy :-

Sr. no.	Topic	Instructional Strategy

1	Overview of Business and Entrepreneurship	Class room teaching	
2	Organizational Management	Class room teaching	
3	Management Process	Class room teaching	
4	Financial management and accounting	Class room teaching	
5	Material management	Class room teaching	
6	Marketing	Class room teaching	
7	Industrial safety and legislative acts	Class room teaching	
8	Quality management and ISO	Class room teaching	

Reference Book :-

Sr. No.	Author	Title	Publisher
1	Sept. 1988, TTTI, Chandigarh	Entrepreneurship development training material	Sept. 1988, TTTI, Chandigarh
2	March. 1988, TTTI, Chandigarh	Report for institutional entrepreneurship development and management courses in selected institutions	March. 1988, TTTI, Chandigarh
3	Uday Parikh, T.V. Rao and D.M. Pestonjee	Behavioral processes in organizations	Tata McGrawhill
4	O.P. Khanna	Industrial engineering and management	Dhanpat Rai and Sons.
5	Banga and Banga	Project Planning and entrepreneurship	Khanna Publishers.
6	David, Kroenke	Management Information Systems	McGraw Hill Book Co.
7	Lester R. Bittel, John W. Newstrom	What every supervisor should know	McGraw Hill Book Co.

Specification Table :-

Sr. No.	Topic	Cognitive Levels			Total
		Knowledge	Comprehension	Application	
1	Entrepreneurship development	03	03	--	06
2	Finance and accounting	06	02	--	08
3	Marketing Fundamentals of accounting	--	04	04	08
4	Organization	06	02	--	08
5	Management	07	04	04	15
6	Acts	10	10	06	26
7	Fields of industrial psychology	04	--	--	04
8		05	--	--	05
	Total	**40**	**26**	**14**	**80**

(Prof.C.Y. Totewar)   (Prof. S. V. Chaudhary)   (Prof. A.S. Zanpure)

Prepared By   Secretary, PBOS   Chairman, PBOS

Government Polytechnic Pune

Name of Programme : **Diploma in CE/ EE/ET/ME/MT/CM/ IT**
Programme Code : **01/02/03/04/05/06/07/15/16/17/18/19**
Name of Course : **Entrepreneurship Development**
Course Code : **MA483**

Teaching Scheme :-

Theory / Practical	Hours / Week	Total Hours
Theory	03	48
Practical	---	---

Evaluation Scheme :-

	Progressive Assessment	Semester End Examination			
		Theory	Practical	Oral	Term Work
Duration	Two class tests of 60 min Duration	3 Hrs	---	---	---
Marks	20	80	---	---	---

Course Rationale :-

To make the students aware of entrepreneurship as one of the career options and hence to teach them the various aspects of starting a enterprise.

Course Outcomes :-

	After studying this course, the student will be able to
1	Use different self-analysis tools for goal setting.
2	Analyse Market requirements by Different Survey technique for finalizing the project.
3	Prepare project report as per the requirements of various agencies.
4	Select appropriate information and support system for finalizing project report.
5	Develop suitable organizational structure for effective functioning of enterprise.
6	Analyze different case studies for avoiding failures of Entrepreneur.

Course Content :-

Chapter No.	Name of Topic / Sub topic	Hrs	Weightage
1.	**Entrepreneurship Awareness** Entrepreneurship – need, scope & philosophy. Definition of an entrepreneur, attributes, Entrepreneurship. Need Analysis: Human Need, SWOT Analysis, goal setting, business environment, emerging trends, Information & collection techniques, opportunities. Role of Entrepreneur in Indian economy	08	10
2.	**Starting & Identification of Project**	08	14

	Product and services, demand availability & resource requirement. Market survey technique – Identification of market, marketing trends, market survey techniques, agencies & organizations to be contacted. Product, suppliers of plant, equipment & raw material technology. Venture Capital Funding			
	Preparation of Project report			
3.	Structure of project report, purpose of project report. Working & fixed capital, financial institutions, procedures & Norms for financing feasibility criteria, project planning, time management, legal formalities, municipal by laws. Safety considerations, plant layout, commissioning of plant & equipment, trial production.	10	16	
4.	**Information & support systems**			

	Information needed & their sources. Information related to Project Information related to procedures & formalities.
	Support systems
	    a) Small scale business planning Requirements
	    b) Govt. & financial Agencies, Formalities.
	Role of Central Government and State Government in promoting Entrepreneurship- introduction to various incentives, subsidies and grants – Export Oriented Units – fiscal and tax concession available. Role of following agencies in the Entrepreneurship Development - District Industries Centers (DIC), Small Industries Service Institute (SISI), Entrepreneurship Development Institute of India (EDII), National Institute of Entrepreneurship & Small Business Development (NIESBUD), National Entrepreneurship Development Board (NEDB)
		10	16	

	Management of Enterprises			
5.	Forms of business Organization. Human behavior, personnel management, sales Management. Marketing practice, distribution channels, Advertisings, Packaging.	06	12	
	Why do entrepreneurs fail?			
6.	The four entrepreneurial pitfalls (Peter Ducker) Case studies of successful entrepreneur. Women entrepreneurs – Reasons for low women entrepreneurs, problems & prospectus.	06	12	
	Total	**48**	**80**	

Instructional Strategy :-

Sr. No.	Topic	Instructional Strategy
1	Entrepreneurship Awareness	
2	Starting & Identification of Project	
3	Preparation of Project report	**Lecture, market survey, workshops, interviews.**
4	Information & support systems.	
5	Management of Enterprises	
6	Why do entrepreneurs fail?	

Text Books :-

Sr. No	Author	Title	Publication
1	S. Saini, B.S. Rathore	Entrepreneurship – Theory & Practice	

Reference Books :-

Sr. No	Author	Title	Publication
1	Vasant Dsai, Pragati Desai	Entrepreneurial development Vol. I	
2	Vasant Dsai, Pragati Desai	Entrepreneurial development Vol. II	
3	Vasant Dsai, Pragati Desai	Entrepreneurial development Vol. III	
4	Colombo Staff College, Manila	Entrepreneurship Development Plan	TMH, New Delhi
5	Jerald Greenberg, Robert A. Baron/ Carol A. Sales/ Frances A. Owen / Verlag (1999)	Behaviour in organizations, Pearson Education.	Tata Mcgraw Hill.

6	The winning Edge, corporate creativity.	Pradip N. Kandwalla	Tata Mcgraw Hill.(2006)
7	John L. Colley, Jacqueline L. Doyle,	Corporate Governance	Tata Mcgraw Hill. (2003)
8	Timpe, Dale A	Creativity	M/s. Jaico Publishing House, New Delhi. Tata Mcgraw Hill. (2005),

Learning Resources :- Books, Articles, Case studies

Specification Table :-

Sr. No.	Topic	Cognitive Levels			Total
		Knowledge	Comprehension	Application	
1	Entrepreneurship Awareness	02	06	02	10
2	Starting & Identification of Project :	04	06	04	14
3	Preparation of Project report business plan.	03	10	03	16
4	Information & support systems.	04	08	04	16
5	Management of Enterprises :	04	06	02	12
6	Why do entrepreneurs fail?	04	04	04	12
	Total	**21**	**40**	**19**	**80**

CO-PO Matrices of course

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
1	2	3	-	2	-	2	3
2	3	3	3	2	-	3	3
3	2	-	3	2	-	3	3
4	3	2	2	2	-	3	3
5	3	2	3	2	-	3	3
6	3	3	3	2	1	3	3

Table 3.12
Enter correlation levels 1, 2 or 3 as defined below:
1**: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)***If there is no correlation, put "-"*

CO-PSO Matrices of course

CO	PSO1	PSO2
1	1	2
2	2	2
3	2	1
4	2	1
5	2	1
6	2	2

Enter correlation levels 1, 2 or 3 as defined below:
1**: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)***If there is no correlation, put "-"*

(Prof. S. P. Paranjape)   (Prof. S. V. Chaudhary)   (Prof. A.S. Zanpure)

Prepared By   Secretary, PBOS   Chairman, PBOS

Name of Programme	:	**Diploma in CE/EE/ET/ME/MT/CM/IT**
Programme Code	:	**01/02/03/04/05/06/07/08/21/22/23/24/26/15/16/17/18/19**
Name of Course	:	**Material Management**
Course Code	:	**MA484**

Teaching Scheme :-

Theory / Practical	Hours / Week	Total Hours
Theory	**03**	**48**
Practical	---	---

Evaluation Scheme :-

	Progressive Assessment	**Semester End Examination**			
		Theory	**Practical**	**Oral**	**Term Work**
Duration	Two class tests of 60 min Duration	3 Hrs	---	---	---
Marks	**20**	**80**	---	---	---

Course Outcomes

1	Explain the importance of Material Management
2	State the purpose of Inventory Management
3	Interpret purchase procedure.
4	Use different techniques for cost reduction
5	Explain the Modern techniques of Material Management

Course Content :-

Chapter No.		Name of Topic / Sub topic	Hrs	Weig
1		**Importance of Materials Management**		
	1.1	Growing importance of Materials Management	**10**	**16**
	1.2	Scope of Materials Management		
	1.3	Outcomes and functions of Materials Management		
	1.4	Organizing for Materials Management		
	1.5	Introduction to Materials planning		
	1.6	Importance of specifications in Materials Management		
2		**Inventory Management**		
	2.1	Selective control – ABC Analysis – Purpose and outcomes of ABC analysis	**10**	**16**
	2.2	Advantages of ABC Analysis and limitations of ABC Analysis		
	2.3	Order point – Lead Time, safety stock, Re-order point, standard order, Economic order		
	2.4	Quantity (EOQ), Graphical & Analytical Method		
3		**Buying procedure**		
	3.1	Sourcing, Buy or lease	**10**	**16**
	3.2	Purchase systems		
	3.3	Problems in relations with supplier		
	3.4	Value Analysis $\rightarrow$ Definition & scope		
	3.5	Selection of products for value analysis		

	3.6	Value analysis framework		
	3.7	Implementation & methodology		
	3.8	Ethics in purchasing		
4		**Price forecasting**	**01**	**02**
	4.1	Importance & Approaches		
5		**Inventory control & Cost reduction techniques**	**05**	**08**
	5.1	Inventory turns ratios		
	5.2	Standardization- need & importance		
	5.3	Codification- concept, benefits.		
	5.4	Value engineering & Value analysis- concept & process		
6		**Latest Techniques in Materials Management**	**05**	**10**
	6.1	Just in Time (JIT) zero inventory concept		
	6.2	Integrated computerized management systems in materials management		
	6.3	Introduction to SAP.		
7		**Management of obsolete Surplus and Scrap material**	**07**	**12**
	7.1	Definitions, Reasons for generation and accumulation of obsolete Surplus and scrap, Survey committee, presale preparations, sale, auction, sale by tender.		
		Total	**48**	**80**

Instructional Strategy :-

Sr. No.	Topic	Instructional Strategy
1	Importance of Materials Management	Class room teaching
2	Inventory Management	Class room teaching
3	Buying procedure	Class room teaching
4	Price forecasting	Class room teaching
5	Inventory control & Cost reduction techniques	Class room teaching
6	Latest Techniques in Materials Management	Class room teaching
7	Management of obsolete & scrap material	Class room teaching

Text Books :-

Sr. No	Author	Title	Publication
1	Ammer Deans S.	Materials Management	R.D. Irwin Hllions
2	P. Gopalkrishan and M. Sundaresan	Materials Management An Integrated approach	Prentice – Hall of India Pvt. Ltd. New Delhi.
3	M.M. Shah	An integrated concept of Materials Management	Tata McGraw Hill Publisher Co. Ltd. New Delhi

Reference Books :-

Sr. No	Author	Title	Publication
1	P.G. Menon	Materials Management	
2	A Deb	Materials Management	Academic Publishers

3	Dobler D.W. and Lee C	Purchasing and Materials Management	---
4	Brandy C.S.	Materials Handbook	---

Learning Resources :- OHP, LCD, Projector, and Transference, White board

Specification Table :-

Sr. No.	Topic	Cognitive Levels			Total
		Knowledge	Comprehension	Application	
1	Importance of Materials Management	6	6	4	16
2	Inventory Management	6	6	4	16
3	Buying procedure	6	6	4	16
4	Price forecasting	--	1	1	02
5	Inventory control & Cost reduction	2	4	2	08
6	Latest techniques in Materials	2	4	4	10
7	Management of obsolete and scrap	6	6	--	12
		28	33	19	80

(Smt. N.S.Kadam)   (Prof. S. V. Chaudhary)   (Prof. A.S. Zanpure)

Prepared By   Secretary, PBOS   Chairman, PBOS

Name of Programme	**:**	**Diploma in CE/EE / ET/ ME/MT/ CM / IT**
Programme Code	**:**	**01/02/03/04/05/06/07/21/24/26/15/16/17/18/19**
Name of Course	**:**	**Supervisory Management**
Course Code	**:**	**MA485**

Teaching Scheme :-

Theory / Practical	Hours / Week	Total Hours
Theory	03	48
Practical	---	---

Evaluation Scheme :-

	Progressive Assessment	Semester End Examination			
		Theory	**Practical**	**Oral**	**Term Work**
Duration	Two class tests of 60 min Duration	3 Hrs	---	---	---
Marks	**20**	**80**	---	---	---

Course Rationale :-

The diploma holders are intended to work as a supervisor in the industry. He has to perform a versatile role in the activities of an industry; he has to coordinate his subordinates and the higher personals.

The students are required to understand to function as a supervisor. He should be able to plan, organize, and direct the subordinates to achieve better results within time for a task assigned to him.

Course Outcomes :-

	After studying this course, the student will be able to
1	Explain the concept of Scientific Management
2	List different functions of Supervisor
3	Maintain the relationship with subordinates
4	Plan the shop floor activities
5	Demonstrate specific job activity

Course Content :-

Sr. No	Sr. No.	Name of Topic / Sub topic	Hrs	Weightage
1	1.1	**Introduction**	**02**	**04**
		Management of a job. Necessity for Scientific Management for supervisor. Handling complexity and achieving optimization.		
2	2.1	**Planning by Supervisor**	**04**	**08**
		Outcomes of planning. Planning activities. Planning by supervisor. Detailing and following of each step. Prescribing standard forms for various activities. Budgeting at supervisory level for materials and man power. Planning a programme and actions for a job.		
3	3.1	**Organizing by supervisor**	**04**	**08**
		Organizing physical resources. Matching human needs with job needs. Allotment of tasks to individual and establishing relationship among persons working in a group.		
4	4.1	**Directions by supervisor**	**06**	**10**
		Need for such directions and instructions to subordinates. Need for clarity, completeness and feasibility of instructions. Reviving of effectiveness of communication. Personal counseling. Advance predictions of possible mistakes. Elaborating decisions. On the spot adjustments during execution of job. Laying disciplinary standards in over all working.		

5		**Motivation to subordinates**	**06**	**10**
	5.1	Workers participation in management of a job. Achievement motivation. Recognition for devotion. Delegating responsibilities to subordinates. Activities and intensions towards the growth of an individual. Identification of human needs and providing safety to the workers.		
6		**Coordination & implementation**	**10**	**14**
	6.1	Understanding link between various departments in respect of process and quality standards. Synchronization of duties of subordinates. Control over the performance in respect of quality; quality of production; time and cost. Measuring performance, comparing with standard, correcting unfavorable deviations.		
7		**Check list by supervisor**	**08**	**10**
	7.1	Introduction to subordinates regarding the job undertaken. Planning the days work suitable for the job. Responsibility survey. Checking possibility for acceptance of assignment from new department.		
8.		**Moving up in the organization**	**08**	**16**
	8.1	Demonstration of job competence. Exhibition of leadership and initiative. Looking for to accept challenging responsibilities and acceptance of the same. Attitude and actions to be followed and avoided. Stressing the value of own contribution. Achievement of trust of subordinates and the higher management.		
		Total	**48**	**80**

Instructional Strategy :-

Sr. No.	Topic	Instructional Strategy
1	Introduction	Lecture method
2	Planning by supervisor	Lecture method
3	Organizing by supervisor	Lecture method
4	Directions by supervisor	Lecture method
5	Motivation to subordinates	Lecture method
6	Coordination & implementation	Lecture method
7	Check list by supervisor	Lecture method
8	Moving up in the organization	Lecture method

Text Books :-

Sr. No	Author	Title	Publication
1	Industrial Management	Shrinivasan	Khanna publisher,New Delhi

Reference Books :-

Sr. No	Author	Title	Publication
1	Industrial organization and Engineering Economies	Banga and sharma.	Khanna publisher,New Delhi
2	Industrial Engineering and Management	O.P. Khanna	Dhanpat Rai and Sons, New Delhi
3	What every Supervisor Should Know	Lestec R. Bittel John W. Newstrom	McGraw Hill Publishing Company, (GREGG Division)

Learning Resources :- Books, Articles, C.D.'s, Visits, Video Cassettes No. 115 and 120

Specification **Table** :-

Sr. No.	Topic	Cognitive Levels			Total
		Knowledge	Comprehension	Application	
1	Introduction	02	02	-	04
2	Planning by supervisor:	06	01	01	08
3	Organizing by supervisor	04	02	02	08
4	Directions by supervisor	05	03	02	10
5	Motivation to subordinates	05	03	02	10
6	Coordination & implementation	10	02	02	14
7	Check list by supervisor	06	02	02	10
8	Moving up in the organization	08	04	04	16
	Total	**46**	**19**	**15**	**80**

(Prof. S.V.Chaudhari)   (Prof. S. V. Chaudhary)   (Prof. A.S. Zanpure)

Prepared By   Secretary, PBOS   Chairman, PBOS

Government Polytechnic Pune

Name of Programme	:	**Diploma in CE/EE / ET/ ME/MT/ CM / IT**
Programme Code	:	**01/02/03/04/05/06/07/15/16/17/18/19**
Name of Course	:	**Total Quality Management**
Course Code	:	**MA486**

Teaching Scheme :-

Theory / Practical	Hours / Week	Total Hours
Theory	03	48
Practical	---	---

Evaluation Scheme :-

	Progressive Assessment	Semester End Examination			
		Theory	Practical	Oral	Term Work
Duration	Two class tests of 60 min Duration	3 Hrs	---	---	---
Marks	20	80	---	---	---

Course Rationale :-

In today's international market the quality is another name for universal acceptance for product and services .Hence the mechanical engineers must have consciousness about various quality aspects required for manufacturing /service sector.

To fulfill this need this subject about various factors and philosophies in quality development is introduced. So that student will have most of basic inputs before they enter their profession.

Course Outcomes :-

	After studying this course, the student will be able to
1	Interpret concept of Quality.
2	Apply TQM Models in organisation.
3	Use Quality improvement tools and techniques.
4	Interpret ISO standards for improvement of quality.
5	Apply Toyota principles for quality improvement.
6	Apply Six sigma process for Quality improvement.

Course Content :-

Chapter No.		Name of Topic / Sub topic	Hrs	Weightage
1		**Introduction**	**06**	**08**
	1.1	Basic concepts related with quality, Various definition of quality. Quality of design and quality of conformance, Service quality Vs product quality.		
	1.2	Quality policy: definition and outcomes. Quality audit.		

