SCOPE OF DIPLOMA IN MECHANICAL ENGINEERING.

Mechanical, the versatile branch of engineering plays a cardinal role for multifaceted, rapid and sustainable socio-economic development of the nation covering each and every aspect of human life. It is concerned with the power generation, production, design and manufacturing, fabrication, automobile, refrigeration and air-conditioning, quality assurance, quality control etc. It is a bedrock upon which the survival and prosperity of whole industrial world rests.

We live in a world of constant change and globalization has changed the ways of organization functions. Customers occupy the focus of business and there is utmost need for an organization to become more creative with the ability to generate marketable products, practices and processes. Today prime motive of the industries is cost reduction, enhanced productivity, technology integration, automation and value addition. To be in tune with the industrial environment. The strong, innovative and well-qualified technical manpower is pre-requisite. They must be able to design and give solutions to the problems in the real world.

Tremendous progress has been made in the field of mechanical engineering such as innovation in design. Tools, equipments and materials with the help of state of art products and services.

This demands technicians of multiple skills and knowledge facets. The blend of mechanical with other branches as a wide professional practice has experienced the surge of growth and outcome of this is the transformation of industries to produce heavy duty sophisticated machine tools and equipments having higher precision and functionality. This made technicians and engineers from mechanical to adopt interdisciplinary and integrated approach. Such type of technicians and engineers is the demand of today's industrial world. Therefore the diploma in mechanical engineering envisages in developing competent technicians with a number of professional skills who can perform their jobs in the industries or as an entrepreneurs effectively and efficiently. In industries, in small businesses or in educational establishments, the mechanical technicians with necessary skills will be able to plan, maintain, design and manufacture, handle advanced machineries and equipments, deliver management functions and have a capacity to improve the existing system and develop new methods.

Mechanical engineering is a perennial flow of advanced technology stream and the most crucial component with great potential for adding value to the products and services for contributing to the national economy. Thus mechanical engineering has become an integral part of every aspect of human progress.

AREAS OF EMPLOYMENT/WORK

S. No.	Type of industries/ organizations	Capacity (Designation) in which employed
1	Self owned industry	Entrepreneur/proprietor/Design engineer/Production executive/ Unit In charge/ Stores Officer
2	Private /Public Limited Companies	Supervisor, Technician, Maintenance Engineer, Quality control Engineer, Vendor development engineer, Store manager, Planning engineer, Development engineer, Design engineer, Marketing Executive, Testing and quality assurance engineer, computer engineer, CAD Designer, Shift engineer
3	Banks, financial corporation	Sales executive, Product Development Executive, surveyor, recovery executive, system in charge, project manager, software development engineer, system maintenance engineer
4	Indian Railways	Loco Pilots, production engineers, Maintenance engineer, Quality control engineer, supervisor, testing and QC Manager
5	Indian army	Junior Technical Officer (Short and Long term commissions)
6	Indian Air force	Ground technicians, Ground engineers
7	Automobile Industries	Production supervisor, Vehicle testing Engineer, Engine testing engineer, Vehicle quality assurance executive, CAD CAM Engineer,
8	Transport Department	Assistant Motor Inspector (AMVI)
9	Indian Merchant Navy	Junior Technical Officer (Mechanical)
10	Communication Sector	Junior Telecom Officer (Mechanical), Marketing engineer
11	Entrepreneur	Proprietor

JOB FUNCTIONS

Sr. no.	Designations of the diploma holders in various employment	Job functions
1	Entrepreneur	Project Management Plan, estimate, procure and install hardware and software systems. Analyze and design systems Administer and manage networks Marketing skills
2	Supervisor/ Production Engineer/ Production Manager	Supervisor production Plan and execute production schedule Arrange for material and tools supplied for production Supervise and guide workers for quality production Train the workers for new production process/ operations Ensure quality in production Handle labour problems Ensure safety in production Maintenance of progress of production
3	Maintenance engineer	Prepare schedule for preventive as well as routine maintenance Organize physical as well as human resources for implementation of maintenance Execute maintenance work as per schedule Obtain / make progress report of maintenance at regular intervals and report to higher authorities
4	Quality control / inspection/ quality assurance engineer	Applications of statistical methods to check quality of production Apply and monitor the quality systems like KAIZEN, CANBAN, ZERO DEFECT systems TQM on shop floor Inspection of quality control from raw material procurement to finished goods Monitor Just In Time Procurement method Guidance to operators at intermediate stages of production To attain Total Quality Management Educate operators about global quality concept and customer focused quality aspects
5	Sales /marketing engineer	Execute the marketing strategies of product Interact with customers and sale the product Plan and participate in marketing campaign of

		product Carry out market survey Plan for selling for achieving the targets of product
6	CAD./ CAM engineer/R &D engineer	Make the product/ part drawing in CAD software like PRO-E, CATIA, SolidWorks and Auto CAD etc Modeling of the parts and assemblies Make the CNC programmes from component parts, CAD drawing and execute production cycles on the machines Interact with production and other departments for feedback of design
7	Loco Pilots	Run the loco trains as per schedules Plan and make regular operational maintenance Follow safety procedures during loco driving
8	Junior Technical Officer (Indian Army)	Operate/ test the mechanical equipment in army like engines of trucks jeeps. Tanks cannon, generator Maintain the mechanical equipments of armed forces Participate in war front and operate / maintain the mechanical equipment
9	Ground engineer / Technician (Indian Air Force)	Operate and maintain mechanical equipment of air force like engines, turbines, cranes etc. Regularly maintain the above mentioned equipment Participate in war front and maintain above equipment
10	Assistant Regional Transport Officer (ARTO)	Control the transportation activities Act as license, Registration and vehicle passing authority Control the pollution by automobiles by regulating PUC norms
11	Junior telecom officer	Erection/ maintenance of Telecom systems and Telephone exchange networks
12	Junior Technical Officer (Navy)	Operate/ maintains various boilers, turbine, generators on ship Maintain missile systems onboard of ships