	1.3	Quality assurance: - definition, meaning it's various forms and advantages .Quality audit, quality mindedness, inspection and quality control.		
2		**Quality Management Foundation and introduction to total quality management.**	**08**	**12**
	2.1	Strategic quality management (HoshinKanri) Strategic quality planning, quality goals. The vision – future state of organization, good understanding by everyone, inspiration, achievable QCDF (Quality Cost Delivery Flexibility), Customer focus, sharing by all values of the leadership, organization and employees.		
	2.2	Total Quality:- definition ,outcomes, eight dimensional model of total quality.		
	2.3	Total Quality management:- definition, need, mission, initiative and concept. Barriers, implementation and advantages.		
	2.4	TQM Models :- Juran trilogy, Deming programme, Mckinsey model, Crosby program..		
3		**Quality Management Processes**	**12**	**20**
	3.1	**Quality planning** Quality culture (Kaizen and Quality circle) Quality Circle: - concept, objective, structure, steps in formation of quality Circle. Roles of people involved in quality Circle. advantages of quality Circle.		
	3.2	What is Kaizen. - The concept, meaning and definition ,areas for Kaizen 10 ground rules for change. - Traditional methods Vs Kaizen , Kaizen Vs innovation - Types of waste and Waste elimination, value added work, hidden waste and obvious waste, Identification of wastes. 5S in housekeeping and their meaning - Improvement in work methods. Achievement after Kaizen		
	3.3	Quality improvement Old statistical and analytical tools for quality. i) Tally-sheet ii) Graphs iii) Histograms iv) Stratification v) Scatter diagram vi) Control chart vii) Pareto diagram		
	3.4	New tools of quality (At least one example to be introduced for each tool) i) Ishikawa diagram ii) Arrow diagram iii) Relations diagram iv) Tree diagram v) Affinity diagram vi) Matrix diagram		
	3.5	Additional tools of quality improvement i) Brains storming ii) Flow charts iii) 5W & 1H iv) 5 WHYS		
4		**Quality Management Infrastructure**	**12**	**16**
	4.1	History of evolution of ISO 9000 standards. European economic community (EEC), need for quality system standards, International organization for standardization (ISO) adopted by Bureau of Indian Standards (BIS)		

	4.2	**ISO 9000: 2000** Quality system ISO 9000 series standards, ISO 9000 elements understanding requirement, assessment with respect to quality system. Documentation and implementation, quality manual, structure, internal quality audit, external audit and certification.		
	4.3	**Various Quality Systems Vocabulary and features** ISO 9001:2008 Requirements for a quality management system ISO 9004 : 2009 Guidelines for the effectiveness and efficiency of the quality management system IS 14000: 2004 series, its importance ISO 19011: guidance on auditing and environmental management systems.		
5		**Principles of the Toyota way**	**04**	**12**
	5.1	Introduction to Toyota way, Toyota production system (TPS), lean production, '4' P model of Toyota way.		
	5.2	Toyota way principles and their meaning.		
6		**Six Sigma**	**06**	**12**
	6.1	Introduction to six sigma, Psychology of six sigma,		
	6.2	**Six sigma DMAIC process**		
	6.3	The six sigma players, their roles and Responsibilities. Champions, Master black Belts, Black belts, Green belts.		
	6.4	Factors to be considered while selecting a project for six sigma, Do's and Don'ts for making six sigma effective. Advantages of six sigma. The zero defects concept.		
		Total	**48**	**80**

Instructional Strategy :-

Sr. No.	Topic	Instructional Strategy
1.	Introduction	Lecture method
2.	Quality Management Foundation and introduction to total quality management.	Lecture method
3.	Quality Management Processes	Lecture method, Transparencies, Internet surfing.
4.	Quality Management Infrastructure	Lecture method, Transparencies, Internet surfing.
5.	Principles of the Toyota way	Lecture, Ppt& Discussion
6.	Six Sigma	Lecture method, Ppt& Discussion

Text Books :-

Sr. No	Author	Title	Publication
1	Dr. K.C.Arora	Total Quality Management	S.K. Kataria and sons
2	B. Janakiraman and R.K. Gopal	Total Quality Management Text and cases	Prentice Hall of India pvt. Ltd. New Delhi.
3	Subburaj	Total Quality Management	Tata Mc - Graw Hill Co., New Delhi.
4	Gupta, Srinivas N & B Valarmathi	Total Quality Management	Tata Mc - Graw Hill Co., New Delhi.

Reference Books :-

Sr. No	Author	Title	Publication

1	Peter S.Pande Robert P. Neuman Roland R.Cavanagh	Six Sigma way	Tata Mc - Graw Hill Co., New Delhi.
2	Jeffrey K. Liker	The Toyota Way	Tata Mc - Graw Hill Co., New Delhi.
3	Suganthi and Samuel	Total Quality Management	Prentice Hall of India pvt. Ltd. New Delhi

Learning Resources :- Books, journals, Internet searches.

Specification Table :-

Sr. No.	Topic	Cognitive Levels			Total
		Knowledge	Comprehension	Application	
1.	Introduction	08	--	--	08
2.	Quality Management Foundation and introduction to total quality management.	08	04	--	12
3.	Quality Management Processes	08	08	04	20
4.	Quality Management Infrastructure	08	08	--	16
5.	Principles of the Toyota way	08	04	--	12
6.	Six Sigma	08	04	--	12
	Total	**52**	**28**	**--**	**80**

CO-PO Matrices of course

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
1	2	-	-	-	3	3	3
2	3	2	-	2	3	3	3
3	3	3	3	3	3	3	3
4	3	2	-	3	3	3	3
5	3	3	3	3	3	3	3
6	3	3	3	3	3	3	3

Table 3.12
Enter correlation levels 1, 2 or 3 as defined below:
1**: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)***If there is no correlation, put "-"*

CO-PSO Matrices of course

CO	PSO1	PSO2
1	-	-
2	-	3
3	-	3
4	-	3
5	-	3
6	-	3

Enter correlation levels 1, 2 or 3 as defined below:
1**: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)***If there is no correlation, put "-"*

(Prof. P.U. Garge)   (Prof. S. V. Chaudhary)   (Prof. A.S. Zanpure)

Prepared By   Secretary, PBOS   Chairman, PBOS

Government Polytechnic Pune

Name of Programme	:	**Diploma in CE/ EE/ET/ ME/MT/ CM /IT/DDGM**
Programme Code	:	**01/02/03/04/05/06 /07/08/21/22/23/24/26/15/16/17/18**
Name of Course	:	**Management Information System**
Course Code	:	**MA487**

Teaching Scheme :-

Theory / Practical	Hours / Week	Total Hours
Theory	**03**	**48**
Practical	---	---

Evaluation Scheme :-

	Progressive Assessment	**Semester End Examination**			
		Theory	**Practical**	**Oral**	**Term Work**
Duration	Two class tests of 60 min Duration	3 Hrs	**---**	**---**	**---**
Marks	**20**	**80**	---	---	---

Course Rationale :-

MIS is a concept continuous to evolve, emerging trend consistent with the evolution of the MIS concept endures computing. It is the power of computers, which makes MIS feasible. From this point of view, the course is introduced.

Course Outcomes :-

	After studying this course, the student will be able to
1	Define Management Information system
2	State Principles of quality Management
3	Classify the different taxes
4	Differentiate between EIS and ESS
5	List various MIS Security threats

Course Contents :-

Chapter No.		Name of Topic / Sub topic	Hrs	Weig htage
1.		**Information Systems and Organizations**		
	1.1	Organizational and Information, System Structure, Data and Information, Management and Decision Making, Classification of Information Systems, Information support for functional areas of Management, Impact of Business on Information System, Organizing Information Systems	**04**	**10**
	1.2	Decision Support Systems: Definition, Evolution of DSS, Characteristics of DSS, Model Management, Group Decisions		
2.		**System Analysis and Design**		
	2.1	Organizational context of System Analysis, Role of System Analyst, System Development Life Cycle, Requirements Analysis	**04**	**10**
	2.2	System Requirements Specification: - System requirements specification: Example, Data dictionary, Steps in Systems Analysis, Modularizing requirements specifications, Conclusions.		
3.		**Feasibility Analysis**		
	3.1	Deciding on project goals, Examining alternative solutions, Evaluating proposed solution, Cost-benefit analysis, Payback period, Feasibility report, and System proposal.	**08**	**15**

	3.2	Data flow diagrams : Symbols used in DFD's Describing a system with a DFD, Good conventions in developing DFDs Leveling of DFDs, Logical and Physical DFDs.		
	3.3	Process Specifications: Process specification methods, structured English Some examples of process specification.		
4.		**Management**		
	4.1	**Quality Management:** **Specific Outcomes:** Meaning of Quality State Principles of Quality Management, Describe Modern Technique & Systems of Quality Management **Quality Management System**: Activities, Benefits Quality Control - Outcomes, Functions, Advantages Quality Circle - Concept, Characteristics & Outcomes Quality Assurance - Concept, Quality Assurance System **Total Quality:** Meaning of Total Quality **Total Quality Management:** Components of TQM, Elements of TQM, Benefits Modern Technique & Systems of Quality Management like 6-Sigma, ISO 9001:2000 - Benefits, Main clauses.	**10**	**15**
	4.2	**Financial Management** **Specific Outcomes:** Explain functions of financial management; State the sources of finance & types of budgets, Describe concepts of direct & indirect taxes. Financial Management- Outcomes & Functions **Budgets and accounts :**Types of Budgets Production Budget - Sample format: Labour Budget - Sample format, **Profit & Loss Account & Balance Sheet**: Meaning, sample format, Meaning of different terms involved. Meaning & Examples of - Excise Tax, Service Tax, Income Tax, Value Added Tax, Custom Duty		
	4.3	Data input Methods: Data input, Coding techniques, Detection of error in codes, Validating input data, interactive data input.		
5.		**Executive Information System and Executive Support System**		
	5.1	Why EIS and ESS? Internal factor and External factor		
	5.2	What is EIS and ESS? Characteristics of EIS and ESS		
	5.3	Informational characteristics, User Interface/Orientation Characteristics, Managerial/Executive Characteristics	**10**	**15**
	5.4	EIS/ESS Capabilities and Benefits		
	5.5	Expert System-Definition, Components, Application and Limitations		
6.		**Management Issues in MIS**		
	6.1	Information Security and Control: - Why break IT System Security?		
	6.2	Information System Security Threats: External Security Threats: Internet Connections, Remote Dial –in Capabilities Internal Security Threats: Passwords, User Terminations, Authorization Levels, Special Privileges, Virus Checking, Audit Trails	**12**	**15**
	6.3	Ethical And Social Dimensions		
		Total	**48**	**80**

Instructional Strategy :-

Sr. No.	Topic	Instructional Strategy
1.	Information and Management	
2.	Information Gathering	
3.	Feasibility Analysis	Class room teaching for all
4.	Decision Table	
5.	Database Management Systems (DBMS)	
6.	Control Audit and security of information systems	

Text Books :-

Sr. No	Author	Title	Publication
1	V Rajaraman	Analysis & design of Information system	PHI
2	S.Sadagopan	Management Information Systems	PHI
3	James A.O`BrienGeorge M.Marakas	Management Information Systems –Tenth Edition	McGraw Hill

Reference Books :-

Sr. No	Author	Title	Publication
1	Gordon B. Davis and Margeth H. Olson	MIS	
2	Kroenke Davis	Management information System	2nd edition
3	Sein	MIS	
4	Jawadekar W.S.	MIS	
5	Millind Oka	MIS	
6	Jayashankar	Decision Support Systems	
7	Lucas	Information System Concepts for Management	4th edition

Learning Resources :- OHP, LCD Projector and Transparency.

Specification Table :-

Sr. No.	Topic	Cognitive Levels			Total
		Knowledge	Comprehension	Application	
1	Information and Management	04	04	02	10
2	Information Gathering	04	02	04	10
3	Feasibility Analysis	02	08	05	15
4	Decision Table	02	08	05	15
5	Database Management Systems (DBMS)	06	04	05	15
6	Control Audit and security of information systems	04	05	06	15
Total		**22**	**31**	**27**	**80**

(Prof. A.B.Bhusagare) (Prof. Smt. N.R.Wagh) (Prof. S. V. Chaudhary) (Prof. A.S. Zanpure)
Prepared By   Prepared By   Secretary, PBOS   Chairman, PBOS

Name of Programme	:	**Diploma in Mechanical Engineering**
Programme Code	:	**04/24/18**
Name of Course	:	**Project and Seminar (Industrial / In-House Training)**
Course Code	:	**ME 481 (Class Declaration)**
Prerequisite	:	**90 Credits, L1**

Teaching Scheme :-

Theory / Practical	Hours / Week	Total Hours
Theory	--	--
Practical	08	128
Tutorial	--	--

Evaluation Scheme :-

	Progressive Assessment	Semester End Examination			
		Theory	Practical	Oral	Term Work
Duration	--	--	--	--	--
Marks	#50	--	--	*50	@50

 #**Internal assessment made by the faculty/Guide based on Progressive Assessment and Seminar.**
@ **Internal Assessment. *External assessment made by the external examiner.**

Course Rationale :-

- In learning process students acquire the theoretical knowledge along with practical lab work. Actual industrial practices are totally different from the theoretical knowledge gained by the students. If students are exposed to industrial practices they can co-relate their theoretical knowledge with practical aspects and their roles in industries. This approach will develop confidence to work as technician.
- A technician has to face a number of problematic situations in his professional life.Technicians requires scientific approach to handle the situation and ability to solve the problems in their professional life. This helps him to develop his level of competence and confidence. It also develops skills in interacting with the industrial group of people, obtaining the information required for problem solving from a number of sources and reporting/presenting the same.

Course Outcomes :-

	After studying this course, the student will
1	Apply the knowledge of Mechanical Engineering
2	Identify the problem of a given system/machine
3	Modify the mechanism of a given mechanical system
4	Design the simple machine component of a project
5	Estimate the cost of project
6	Prepare a technical report of project

Course Content :-

Chapter No.		Name of Topic / Sub topic	Hrs	Weightage
		One project will be selected on any one of the following heads :		
		Fabrication		
1	1.1	Fabrication of small machine with modification / devices / test rigs / material handling devices/ jig & fixtures/ demonstration models, etc. Report involving aspects of drawing, process sheets, costing, installation, commissioning & testing should be prepared and submitted.	--	--
2		**Industry sponsored projects**	--	--

	2.1	Industrial sponsored project related with solving the problems identified by industry should be selected. One person / engineer from industry is expected to work as co-guide along with guide from institution.		
3		**Investigative projects**	--	--
	3.1	Experimental investigation Project related with investigations of causes for change in performance or structure of machine or component under different parameters and constraints through experimentation and data analysis.		
4		**Maintenance based projects**	--	--
	4.1	The institute may have some machine/ equipment/ system which are lying idle due to lack of maintenance. Students may select the specific machines/equipment/system, overhaul it, repair it and bring it to working condition. The systematic procedure for maintenance to be followed and the report of the activity be submitted.		
5		**Innovative / Creative projects**	--	--
	5.1	Projects related with design, development & implementation of new concept for some identified useful activity using robotics, non-conventional energy sources, PLC, mechatronics, etc.		
6		**Environmental management systems projects**	--	--
	6.1	Projects related with pollution control, Solid waste management, liquid waste management, Industrial hygiene, etc, Working model or case study should be undertaken.		
7		**Design & fabrication**	--	--
	7.1	Design & fabrication of mechanisms, machines, devices, robots etc. Report involving aspects of in depth study of component designing & fabricating should be prepared & submitted.		
	7.2	Development of computer program for designing and /or drawing of machine components, Simulation of movement & operation, 3D modeling, pick & place robots and preparation of a Model À Devise / Robot there in etc.		
8	8.1	In-plant training in the industry. Student should complete minimum 16 weeks training and submit a report based on the training. Preferably with industrial person as a co guide.	--	--
Total			--	--

Note :-

1. Every student will prepare a project report in duplicate (typed) one with him and one with the institute. A logbook (diary) is to be maintained by each student which is to be assessed by the Project Guide from time to time.
2. Every student will prepare & deliver the seminar in the 5th semester. Evaluation of seminar will be carried out by panel of at least three teaching staff from the department.
   a) Selection of topic for the seminar should be finalized in consultation with teacher guide allotted for the batch
      to which student belongs. The topic of seminar may be based on his project or different topic
   b) Seminar report should be of min.10 & max. 20 pages & it should be certified by guide teacher and head of the
      department.
3. a) Project group size: Maximum 4 students
   b) Project report will be of minimum 40 pages unless otherwise specified.
   c) Project diary should be maintained by each student.

List of Suggested Projects :-

Sr. No.	Name of Project	Hrs
1.	Fabrication	--
2.	Industry sponsored projects-	--
3.	Investigative projects-	--

4.	Maintenance based projects	--
5.	Innovative/ Creative projects	--
6.	Environmental management systems projects:	--
7.	Design & fabrication	--
Total		**128**

Instructional Strategy :-

Sr. No.	Project Topic	Instructional Strategy
1	Fabrication	Lecture, Internet, G.D., case study
2	Industry sponsored projects-	Lecture, Internet, G.D., case study
3	Literature survey based projects:	Lecture, Internet, G.D., case study
4	Investigative projects-	Lecture, Internet, G.D., case study
5	Maintenance based projects	Lecture, Internet, G.D., case study
6	Innovative/ Creative projects	Lecture, Internet, G.D., case study
7	Environmental management systems projects:	Lecture, Internet, G.D., case study
8	Design & fabrication	Lecture, Internet, G.D., case study

Reference Books :- ---

Sr. No	Author	Title	Publication
1.	--	Invention Intelligence	Chennai

Learning Resources :- Magazines, Journals, Books, Models, Internet

CO-PO Matrices of course

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
1	3	3	2	2	2	3	3
2	3	3	2	2	2	3	3
3	3	3	2	3	3	3	3
4	3	3	2	3	3	3	3
5	3	3	2	2	2	3	3
6	3	3	2	3	3	3	3

Table 3.12
Enter correlation levels 1, 2 or 3 as defined below:
1**: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)***If there is no correlation, put "-"*

CO-PSO Matrices of course

CO	PSO1	PSO2
1	1	1
2	1	1
3	2	2
4	3	3
5	1	3
6	3	1

Enter correlation levels 1, 2 or 3 as defined below:
1**: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)***If there is no correlation, put "-"*

(Prof. M. W. Giridhar)   (Prof. S. V. Chaudhary)   (Prof. A.S. Zanpure)

Prepared By   Secretary, PBOS   Chairman, PBOS

Name of Programme	:	**Diploma in Mechanical Engineering**
Programme Code	:	**04/24/18**
Name of Course	:	**Power Engineering**
Course Code	:	**ME 482 (Class Declaration)**
Prerequisite	:	**ME 382, L1**

Teaching Scheme :-

Theory / Practical	Hours / Week	Total Hours
Theory	04	64
Practical	02	32

Evaluation Scheme :-

	Progressive Assessment	Semester End Examination			
		Theory	**Practical**	**Oral**	**Term Work**
Duration	Two class tests each of 60 minutes	3Hrs.	--	--	--
Marks	**20**	**80**	--	**25**	**25**

Course Rationale :- Students will be able to understand

- Working of different types of I.C. engines and their sub systems.
- The working and applications of different types of air compressors.
- The working of gas turbines.
- The various refrigeration systems and their applications.
- The principles of jet propulsion systems.
- The working of vapour compression, vapour absorption, & refrigeration components.
- Various types of heat exchangers.
- Various thermodynamic cycles.
- Layout of different Power plants.

Course Outcomes :-

	After studying this course, the student will be able to
1	Interpret the concept of Air Standard cycles.
2	Test the performance of a given I. C engine.
3	Test the performance of Air Compressor.
4	Apply Heat transfer principles to Heat exchanger.
5	Identify different components of Refrigeration and air conditioning system
6	Explain the working of different Power plants.

Course Content :-

Chapter No.		Name of Topic / Sub topic	Hrs	Weightage
		SECTION- I		
1		**Thermodynamic cycles**	**09**	**08**

	1.1	Air standard power cycles, Carnot cycle, representation on P-V and T-S diagram, Air standard efficiency derivation		
	1.2	Otto cycle, Diesel cycle, representation on P-V and T-S diagram. Air standard efficiency derivation. (Numericals to be solved)		
	1.3	Duel combustion and Brayton cycles, representation on P-V and T-S diagram.		
2		**I.C. Engines**	**09**	**12**
	2.1	Classification & applications of I.C. engines,		
	2.2	Construction and working four stroke petrol and diesel engines,		
	2.3	Combustion and ignition system in petrol engines including electronic ignition, DIS (distributor less ignition system controlled by ECV)		
	2.4	Concept of carburetion, air fuel ratio.		
	2.5	Multi point fuel injection system, concept of bifuel and dual fuel engine.		
	2.6	Engine modification system for LPG and CNG operation, Comparison of alternate fuels like CNG, LPG with conventional fuels. Brief introduction to engine simulation and simulation software.		
3		**Testing of I.C. Engines**	**09**	**12**
	3.1	Engine power, indicated and brake, methods of determining indicated and brake power,		
	3.2	Morse tests.		
	3.3	Calculations of I.P., B.P. Mechanical, thermal and relative efficiencies, fuel consumptions at various loads		
	3.4	Heat balance sheet. (Numericals on above four sub topics)		
	3.5	Testing of I.C. engines as per I.S. specifications		
4		**Gas turbines and jet propulsion**	**05**	**08**
	4.1	Working cycle, elements of gas turbine (descriptive treatment only).		
	4.2	Closed cycle and open cycle gas turbines, their comparison (descriptive treatment only).		
	4.3	Applications of gas turbines (descriptive treatment only).		
	4.4	Principles of turbojet, turboprop, ramjet and rockets, rocket fuels (descriptive treatment only).		
		SECTION- I Total	**32**	**40**
		SECTION- II		
5		**Air – Compressor**	**11**	**10**
	5.1	Uses of compressed air, classification of air compressor		
	5.2	construction and working of single stage, single acting, reciprocating air compressors displacement, volumetric, isothermal, mechanical efficiencies, (Numericals)		
	5.3	Effect of clearance and pressure ratio on volumetric efficiency,		
	5.4	Necessity of multi-staging, inter-cooling (perfect and imperfect), advantages of multi-staging, after coolers (use of formulae only, no derivation).		
	5.6	Rotary compressors - Roots Blower, vane, screw compressor. Factors to be considered for energy saving in air compressors.		
6		**Heat Exchangers**	**08**	**10**
	6.1	Introduction to heat exchangers.		
	6.2	Revision of heat transfer principles – modes of heat transfer.		
	6.3	Classification of heat exchangers.		
	6.4	Log mean Temperature Difference (L.M.T.D.), derivation of LMTD for parallel flow & counter flow heat exchangers.		
	6.5	Effectiveness of heat exchangers.		
	6.6	Simple numerical.		
7		**Refrigeration and Air-conditioning**	**08**	**12**
	7.1	Definition, vapour compression cycle, vapour compression cycle components,		

		C.O.P., Unit of Refrigeration,		
	7.2	Refrigerants – properties, R12, R22, R134a & hydrocarbon..		
	7.3	Ice-plant, domestic refrigerator- Construction and working		
	7.4	Definition of air conditioning, air conditioning systems,		
	7.5	Window room air conditioner,		
	7.6	Vapour Absorption Refrigeration system (No numericals).		
8		**Power plant engineering**	**05**	**08**
	8.1	Introduction		
	8.2	Layouts of steam power plant,		
	8.3	I.C. engine power plants, gas turbine power plant,		
	8.4	Nuclear power plant. Site selection criteria.		
	8.5	Survey of different power plants in India- Type, Capacity & Year of Installation.		
		SECTION- II Total	**32**	**40**
		Total	**64**	**80**

List of Practicals / Experiments / Assignments :-

Sr. No.	Name of Practical / Experiment / Assignment	Hrs
1	Dismantling of diesel or petrol engine, studying different parts and assembling.	04
2	Dismantling and assembling carburetors fuel injector, fuel pump, diaphragm type petrol pump.	04
3	Common faults, their detection and remedies for petrol and diesel engine.	04
4	Study and demonstration, report writing of two stroke engine.	04
5	Trial on four stroke engine with heat balance sheet.	04
6	Trial on reciprocating air compressor system.	04
7	Study of heat exchangers.	04
8	Study of domestic refrigerator / window air – conditioner, Split A/C.	02
9	Extended work on selected topic.	02
	Total	**32**

Instructional Strategy :-

Sr. No.	Topic	Instructional Strategy
	Section I	
1.	Thermodynamic cycles	(Common for all)
2.	I.C. Engines	
3.	Testing of I.C. Engines	Classroom teaching, Charts, Models, actual working engines, Internet.
4.	Gas turbines and jet propulsion	
	Section II	
5.	Air – Compressor	(Common for all)
6.	Heat Exchangers	
7.	Refrigeration and Air-conditioning	Classroom teaching, Charts, Models, actual working engines, Internet.
8.	Power plant engineering	

Learning Resources :- Charts, Cut Section models, Working Models, Animations from Internet , Website of SAE,   ASHRAE.

Reference Books :-

Sr. No	Author	Title	Publication
2.	Mthur & Sharma	A Course in I.C. Engine.	Dhanpat Rai Publications, Delhi.
3.	V.P. Vasudani and D.S. Kumar	Heat engineering	Metropolitan Book Co., New Delhi
4.	P.L. Ballaney	Thermal Engineering	Khanna Publishers, Delhi 6.

5.	A.S. Sarao, P.S. Gaabi	Refrigeration and air conditioning	Satya Prakashan, New Delhi
6.	Domkundwar and others	A course in thermodynamics and heat engines	Dhanpatrai and Sons, New Delhi 6
7.	Patel Karamchandani	Heat engine – Vol – III	Acharya Publication, Vadodara
8.	V. Ganeshan	Internal Combustion Engines	Tata Mcgraw Hills, New Delhi.
9.	P.K. Nag	Thermodynamics and Heat Engines	Tata Mcgraw Hills, New Delhi.

Specification Table :-

Sr. No.	Topic	Cognitive Levels			Total
		Knowledge	Comprehension	Application	
Section I					
1.	Thermodynamic cycles	03	--	07	10
2.	I.C. Engines	06	06	--	12
3.	Testing of I.C. Engines	04	--	08	12
4.	Gas turbines and jet propulsion	02	04	--	06
	Total	15	10	15	40
Section II					
5.	Air – Compressor	02	02	06	10
6.	Heat Exchangers	03	03	02	08
7.	Refrigeration and Air-conditioning	02	08	02	12
8.	Power plant engineering	03	03	04	10
	Total	10	16	14	40

CO-PO Matrices of course

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
1	3	2	-	-	-	2	2
2	3	3	2	3	3	3	3
3	3	3	2	3	1	3	3
4	2	2	1	1	-	-	2
5	3	1	-	-	2	-	3
6	2	-	-	-	1	-	3

Table 3.12
Enter correlation levels 1, 2 or 3 as defined below:
1**: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)***If there is no correlation, put "-"*

CO-PSO Matrices of course

CO	PSO1	PSO2
1	-	-
2	3	3
3	-	3
4	2	1
5	-	2
6	-	-

Enter correlation levels 1, 2 or 3 as defined below:
1**: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)***If there is no correlation, put "-"*

(Dr. M. J. Pable)   (Prof. S. V. Chaudhary)   (Prof. A.S. Zanpure)

Prepared By   Secretary, PBOS   Chairman, PBOS

Name of Programme	:	**Diploma in Mechanical Engineering**
Programme Code	:	**04/24/18**
Name of Course	:	**Industrial Hydraulics and Pneumatics**
Course Code	:	**ME483 (Class Declaration)**
Prerequisite	:	**L1**

Teaching Scheme :-

Theory / Practical	Hours / Week	Total Hours
Theory	04	64
Practical	02	32

Evaluation Scheme :-

	Progressive Assessment	Semester End Examination			
		Theory	**Practical**	**Oral**	**Term Work**
Duration	Two class tests each of 60 minutes	3Hrs.	--	--	--
Marks	**20**	**80**	--	**25**	**25**

Course Rationale :-

In any mechanical industry hydraulic and pneumatic control systems are widely used due to its versatility and adaptability to automation, Understanding of fundamental principles, construction and working of elements of hydraulic and pneumatic control systems helps a Diploma technician in operation, maintenance and erection of modern machine tools. Practical circuits and PLC ladder diagrams are also dealt so that that student is familiar with the industrial automation.

Course Outcomes :-

	After studying this course, the student will be able to
1	**Illustrate the working principle of various components used for hydraulic & pneumatic systems.**
2	**Select appropriate working medium and components required for simple hydraulic and pneumatic circuits**
3	**Select appropriate accessories in the fluid system wherever necessary**
4	**Connect simple hydraulic and pneumatic circuits as per the drawings**
5	**Develop hydraulic and pneumatic circuits for given applications.**
6	**Draw architectural diagram and Ladder diagram for simple PLC circuits**

Course Content :-

Chapter No.		Name of Topic / Sub topic	Hrs	Weightage
		Section I		
1		**Introduction to Hydraulic & Pneumatic Systems**		
	1.1	Applications of fluid power**,** Principles of fluid system, General layout of oil hydraulic& pneumatic system	**08**	**08**
	1.2	Merits and limitations of oil hydraulic, comparison of hydraulic & pneumatic system		
	1.3	Types of Hydraulic fluids, Properties of fluids, Selection of fluids, effect of temperature & Pressure on Hydraulic fluid system		

	1.4	ISO Symbols used in hydraulic & pneumatic system		
	1.5	Accessories: Pipes, hoses, fittings, Oil filters, Seals and gaskets, Accumulators.		
2		**Hydraulic Pumps**		
	2.1	Types, construction, working principle of following hydraulic pumps. Vane pump, Gear pump, Screw pump, Piston pump, Selection of Pump for Power Transmission, Pump performance	**06**	**08**
3		**Hydraulic Actuators**		
	3.1	Linear Actuators: Cylinders - single acting, double acting, telescopic, tandem etc.	**06**	**08**
	3.2	Rotary Actuators: Hydraulic motors Vane, gear, Geroter, piston motors etc. Motor performance.		
4		**Control Components in Hydraulic Systems**		
	4.1	Direction control valves – Poppet valve, spool valve, 3/2, 4/2, 4/3, 5/2, 5/3, D.C, valves with their actuation methods, check valves	**06**	**08**
	4.2	Flow control valves –Pressure compensated, non pressure compensated flow control valve. Pressure & temperature compensated valves, meter in, meter out, bleed off circuits.		
5		**Pressure Control valves**		
	5.1	Relief, unloading, sequence, counter balance, pressure reducing valves. Construction, working and their applications in various hydraulic circuits. (Counter balance circuit, sequence circuit etc.)	06	08
		Section II		
6		**Hydraulic Circuit Design and Analysis**		
	6.1	Control of single and Double acting Hydraulic cylinders, motors.		
	6.2	Regenerative circuit, Cylinder Synchronizing Circuits,	**10**	**10**
	6.3	Accumulators and accumulator circuits. Hydraulic circuits for Milling machine, Shaper machine, Two pump unloading circuit.		
7		**Components of Pneumatic Systems**		
	7.1	Compressors: Types, construction, working principle of Reciprocating & Rotary compressors		
	7.2	Construction, working principle and symbols of FRL unit, Dual pressure valve, Shuttle valve, Quick exhaust valve, Time delay valve.	**06**	**08**
	7.3	Actuators: Types, construction, working principle and symbols of : Linear actuators - Cylinders-Single acting, Double acting and Rotary actuators – air motors		
8		**Industrial Pneumatic Circuits**		
	8.1	Use of Logic functions – OR, AND functions in pneumatic applications, Practical circuits involving the use of logic functions. Time delay circuit. Actuation of S/A, D/A, pneumatic cylinder, direct and indirect (with pilot valve). Automatic reversal of piston through roller operated DC Valve. Continuous to and fro motion of D/A cylinder with roller operated valves and solenoid operated valves & limit switches.	**08**	**10**
9		**Fundamentals of Programmable Logic Controllers**		
	9.1	History, Introduction, definition, Advantages & disadvantages of PLC.		
	9.2	PLC Manufacturers, Block diagram And Architecture of a PLC.		
	9.3	Input devices such as limit switches, pressure switch, float switches, thermostat, temperature sensors and proximity switches. Output devices of PLC such as contactors, relay, Solenoid valve. Input & Output modules, Scan cycle & Watchdog timer, Types of Timers & Counters.	**08**	**12**
	9.4	Development of Ladder Diagram of simple hydraulic & pneumatic circuit s. a. OR, AND, Time delay, sequencing, NOR, NAND.		

		Total	64	80

List of Practicals / Experiments / Assignments :-

Sr. No.	Name of Practical / Experiment / Assignment	Hrs
1	Survey & Properties of oil used for hydraulic circuits, Filters, power packs.	04
2	List and draw ISO symbols used in fluid systems, accumulators.	02
3	Comparison of different types of pump	02
4	Study and demonstration of direction control valves.	02
5	Study and demonstration of pressure control valves & circuits	04
6	Demonstration of meter in and meter out circuits	02
7	Connection & demonstration of various pneumatic circuits on trainer Circuit diagrams which are actually connected on pneumatic trainer.	04
8	Connection & demonstration of various Hydraulic circuits on trainer Circuit diagrams which are actually connected on hydraulic trainer.	04
9	Advance Hydraulic & Pneumatic circuit.(S.A. 'AND, 'OR', Time Delay, Accumulator ckts.)	04
10	Study of PLC (Block Diagram, Input-Output Devices, I/O modules, simple ladder diagrams, demonstration on PLC/Monitor.	04
	Total	32

Instructional Strategy :-

Sr. No.	Topic	Instructional Strategy
1.	Introduction to hydraulic & Pneumatic systems	Class rooms teaching
2.	Introduction to Hydraulic Power & Pumps	Class rooms teaching, Power point presentation, Demonstrations
3.	Hydraulic Actuators and Motors	Class rooms teaching, Power point presentation, Demonstrations
4.	Control Components in Hydraulic Systems	Class rooms teaching, Power point presentation, Demonstrations
5.	Hydraulic Circuit Design and Analysis	Class rooms teaching, Power point presentation, Demonstrations
6.	Components of pneumatic systems	Class rooms teaching, Power point presentation, Demonstrations
7.	Industrial Pneumatic Circuits	Class rooms teaching, Power point presentation, Demonstrations
8.	Fundamentals of Programmable Logic Controllers	Class rooms teaching, Power point presentation, Demonstrations
9.	Development of Ladder diagram, general guidelines for ladder diagram	Class rooms teaching, Power point presentation, Demonstrations

Text Books :-

Sr. No	Author	Title	Publication
1.	Anthony Esposito	Fluid Power with application's	Fifth edition, Pearson Education, Inc 2000.
2.	S.R. Majumdar	Oil Hydraulic Systems (Principle & maintenance)	Tata McGraw Hill Publications, New Delhi
3.	S.R. Majumdar	Pneumatic Systems	Tata McGraw Hill Publications, New Delhi
4.	Andrew Parr	Hydraulics & Pneumatics A Technicians & Engineers Guide	Jaico Publishing
5.	Pippinger, Hicks	Industrial Hydraulics	Tata McGraw Hill Publications, New Delhi

Reference Books :-

Sr. No	Author	Title	Publication
1.	D. Stewart	Hydraulic And Pneumatic Power For Production Industrial Hydraulics	Industrial Press INC. 200, Madison Avenue, New-York 10016.
2.	Vickers Perry	Industrial Hydraulics Manual	Vickers Systems International (Company Manual)
3.	Festo	Basic Pneumatic manual	Festo (Company Manual)

Learning Resources :- Books, Manuals, Models, Animation of pumps, Motors, etc. on You Tube.

Specification Table :-

Sr. No.	Topic	Cognitive Levels			Total
		Knowledge	Comprehension	Application	
Section - I					
1.	Introduction to hydraulic & Pneumatic systems	04	04	--	08
2.	Hydraulic Pumps	04	04	--	08
3.	Hydraulic Actuators	04	04	--	08
4.	Control Components in Hydraulic Systems	--	04	04	08
5.	Pressure Control valves	--	04	04	08
	Total	12	20	08	40
Section - II					
6.	Hydraulic Circuit Design and Analysis	--	04	06	10
7.	Components of Pneumatic Systems	04	04	--	08
8.	Industrial Pneumatic Circuits	--	04	06	10
9.	Fundamentals of Programmable Logic Controllers	04	04	04	12
	Total	**08**	**16**	**16**	**40**
	Total	**20**	**36**	**24**	**80**

CO-PO Matrices of course

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
1	3	--	1	--	--	--	1
2	2	2	1	--	1	--	1
3	2	1	--	--	--	--	2
4	3	2	--	1	1	1	--
5	2	3	2	2	1	1	2
6	3	2	--	--	--	--	3

Table 3.12
Enter correlation levels 1, 2 or 3 as defined below:
1**: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)***If there is no correlation, put "-"*

CO-PSO Matrices of course

CO	PSO1	PSO2
1	--	--
2	--	--
3	--	--
4	--	1
5	2	2
6	3	--

Enter correlation levels 1, 2 or 3 as defined below:
1**: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)***If there is no correlation, put "-"*

(Prof. M.S. Deshmukh)   (Prof. S. V. Chaudhary)   (Prof. A.S. Zanpure)

Prepared By   Secretary, PBOS   Chairman, PBOS

Name of Programme : **Diploma in Mechanical Engineering**
Programme Code : **04/24/18**
Name of Course : **Production Planning and Control**
Course Code : **ME484**
Prerequisite : **L1**

Teaching Scheme :-

Theory / Practical	Hours / Week	Total Hours
Theory	03	48
Practical	02	32

Evaluation Scheme :-

	Progressive Assessment	**Semester End Examination**			
		Theory	**Practical**	**Oral**	**Term Work**
Duration	Two class tests each of 60 minutes	3Hrs.	--	--	--
Marks	**20**	**80**	--	**25**	**25**

Course Rationale :-

Modern manufacturing industries have complex manufacturing processes. A technician working in production department has to deal with various processes, planning for processes and control for the same for increasing the productivity. This course is being introduced so as to enable the students to work efficiently as a production supervisor, which is the main job area for technicians.