PROGRAMME AIMS FOR DIPLOMA IN MECHANICAL ENGINEERING

1. Development of personality, communication and generic skills in the Mechanical Engineer.
2. Acquiring working knowledge of engineering science.
3. Acquiring working knowledge of engineering mechanics.
4. To prepare and interpret product drawings as per IS code.
5. To become familiar with basic workshop processes.
6. To acquire working knowledge of various production process, metal forming and finishing process.
7. To acquire working knowledge of Heat Power Engineering areas.
8. To identify mechanisms and select the component for operation and maintenance of various machines.
9. To identify and operate maintenance of various Electrical and Electronic devices.
10. To identify and operate maintenance of various Electronics circuits and controls related to mechanical field.
11. To select, install and operate hydraulically / pneumatically operated devices, circuits, devices and pumps.
12. To acquire skills for automation applications.
13. To use computer for mechanical engineering applications.
14. To select appropriate materials and allied process for various mechanical components and applications.
15. To become conversant with professional and commercial practice.
16. To become conversant with basics of measurements and instrumentations.
17. To understand fundamentals of various thermodynamics system with a view of their effective operation and maintenance in practice.
18. To understand mechanisms used in practical machines and equipments with view of operation and maintenance of machines.
19. To get acquainted with metallurgy and manufacturing process and materials with a view to operate them effectively in practical situation.
20. To understand basics and fundamentals of industrial engineering and world class manufacturing practices so as to apply them in practice.
21. To develop logical approach for problem solving in mechanical engineering areas using programming language i.e. Visual basic, etc.
22. To understand fundamental concepts of basics of CNC machines and develop the skills of part programming.
23. To understand and get proficiency in handling the measuring instruments in the practical situations.
24. To operate and maintain the automobiles by understanding the basic and principles.
25. To understand the latest developments in software and Automation.
26. To develop Entrepreneurial skills.
27. To create environmental conscious.
28. To design press tools, forging dies, moulds, etc.
29. To interpret using with easy drawing.
30. To be able to plan the process for manufacturing a component as per part drawing.
31. To acquire the skills in 2D & 3D modeling using different software.

SALIENT FEATURES OF CURRICULUM

- Inclusion of Personality Development enhancing subject contents (DGS & PP)
- Inclusion of Implant Training as a part of curricula in two phases.
- Increased leverage on hands on skill areas (Workshop Subjects)
- Participation of Industry Expert in Curriculum Revision.
- Making Management and EDP more Interactive and Industry oriented.
- More flexibility in opting optional subjects.

DEVELOPMENT STRATEGY ADOPTED FOR CURRICULUM

INTRODUCTION

Curriculum development is a dynamic process, which is governed by the contemporary needs of the user-system. All the activities in any academic institution are guided by the curricula operating in the institution. Design of curricula and their implementation therefore requires utmost attention of one and all for its effectiveness.

It was felt that design, review/revision should be based on scientific principles of educational technology and theories of learning and it must reflect the needs, expectations and aspirations of stakeholders/ clients in the technician education system. These needs of user system mainly fall in the following four domains namely

- Personal development domain
- Social development domain
- Continued learning skills domain
- Earning to live' or 'Professional Skills' development domain

.

Curriculum is designed on competency based. All competencies needed for mechanical diploma holder is first listed. Based on this structure of curriculum is prepared. Attempts have been made in this document to address to the expectations of the user system from the Diploma pass outs. If implemented in right spirit, it would pay much better dividends, it is hoped.

APPROACH TO DESIGN OF CURRICULUM

- This Curriculum has been designed on the systematic approach based on competency-based curriculum of educational technology and theories of learning. The data is collected in following ways

- Feedback from industry/alumni.
- Search conference.

- Feedback of staff
- Past experience of 3 years.
- Through observational records
- By study of documents used in industries, expert reports, newspapers and trade literatures etc., their views on different aspects of the curriculum.
- Through a series of discussions in programme committee.

Taking into account the knowledge, skills/competencies, attitudes etc. required to be possessed by the diploma pass outs the content of different courses is designed.

While designing the curriculum emphasis is given on following points.

- New/emerging technologies being used in the world of work.
- Personal values and social skills required to be possessed.
- Skills related to life-long learning and independent study.
- Professional skills required for different jobs along a career path.

Describing roles/ functions of a technician

A technician, say for example in a medium size engineering enterprise, working at middle level management position may have to carry out jobs in different departments. These are identified as

- Installation, inspection, production & control
- Repair & maintenance
- Marketing and sales
- Purchase & Store
- Observation at Site
- Analysis, Design and Costing.
- Research & development

Designing content of each curriculum area

- Different courses are categorized as
  - Foundation Level
  - Basic Level
  - Allied Level
  - Applied Level
  - Diversified Level
- Curriculum scheme of each course along with course code is given at the beginning
- Competencies to be developed are identified and written.
- Rationale of each course is highlighted.
- Objectives of each course are highlighted and written.
- Content outline in descriptive form was derived. Generally the content outline of a subject was divided into chapters and then from chapters into topic outline.