Course Outcomes :-

	After studying this course, the student will be able to
1	Interpret Process planning terminology
2	Apply different Techniques for Production Forecasting.
3	Use of Computer aided Process Planning and control
4	Correlate production, manpower and financial activities for given system
5	Interpret Supply Chain Management for given system

Course Content :-

Chapter No.		Name of Topic / Sub topic	Hrs	Weightage
1		**Introduction**		
	1.1	Meaning, scope, outcomes and functions of production planning and control, types of PPC organizations.	04	08
2		**Process Planning**		
	2.1	Introduction, definition, contents of process plan factors affecting Process Planning.		
	2.2	Process Operations – Basic process operations, principal process operations, major operations & its types, auxiliary process operations, supporting operations.	12	16
	2.3	Steps in process planning, selection of machines, combining operations, planning sequence of machining operations by selection of tools, Jigs & fixtures, cutting		

		variables.		
	2.4	Process sheet format, process sheet design for simple parts. Machine load charts, Gantt charts, Master Schedule.		
3		**CAPP – Computer Aided Process Planning**	03	08
	3.1	Introduction, Retrieval CAPP, Generative CAPP, Benefits of CAPP.		
4		**Production Forecasting**		
	4.1	Introduction, definition, need, types, Judgmental Techniques, Time series analysis – least square, moving avg., Regression & Commutation analysis, (simple problems on above forecasting methods).	05	08
5		**Production Planning**		
	5.1	Planning functions, routing, scheduling, loading, types of production and their characteristics – continuous, intermittent production. Determination of capacity.	10	12
	5.2	Sequential load statements, scheduling, difficulties, machine capacity, make-buy decisions.		
	5.3	Introduction to operation research tools. Outcomes, functions, Computer assisted planning. Linear programming, two variable problem, graphical solutions, Sequencing – n jobs, 2 machines n jobs 3 machines.		
6		**Production Control**		
	6.1	Definition – Dispatching, follow-up and co-ordination with various departments. Dispatching: Job orders and issuing system.	08	12
	6.2	Progressing, types of feedback system, preventing production delays, causes of delay. Work flow systems.		
	6.3	Definition, need, importance and advantages of evaluation.		
	6.4	Production control of continuous and intermittent production. Flow control applied to continuous production		
7		**Production Co-ordination**		
	7.1	Co-ordination and manufacturing planning, facility planning, sales planning, production planning, quality planning, inventory planning, manpower planning and financial planning activity.	04	08
	7.2	Total cost of production, impact of all the activities as cost of production.		
8		**Resource Engineering**		
	8.1	Supply, Chain, Management, Logistic. Development, relation quality improvement and transportation	02	08
		Total	**48**	**80**

List of Practicals / Experiments / Assignments :-

Sr. No.	Name of Practical / Experiment / Assignment	Hrs
1.	Process sheet design of one machined component involving general machine operations / assembly operations. The following points are to be covered. a) Material specifications. b) Material estimate. Sequence of operation along with in process dimensions, gauging, special tools etc.	20
2.	Forecasting technique.	04
3.	Routing and process engineering.	04
4.	Production control, Machine load charts.	04
	Total	**32**

Instructional Strategy :-

Sr. No.	Topic	Instructional Strategy
1.	Introduction	Classroom teaching
2.	Process Planning	Classroom teaching
3.	CAPP	Classroom teaching
4.	Production Forecasting	Classroom teaching, assignments, case study
5.	Production Planning	Classroom teaching, case study
6.	Production Control	Classroom teaching
7.	Production Co-ordination	Classroom teaching, Three lectures by industrial experts.
8.	Resource Engineering	Classroom teaching

Reference Books :-

Sr. No	Author	Title	Publication
1.	E.H. Mac NIECE	Production forecasting, planning and control	John Wiley and sons, New York
2.	V. Kovan	Fundamentals of process engineering	Foreign language publishing house, Moscow
3.	Mayer	Production management	Tata McGraw Hill, New York
4.	Samuel Eilon	Production planning and control	McMillan company, New York
5.	P.C. Moore and T.E. Hendrick	Production / Operations management	McGraw Hill Book Company, New York
6.	Martand Telsang	Ind. Engg. & Production Management	S. Chand & Co. Ltd., New Delhi.
7.	M.P. Groover	Automation Production Systems & CIM	Prentice Hall of India, New Delhi
8.	P.C. Sharma	Production Engineering	S. Chand & Co. Ltd., New Delhi.

Learning Resources :- Industrial learning material, Handbooks,

Specification Table :-

Sr. No.	Topic	Cognitive Levels			Total
		Knowledge	Comprehension	Application	
1	Introduction	08	--	--	08
2	Process Planning	--	06	10	16
3	CAPP	04	02	02	08
4	Production Forecasting	--	04	04	08
5	Production Planning	04	04	04	12
6	Production Control	04	04	04	12
7	Production Co-ordination	04	04	--	08
8	Resource Engineering	04	04	--	08
	TOTAL	**28**	**28**	**24**	**80**

CO-PO Matrices of course

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
1	3	-	-	-	-	1	2
2	2	-	-	-	1	-	2
3	2	-	-	1	1	2	2
4	2	-	-	1	1	1	2

5	2	-	-	-	-	-	2

Table 3.12
Enter correlation levels 1, 2 or 3 as defined below:
1**: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)***If there is no correlation, put "-"*

CO-PSO Matrices of course

CO	PSO1	PSO2
1	-	-
2	-	-
3	3	2
4	1	-
5	1	2

Enter correlation levels 1, 2 or 3 as defined below:
1**: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)***If there is no correlation, put "-"*

(Dr. S.R. Adhau)   (Prof. S. V. Chaudhary)   (Prof. A.S. Zanpure)

Prepared By   Secretary, PBOS   Chairman, PBOS

Name of Programme	:	**Diploma in Mechanical Engineering**
Programme Code	:	**04/24/18**
Name of Course	:	**Design of Machine Elements**
Course Code	:	**ME 485 (Class Declaration)**
Prerequisite	:	**AM384, L1**

Teaching Scheme :-

Theory / Practical	Hours / Week	Total Hours
Theory	04	64
Practical	02	32

Evaluation Scheme :-

	Progressive Assessment	**Semester End Examination**			
		Theory	**Practical**	**Oral**	**Term Work**
Duration	Two class tests each of 60 minutes	3Hrs.	--	--	--
Marks	**20**	**80**	--	**25**	**25**

Course Rationale :-

Design office of Industry is one of the major job areas for Diploma Technicians. To enable a   student to work there he should know how to design the simple machine elements. He should also be aware of economic considerations and usual design procedures   and selection of appropriate material.

Course Outcomes :-

	After studying this course, the student will be able to
1	Select suitable materials for designing machine elements.
2	Design joints and levers for variousapplications.
3	Designate power transmission elements like shafts, keys and couplings.
4	Select the suitable fasteners for different applications
5	Design power screws and springs for various applications.
6	Select standard components with their specifications from manufacturer's catalogue

Course Content :-

Chapter No.		Name of Topic / Sub topic	Hrs	Weightage
1.		**Introduction**		
1	1.1	Machine design philosophy and phases in design, Aesthetic and Ergonomic consideration in design and consideration of design in environment	**04**	**06**
	1.1	Types of load and stresses, eccentric loading, Crushing and bearing stresses, strain, yield point, strength consideration, stress strain diagram, proof stress		
	1.2	Reversed bending cycle, endurance limit. Dynamic loading concept and Fatigue failure.		
	1.3	Use of principle stress equations, maximum principle stress theory, shear stress theory and distortion energy theory		
2.		**Design consideration**	**04**	**06**
	2.1	Selection of materials and manufacturing processes. (To be covered in practical		

		with practical examples) Use of design data books, standardizations.		
	2.2	Factors of safety, conditions for selection of F.S.		
	2.3	Stress concentration meaning, causes and remedies		
3.		**Force consideration**	**08**	**10**
	3.1	Forces resulting in direct tension, compression and shear,		
	3.2	Forces resulting in combined, direct and bending. Design of C- frame, offset link		
	3.3	Design of simple machine parts such as knuckle joint, turn buckle, cotter joint.		
	3.4	Forces resulting in bending, designing lever of lever loaded safety valve, bell crank lever		
4.		**Design of Shaft**	**10**	**10**
	4.1	Design of hollow and solid shaft for combined loading. ASME code equations for shafts. Line shaft supported on two bearing with one or two pulleys (between the bearings) and with overhung. Design of shaft based on rigidity		
5.		**Design of keys and couplings**	**06**	**08**
	5.1	Design of keys.		
	5.2	Types of couplings, Design of muff coupling, flange coupling, bushed pin type flexible coupling		
		Total	**32**	**40**
		Section II		
6.		**Design of Fasteners**	**06**	**10**
	6.1	Bolts of uniform strength. Design of bolted joints, arranged symmetrically and subjected to eccentric loading (about one axis only)		
	6.2	Design of transverse and parallel fillet welded joints		
7.		**Power screw**	**08**	**12**
	7.1	Thread profiles used for power screw.		
	7.2	Torque required for raising and lowering the load, Efficiency, self locking and overhauling conditions. Stresses in power screws		
	7.3	Design of screw jack, screw press, screw clamp. (Numerical problems limited to square threads only)		
8.		**Design of springs**	**08**	**10**
	8.1	Classification, application and functions of springs.		
	8.2	Selection of material for springs and specifications of spring.		
	8.3	Wahl's correction factor and its application,		
	8.4	Design of helical springs with circular cross section wire only.		
	8.5	Design of multi leaf spring.		
9.		**Bearings**	**06**	**08**
	9.1	Types of bearings, common bearings used in practice, Types of ball and roller bearings,		
	9.2	Static capacity, Dynamic capacity, limiting speed, bearing life.		
	9.2	Selection of bearings from handbook, causes of bearing failures, Mounting.		
10.		**Introduction to CADD**	**04**	**---**
	10.1	Introduction to any one design software (for example CATIA, PRO-E, UNIGRAPHICS etc.)		
	102	Demonstration of preparing 3D model of simple objects		
			32	**40**
		Total	**64**	**80**

List of Practicals / Experiments / Assignments :-

Sr. No.	Name of Practical / Experiment / Assignment	Hrs
1.	Assignment on question answers based on the topic 1 and topic 2 – min. 15 questions. (Students are expected to find out the answer of questions from Design data book, hand books)	04
2.	Design and Drawing of joint, design of lever. Failure mode and its cognizance in design. (Students are expected to-	04
3.	Combined Assembly containing minimum 6 machine parts and its production drawings covering topic no 4, 5 and 6.	06
4.	Design & drawing of power screw	06
5.	Assignment of question answers type convening topics 8& 9. Minimum 10 questions on the above topics. (Students are expected to draw sketches wherever applicable.)	06
6.	Assignment on Introduction to CADD	06
	Total	**32**

Instructional Strategy :-

Sr. No.	Topic	Instructional Strategy
1.	Revision of fundamental mechanics	Lecture
2.	Design Considerations	Lecture, explaining standards used in industry
3.	Force considerations	Lecture, demonstration using model of levers, frames, knuckle joint
4.	Forces resulting torsion	Lecture, demonstration, seminar
5.	Forces resulting in combined bending and twisting and direct.	Lecture, demonstration
6.	Design of fasteners	Self study, lecture
7.	Power screws	Lecture, demonstration of screw clamp, screw press, screw jack
8.	Design of springs	Lecture, demonstration of various types of springs.
9.	Bearings	Lecture with actual bearings, referring product catalogues
10.	Introduction to CADD	Demonstration of software

Text Books :-

Sr. No	Author	Title	Publication
1.	R.S. Khurmi	Design of machine elements	Eurasia Publ. HS (Pvt.) Ltd., New Delhi

Reference Books :-

Sr. No	Author	Title	Publication
1.	Pandya and Shah	Machine Design	Charotar Publ. Hs. Anand
2.	Abdulla – Sherif	Machine Design	
3.	Spotts	Machine Design	Prentice – Hall Publ.
4.		P.S.G. Design Data and handbook	
5.	Shigley	Mechanical Engg. Design	Mc Graw Hill Publ.
6.	Shaum series	Machine Design	Hall Holowenko, Laughlin

Learning Resources :-

1) P.S.G. Design Data Book

2) I.S. Standards

3) Design handbook

4) Transparencies

Specification Table :-

Sr. No.	Topic	Cognitive Levels			Total
		Knowledge	Comprehension	Application	
	Section - I				
1.	Introduction	04	02	--	06
2.	Design considerations	04	02	--	06
3.	Force considerations	04	--	06	10
4.	Design of Shaft	--	04	06	10
5.	Design of keys and couplings.	02	--	06	08
	Total	14	8	18	40
	Section -				
6.	Design of fasteners	02	--	08	10
7.	Power screws	04	06	02	12
8.	Design of springs	04	04	02	10
9.	Bearings	04	02	02	08
10.	Introduction to CADD	---	---	---	---
	Total	14	12	14	40
	Total	**30**	**18**	**32**	**80**

CO-PO Matrices of course

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
1	2	2	-	-	1	-	2
2	2	3	3	-	-	2	1
3	2	2	2	-	1	1	2
4	1	2	1	-	1	-	1
5	1	2	3	-	1	2	1
6	**1**	**3**	**2**	**-**	**-**	**2**	**3**

Table 3.12
Enter correlation levels 1, 2 or 3 as defined below:
1**: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)***If there is no correlation, put "-"*

CO-PSO Matrices of course

CO	PSO1	PSO2
1	-	2
2	2	-
3	2	2
4	-	2
5	2	-
6	-	3

Enter correlation levels 1, 2 or 3 as defined below:
1**: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)***If there is no correlation, put "-"*

(Mrs. M. S. Deshmukh)   (Prof. S. V. Chaudhary)   (Prof. A.S. Zanpure)

Prepared By   Secretary, PBOS   Chairman, PBOS

Government Polytechnic Pune

Name of Programme	:	**Diploma in Mechanical Engineering**
Programme Code	:	**04/24/18**
Name of Course	:	**Metrology & Quality Control**
Course Code	:	**ME 486 (Class Declaration)**
Prerequisite	:	**L1**

Teaching Scheme :-

Theory / Practical	Hours / Week	Total Hours
Theory	04	64
Practical	02	32

Evaluation Scheme :-

	Progressive Assessment	**Semester End Examination**			
		Theory	**Practical**	**Oral**	**Term Work**
Duration	Two class tests each of 60 minutes	3Hrs.	--	--	--
Marks	**20**	**80**	**25**	**--**	**25**

Course Rationale :-

The course has been included in the curriculum as inspection and quality control activities are given prime importance in industry. A diploma technician working in the industry has to identify the variables to be measured, Decide the accuracy required, Select the instrument, Investigate reasons for defects and give suggestions, decide whether to accept or reject the jobs, Suggest methods of salvaging the defective material manufactured. Therefore, this course attempts to impart the necessary knowledge and develop the required abilities so that he can perform his job efficiently and effectively in modern industry.

Therefore, this course attempts to impart the necessary knowledge and develop the required abilities so that he can perform his job efficiently and effectively in modern industry.

Course Outcomes :-

	After studying this course, the student will be able to
1	Use basic measuring instruments.
2	Interpret fits and tolerances
3	Use relevant Instruments for Screw thread and gear measurement
4	Describe different quality aspects and their measurement
5	Describe various ISO standards.
6	Draw graphs and charts for analysis of available data using SQC Techniques.

Course Content :-

Chapter No.		Name of Topic / Sub topic	Hrs	Weightage
		Section I		
		Introduction To Metrology		
1	1.1	Definition of metrology, objective of metrology , Need of inspection ,accuracy,Presision,Sensitivity,Reproducibility,Amplification,Magnification,Errors,Sources of errors, Types of errors, Selection of instrument, general Precautions of instruments .	**04**	**06**

	1.2	**Standards in measurement** : Definition and introduction to Line std & end std		
2		**Measuring instrument**	**08**	**10**
	2.1	**Linear measurement**: use of surface plate, V block, angle plate. Study (construction, working) and use of vernier calipers, vernier height gauge, micrometer, slip gauges(With Numerical on setting of slip gauges)		
	2.2	**Angular measurement:** Working And Use of Universal Bevel Protractor, Sine principle and sine Bar, Spirit Level, Angle Gauges (With Numerical on Setting of Angle Gauges).Angle dekkor, Autocollimator		
3		**Limits Fits and Gauges**	**08**	**12**
	3.1	**Limits Fits and tolerances:** Concept of Limits, Deviation, And Tolerances, terminology, Selective Assembly, Interchangeability, Indian standard(IS 919-1993),Fits, types of fits, Hole And Shaft Basis System, Guide for selection of fit, ISO system of limit and fit,(Numerical on finding the limit and tolerances of hole and shaft assembly)		
	3.2	**Gauges**: Limit gauges. Taylors principle, of gauge design Plug, Ring Gauges, snap gauge, adjustable snap gauge		
4		**Comparators And Testing**	**12**	**12**
	4.1	**Comparators :** Definition, Requirement of good comparator, Classification, use of comparators, Working principle of comparators, Dial indicator, Sigma comparator, Pneumatic comparator		
	4.2	**Screw thread Measurements :** Screw thread terminology, Errors in threads, Pitch errors, Measurement of different elements such as major diameter, minor diameter, effective diameter, pitch ,Best size of wire Two wire method, Thread gauge micrometer, Working principle of floating carriage dial micrometer,		
	4.3	**Gear Measurement:** Analytical and functional inspection, Gear Rolling tester, Measurement of tooth thickness (constant chordmethod), gear tooth vernier, Profile projector, Errors in gears such as backlash, runout, composite etc.		
	4.4	Measurement of Surface Finish: Meanings of surface texture and definitions, terminology as per Indian standard, methods of surface measurement.		
		SECTION II		
		Quality Assurance		
5	5.1	**Quality :** Definitions, Quality characteristics, Factor affecting quality, Facet of quality- Quality of design, Quality of conformance, Quality of performance, reliability, Quality control, objective, Area of application, Quality policy, Quality planning, Quality Motivation, Quality losses and avoidance, Quality assurance, Quality & Inspection,	**08**	**10**
6		**Total quality management**	**08**	**10**
	6.1	**Total quality management:** concept, objective and Principles of total quantity management, TQM implementation, quality circle, quality mindness, quality audit,		
	6.2	**Six sigma:** Definition and Statistical meaning, advantages, implementation, methodology of system Improvement DMAIC and DMADV,		
	6.3	**ISO 9000 Series:** Concept, ISO 9000 series quality standards, QS14000, Standards in general, Its evaluation & Implications, necessity of ISO certification, other Quality systems		
7	7.1	**Statistical Process Control**	**12**	**12**
	7.2	**Statistical Quality Control** – variation in quality, central tendency, Dispersion, universe, Meaning and importance ofSQC, Variable and attribute Measurement. control charts –inherent and assignable sources of variation, control charts for variables – X & R charts, control charts for attributes p, np, C charts, Trend of control charts, (Numerical on control chart) , process capability.		
	7.3	**Acceptance Sampling** –Concept, Comparison with 100%inspection, Different types of sampling plans, with merits and demerits. Operating characteristics curve, its important characteristics, AQL,RQL(LTPD), AOQ, AOQL, producer risk, consumer risk,		

8	7.1	**Measuring Machine Metrology** Coordinate Measuring Machine, Features, Performance and applications. universal Measuring Machine ,numerical controlled(NC) Coordinate Measuring Machine, computer in metrology,	**04**	**08**
		Total	**64**	**80**

List of Practicals / Experiments / Assignments :- Any ten

Sr. No.	Name of Assignment	Hrs
1	Study & use of various basic measuring instruments.	02
2	To find unknown angle of component using Sine-Bar, slip gauge and dial indicator	02
3	Demonstration of angle dekkor / autocollimator.	04
4	Study & use of pneumatic / mechanical comparator.	02
5	Study and use of dial indicator as a mechanical comparator for run out measurement, roundness comparison.	02
6	Study and use of optical flat for flatness testing.	02
7	Measurement of gear tooth elements by using gear tooth vernier caliper	02
8	Study & use of Tool Maker's microscope.	02
9	Measurement of different Parameters of screw thread.	02
10	Study & use of optical profile projector	02
11	To draw the normal distribution curve and find standard deviation, variance, and range.	02
12	Assignment on Statistical Quality Control • Normal distribution curve • Control charts • O.C. curve.	04
13	Assignment on measuring machine.	04
	Total	**32**

Instructional Strategy :-

Sr. No.	Topic	Instructional Strategy
1.	Introduction To Metrology	Classroom teaching, demonstration.
2.	Measuring instrument	Classroom teaching, on job working.
3.	Limits Fits and Gauges	Classroom teaching, case study.
4.	Comparators And Testing	Classroom teaching. Demonstration.
5.	Quality Assurance	Classroom teaching, group discussion, seminar.
6.	Total Quality Management	Classroom teaching, case study. Seminar
7.	Statistical Process Control	Class rooms teaching, Power point presentation, Demonstrations
8	Measuring Machine Metrology	Class rooms teaching, Power point presentation,

Text Books :-

Sr. No	Author	Title	Publication
1.	R.K. Jain	Metrology	Khanna Publisher, Delhi
2.	Juran U.M. and Gryna	Quality planning and analysis	Tata McGraw Hill

Reference Books :-

Sr. No	Author	Title	Publication
1.	TTTI, Bhopal	Learning package in Metrology and Instrumentation	
2.	M. Mahajan	Statistical Quality Control	Dhanpat Rai and Sons
3.	R.K. Jain	Engineering Metrology	Khanna Publication, New Delhi
4.	H.L. Grant	Quality Control	TATA McGraw Hills, New Delhi
5.	I.C. Gupta	A text book of Engineering Metrology	Dhanpat Rai and Sons,
6.	TTTI, Bhopal	Quality Control	TATA McGraw Hills, New Delhi
7.	Helpen	Assurance science	Swan Publication, New Delhi
8.	Sharp	Engineering metrology	Sir Isaac Pitman and sons co. London
9.	K.J. Hume	Engineering metrology	Kalyani Publication, Ludhiyana
10.	B.Senthil Arasu J. Praveen Paul	Total Quality Management	Scitech Publication PVT LTD
11.	J.B. Zende	Quality Circle	Quality Circle Forum of India, Maharashtra Chapter, Pune.

Learning Resources :- Books, video, Powerpoint presentation, Transparency, U-tube.

Specification Table :-

Sr. No.	Topic	Cognitive Levels			Total
		Knowledge	Comprehension	Application	
Section – I					
1	Introduction To Metrology	02	02	04	08
2	Measuring instrument	02	04	04	10
3	Limits Fits and Gauges	04	04	04	12
4	Comparators And Testing	04	02	04	10
TOTAL		12	12	16	40
Section – II					
5	Quality Control	02	02	04	08
6	Total Quality Management	04	04	04	12
7	Statistical Quality control	04	04	04	12
8	Measuring machine.	02	02	04	08
		12	12	16	40
TOTAL		24	24	32	80

CO-PO Matrices of course

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
1	3	-	-	3		1	2
2	3	2	2	2	1	2	1
3	3	2	2	3	-	2	1
4	3	2	-	2	1	1	1
5	2	-	2	1	2	-	1
6	3	2	1	1	2	2	1

Table 3.12
Enter correlation levels 1, 2 or 3 as defined below:
1**: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)***If there is no correlation, put "-"*

CO-PSO Matrices of course

CO	PSO1	PSO2
1	-	3
2	-	1
3	-	2
4	1	2
5	-	-
6	2	1

Enter correlation levels 1, 2 or 3 as defined below:

1**: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)***If there is no correlation, put "-"*

(Prof. V.G.Talkit)   (Prof. S. V. Chaudhary)   (Prof. A.S. Zanpure)

Prepared By   Secretary, PBOS   Chairman, PBOS

Government Polytechnic Pune

Name of Programme : **Diploma in Mechanical Engineering**
Programme Code : **04/24/18**
Name of Course : **Production Technology**
Course Code : **WS 481**

Teaching Scheme :-

Theory / Practical	Hours / Week	Total Hours
Theory	04	64
Practical	04	64

Evaluation Scheme :-

	Progressive Assessment	**Semester End Examination**			
		Theory	**Practical**	**Oral**	**Term Work**
Duration	Two class tests each of 60 minutes	3Hrs.	--	--	--
Marks	**20**	**80**	**25**	**--**	**25**

Course Rationale :-

Student should be trained about wide range of production processes involved for mass production of engineering components needs to be employed with due consideration of functional and economical aspects.

Course Outcomes :-

	After studying this course, the student will be able to
1	Use Drilling and Milling machine for given job.
2	Identify different components of Broaching machine
3	Select Finishing and super finishing processes for given manufacturing components with justification.
4	Select appropriate Gear manufacturing machine with justification
5	Develop Jigs and fixtures for given component.
6	Use of CAM for Manufacturing processes and control.

Course Content :-

Ch. No.		Name of Topic / Sub topic	Hrs	Weightage
1		**Drilling Machine And Boring Machines**	**07**	**12**
	1.1	Classification of machines, Specifications, Tools, Accessories, Attachments,		
	1.2	Drilling and Boring operations		
2		**Milling Machines**	**14**	**12**
	2.1	Working principles, classification, Specification		
	2.2	Milling operations		
	2.3	Milling cutters, universal dividing head, different types of indexing methods		
3		**Broaching machine**	**04**	**06**
	3.1	Introduction to broaching, classification, broaching tools, principle, application.		
4		**Finishing and super finishing processes**	**15**	**10**

	4.1	Types of grinding, grinding machines, grinding wheels, abrasive materials, bonding, selection of grinding wheels, dressing, types of dressing,		
	4.2	Super finishing honing, lapping.		
5		**Gear production machines**	**10**	**18**
	5.1	Gear tooth elements, introduction to gear shaping, working principle of gear shaping machine, gear shaping cutter		
	5.2	Introduction to gear hobbing cutters, working principle of gear hobbing machine, Gear finishing.		
6		**Jigs and Fixtures**	**08**	**14**
	6.1	Definition, Utility in production, Comparison, Principles of Locations, Fool proofing		
	6.2	Types of Jigs and fixtures		
	6.3	Job holding devices		
7		**Introduction to CAM**	**06**	**08**
	7.1	Manufacturing planning, Manufacturing control, Steps involved in CAM, Process control,		
	7.2	Computer Aided Inspection		
		Total	**64**	**80**

Note :-Practical Examination in Metal turning   04 hours duration

List of Practicals / Experiments / Assignments :-

Sr. No.	Name of Practical / Experiment / Assignment	Hrs
1.	Two composite job and Journal / Report writing.	24
2.	Gear Milling using module cutter and Polygon milling.	24
3	A job on center less Grinder / Demonstration.	16
	Total	**64**

Instructional Strategy :-

Sr. No.	Topic	Instructional Strategy
1.	Drilling and boring machine	Common for all topics: Lecture, Explanation, Discussion (group), Diagram, Demonstration, Notes.
2.	Milling machine	
3.	Broaching machine	
4.	Finishing and super finishing processes	
5.	Gear production machine	Common for all topics: Lecture, Explanation, Discussion (group), Diagram, Demonstration, Notes.
6.	Jigs and Fixtures	
7.	Introduction to CAM	

Reference Books :-

Sr. No	Author	Title	Publication
1.	Hajra Chaudhari Vol. II	Workshop Technology	Media Promoter Pvt. Ltd., Mumbai.
2.	O.P. Khanna and Lal	Production Technology	Dhanpat Rai Sons, Delhi.
3.	Chapman Vol II	Workshop Technology	Oxford α I.B.H. Ltd., Delhi
4.	H.S. Bawa Vol II	Workshop Technology	Tata McGraw Hill, Delhi.
5.	E. Paul Degarmo, J.T. Black	Materials and Process in Manufacturing	Prentice Hall of India, New Delhi.
6.	M.P. Groover	Automation, Production Systems and CIM	Prentice Hall of India, New Delhi.

Specification Table :-

Sr. No.	Topic	Cognitive Levels			Total
		Knowledge	Comprehension	Application	

1.	Drilling and boring machine	06	02	04	12
2.	Milling machine	08	02	02	10
3.	Broaching machine	02	02	02	06
4.	Finishing and super finishing processes	04	02	04	10
5.	Gear production machine	06	04	04	18
6.	Jigs and Fixtures	06	02	02	14
7.	Introduction to CAM	04	02	02	08
	TOTAL	**40**	**18**	**22**	**80**

CO-PO Matrices of course

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
1	3	-	-	2	-	3	3
2	3	-	-	2	-	3	3
3	3	-	-	2	-	1	3
4	3	2	-	2	-	3	3
5	3	2	3	2	-	3	3
6	**3**	**-**	**-**	**2**	**-**	**3**	**3**

Table 3.12
Enter correlation levels 1, 2 or 3 as defined below:
1**: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)***If there is no correlation, put "-"*

CO-PSO Matrices of course

CO	PSO1	PSO2
1	-	3
2	-	-
3	-	1
4	1	2
5	2	2
6	3	1

Enter correlation levels 1, 2 or 3 as defined below:
1**: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)***If there is no correlation, put "-"*

(Prof. C. S. Ashtekar)   (Prof. S. V. Chaudhary)   (Prof. A.S. Zanpure)
Prepared By   Secretary, PBOS   Chairman, PBOS

Name of Programme : **Diploma in CE/EE/ET/ME//MT/CM/IT/DDGM**
Programme Code : **01/02/03/04/05/06/07/08/21//22/23/24/26**
Name of Course : **Development of Soft Skills - I**
Course Code : **NC481**

Teaching Scheme :-

Theory / Practical	Hours / Week	Total Hours
Theory	--	--
Practical	02	32

* NON EXAM.NON CREDIT COURSES (COMPULSORY)   # Credits over & above 180 credits

Evaluation Scheme :-

	Progressive Assessment	Semester End Examination			
		Theory	Practical	Oral	Term Work
Duration	--	--	--	--	--
Marks	--	--	--	--	--

Course Rationale :-

This course aims to make students aware of good interpersonal relations, Professionalism in etiquettes, importance of time management and importance of good health. The techniques such as role play, group discussions can be used effectively to demonstrate   understanding emotions of persons in daily contact.

Course Outcomes :-

After studying this course, the student will be able to	
1	Develop r interpersonal relations among their group, subordinates and superiors .
2	Apply principles of corporate etiquettes and professionalism.
3	Use time Management principle for completion of work.
4	Analyze SWOT analysis of a group for completing given task
5	Use health tips for maintaining good health.

Course Content :-

Chapter No.		Name of Topic / Sub topic	Hrs	Weightage
1.		**Interpersonal Skills through Personal Development**		
	1.1	Reducing conflict by preventing problems in the classroom.	--	--
	1.2	Interpersonal Skills through Self Development and change.		
2.		**Corporate Etiquettes & Professionalism**		
	2.1	Understanding Self		
	2.2	Polished personal habits		
	2.3	Ethics & Etiquettes: a way of life	--	--
	2.4	Personal Attire & Grooming		
	2.5	Cell phone manners		
3.		**Time Management**		
	3.1	Time management skills in groups for completion of project		
	3.2	Factors that lead to time loss and how they can be avoided	--	--
	3.3	Time matrix & urgent versus , Important jobs		
4.		**Managing Emotions**		
	4.1	To understand and identify emotions,	--	--

	4.2	To know our preferences		
	4.3	Strength, weaknesses ,opportunities and threats , Techniques of self control		
	4.4	To get desirable response from others		
5.		**Health Management**		
	5.1	Importance of health management,		
	5.2	Relevance of it ,	**--**	**--**
	5.3	Tips to maintain good health		
		Total	**--**	**--**

List of Practicals / Experiments / Assignments :-

Sr. No.	Name of Practical / Experiment / Assignment	Hrs
1	Case studies to be discussed in a group and presentation of the same by group /group leader.	**04**
2	Field exercises for the group of students.	**02**
3	Role play by individual/group leader.	**04**
4	Arranging Quizzes, puzzle- solving and educational games.	**02**
5	Group discussions.	**04**
6	Sharing of self -experiences in a group.	**04**
7	Brain storming sessions	**02**
8	Questionnaire -filling & discussing results of the same in a group.	**04**
9	Live demonstrations on Yoga and other stress relieving techniques by professional persons.	**06**
	Total	**32**

Reference Books :-

Sr. No	Author	Title	Publication
1.	Mr. Shiv Khera	You can win	
2.	Mr. Abdul Kalam	Wings of Fire	
3.	Mr. Nirfarake	Prabhavi Vyaktimatwa.(Marathi)	
4.	Mr. Iyyengar	YogaDipika	
5.	Mr. Anand Nadkarni	Tan tanavache niyojan (Marathi)	
6.	Mr. Rajiv Sharangpani	Khusit raha ,Mast Jaga.(Marathi)	

Learning Resources :- Video cassettes on 1. Effective Communication 2. Group discussions,
3.Corporate

Etiquettes and professionalism.

CO-PO Matrices of course

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
1	2	-	-	-	2	3	3
2	2	-	-	-	2	3	3
3	3	-	-	-	3	3	3
4	2	2	3	-	3	3	3
5	2	-	-	-	2	3	3

Table 3.12
Enter correlation levels 1, 2 or 3 as defined below:
1**: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)***If there is no correlation, put "-"*

CO-PSO Matrices of course

CO	PSO1	PSO2
1	-	-
2	-	-
3	-	-
4	-	-
5	-	2

Enter correlation levels 1, 2 or 3 as defined below:

1**: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)**If there is no correlation, put "-"

(Prof. D.K.Bhandare)   (Prof. S. V. Chaudhary)   (Prof. A.S. Zanpure)

Prepared By   Secretary, PBOS   Chairman, PBOS

Name of Programme : **Diploma in CE/EE/ET/ME/ MT/CM/IT/DDGM**
Programme Code : **01/02/03/04/05/06/07/8/21/22/23/24/26**
Name of Course : **Development of Soft Skills – II**
Course Code : **NC482**

Teaching Scheme :-

Theory / Practical	Hours / Week	Total Hours
Theory	--	--
Practical	02	32

* NON EXAM.NON CREDIT COURSES (COMPULSORY) - B # Credits over & above 180 credits

Evaluation Scheme :-

	Progressive Assessment	Semester End Examination			
		Theory	Practical	Oral	Term Work
Duration	--	--	--	--	--
Marks	--	--	--	--	--

Course Rationale :-

This course aims to make students aware of importance of goal setting , develop self study techniques , importance of ethics and value system , This also aims one to inculcate creative mind along with interest in using problem solving techniques while dealing with any work. It also emphasizes about importance of stress relieving techniques to be practiced for good health.

Course Outcomes :-

	After studying this course, the student will be able to
1	Set up goal for given task.
2	Use different study techniques for memory enhancement
3	Use different Stress relieving methods for overcoming stress.
4	Apply interpersonal skill for improving interpersonal relationship among group
5	Use different tips for increasing creativity skill.
6	Use different problem solving techniques for solving technical problems effectively.

Course Content :-

Sr. No.		Name of Topic / Sub topic	Hrs	Weigh tage
1.		**Motivation & Goal Setting**		
	1.1	Importance of goal setting,	--	--
	1.2	How to set SMART goals.		
2.		**Study Habits**		
	2.1	Note taking, Methods of Learning,		
	2.2	Memory Enhancement, self - Study Techniques,	--	--
	2.3	Techniques for effective Reading and Writing.		
3.		**Stress Management**		
	3.1	Stresses in groups, how to control emotions,	--	--

	3.2	Strategies to overcome stress, understanding importance of good health to avoid stress.		
4.		**Ethics & Motivation**		
	4.1	What are ethics, how ethics help to ensure positive interpersonal relations,	**--**	**--**
	4.2	Personal value system, and personal quality primer		
5.		**Creativity**		
	5.1	Definition of Creativity, Tips and ways to increase creativity, importance of creativity.	**--**	**--**
6.		**Problem Solving Techniques**		
	6.1	Puzzles and technical quizzes to be organized to develop these skills.	**--**	**--**
		Total	**--**	**--**

List of Practicals / Experiments / Assignments :-

Sr. No.	Name of Practical / Experiment / Assignment	Hrs
1	Case studies to be discussed in a group and presentation of the same by group /group leader.	**04**
2	Field exercises for the group of students.	**02**
3	Role play by individual/group leader.	**04**
4	Arranging Quizzes, puzzle- solving and educational games.	**02**
5	Group discussions.	**04**
6	Sharing of self -experiences in a group.	**04**
7	Brain storming sessions	**02**
8	Questionnaire -filling & discussing results of the same in a group.	**04**
9	Live demonstrations on Yoga and other stress relieving techniques.	**06**
	Total	**32**

Reference Books :-

Sr. No	Author	Title	Publication
1.	Mr. Shiv Khera	You can win	
2.	Mr .Abdul Kalam	Wings of Fire	
3.	Mr. Nirfarake	Prabhavi Vyaktimatwa.(Marathi)	
4.	Mr. Iyyengar	YogaDipika	
5.	Mr. Anand Nadkarni	Tan tanavache niyojan (Marathi)	
6.	Mr. Rajiv Sharangpani	Khusit raha ,Mast Jaga.(Marathi)	

Learning Resources :- Video cassettes on 1. Motivation & Goal Setting
2. Stress Management,3. Ethics & Motivation

CO-PO Matrices of course

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
1	2	1	-	-	3	3	3
2	2	1	-	-	3	3	3
3	2	1	-	-	3	3	3
4	2	1	1	1	3	3	3
5	2	2	2	1	3	3	3
6	**2**	**3**	**3**	**1**	**3**	**3**	**3**

Table 3.12

Enter correlation levels 1, 2 or 3 as defined below:
1**: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)***If there is no correlation, put "-"*

CO-PSO Matrices of course

CO	PSO1	PSO2
1	-	-
2	-	-
3	-	-
4	-	-
5	-	2
6	-	1

Enter correlation levels 1, 2 or 3 as defined below:
1**: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)***If there is no correlation, put*

(Prof. D.K.Bhandare)   (Prof. S. V. Chaudhary)   (Prof. A.S. Zanpure)

Prepared By   Secretary, PBOS   Chairman, PBOS

Name of Programme : **Diploma in Mechanical Engineering**
Programme Code : **04/ 24/18**
Name of Course : **CNC & Advanced Manufacturing**
Course Code : **WS 581(Class Declaration)**
Pre-requisite : **WS 381, L1**

Teaching Scheme :-

Theory / Practical	Hours / Week	Total Hours
Theory	03	48
Practical	03	48
Tutorial	--	

Evaluation Scheme :-

	Progressive Assessment	Semester End Examination			
		Theory	Practical	Oral	Term Work
Duration	Two class tests each of 60 minutes	3Hrs.	--	--	--
Marks	20	80	--	25	25

Course Rationale :-

Student should be made aware of new developments in the area of Manufacturing so as to acquire proficiency in handling new machine tools and equipments such as CNC, FMS, AUTOMATION KITS, JIT & Lean manufacturing.