- Having derived the total content outlines i.e. Theory. At the end of the theory content list of practical is added for each course, following were arrived at by consensus-
    - Time required by a teacher to teach the prescribed theory and practical parts
    - Number of courses per term to be taken.
    - Total no. of hours required to teach the entire course.
    - Total no. of lectures and practical per week.

- Approach to the assessment of student's learning and types of assessment techniques to be used were decided. An assessment scheme was designed, which is a suitable mix of (a) continuous evaluation of term-work (b) progressive test (c) Term end examination.

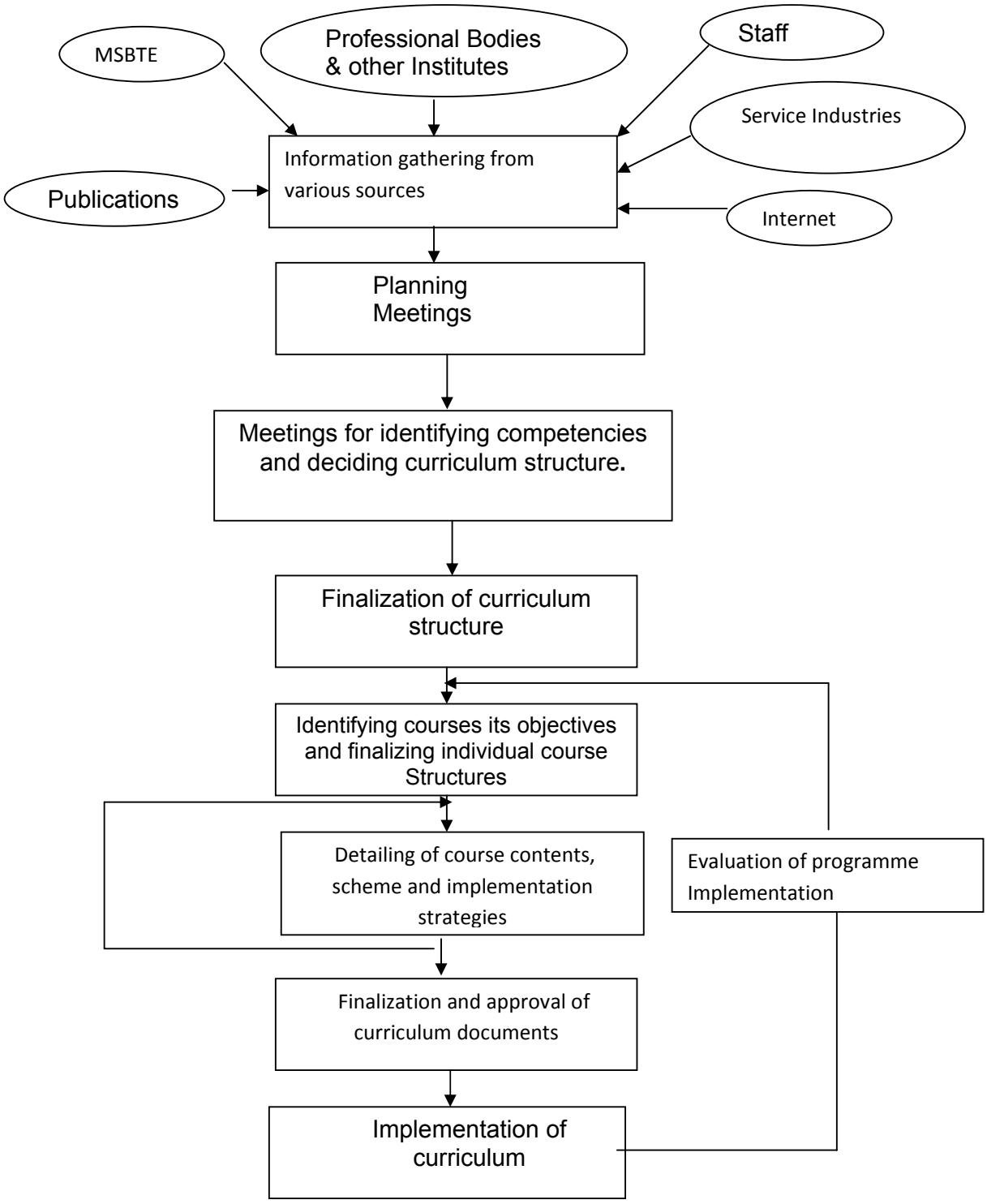
- Implementation strategies for each subject were identified.

- Learning resources for students were prescribed such as
    - Teacher's lecture notes
    - Basic text-book covering most of the topics in the curriculum and other books
    - Monographs, handbooks, periodicals, articles, journals etc.
    - Data-books, manuals, standards etc

  In all these activities, views of senior teachers regarding relevance of course contents and implementation strategies being presently followed are sought.

DEVELOPING/ FINALISING A PROGRAMME STRUCTURE

Programme structure consisting of teaching and examination schemes was finally arrived at through consensus. The approach followed for curriculum development is shown diagrammatically as follows:-



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PROGRAMME STRUCTURE

Programme: Diploma in _MECHANICAL ENGINEERING

Level: 1 Foundation Level Courses

FOUNDATION LEVEL												
Sr. No.	**Course Code**	**Course Name**	**Teaching Scheme**				**Examination Scheme**					
			Th	**Pr**	**Cr**	**Term**	**PT**	**Th**	**Pr**	**Tw**	**Or**	**Total**
1	5G101	Basic Mathematics(BMT)	4	0	4	I	20	80	0	0	0	100
2	5G102	Engineering Mathematics (EMT)	4	0	4	II	20	80	0	0	0	100
3	5G103	Engineering Physics (EPH)	3	2	5	II	20	80	25	25	0	150
4	5G104	Engineering Chemistry (ECH)	3	2	5	I	20	80	25	25	0	150
5	5G105	Work Shop Practice	0	3	3	I	0	0	0	50	0	50
6	5G106	Engineering Graphics	2	2	4	I	0	0	50	50	0	100
7	5G107	Basics of computer system	1	2	3	I	0	0	50	50	0	100
			17	11	28		80	320	150	200		750

Scheme at Glance:

Total number of courses offered : 7
Number of Compulsory Courses : 7
Number of Optional Courses : Nil
Total Courses : 7
Total Credits : 28
Total Marks : 750

G-COURSES COMMON TO ALL BRANCHES
R-COURSES COMMON TO MECHANICAL AND AUTOMOBILE
Q- COURSES COMMON TO MECHANICAL, AUTOMOBILE AND CIVIL
M-COURSES FOR MECHANICAL ONLY

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Programme: Diploma in MECHANICAL ENGINEERING

Level: 2 Basic Level Courses

Sr. No	Course Code	Course Name	Teaching Scheme				Examination Scheme					
			Th	Pr	Cr	Term	PT	Th	Pr	Tw	Or	Total
1	5R201	Engineering Drawing	2	4	6	II	0	0	50	25	0	75
2	5M202	Manufacturing Processes	2	4	6	IV	20	80	50	50	0	200
3	5M203	Measurement & Controls	3	2	5	IV	20	80	0	25	25	150
4	5Q201	Applied Mechanics	4	2	6	II	20	80	0	50	0	150
5	5M205	Thermal Engineering	3	2	5	IV	20	80	0	25	25	150
6	5R206	Development of Life Skills	0	2	2	III	0	0	0	25	25	50
7	5R207	Professional Practices	0	2	2	IV	0	0	0	25	0	25
8	5R208	Mechanical Technology	2	3	5	II	20	80	0	25	25	150
9	5Q202	Strength Of Materials	3	2	5	III	20	80	0	25	25	150
			19	23	42		600		500			1100

Scheme at Glance:

Total number of courses offered : 9
Number of Compulsory Courses : 9
Number of Optional Courses : Nil
Total Courses : 9
Total Credits : 42
Total Marks : 1100

G-COURSES COMMON TO ALL BRANCHES
R-COURSES COMMON TO MECHANICAL AND AUTOMOBILE
Q- COURSES COMMON TO MECHANICAL, AUTOMOBILE AND CIVIL
M-COURSES FOR MECHANICAL ONLY

DEPT.COORDINATOR HOD CDC INCHARGE

Level : 3 Allied Level Courses

Sr. No.	Course Code	Course Name	Teaching Scheme				Examination Scheme					
			Th	Pr	Cr	Term	PT	Th	Pr	Tw	Or	Total
1	5G301	English	2	2	4	I	20	80	0	25	0	125
2	5G302	Communication Skills	1	2	3	II	0	0	0	50	25	75
3	5R301	Basics of electrical Engineering and Electronics	4	2	6	IV	20	80	0	50	0	150
4	5G304	Environmental Science	2	0	2	IV	0	0	0	50	0	50
5	5G305	Industrial Management	3	2	5	V	20	80	0	25	25	150
6	5G311 to 5G325	Non- Exam	0	2	2	II	0	0	0	0	0	0
7	5G311 to 5G328	Non-Exam	0	2	2	III	0	0	0	0	0	0
8	5G303	Entrepreneurship Development	2	2	4	III	0	0	0	25	25	50
			14	14	28		300			300		600

Scheme at Glance:

Total number of courses offered : 8
Number of Compulsory Courses : 6
Number of Optional Courses : 2
Total Courses : 8
Total Credits : 28
Total Marks : 600

G-COURSES COMMON TO ALL BRANCHES
R-COURSES COMMON TO MECHANICAL AND AUTOMOBILE
Q- COURSES COMMON TO MECHANICAL, AUTOMOBILE AND CIVIL
M-COURSES FOR MECHANICAL ONLY