Course Outcomes :-

	After studying this course, the student will be able to
1	Select Non traditional Marching process for manufacturing given job with justification.
2	Identify Different elements of automation of a given manufacturing System
3	Prepare part programming for manufacturing a given Job
4	Use FMS concept for manufacturing process planning and implementation.
5	Apply principles of JIT and Lean Manufacturing for given manufacturing process.
6	Prepare Maintenance record for repair cycle analysis.

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Course Content :-

Chapter No.		Name of Topic / Sub topic	Hrs	Weightage
		Section I		
		Non Traditional Machining Processes		
1	1.1	Introduction, concept of NCM, need, classification based on energy sources, constructional features, Working principles, industrial applications advantages/disadvantages of EDM,ECM,EBM,LBM and PAM, USM, AJM etc.	08	12
		Manufacturing Operations & Automation		
2.	2.1	Manufacturing Industries and products, Manufacturing operations, Costs of manufacturing operation	06	10
	2.2	Basic elements of Automated system, Levels of Automation, Machine, material handling, process automated systems.		
		Computer Numerical Control		
3	3.1	Fundamentals of CNC Technology, CNC, DNC, Applications of NC	10	18
	3.2	NC part programming – APT Tool path generation, CNC lathe programming, CNC programming for machining centre, Subroutines, Do loops, Canned cycles.		
		Section II		
		Flexible Manufacturing System (FMS)		
4.	4.1	Group technology Cellular Mfg, Part families, part classification & coding, cellular manufacturing.	06	12
	4.2	FMS Concept, Component, Application, benefits, FMS planning & Implementation		
		JIT (Just in Time)		
5	5.1	Introduction, Philosophy of JIT, Elements of JIT, Master schedule, Kanban System, Layout and JIT, Effect on workers, Vendors, Implementation of JIT.	06	10
		Lean Manufacturing System		
6	6.1	Introduction, Lean production, Ten steps to Lean Production, Design of linked cell factory, Agile manufacturing, Comparison of Lean and Agile manufacturing,	06	08
		Maintenance of Machine Tools.		
	7.1	Need and Importance		
7	7.2	Types		
	7.3	Maintenance practices :- Couplings, Pulleys and Bearings	06	10
	7.4	Maintenance Records		
	7.5	Repair cycle analysis		

		Total	48	80

List of Practicals / Experiments / Assignments :-

Sr. No.	Name of Assignment	Hrs
1	Dismantling and Assembly of a)Three Jaw Chuck b)Tail Stock c) Draw Bolt d)Arbor	24
2	One job on turning centre/ Visit	10
3	Writing programme for a given object, Feeding data (above) to CNC computer and correcting errors. Simulating actual tool path and Operating CNC to perform the above object.	04
4	One job on machining centre/ Turning center / Visit.	10
5	Assignment on above topics	
	Total	**48**

Instructional Strategy :-

Sr. No.	Topic	Instructional Strategy
1	Non Traditional Machining Processes	Class rooms teaching, Power point presentation, Demonstrations
2	Manufacturing Operations & Automation	Class rooms teaching, Power point presentation, Demonstrations
3	Computer Numerical Control	Class rooms teaching, Power point presentation, Demonstrations
4	Flexible Manufacturing System (FMS)	Class rooms teaching, Power point presentation, Demonstrations
5	JIT (Just in Time)	Class rooms teaching, Power point presentation, Demonstrations
6	Lean Manufacturing System	Class rooms teaching, Power point presentation, Demonstrations
7	Maintenance of Machine Tools.	Class rooms teaching, Power point presentation, Demonstrations

Reference Books :-

Sr. No	Author	Title	Publication
1	Automation Production System and CIM	Mikell P Groover,	Prentice Hall of India Pvt. Ltd. New Delhi – 01, 1998
2	Non Traditional Etching Processes	Dr. Adhitan	Prentice Hall of India Pvt. Ltd. New Delhi – 01, 1998
3	Non conventional Machining	R.K. Mishra	Narso Publishing House, New Delhi – 1997
4	Workshop Technology Volume – 2	A K and S K Chaudhary S K Bose	Media promoters and publishers pvt. Ltd. Mumbai – 7
5	CNC	Dr. Adhitan & Dabla	
6	PPC Management	R.K. Garg, V. Sharma	Dhanpat Rai Publishing Co. New Delhi.

Specification Table :-

Sr. No.	Topic	Cognitive Levels			Total
		Knowledge	Comprehension	Application	
Section - I					
1.	Non Traditional Machining Processes	05	03	04	12
2.	Manufacturing Operations & Automation	04	03	03	10
3.	Computer Numerical Control	06	06	06	18
	TOTAL	15	12	13	40
Section - II					
4.	Flexible Manufacturing System (FMS)	06	03	03	12
5.	JIT (Just in Time)	04	03	03	10
6.	Lean Manufacturing System	04	02	02	08
7	**Maintenance of Machine Tools.**	04	02	04	10
		18	10	12	40
	TOTAL	33	22	25	80

CO-PO Matrices of course

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
1	2	1	-	1	-	2	3
2	2	-	-	-	-	2	3
3	3	3	3	3	-	3	3
4	2	1	-	-	-	2	3
5	2	-	-	1	-	2	3
6	2	1	1	2	-	2	3

Table 3.12
Enter correlation levels 1, 2 or 3 as defined below:
1**: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)***If there is no correlation, put "-"*

CO-PSO Matrices of course

CO	PSO1	PSO2
1	-	3
2	1	2
3	3	3
4	2	3
5	2	3
6	-	2

Enter correlation levels 1, 2 or 3 as defined below:
1**: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)***If there is no correlation, put "-"*

(Prof. C.S. Ashtekar)   (Prof. S. V. Chaudhary)   (Prof. A.S. Zanpure)

Prepared By   Secretary, PBOS   Chairman, PBOS

Name of Programme : **Diploma in Mechanical Engineering**

Programme Code : **04/ 24/18**
Name of Course : **Refrigeration and Air Conditioning**
Course Code : **ME 581(Class Declaration)**
Pre-requisite : **L1**

Teaching Scheme :-

Theory / Practical	Hours / Week	Total Hours
Theory	04	64
Practical	02	32

Evaluation Scheme :-

	Progressive Assessment	Semester End Examination			
		Theory	Practical	Oral	Term Work
Duration	Two class tests each of 60 minutes	3Hrs.	--	--	--
Marks	20	80	--	25	25

Course Rationale :-

Refrigeration and Air conditioning is one of the most promising job area for diploma holders in Mechanical Engineering. Considering the wide and increasing use of Refrigeration and Air conditioning for domestic and commercial applications and the challenges put by the use of Refrigeration and air conditioning equipments in existing stage, it is absolutely necessary that Diploma technicians should learn this course. They should know the processes, equipments, systems of Ref. and A/C with their functioning, maintenance and repairs and measures to meet the challenges of the near future in the area.

Course Outcomes :-

	After studying this course, the student will be able to
1	Calculate COP of given Refrigeration system.
2	Identify different components of VCC and VAS system
3	Select relevant refrigerant for given system
4	Calculate Psycrometric properties using psyctromtric chart
5	Select the air distribution components for relevant system
6	Calculate cooling load of a given system

Course Content :-

Chapter No.		Name of Topic / Sub topic	Hrs	Weightage
1		**Section-I**		
		Refrigeration		
		Introduction		
	1.1	Introduction to refrigeration, Methods of refrigeration	02	02
	1.2	Concept of Heat pump, Refrigerator.		
	1.3	Concept of COP, Refrigerating effect, Units of Refrigeration.		
2		**Refrigeration Systems**		
	2.1	**Vapor Compression System**: Principle of working, Basic Components of Vapor compression systems (VCC),	14	16

		Representation of simple and actual cycle on T-S and P-H Charts, effect of superheating and subcooling. Calculations of Refrigeration effect, work done, COP, Mass flow of refrigerant, Refrigeration Capacity using P-H charts only		
	2.2	**Vapor Absorption Systems:** Principle, components and working of Ammonia- water Vapor Absorption System, Principle, components and working of Lithium Bromide- Water Vapor Absorption System. Principle, components and working of Electrolux Refrigerators. Comparison of VCC and absorption systems,		
3		**Vapor Compression System Components:**	**10**	**14**
	3.1	**Compressor:** Construction, working and applications of Open Type, Hermetically sealed, Centrifugal, Screw type compressors.		
	3.2	**Condenser:** Construction and working of air cooled (forced and natural convection), water cooled (double tube, shell tube, shell coil) and evaporative condensers		
	3.3	**Evaporators:** Types of evaporators such as bare tube, plate surface, finned tube, flooded type, dry expansion type, Selection of evaporators		
	3.4	**Expansion Devices:** Construction and working of various types of expansion devices such as capillary tube, automatic expansion, thermostatic expansion valves.		
	3.5	**Controls:** LP/HP control, thermostats, overload protectors, relays.		
4		**Refrigerants:**	**06**	**08**
	4.1	**Classification of Refrigerants:** Primary Refrigerants, Secondary Refrigerants		
	4.2	**Desirable properties of an Ideal Refrigerant:** Thermodynamic properties, Chemical properties, Physical properties.		
	4.3	Effect of CFC on Ozone layer depletion and Global Warming, Montreal Protocol , Kyoto Protocol.		
	4.4	Alternative Refrigerants		
		Section- II Air-conditioning		
5		**Psychometry**	**10**	**12**
	5.1	Definition, necessity of air-conditioning, concept of dry air, moist air and saturated air.		
	5.2	Psychometric properties of air: DBT, WBT, DPT, absolute humidity, specific humidity, relative humidity, sp. Volume, enthalpy.		
	5.3	Psychometric processes: Psychometric chart, representation of psychometric processes such as sensible heating, sensible cooling, latent heating, latent cooling, heating and humidification, cooling and humidification, heating and dehumidification, cooling and dehumidification, evaporative cooling.		
	5.4	Numericals relating to finding the properties after the air undergoes certain processes (using psychrometric chart), bypass factor of coil.		
6		**Air-conditioning Systems and Equipments**	**08**	**10**
	6.1	Unitary System: Window air conditioner, Split air conditioner		
	6.2	Central air conditioning systems		
	6.3	Package, Summer, winter and Year-round year conditioner systems		
	6.4	Types of filters, Humidifiers ,humidistat		
	6.5	Insulation: Type of insulating materials used in refrigeration system, properties required and applications.		
	6.6	Introduction to Car air conditioning		
7		**Air Distribution Systems**	**08**	**10**
	7.1	Room air distribution, Concept of draft, throw, drop, induction ratio or entrainment ratio and spread.		
	7.2	Types of supply air outlets, return outlets, sealing diffusers, grills registers, fixed/ adjustable louvers, low/high wall outlets, floor baseboard and sealing outlets Considerations for selection and location of outlets		
	7.3	Ducts: Flow through Ducts , Static & Dynamic Losses, Duct Design–Equal Friction		

		Method , Duct Balancing , Fan Arrangement Variable Air Volume systems , Air Handling Units and Fan Coil units.		
8		**Principles of Load Calculations**		
	8.1	Human comfort: Body heat regulation, concept of effective temperature, human comfort chart.	06	08
	8.2	Concept of sensible, latent heat and total heat load, Sensible heat factor, Sources of heat load, ERSHF, Grand total heat load, Grand room sensible heat factor.		
		Total	**64**	**80**

NOTE: The students are supposed to select at least two topics from the syllabus to give seminar / presentation in groups.

List of Practicals / Experiments / Assignments :-

Sr. No.	Name of Practical / Experiment / Assignment	Hrs
1.	Demonstration of domestic refrigerator in view of construction, operation and controls used & its troubleshooting.	2
2.	Identification of components of 'hermetically sealed compressor'.	4
3.	Demonstration of various controls like L.P./H.P. cut outs, thermostat, overload protector, solenoid valve used in RAC.	4
4.	Trial on water cooler test rig.	2
5.	Trial on ice plant test rig.	2
6.	Trial on three fluid system	2
7.	Trial on A.C. test rig.	4
8.	Cooling load calculations for cabin, classrooms, laboratory, canteen and dairy plant, milk storage, small freezers (minimum one).	4
9.	Visit to repair and maintenance workshop in view of use of various tools and charging procedure	4
10.	Visit to ice plant / air conditioning plant / cold storage	4
	Total	**32**

Note :- Assignments based on the above topics (at least one for each)Mini project: Group of 4 to 6 students. (Use of   information on internet, research papers, proceedings of conferences, etc can be made)

Instructional Strategy :-

Sr. No.	Topic	Instructional Strategy
1	Introduction	Lecture method
2	Refrigeration Systems	Lecture method, Demonstration
3	Vapor Compression System Components	Lecture method, Transparencies
4	Refrigerants	Lecture method, Transparencies
5	Psychometry	Lecture, Demonstration & Discussion
6	Air-conditioning Systems and Equipments	Lecture method, Demonstration
7	Air Distribution Systems	Lecture method, Demonstration, visits
8	Principles of Load Calculations	Lecture method, assignments

Text Books :-

Sr. No	Author	Title	Publication
1.	R.S. Khurmi and J.K. Gupta	Refrigeration and Air conditioning	Eurasia publishing house, New Delhi
2.	Arora / S. Domkundwar	Refrigeration and Air conditioning	DhanpatRai& Sons
3.	C.P. Arora	Refrigeration and Air conditioning	Tata McGraw Hill
4.	Ballney	Refrigeration and Air conditioning	Khanna Publication
5.	Ananthnarayanan	Basics of Ref. and A/C	Tata McGraw Hill

Reference Books :-

Sr. No	Author	Title	Publication

1	V.K. Jain	Refrigeration and Air conditioning	
2	Jordan and Priester	Refrigeration and Air conditioning	Prentice Hall
3	Sarao and Gabbi	Refrigeration and Air conditioning	SatyaPrakashan, New Delhi
4	Dossat	Principles of Refrigeration	Prentice Hall

Learning Resources :- Books, Models

Specification Table :

Sr. No.	Topic	Cognitive Levels			Total
		Knowledge	Comprehension	Application	
	Section- I				
1.	Introduction	0	0	0	0
2.	Refrigeration Systems	02	04	06	12
3.	Vapor Compression System Components	04	8	04	16
4.	Refrigerants	04	08	0	12
	Total	**10**	**20**	**10**	**40**
	Section- II				
5.	Psychometry	02	00	04	06
6.	Air-conditioning Systems and Equipments	04	02	04	10
7.	Air Distribution Systems	04	04	04	12
8.	Principles of Load Calculations		04	08	12
	Total	**10**	**10**	**20**	**40**

CO-PO Matrices of course

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
1	3	2	-	-	2	2	1
2	2	-	-	1	-	-	1
3	2	-	-	-	3	-	2
4	3	2	1	2	-	2	1
5	2	-	-	-	-	-	2
6	**2**	**2**	**2**	**1**	**2**	**2**	**1**

Table 3.12

Enter correlation levels 1, 2 or 3 as defined below:

1**: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)***If there is no correlation, put "-"*

CO-PSO Matrices of course

CO	PSO1	PSO2
1	-	2
2	-	-
3	-	-
4	-	2
5	-	-
6	-	2

Enter correlation levels 1, 2 or 3 as defined below:

1**: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)***If there is no correlation, put "-"*

(Prof. S.S. Nagawade)   (Prof. S. V. Chaudhary)   (Prof. A.S. Zanpure)

Prepared By   Secretary, PBOS   Chairman, PBOS

Name of Programme : **Diploma in Mechanical Engineering**
Programme Code : **04/ 24/18**
Name of Course : **Instrumentation and Control**
Course Code : **ME 582(Class Declaration)**
Pre-requisite : **L1**

Teaching Scheme :-

Theory / Practical	Hours / Week	Total Hours
Theory	04	64
Practical	02	32

Evaluation Scheme :-

	Progressive Assessment	Semester End Examination			
		Theory	Practical	Oral	Term Work
Duration	Two class tests each of 60 minutes	3Hrs.	--	--	--
Marks	20	80	--	25	25

Course Rationale :- The art of measurement plays an important role in all branches of engineering. With advances in technology, measurement techniques & sensor have also taken rapid strides, with many types of instrumentation devices, innovations, and refinements. The course aims at making a Mechanical Engineering student familiar with the principles of instrumentation, transducers & measurement like temperature, pressure, flow, force, level and strain etc.

Course Outcomes :-

	After studying this course, the student will be able to
1	Identify errors in the instrumentation and control system.
2	Select transducers for given application with justification
3	Use control systems for given application
4	Measure different parameters of Instrumentation and control system using appropriate instruments.

Course Content :-

Chapter No.		Name of Topic / Sub topic	Hrs	Weightage
		Section I		
		Introduction		
1	1.1	Fundamental of Instrumentation**:** introduction. Types of measurement, Significance of measurement. Classification of instruments.	08	10
	1.2	Characteristics of instruments : Static characteristics such as range and span, accuracy and precision, reliability, calibration, hysteresis and dead zone, drift, sensitivity, threshold and resolution, repeatability and reproducibility, linearity. Dynamic characteristics- speed of response, fidelity, lag and dynamic errors, overshoot.		
	1.3	Types of error- and sources of error. Comparison of hydraulic, Pneumatic and electronic systems, Servomechanism.		
		Transducers		
2	2.1	Definition and classification of transducers.	12	16
	2.2	Characteristic of transducer and selection criteria for transducer.		