DEPT.COORDINATOR HOD CDC INCHARGE

Level: 4 Applied Level Courses

Sr. No	Course Code	Course Name	Teaching Scheme				Examination Scheme					
			Th	Pr	Cr	Term	PT	Th	Pr	Tw	Or	Total
1	5R401	Fluid Power	3	2	5	III	20	80	0	25	25	150
2	5R402	Machine Drawing	2	4	6	IV	20	80	0	50	25	175
3	5R403	Project	0	4	4	VI	0	0	0	100	50	150
4	5R404	Seminar	0	2	2	V	0	0	0	50	50	100
5	5M405	Heat Power Engineering	3	2	5	V	20	80	0	25	25	150
6	5R406	Theory of Machines	3	2	5	III	20	80	0	25	25	150
7	5R407	3-D Modeling	1	2	3	VI	0	0	0	50	50	100
8	5M408	Computer Integrated Machining	1	2	3	V	0	0	0	50	25	75
9	5M409	Advanced Manufacturing Processes	3	4	7	V	20	80	0	25	25	150
10	5M410	Tool Engineering	3	2	5	V	20	80	0	25	25	150
11	5R411	Mechanical Engineering Materials	3	2	5	III	20	80	0	25	25	150
12	5R412	Industrial visit	0	2	2	IV	0	0	0	50	0	50
ELECTIVE												
Sr. No	**Course Code**	**Course Name ELECTIVE ANY ONE GROUP I & II**	**Teaching Scheme**				**Examination Scheme**					
			Th	**Pr**	**Cr**	**Term**	**PT**	**Th**	**Pr**	**Tw**	**Or**	**Total**
		GROUP A (Any one)										
1	5M414	Power plant Engineering	4	2	6	V	20	80	0	25	25	150
2	5M415	Material Management	4	2	6	V	20	80	0	25	25	150
3	5M416	Refrigeration and Air-conditioning	4	2	6	V	20	80	0	25	25	150
4	5M417	Automobile Engineering	4	2	6	V	20	80	0	25	25	150
5	5R418	Advance Engineering mathematics	4	2	6	V	20	80	0	25	25	150
			26	32	58		800			900		1700

Scheme at Glance:

Total number of courses offered : 17
Number of Compulsory Courses : 12
Number of Optional Courses : 1
Total Courses : 13
Total Credits : 58
Total Marks : 1700

G-COURSES COMMON TO ALL BRANCHES
R-COURSES COMMON TO MECHANICAL AND AUTOMOBILE
Q- COURSES COMMON TO MECHANICAL, AUTOMOBILE AND CIVIL
M-COURSES FOR MECHANICAL ONLY

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Level: 5 Diversified Level Courses

S.N	Course Code	Course Name ELECTIVE ANY ONE GROUP I & II	Teaching Scheme				Examination Scheme					
			Th	Pr	Cr	Term	PT	Th	Pr	Tw	Or	Total
1	5M501	Design of Machine Elements.	4	2	6	VI	20	80	0	25	25	150
2	5R502	Metrology and Quality Control	3	2	5	VI	20	80	25	25	0	150
3	5M503	Production Engineering	3	2	5	VI	20	80	0	25	25	150
4	5R504	IC Engines	4	2	6	VI	20	80	0	25	25	150
		GROUP B (Any one)										
1	5M505	Advance Manufacturing Systems	4	2	6	VI	20	80	0	25	25	150
2	5R506	Alternative Energy Sources	4	2	6	VI	20	80	0	25	25	150
3	5M507	Marketing Management	4	2	6	VI	20	80	0	25	25	150
4	5R508	C-Programming	4	2	6	VI	20	80	0	25	25	150
5	5M509	Production Planning & control	4	2	6	VI	20	80	0	25	25	150
			18	10	28		500		250			750

Scheme at Glance:

Total number of courses offered : 9
Number of Compulsory Courses : 4
Number of Optional Courses : 1
Total Courses : 5
Total Credits : 28
Total Marks : 750

G-COURSES COMMON TO ALL BRANCHES
R-COURSES COMMON TO MECHANICAL AND AUTOMOBILE
Q- COURSES COMMON TO MECHANICAL, AUTOMOBILE AND CIVIL
M-COURSES FOR MECHANICAL ONLY

DEPT.COORDINATOR HOD CDC INCHARGE

PROGRAMME STRUCTURE AT A GLANCE:

SR. NO	LEVES	COMPULSORY COURCES	OPTIONAL COURSES	CREDITS COMP. + OPTIONAL	MARKING SCHEME		
					COMPULSORY COURSES	OPTIONAL COURSES	TOTAL
1	Foundation	07	--	28	750	--	750
2	Basic	09	--	42	1100	-	1100
3	Allied	06	02/15	28	600	-	600
4	Applied	12	01/5	58	1550	150	1700
5	Diversified	04	01/5	28	600	150	750
	TOTAL	38	4	184	4600	300	4900

Scheme at a glance:

Total number of courses offered : 63

Number of Compulsory courses : 38

Number of Optional course : 25

Total courses to be applied : 42

DEPT.COORDINATOR HOD CDC INCHARGE

(LIST OF NON EXAM COURSES)

COURSE CODE	COURSE TITLE	PRE REQ	TEACHING SCHEME				EXAMINATION SCHEME					
			TH	PR	CR	TERM	PT	TH	PR	TW	OR	TOTAL
Any two of the following												
5G311	Personality Development			02	02							
5G312	EDP(Civil Engg)			02	02							
5G313	Hobby Electronics			02	02							
5G314	Spoken English			02	02							
5G315	German			02	02							
5G316	French			02	02							
5G317	Yoga			02	02							
5G318	Music-Instrumental			02	02							
5G319	Two wheeler Maintenance			02	02							
5G320	EDP(Electrical Engineering)			02	02							
5G321	Electrical Maintenance			02	02							
5G322	Electronics Maintenance			02	02							
5G323	Computer Maintenance			02	02							
5G324	Japanese			02	02							
5G325	Music-vocal			02	02							
5G326	Aerobics			02	02							
5G327	Indian classical dance			02	02							
5G328	Sewing Machine Maintenance			02	02							