	2.3	Types of transducers: Strain Gauge, LVDT, RVDT, Capacitive, Resistive, Piezoelectric – Principle of Working, Advantages, Disadvantages and Applications.		
3		**Fundamentals of Control Systems**	**12**	**14**
	3.1	Block diagram of automatic control system, closed loop system, open loop system, and feed back control system.		
	3.2	On-off, cascade, P, PI, PID and feed-forward controls		
	3.3	Applications of measurements and control setup for boilers, air conditioners, and motor speed control.		
		Section II		
4		**Pressure and flow measurement**	**10**	**12**
	4.1	Pressure Measurements: Methods of measuring pressure, elastic transducer tester. Pressure sensor (solid state), piezoelectric pressure sensor.		
	4.2	Flow Measurements: Rota meter(basic concepts only), mechanical meter (turbine type), ultrasonic flow meter, electromagnetic flow meter, thermal flow meter		
5		**Displacement , Strain and Level Measurement**	**12**	**14**
	5.1	Displacement Measurement Potentiometer, LVDT, Eddy current generation type, encoder, incremental and absolute type. Ultrasonic displacement.		
		Strain Measurement Types of strain gauges, strain gauge materials, mounting of gauges, resistance strain gauge- bonded and unbonded, types (foil, semiconductor, wire wound gauges), load cells, rossets.		
	5.3	Level Measurement Mechanical type & Electrical type (float, gauge), level measurement of solid substance.		
6		**Force ,Torque and temperature measurement**	**10**	**14**
	6.1	Force Measurement: Force measurement by Accelerometer, measurement with elastic elements, load cell using strain gauges.		
	6.2	Torque Measurement: Torque Measurement using mechanical dynamometer, electric dynamometer, and transmission dynamometer.		
	6.3	Temperature Measurements : Bimetallic Thermometers, RTDs and thermistor– PTC, NTC. Thermocouple- elements of thermocouple, See back & Peltier Effect law of intermediate temperature, law of intermediate metals. Use of thermocouple for temperature measurement, thermopile. Pyrometer- radiation and optical.		
		Total	**64**	**80**

NOTE: The students are supposed to select at least two topics from the syllabus to give seminar / presentation in group

List of Practicals / Experiments / Assignments :-

Sr. No.	Name of Practical / Experiment / Assignment	Hrs
1	Displacement measurement by inductive transducer and verify characteristics of LVDT	4
2	Verification of PID controller action	4
3	Flow rate Measurement by using Rotameter	2
4	Measurement of strain by using a basic strain gauge and hence verify the stress induced.	2
5	Determination of negative temperature coefficient and calibration of a thermister.	4
6	Liquid Level Measurement by using Capacitive Transducer system OR Level Measurement by using air purge system	2
7	Speed Measurement by using Stroboscope / Magnetic / Inductive Pick Up	2
8	To plot the Characteristics of RTD (PT-100) and Thermocouple	4

9	Measurement of force & weight by using a load cell.	2
10	Displacement Measurement by using LVDT OR Displacement or Position Measurement by using rotary encoder	2
11	Temperature calibration by using Thermocouple	4
	Total	**32**

Instructional Strategy :-

Sr. No.	Topic	Instructional Strategy
1.	Introduction	Lecture method, Demonstration
2.	Transducers	Lecture method, Demonstration
3.	Fundamentals of Control Systems	Lecture method, Transparencies, Demonstration
4.	Pressure and flow measurement	Lecture method, Transparencies, Demonstration
5.	Displacement , Strain and Level Measurement	Lecture, Demonstration
6.	Force ,Torque and temperature measurement	Lecture method, Demonstration

Text Books :-

Sr. No	Author	Title	Publication
1.	Earnest O Deobelin	Measurement systems – Application and Design	McGraw Hill Publication
2.	A.K.Sawhney	Mech. Measurements & Instrumentation'	DhanpatRai and Sons, Delhi 110006.
3.	D.Patranabis	Principles of Industrial Instrumentation	Tata McGraw Hill
4.	R.K.Jain	, 'Mechanical & Industrial Measurements',	Khanna Publications, New Delhi
5.	R.V. Jalgaonkar	Mechanical Measurement & Control'	Everest Publishing House, Pune
6.	D.S.Kumar	Mechanical Measurements & Control',	Metropolitan Publi., New Delhi.

Reference Books :-

Sr. No	Author	Title	Publication
1	B.C.NakraK.K.Chawdhry	Instrumentation Measurement and Analysis	Tata McGraw Hill
2	Rangan Mani Sharma	Instrumentation systems and devices	Tata McGraw Hill
3	BelaLiptakKrisztaVenczel	Process Measurement Instrument Engineers Handbook	Chilton Book Company
4	C.S. Narang	Instrumentation Devices & Systems'	Tata McGraw Hill Publications, New Delhi

Learning Resources :- Books, Models

Specification Table :-

Sr. No.	Topic	Cognitive Levels			Total
		Knowledge	Comprehension	Application	
1.	Introduction	06	02	02	10
2.	Transducers	04	04	08	16
3.	Fundamentals of Control Systems	06	04	04	14
4.	Pressure and flow measurement	04	02	06	12
5.	Displacement , Strain and Level Measurement	04	02	08	14
6.	Force ,Torque and temperature measurement	04	02	08	14
	Total	**28**	**16**	**36**	**80**

CO-PO Matrices of course

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
1	3	2	-	2	2	2	1
2	2	-	-	1	-	-	1
3	2	-	1	2	3	-	2
4	3	2	2	2	-	2	3

Table 3.12
Enter correlation levels 1, 2 or 3 as defined below:
1**: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)***If there is no correlation, put "-"*

CO-PSO Matrices of course

CO	PSO1	PSO2
1	-	2
2	-	2
3	-	2
4	-	2

Enter correlation levels 1, 2 or 3 as defined below:
1**: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)***If there is no correlation, put "-"*

(Prof. P. U. Garge)   (Prof. S. V. Chaudhary)   (Prof. A.S. Zanpure)

Prepared By   Secretary, PBOS   Chairman, PBOS

Name of Programme : **Diploma in Mechanical Engineering**
Programme Code : **04/ 24/18**
Name of Course : **Tool Engineering**
Course Code : **ME 583(Class Declaration)**
Pre-requisite : **L1**

Teaching Scheme :-

Theory / Practical	Hours / Week	Total Hours
Theory	**04**	**64**
Practical	**02**	**32**

Evaluation Scheme :-

	Progressive Assessment	Semester End Examination			
		Theory	**Practical**	**Oral**	**Term Work**
Duration	Two class tests each of 60 minutes	3Hrs.	--	--	--
Marks	**20**	**80**	**--**	**25**	**25**

Course Rationale :-

Modern manufacturing industries use complex production processes. A technician working in production department comes across various problems involving metal cutting processes, forming processes, Jigs and Fixtures for mass production to increase productivity of company.
This course is introduced so as to enable the students to get the knowledge of cutting tools , jigs and fixtures etc. to enter into the practical field of engineering

Course Outcomes :-

	After studying this course, the student will be able to
1	Select proper tool for manufacturing operations.
2	Interpret designation system of cutting tools and tool holders.
3	Select locating and clamping devices for components.
4	Select jig and fixture for components.
5	Use various press tools for given press tools operation.
6	Select dies for simple components

Course Content :-

Chapter No.		Name of Topic / Sub topic	Hrs	Weightage
1		**Section-I**	**06**	**08**
		Mechanics of Metal Cutting		
	1.1	Introduction, mechanics of chip formation		
	1.2	Single point tool geometry- ASA System, ORS System, importance of tool angles		
	1.3	Methods of machining- orthogonal and oblique cutting		

	1.4	Types of chips, tool materials		
	1.5	Machinability – index, chip breakers		
		Design of Single Point Cutting Tool		
	2.1	Shear angle and its determination		
	2.2	Velocities in metal cutting processes, determination of un-deformed chip thickness		
2	2.3	Force relations, merchant's circle, theory of Lee and Shaffer, cutting power, MRR, energy consideration in metal cutting, oblique cutting	14	18
	2.4	Tool wear- types, tool life- definition, criteria, variables affecting tool life		
	2.5	Types of single point cutting tools- solid tools, tipped tools, dimensions of tool shank		
	2.6	Economics of metal cutting (problems on tool angles and on tool life		
		Design of Multipoint Cutting Tool & Cutting Fluids		
	3.1	Design of milling cutter		
	3.2	Design of drills		
3	3.3	Design of reamers	12	14
	3.4	Cutting fluids- requirement, types, application, selection of cutting fluids		
	4.1	Form Tool		
		Section II		
		Jigs and Fixtures		
	4.1	Introduction, definition, principle of pin location, design principle for location purposes		
	4.2	Clamping- principles devices		
4	4.3	Design principles for jigs and fixtures	08	12
	4.4	Drilling jigs- design principles, bushes, types		
	4.5	Design principles of milling fixtures, lathe fixtures, assembly fixtures,		
	4.6	Indexing jigs and fixtures		
		Jigs and fixture construction- casting, fabrication, welding and comparison		
		Press working and Cutting Dies		
	5.1	Introduction, definitions of various press operations, types of press, press working terminology		
	5.2	Cutting dies- types, principle , scrap strip layout, clearance applications, cutting forces, methods to reduce cutting forces , minimum diameter of piercing		
5	5.3	Blanking dies- types, die block, die block thickness, die opening, fastening of die block, punch, backup plate, centre of pressure	14	16
	5.4	Strippers- types, stock stop- latch stop, automatic stop, solid stop, strip feeding, knock-outs		
	5.5	Piercing dies- mounting, piercing punches, pilots- types		
		Forming Dies		
	6.1	Drawing dies- design consideration, types, no. of draws, drawing pressure, blank holding pressure, redraw dies		
6	6.2	Bending dies- bending methods, design principles, spring back, bending pressure	10	12
	6.3	Forging dies- open die forging and closed die forging		
	6.4	Forging design factors- draft, fillet, parting line, shrinkage and die wear, mismatch, finish allowances, tolerance, webs and ribs		
		Total	64	80

List of Practicals / Experiments / Assignments :-

Sr. No.	Name of Practical/Experiment/ Assignment	Hrs
1.	Assignment on tool geometry and Machinability	4
2.	Assignment on merchant circle, tool wear, tool types	6

3.	Assignment on multipoint cutting tool- milling cutters, drills and cutting fluids		6
4.	Assignment on jig or fixture design for sample part		6
5.	Assignment on cutting dies		6
6.	Assignment on forming dies		4
	Total		**32**

Note :- The students are supposed to select at least two topics from the syllabus to give seminar / presentation in groups.

Instructional Strategy :-

Sr. No.	Topic	Instructional Strategy
1	Mechanics of Metal Cutting	Lecture method
2	Design of Single Point Cutting Tool	Lecture method, Demonstration
3	Design of Multipoint Cutting Tool & Cutting Fluids	Lecture method,
4	Jigs and Fixtures	Lecture method,
5	Press working and Cutting Dies	Lecture, Discussion
6	Forming Dies	Lecture method

Reference Books :-

Sr. No	Author	Title	Publication
1.	G. B. S. Narang	Machine Tool Engineering	S. Chand & Co. New Delhi
2.	Lindberg	Manufacturing Engineering and Processes	Tata Mc Graw HILL N. Delhi
3.	P.C. Sharma	Production Engineering	S. Chand & Co. New Delhi

Learning Resources :- Books

Specification Table :-

Sr. No.	Topic	Cognitive Levels			Total
		Knowledge	Comprehension	Application	
Section- I					
1.	Mechanics of Metal Cutting	08	--	--	08
2.	Design of Single Point Cutting Tool	08	06	04	18
3.	Design of Multipoint Cutting Tool & Cutting Fluids	06	04	04	14
		22	10	08	40
Section- II					
4.	Jigs and Fixtures	06	04	02	12
5.	Press working and Cutting Dies	08	04	04	16
6.	Forming Dies	04	04	04	12
		18	12	10	40
		40	**22**	**18**	**80**

CO-PO Matrices of course

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
1	3	-	-	1	-	-	2
2	3	3	-	1	-	-	2
3	3	2	-	2	-	2	2
4	3	-	-	2	-		
5	2	-	-	1	1	2	1
6	2	-	-	2	-	2	2

Table 3.12
Enter correlation levels 1, 2 or 3 as defined below:
1**: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)***If there is no correlation, put "-"*

CO-PSO Matrices of course

CO	PSO1	PSO2
1	-	1
2	-	1
3	-	2
4	-	2
5	-	3
6	-	2

Enter correlation levels 1, 2 or 3 as defined below:
1**: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)***If there is no correlation, put "-"*

(Dr S. R. Adhau)   (Prof. S. V. Chaudhary)   (Prof. A.S. Zanpure)

Prepared By   Secretary, PBOS   Chairman, PBOS

Government Polytechnic Pune

Name of Programme	:	**Diploma in Mechanical Engineering**
Programme Code	:	**04/ 24/18**
Name of Course	:	**Automobile Engineering**
Course Code	:	**ME 584(Class Declaration)**
Pre-requisite	:	**L1**

Teaching Scheme :-

Theory / Practical	Hours / Week	Total Hours
Theory	**04**	**64**
Practical	**02**	**32**

Evaluation Scheme :-

	Progressive Assessment	**Semester End Examination**			
		Theory	**Practical**	**Oral**	**Term Work**
Duration	Two class tests each of 60 minutes	3Hrs.	--	--	--
Marks	**20**	**80**	**--**	**25**	**25**

Course Rationale :-

Due to the ever increasing population in the developing cities in India, the need of transportation facilities are increasing due to which there is tremendous rise in the number of automobiles. To meet the demand of service Industry a Mechanical engineer should have at least basic knowledge of this field before he enters in profession.

- This course aims to :
1) Make the student capable to work in various shops of an automobile industry.
2) Create consciousness about problems created due to wide use of automobiles e.g. Pollution and its control.
3) Create awareness about new standards used in modern automobile industry.
4) Create awareness about new technologies used in modern automobile industry.

Course Outcomes :

	After studying this course the student will be able to
1	Draw general layout of Automobile systems.
2	Identify faults in Transmission system of an automobile.
3	Inspect different elements of starting and Charging circuit of an automobile.
4	Identify different components of steering and Suspension systems.
5	Inspect braking system of an automobile.
6	Use Emission analyzer tools for effective implementation of legislative emission norms.

7	Draw general layout of Automobile systems.
8	Identify faults in Transmission system of an automobile.

Course Content:

Chapter No.		Name of Topic / Sub topic	Hrs	Weightage
		Section I		
		Introduction		
1	1.1	Classification of Automobile.	02	04
	1.2	Resistance to vehicle motion – rolling resistance, air resistance, Gravitation resistance, inertia resistance.		
	1.3	Types of Chassis and their functions		
		Transmission system I		
2	2.1	Automobile clutches – construction and working of single plate, multi-plate, cone clutch, centrifugal clutch. Faults and remedies/repairs of clutches.(Brief Description)	14	16
	2.2	Gear Box – Construction and working of sliding mesh, constant mesh, synchro-mesh, epicyclic gear box, torque converter, Faults and remedies/repairs of gear box.		
		Transmission System II		
3	3.1	Propeller shaft and U joint – construction and working of Universal joint, Rzeppa joint, C.V. joint.	10	12
	3.2	Differential - function, construction, working principal, Transfer case.		
	3.3	**Rear axle and bearing** – types, semi-floating, full floating bearing, three quarter floating axle.		
	3.4	**Wheels and tyres** – requirements of automobile wheels, disk wheel, wire wheel. Functions and desirable properties of tyres. Conventional tube and tubeless tyres, Car-case types: Cross Ply, Radial ply, Belted bias. Considerations in tread design. Tyre specification, Tyre rotation, Tyre wear patterns and remedies, tyre life.		
		Electric Systems		
4	4.1	Construction and working of dynamo and alternator, specifications of alternator Cutouts, relay and regulator. Automotive Battery capacity rating, charging.	06	08
	4.2	Starting system. Bendix drive, role of over running clutch drive.		
		Section II		
		Steering		
5	5.1	Front axle, types of stub axle, steering geometry, Ackerman's mechanism. Under steer, over steer, steering linkage for rigid and independent suspension.	08	10
	5.2	Type of steering gears – worm and wheel, re-circulating ball type, rack and pinion. Power steering : Hydraulic and electric/electronic. Faults and remedies of steering, wheel alignment, wheel balancing		
		Braking System		
6	6.1	Types, drum brakes, disk brakes. Hand Brake/ Parking Brake. hydraulic, air brakes, Brake trouble shooting,. ABS.	08	12
		Suspension and shock absorber		
7	7.1	Necessity of suspension, Types of suspension- concept of passive and active suspension.	08	12
	7.2	Types of suspension springs – leaf spring, coil spring, torsion bar. Rubber, Anti roll		

		bar, air suspension, Introduction to Active Suspensions		
	7.3	Shock absorber.		
	7.4	Independent suspension – Wishbone, Mac-Pherson strut type.		
	7.5	Pitching, rolling, bouncing.		
8		**Automobile emission and its Control**	**08**	**06**
	8.1	Introduction, Complete and Incomplete Combustion, Constituents of Exhaust Gases.		
	8.2	Pollutant Formation.		
	8.3	Effect of Air Fuel Ratio on Exhaust Emission.		
	8.4	Three way catalytic convertor - Construction and working.		
	8.5	Emission norms		
Total			**64**	**80**

List of Practicals / Experiments / Assignments :-

Sr. No.	Name of Practical / Experiment / Assignment	Hrs
1	Study of general components of an automobile	02
2	Demonstration of different types of Automobile clutches	02
3	Demonstration of assembling and dismantling of torque convertor and study of power flow of automatic transmission.	02
4	Demonstration of assembling and dismantling of automobile gear box.	04
5	Study and demonstration of differential.	02
6	Tracing of starter circuit of a modern Automobile.	04
7	Assembling and dismantling of mechanical & hydraulic braking system.	04
8	To study independent & conventional Suspensions system.	04
9	Measurements of emission on Petrol and Diesel gas Analyzer & analyze results.	04
10	Study PUC Regulations in the Central Motor Vehicle Act 1988. Sections 115, 116.	04
Total		**32**

Instructional Strategy :-

Sr. No.	Topic	Instructional Strategy
Section I		
1	Classification of Automobile. Resistance to vehicle motion	Classroom teaching, Laboratory demonstration, Industrial visits, Seminar, Group Activity, Assignments.
2	Transmission system I	
3	Transmission system II	
4	Electric Systems	
Section II		
5	Steering	Classroom teaching, Laboratory demonstration, Industrial visits, Seminar, Group Activity, Assignments.
6	Braking System	
7	Suspension and shock absorber	
8	Automobile emission and its Control	

Text Books :-

Sr. No	Author	Title	Publication
1	Kirpalsing	Automobile Engg. Vol I & II	Standard Publishers Distributors
2	GBS Narang	Automobile Engineering	Khanna Publishers
3	H.M. Sethi	Automotive Technology	Tata McGraw Hill

Reference Books :-

Sr. No	Author	Title	Publication
1	Crouse Anglin	Automotive Mechanics	McGraw Hill International
2	Newton Garrett	The Motor Vehicle	Butterworth International
3	W. H. Crouse	Automobile Mechanics	Tata McGraw Hill

Learning Resources :- Manuals of different vehicles, Models, Animations from Internet.

Specification Table :-

Sr. No.	Topic	Cognitive Levels			Total
		Knowledge	Comprehension	Application	
Section I					
1	Classification of Automobile. Resistance to vehicle motion	04	02	--	06
2	Transmission system I	04	06	06	16
3	Transmission system II	05	05	--	10
4	Electric Systems	04	04	--	08
		17	17	06	40
Section II					
5	Steering	02	04	04	10
6	Braking System	03	--	06	09
7	Suspension and shock absorber	06	03	--	09
8	Automobile emission and its Control	04	04	04	12
		15	11	14	40
Total		**32**	**28**	**20**	**80**

CO-PO Matrices of course

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
1	2	-	1	2	2	2	3
2	3	2	2	2	-	2	3
3	3	3	3	2	2	2	3
4	2	-	-	-	-	-	3
5	2	2	2	2	-	2	3
6	3	3	3	2	3	2	3

Table 3.12
Enter correlation levels 1, 2 or 3 as defined below:
1**: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)***If there is no correlation, put "-"*

CO-PSO Matrices of course

CO	PSO1	PSO2
1	-	2
2	-	3
3	-	3
4	2	3
5	-	3
6	2	3

Enter correlation levels 1, 2 or 3 as defined below:
1**: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)***If there is no correlation, put "-"*

(Dr. M.J. Pable)　　　　　(Prof. S. V. Chaudhary)　　　　　(Prof. A.S. Zanpure)

Prepared By　　　　　Secretary, PBOS　　　　　Chairman, PBOS

Government Polytechnic Pune

Name of Programme : **Diploma in Mechanical Engineering**
Programme Code : **04/ 24/18**
Name of Course : **Advanced Welding Technology**
Course Code : **ME 585(Class Declaration)**
Pre-requisite : **L1**

Teaching Scheme :-

Theory / Practical	Hours / Week	Total Hours
Theory	04	64
Practical	02	32

Evaluation Scheme :-

	Progressive Assessment	Semester End Examination			
		Theory	**Practical**	**Oral**	**Term Work**
Duration	Two class tests each of 60 minutes	3Hrs.	--	--	--
Marks	20	80	--	25	25

Course Rationale :-

Advanced Welding builds on knowledge and skills developed in Welding. Students will develop advanced welding concepts and skills as they relate to personal and career development. This course integrates academic and technical knowledge and skills. Students will have opportunities to reinforce, apply, and transfer knowledge and skills to a variety of settings and problems.

Course Outcomes :-

	After studying this course, the student will be able to
1	Classify welding processes
2	Select relevant welding process for given job
3	Use of advanced welding techniques
4	Interpret the welding temperature distribution
5	Inspect the defects of welding

Course Content :-

Chapter No.		Name of Topic / Sub topic	Hrs	Weightage
		SECTION- I		
1		**Introduction**	**04**	**08**
	1.1	Importance and applications of welding, classification of welding processes. Selection of welding processes.		
2		**Brief review of conventional welding processes**	**12**	**12**
	2.1	Gas welding, Arc welding, MIG, TIG welding. Resistance welding. Electro slag welding, Friction welding etc.		
	2.2	Welding of MS, sCI, Al, and Stainless steel & Maurer/Schaefflar Diagram. Soldering & Brazing.		

3	3.1	**Advanced welding Techniques**		**16**	**20**
		Principle, working and application of advanced welding techniques.			
	3.2	Plasma Arc welding, Laser beam welding, Electron beam welding, Ultrasonic welding.			
	3.3	Principle, working and application of advanced welding techniques such as explosive welding/ cladding, Underwater welding, Spray-welding / Metallising, Hard facing.			
		SECTION- II			
4		**Thermal and Metallurgical consideration**		**08**	**12**
	4.1	Thermal considerations for welding,			
	4.2	Temperature distribution, Analytical/Empirical analysis/formulae, heating & cooling curves.			
	4.3	Metallurgical consideration of weld, HAZ and Parent metal, micro & macro structure.			
	4.4	Solidification of weld and properties.			
5		**Welding automation and precision welding processes**		**12**	**14**
	5.1	Welding fixtures, welding automation and robotic applications.			
	5.2	Welding of plastics, ceramics and composites.			
	5.3	Frictions stir welding, under-water welding, quality assurance in welding, welding fumes and their effect on the environment.			
6		**Weld Design**		**12**	**14**
	6.1	Welding machines/equipments and its characteristics and arc-stability,			
	6.2	Weld defects and distortion and its remedies			
	6.3	Inspection/testing of welds, Weld Design			
		Total		**64**	**80**

List of Practicals / Experiments / Assignments :-

Sr. No.	Name of Practical / Experiment / Assignment	Hrs
1	Survey on various advance welding equipments and selection criteria, specifications and manufacturers	03
2	Listing of welding electrodes for advanced welding processes and their application	03
3	Assignments on testing of weld joints.	03
4	Assignments on safe practices in welding	03
5	Assignments on weldability of various materials.	04
6	Industrial visit to small scale fabrication units.	08
7	Industrial visit to large scale industry.	08
	Total	**32**

Instructional Strategy :-

Sr. No.	Topic	Instructional Strategy
	Section I	
1	Introduction	(Common for all)
2	Brief review of conventional welding process	
3	Advanced welding Techniques	Classroom teaching, Charts, Models, actual working engines, Internet.
	Section II	
4	Thermal and Metallurgical consideration	(Common for all)
5	Welding automation and precision welding processes	
6	Weld Design	Classroom teaching, Charts, Models, actual working engines, Internet.

Learning Resources :- Charts, models, Video cassette

Reference Books :-

Sr. No	Author	Title	Publication
1	O. P. khanna	A Text Book of Welding Technology	Dhanpat Rai & Sons.
2	R.S. Parmar	Welding Engineering and Technology	Khanna Publishers
3	M. Bhattacharyya	Weldment Design	The Association of Engineers, India Publication, Kolkata.
4	J.C. Lippold and D.J. Kotecki,	Welding Metallurgy and Weldability of Stainless Steels,	Wiley-India (P) Ltd., New Delhi
5	Udin, Funk and Wulf	Welding for Engineers	John Wiley and Sons
6		Welding Hand Book	

Learning Resources: Charts, models.

Specification Table :-

Sr. No.	Topic	Cognitive Levels			Total
		Knowledge	Comprehension	Application	
1	Introduction	05			05
2	Brief review of conventional welding process	06	04	07	17
3	Advanced welding Techniques	04	06	08	18
4	Thermal and Metallurgical consideration	03	05	06	14
5	Welding automation and precision welding processes	03	05	06	14
6	Weld Design	04	06	02	12
	Total	25	26	29	80

CO-PO Matrices of course

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
1	3	1	-	1	-	2	3
2	2	1	-	1	-	2	3
3	2	1	-	1	-	2	3
4	2	1	-	1	1	2	3
5	2	1	-	1	1	2	3

Table 3.12
Enter correlation levels 1, 2 or 3 as defined below:
1**: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)***If there is no correlation, put "-"*

CO-PSO Matrices of course

CO	PSO1	PSO2
1	-	1
2	-	1
3	-	1
4	-	1
5	-	1

Enter correlation levels 1, 2 or 3 as defined below:
1**: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)***If there is no correlation, put "-"*

(Dr. Sunil Adhau) (Prof. S. V. Chaudhary) (Prof. A.S. Zanpure.)

Prepared By Secretary, PBOS Chairman, PBOS

Government Polytechnic Pune

Name of Programme : **Diploma in Mechanical Engineering**
Programme Code : **04/ 24/18**
Name of Course : **Mechatronics**
Course Code : **ME 586(Class Declaration)**
Pre-requisite : **L1**

Teaching Scheme :-

Theory / Practical	Hours / Week	Total Hours
Theory	04	64
Practical	02	32

Evaluation Scheme :-

	Progressive Assessment	Semester End Examination			
		Theory	Practical	Oral	Term Work
Duration	Two class tests each of 60 minutes	3Hrs.	--	--	--
Marks	20	80	--	25	25

Course Rationale :-

Modern manufacturing industries have complex processes. A technician working in production department has to deal with various complex processes related to automation& control for the same to increase the productivity. This course is being introduced so as to enable the students to get the knowledge & design of robots & various mechatronics systems.

Course Outcomes :-

	After studying this course, the student will be able to
1	Identify different instruments, sensor, actuators, microprocessor, software and mechanical components in mechatronics based systems.
2	Use sensor for different mechatronics applications.
3	Use transducers for different mechatronics based applications.
4	Use actuator for various mechatronics based applications.
5	Programme PLC for various applications.
6	Use microprocessor and microcontroller for various mechatronics based applications.

Course Content :-

Ch. No.		Name of Topic / Sub topic	Hrs	Weightage
		SECTION -I		
1		**Introduction to Robotics**	06	08
	1.1	Introduction, history		
	1.2	Laws of robotics, definitions		
	1.3	Robotic system, Six axes PUMA robot, SCARA robot		
	1.4	Robot manipulator arm		
	1.5	Revolute pair		
2		**Construction of Robot**	12	16

	2.1	Robot co-ordinate systems, work envelopes		
	2.2	Robot wrists		
	2.3	Robot end effectors-Mechanical grippers, magnetic grippers, vacuum grippers, adhesive grippers		
	2.4	Robot actuators-pneumatic, hydraulic, electric		
	2.5	Robotic control systems-non-servo system, positional servo system		
	2.6	Motion control of robots- PTP & continuous path control		
3		**Programming methods &applications of robot**	**14**	**16**
	3.1	Programming methods-lead through, teach pendent, textual programming		
	3.2	Robot sensors-Tactil, non-tactile		
	3.3	Robot I/O interfaces, Human systems & robotics		
	3.4	Specification of robots,		
	3.5	Safety measures in robotics		
	3.6	Applications of robots in industry-Pick & place, machine loading & unloading, assembly, inspection, welding		
	3.7	Accuracy & repeatability of robot		
	3.8	Cost justification of robot		
		SECTION -II		
4		**Introduction to mechatronics**	**12**	**14**
	4.1	Roll of mechatronics, scope,		
	4.2	Basic design elements		
	4.3	Sensors & transducers-classification, selection ,		
	4.4	Types- LVDT, strain gauges, thermistors, pressure transducers-bellows, piezoeletric		
5		**Signal conditioning**	**10**	**14**
	5.1	Need, types		
	5.2	OPAMP- inverting, voltage follower, adder, subtractor, integrator		
	5.3	Convertors, maintenance of circuit		
	5.4	Actuators- mechanical, hydraulic, pneumatic, stepper motors, servomotors		
6		**Mechatronics Systems**	**10**	**12**
	6.1	MEMS (Micro electro mechanical systems)		
	6.2	Elements of MEMS		
	6.3	Applications, advantages of MEMS		
	6.4	Micromachining		
	6.5	Microprocessors, I/O systems		
		Total	**64**	**80**

NOTE: The students are supposed to select at least two topics from the syllabus to give seminar / presentation in group.

List of Practicals / Experiments / Assignments :-

Sr. No.	Name of Practical / Experiment / Assignment	Hrs
1	Assignment on PUMA & SCARA robot	02
2	Assignment on elements of robot& control systems of robot	06
3	Assignment on programming methods & applications of robot	06
4	Assignment on sensors & transducers	06
5	Assignment on OPAMP & actuators	06
6	Assignment on mechatronic system	06
Total		**32**

Instructional Strategy :-

Sr. No.	Topic	Instructional Strategy

1.	Introduction to Robotics	Lecture, Demonstration & Discussion
2.	Construction of Robot	Lecture, Demonstration & Discussion
3.	Programming methods & applications of robots	Lecture, Demonstration & Discussion
4.	Introduction to mechatronics	Lecture, Demonstration & Discussion
5.	Signal conditioning	Lecture, Demonstration & Discussion
6.	Mechatronic systems	Lecture method, Demonstration

Reference Books :-

Sr. No	Author	Title	Publication
1	S.R. Deb	Robotics Technology& Flexible Automation	Mc - Graw Hill Co., USA
2	Yorem korean	Robotics for Engineers	Mc - Graw Hill Co., USA
3	Groover,Weiss	Industrial Robotics	Mc - Graw Hill Co., USA
4	K.S.Fu, C.S.G.Lee	Robotics	Mc - Graw Hill Co., USA
5	M.P. Groover	Automation,Production systems & CAM	Prentice Hall
6	J.G. Joshi	Mechatronics	

Learning Resources :- Books, Models

Specification Table :-

Sr. No.	Topic	Cognitive Levels			Total
		Knowledge	Comprehension	Application	
SECTION -I					
1	Introduction to Robotics	08	--	--	08
2	Construction of Robot	06	06	04	16
3	Prog. Methods & Applications of Robots	04	04	08	16
	Total	18	10	12	40
SECTION -II					
4	Introduction to Mechatronics	08	06	--	14
5	Signal conditioning	06	04	04	14
6	Mechatronics systems	04	04	04	12
	Total	18	14	08	40
	Total	36	24	20	80

CO-PO Matrices of course

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
1	2	-	-	1	1	-	2
2	2	-	-	1	-	1	2
3	1	-	-	1	-	-	2
4	1	-	-	1	-	-	2
5	3	-	-	2	1	2	3
6	2	-	-	1	1	1	3

Table 3.12

Enter correlation levels 1, 2 or 3 as defined below:
1**: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)***If there is no correlation, put "-"*

CO-PSO Matrices of course

CO	PSO1	PSO2
1	-	1
2	-	-
3	-	-
4	-	-
5	3	3
6	2	2

Enter correlation levels 1, 2 or 3 as defined below:
1**: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)***If there is no correlation, put "-"*

(Dr. S.S. Deshpande)   (Prof. S. V. Chaudhary)   (Prof. M.S.Deshmukh.)
Prepared By   Secretary, PBOS   Chairman, PBOS

Name of Programme	:	**Diploma in Mechanical Engineering**
Programme Code	:	**04/ 24/18**
Name of Course	:	**Computer Aided 3 D Modeling**
Course Code	:	**ME587(Class Declaration))**
Pre-requisite	:	**L1**

Teaching **Scheme** :-

Theory / Practical	Hours / Week	Total Hours
Theory	**02**	**32**
Practical	**04**	**64**

Evaluation **Scheme** :-

	Progressive Assessment	**Semester End Examination**			
		Theory	**Practical**	**Oral**	**Term Work**
Duration	Two Practical tests	--	--	--	--
Marks	**50**	--	**50**	--	**50**

Course **Rationale** :-

The market driven economy demands frequent changes in product design, data collection, analysis & retrieval at much faster rates. Computers play very important role in this diversified fields such as CAD, CAM, CIM and simulation etc. It is essential for a Diploma Technician to have a knowledge regarding the latest drafting software used in the industries and to acquire skill in operating different software's available such as Pro-E, Catia, Solid Works, and Edge Cam etc. Keeping in view the tasks to be performed by an Engineer working at various levels and to cater the basic requirements of his professional career.

Course **Outcomes** :-

	After studying this course, the student will be able to
1	Use parametric solid modeling software workspace & interface.
2	Draw 2D sketch using sketcher workbench tools of parametric solid modeling software.
3	Develop 3D solid model from sketch using part workbench tools of parametric solid modeling software
4	Assemble various parts using Assembly workbench tools of parametric solid modeling software
5	Generate various orthographic views of parts & assemblies using drawing workbench tools of parametric solid modeling software

Course **Content** :-

Chapter No.		Name of Topic / Sub topic	Hrs	Weightage
		Section I		
1		**Introduction to 3-D software GUI**		

	1.1	Tool bars:-Standard Toolbar, Sketch Toolbar, Relationship Toolbar ,View Toolbar, Drawing Toolbar, Feature Toolbar, Annotation Toolbar.	02
	1.2	Feature Manger Design Tree: Design Manager, Property Manager, Configuration Manager.	
	1.3	Selection Method: Selection From Design Tree, Graphic Area	
2		**Sketching With 3-D software**	
	2.1	Sketch Plane, Grid and units, Edit and modify sketch, Sketch relations, Adding and changing geometric relations.	04
	2.2	Dimensioning: Vertical and horizontal dimensioning, aligned, angular, circular sketches.	
	2.3	Reference Geometry : Creating axis, Creating reference planes	
3		**Part Modeling**	
	3.1	Creating Features : Extrude, Cut Extrude, Holes, Revolve, Shell, Loft, Sweep, Draft, Fillet, Chamfer, and Hole Wizard.	04
	3.2	Creating Feature Pattern: Circular Pattern, Rectangular Pattern, Through Sketch.	
4		**Editing and Modifying Part Model**	
	4.1	Feature Manager Design Tree, Editing a Feature definition, Editing sketch of the part model,	10
	4.2	Move and copy Features, Suppress, Rollback, Part colour, Mass properties. .	
5		**Assembly**	
	5.1	Assembly Toolbar, Feature Manager design tree conventions	08
	5.2	Mate components , Align concentric, parallel. Calling part model into assembly from library.	
6		**Drawings**	
	6.1	Creating Drawings & Sheet setup.	04
	6.2	Adding dimensions, Bill of Material, Standard three views, Sectional views, auxiliary views, detailed views, exploded views.	
	6.3	Page Setup, Print selection, Print preview and Print document	
		Total	32

List of Practicals / Experiments / Assignments :-

Sr. No.	Name of Practical / Experiment / Assignment	Hrs
1	Introduction to 3-D environment & it's components	**04**
2	Draw sketches of the machine parts using 3-D software (Minimum 05)	**06**
3	Create parts using features extrude, cut, rib etc. (Minimum 10)	**06**
4	Create parts using revolve, chamfer, fillet, sweep, loft, etc. (Minimum05)	**10**
5	Part modeling using reference axis and planes, editing and modifying the Parts, patterns circular and rectangular. (Minimum 05)	**08**
6	Create assemblies of the parts designed. (Minimum 02)	**14**
7	Create drawing views of the parts and the assemblies. (Minimum 02	**12**
8	Plot/print the Drawings with dimension and annotations(Minimum02)	**04**
	Total	**64**

Instructional Strategy :-

Sr. No.	Topic	Instructional Strategy
1	Introduction to 3-D software GUI	Lecture, Explanation, demonstration on Computer with any (at least one)3-D modeling software e.g PROE/CATIA/ UNIGRAPHICS etc. with the help of LCD projector
2	Sketching With 3-D software	
3	Part Modeling	
4	Editing and Modifying Part Model	

5	Assembly	Lecture, Explanation with the help of model, Discussion (group), Demonstration on Computer with any (at least one)3-D modeling software such as PROE/ CATIA/ UNIGRAPHICS etc. with the help of LCD projector
6	Drawings	

Reference Books :-

Sr. No	Author	Title	Publication
1	CATIA v5R19/R20	Prof. Sham Tickoo	Dreamtech Press
2	Pro/ENGINEER Wildfire 5.0	Prof. Sham Tickoo	Dreamtech Press
3	CAD/CAM	M.Groover	Pearson Education

Specification Table :-

No Theory Exam hence not Applicable.

CO-PO Matrices of course

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
1	2	2	1	-	-	1	2
2	2	2	1	-	-	1	2
3	3	3	1	-	-	1	2
4	3	3	1	-	-	1	2
5	3	3	1	-	-	1	2

Table 3.12
Enter correlation levels 1, 2 or 3 as defined below:
1**: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)***If there is no correlation, put "-"*

CO-PSO Matrices of course

CO	PSO1	PSO2
1	3	-
2	3	-
3	3	-
4	3	-
5	3	-

Enter correlation levels 1, 2 or 3 as defined below:
1**: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)***If there is no correlation, put "-"*

(Prof. P.U.Garge)	(Prof. S. V. Chaudhary)	(Prof. A. S. ZANPURE)
Prepared By	Secretary, PBOS	Chairman, PBOS