184 CREDITS
PROPOSED SAMPLE PATH (XTH)

Year - I		Year - II		Year - III	
ODD Sem.	**EVEN Sem.**	**ODD Sem.**	**EVEN Sem.**	**ODD Sem.**	**EVEN Sem.**
Course Code Course Title Credits (Th+Pr)	**Course Code Course Title Credits (Th+Pr)**	**Course Code Course Title Credits (Th+Pr)**	**Course Code Course Title Credits (Th+Pr)**	**Course Code Course Title Credits (Th+Pr)**	**Course Code Course Title Credits (Th+Pr)**
Workshop Practice (5G105) (0+3)	Engineering Physics (5G103) (3+2)	Theory of Machines (5R406) (3+2)	Mfg Process (5M202) (2+4)	Heat Power Engg (5M405) (3+2)	Production Engg (5M503) (3+2)
Basic. Mathematics (5G101) (4+0)	Applied Mechanics (5Q201) (4+2)	Fluid Power (5R401) (3+2)	Thermal Engg (5M205) (3+2)	Advance Mfg Process (5M409) (3+4)	Design of m/c Element (5M501) (4+2)
ENGINEERING CHEMISTRY (5G104) (3+2)	Engineering Mathematics (5G102) (4+0)	Strength of Material (5Q202) (3+2)	Machine Drawing (5R402) (2+4)	Tool Engg (5M410) (3+2)	PROJECT (5R403) (0+4)
Engineering Graphics (5G106) (2+2)	Communication Skill (5G302) (1+2)	Mechanical Engg. Mtrls. (5R411) (3+2)	Professional Practice (5R207) (0+2)	Elective I (Any one) (5M414-418) (4+2)	Elective II (Any one) (5M505-509) (4+2)
Basics of Computer (5G107) (1+2)	Engineering Drawing (5R201) (2+4)	Entrepreneur ship Development (5G303) (2+2)	Measurement & Control (5M203) (3+2)	Computer Integrated Machining (5M408) (1+2)	Metrology and Quality Control (5R502) (3+2)
English (5G301) (2+2)	Non exam (5G311-328) (0+2)	Development of Life Skills (5R206) (0+2)	Industrial Visit (5R412) (0+2)	Seminar (5R404) (0+2)	I.C.Engines (5R504) (4+2)
	Mechanical Technology (5R208) (2+3)	Non Exam (0+2) (5G311-328)	Environmental Science (5G304) (2+0)	Industrial Management (5G305) (3+2)	3 D Modelling (5R407) (1+2)
			Basic of Electrical Engg and Etx (5R301) (4+2)		
23	**31**	**28**	**34**	**33**	**35**
Total Credits	**184**				

SAMPLE PATH (10th Pass Students)
PTD

Year - I		Year - II		Year - III		YEAR IV	
ODD Sem.	**EVEN Sem.**	**ODD Sem.**	**EVEN Sem.**	**ODD Sem.**	**EVEN Sem.**	**ODD**	**EVEN**
Course Title Credits (Th+Pr)	**Course Title Credits (Th+Pr)**	**Course Title Credits (Th+Pr)**	**Course Title Credits (Th+Pr)**	**Course Title Credits (Th+Pr)**	**Course Title Credits (Th+Pr)**	**Course Title Credits (Th+Pr)**	**Course Title Credits (Th+Pr)**
Basic. Mathematics (5G101) (4+0)	Engineering Physics (5G103) (3+2)	Theory of Machines (5R406) (3+2)	Thermal Engg (5M205) (3+2)	Machine Drawing (5R402) (2+4)	Design of m/c Element (5M501) (4+2)	Tool Engineering (5M410) (3+2)	Elective-II(5M505 TO 5M509) (4+2)
ENGINEERING CHEMISTRY (5G104) (3+2)	Entrepreneurship Development (5G303) (2+2)	Engg. Drawing (5R201) (2+4)	Basic of Electrical Engg and Etx (5R301) (4+2)	Development of Life Skills (5R206) (0+2)	Advanced Manufactu -ring Processes (5M409) (3+4)	Elective- I (5M414-5M418) (4+2)	MQC (5R502) (3+2)
Engineering Graphics (5G106) (2+2)	Engineering Mathematics (5G102) (4+0)	Environmental science (5G304) (2+0)	SOM (5Q202) (3+2)	Measurement and Control (5M203) (3+2)	Computer Integrated Machining (5M408) (1+2)	Seminar (5R404) (0+2)	IC Engines (5R504) (4+2).
Basics of Computer (5G107) (1+2)	Communication Skill (5G302) (1+2)	Applied Mechanics (5Q201) (4+2)	Mfg Process (5M202) (2+4)	Fluid Power (5R401) (3+2)	Industrial Managem ent (5G305) (3+2)	Production Engineering (5M503) (3+2)	Project (5R403) (0+4)
English (5G301) (2+2)	Mechanical Technology (5R208) (2+3)	MEM (5R411) (3+2)		Heat power Engg (5M405) (3+2)		3 D Modeling (5R407) (1+2)	
12+8 =20	12+9 =21	14+10 =24	12+10 =22	11+12 =23	11+10 =21	11+10 =21	11+10 =21
Total Credits							173

Exemptions:WP (0+3) +NON EXAM (0+4) +INDUSTRIAL VISIT (0+2) +PP (0+2)

TOTAL CREDITS EXEMPTED = 11

CONCERN TEACHER DEPT.COORDINATOR HOD CDC INCHARGE

5G101BASIC MATHEMATICS

COURSE STRUCTURE:

Teaching Scheme		Evaluation Scheme						
TH	04		PT	TEE	TW	PR	OR	Total
PR	00	Max.Marks	20	80	--	--	--	100
TOTAL	04	Duration	1.00	3.00	--	--	--	--

RATIONALE:

The subject is classified under basic sciences and intends to teach students basic facts, concepts and principles of mathematics, as a tool to analyze Engineering problems. Mathematics lies down the foundation to understand core technology subjects.

COMPETENCY STATEMENT(S):

1. To inculcate the practice of mathematic
2 Comprehend the principles of other subjects
3 Solve problems by using analytical and systematic approach.
4 The students will be able to develop process of logical thinking

CONTENTS:

COURSE CONTENTS:-

Sr.no.	Name of the Chapter / topic (Follow S.I. units)	Hours	Marks
1.	**Algebra** 1. Logarithms 1.1 Defination natural and common logarithams. 1.2 Laws of logarithams 1.3 Simple numericals. On logarithams	**04**	**04**
2.	**Determinant** 2.1 Definition of Determinant, Order of Determinant 2.2 Expansion of Determinant of order 3 2.3 Properties of Determinant 2.4Cramer's Rule (solution of simultaneous equations in three Unknowns)	**08**	**08**
3.	**Partial fractions** 3.1Definition of Rational fraction, Partial fractions, proper and improper fractions 3.2 To resolve given rational fraction into partial fractions 3.3 Denominator containing Non repeated linear factors 3.4 Denominator containing repeated linear factors	**06**	**08**

	3.5 Denominator containing irreducible non-repeated Quadratic factors		
4.	**Matrices** 4.1 Definition of matrix: Type of matrix: viz.- null, row, column, square, diagonal, scalar, unit, Triangular. 4.2 Algebra of matrices –Addition, Subtraction and Multiplication 4.3 Transpose of a matrix 4.4 Adjoint of a matrix 4.5I nverse of matrix by adjoint method	**08**	**10**
5.	**Trigonometry** 5.1 Trigonometric ratios of allied, compound and multiple angles 5.2 Trigonometric Ratios of allied angles 5.3 Trigonometric Ratios of compound angles 5.4 Trigonometric Ratios of multiple angles Product, sum and difference formulae 5.5 Sub-multiple angles.	**10**	**16**
6.	**Inverse circular functions** 6.1 Definition of Inverse circular functions 6.2 Principle values of Inverse circular functions 6.3 Simple problems	**04**	**08**
7.	**Properties of Triangles** 7.1 Sine rule, Cosine rule, 7.2 Tangent rule(without proof)Simple problems	**06**	**06**
8.	**Calculus** 8.1Cartesian products of sets. 8.2Definition of relation,definition of fuction, real valued fuction,domain,co-domain of a fuction. 8.3 Types of Fuctions. 8.4 value of the fuction at given point. 8.5 composite fuction.	**08**	**08**
9.	**Limits** 9.1Definition and concept of limit Limits of algebraic functions 9.2 Limits of trigonometric functions 9.3 Limits of exponential functions 9.4 Limits of logarithmic functions	**10**	**12**
	TOTAL	**64**	**80**

TEXT B00KS

Sr. No	Title of Book	Author and Publication
1	Mathematics for polytechnic students for first year	By S.P.Deshpande
2	Mathematics for polytechnic students for first year	By G.V.Kumbhojkar
3	Mathematics for polytechnics	By TTTI Bhopal
4	Applied Mathematics	By Gore and Patil
5	Trigonometry Part I	By Loney

5G102- ENGINEERING MATHEMATICS

COURSE STRUCTURE:

RATIONALE:
The subject is classified under basic sciences and intends to teach students basic facts, concepts and principles of mathematics, as a tool to analyze Engineering problems.

Teaching Scheme		Evaluation Scheme						
TH	04		PT	TEE	TW	PR	OR	Total
PR	00	Max.Marks	20	80	--	--	--	100
TOTAL	04	Duration	1.00	3.00	--	--	--	--

Mathematics lies down the foundation to understand core technology subjects.

COMPETENCY STATEMENTS:

To inculcate the practice of mathematic
Comprehend the principles of other subjects
Solve problems by using analytical and systematic approach.

COURSE CONTENTS:-

TOPIC NO	Name of the Chapter / topic (Follow S.I. units)	Hours	Marks
1	**Derivatives** 1.1 Definition of derivative, notation. 1.2 Derivative of standard functions. 1.3 Rules of Differentiation (without proof) such aS sum, difference, product and quotient. 1.4 Derivative of composite functions. 1.5 Derivative of inverse trigonometric functions. 1.6 Derivative of implicit functions. 1.7 Derivative of parametric functions. 1.8 Logarithmic differentiation. 1.9 Second order derivatives. 1.10 Simple applications of derivative such as equation of Tangent & normal, maxima & minima, radius of Curvature.	**18**	**26**
2	**Integration** 2.1 Definition of integration. 2.2 Integration of standard function. 2.3 Rules of Integration: sum, difference & multiplication. 2.4 Methods of Integration. 2.4.1 Integration by substitution. 2.4.2 Integration by partial fraction. 2.4.3 Integration by parts. 2.5 Definition of Definite integral. 2.6 Simple problems on definite integral.	**18**	**22**
	Differential Equations 3.1 Definition of differential equation, order &degree. 3.2 Formation of differential equation.	**14**	**16**

3	3.3 Solution of Diff. equation. 3.3.1 variable separable. 3.3.2 Homogeneous equation. 3.3.3 Exact diff. equation. 3.3.4 Linear diff. equation.		
4	**Statistics** 4.1 Graphical representation: Histogram & give curve to find Mode and median. 4.2 Measures of dispersion : Range, mean deviation and Standard deviation	**06**	**08**
5	**Probability.** 5.1 Introduction & definitions of different terms permutation & combination. 5.2 Definition of probability. 5.3 Addition Theorem of probability. 5.4 Multiplication Theorem. 5.5 Conditional probability.	**08**	**08**
	TOTAL	**64**	**80**

TEXT BOOKS:

S.No.	Name of Book	Author	Publication
1.	Mathematics for polytechnic students for second Year	S. P. Deshpande	Dhanpatrai publishing Co.
2.	Applied Mathematics	ByPatel & Rawal	S. Chand & Co., N. Delhi
3.	Fundamentals of Mathematical statistics	S.C.Gupta & Kapoor	Pune vidhyarti graham prakshan

5G103- ENGINEERING PHYSICS

COURSE STRUCTURE:

Teaching scheme		Evaluation scheme						
TH	03		PT	TEE	TW	PR	OR	TOTAL
PR	02	MAX MARKS	20	80	25	25		150
TOTAL	05	DURATION	01	03				

COMPETENCY STATEMENT:

The Student will be able to:

1. Analyze different factors on which accuracy depends.
2. Differentiate between scalars and vectors
3. Describe principle and working of Laser.
4 Differentiate between conductor, insulator and semiconductor on the basis of Band theory

RATIONALE:

Physics provides foundation for core technology subjects. Understanding of any subject is entirely depending on logical thinking and hierarchy of knowledge component. As Physics is considered as basic science its principles, laws, hypothesis, concepts, ideas are playing important role in reinforcing the knowledge of technology.

Deep thought is given while selecting topics in physics. They are different for different groups. This will provide sound background for self-development in future to cope up with new innovations. Topics are relevant to particular programme and student will be motivated to learn and can enjoy the course of Physics as if it is one of the subjects of their own stream.

Topic no	contents	hrs	Marks
	01 UNITS AND MEASUREMENTS	**07**	**12**

01	**1.1 D**efinition of unit , requirements of standard unit, , fundamental and derived quantities and their units **1.2** Definition of accuracy, precision and error, estimation of errors -absolute error, relative error and percentage error, rules and identification of significant figures. **1.3** Scalars & Vectors: Definition, laws of Vectors (Law of Triangle, law of parallelogram). **(Numerical on percentage error and significant figures, Law of parllelograms)**		
02	**KINEMATICS** **2.1 Angular Motion:** Definition of Angular displacement, angular velocity, angular acceleration, Relation between angular velocity and linear velocity, definition of S.H.M **2.2 Kinetics:** Definition of momentum,impulse,impulsive force, Statements of Newton's laws of motion with equations, Application of laws of motion-Recoil of gun, Motion of two connected bodies by light inextensible string passing over smooth pulley, motion of lift. **2.3 work power & energy.** Definition of work, power & energy equation for potential energy & kinetic energy, work done by a torque.	**08**	**10**
03	**GENERAL PROPERTIES OF MATTER** **3.1 Elasticity** Deforming force, restoring force, elastic and plastic body, and stress and strain with their types. Elastic limit, Hooke's law, Young's modulus, bulk modulus, modulus of rigidity and relation between them (no derivation), **(Numerical on stress, strain and Young's modulus)** **3.2 Surface Tension.** Molecular force, cohesive and adhesive force, Molecular range , sphere of influence, Laplace's molecular theory, Definition of surface tension and its S.I.unit,angle of contact, capillary action with examples,relation between surface tension , capillary rise and radius of capillary (no derivation),effect of impurity and temperature on surface tension **(Numerical on relation between surface tension, capillary rise and radius)** **3.3 Viscosity** Viscous force, Definition of viscosity, velocity gradient, Newton's law of viscosity, coefficient of viscosity and its S.I.	**14**	**20**

	unit, free fall of spherical body through viscous medium (no derivation) terminal velocity, Stokes law (statement and formula). **(Numerical on coefficient of viscosity and Stroke's formula)**		
04	**HEAT** **4.1 Transmission of heat and expansion of solids** Three modes of transmission of heat -conduction, convection and radiation,steady state coefficient of Thermal conductivity and its S.I. unit, Definition of linear, Aerial and cubical expansion and relation between them.(no derivation)	**02**	**04**
05	**LIGHT, LASER and SOUND** **5.1 Properties of light** Reflection, refraction, and their laws, Snell's law, physical significance of refractive index, definition of dispersion, polarization and diffraction of light along with ray diagram **5.2 LASER** Properties of laser,absorption, spontaneous and stimulated emission, population inversion,optical pumping,active system(concept and definations) construction and working of He-Ne laser,application of lasers(medical and engineering) **5.3 Sound** Definition of wave motion, amplitude, period, frequency, and wavelength, relation between velocity, frequency and wavelength , equation of progressive wave (no derivation), longitudinal and transverse wave, comparison, forced and free vibrations, definition of resonance with examples, formula for velocity of sound with end correction (no derivation) **(Numerical on relation v = nλand resonance)**	**06**	**12**
06	**ELECTROSTATICS** **6.1 ELECTROSTATICS** Coulomb's Inverse square law, intensity of electric field, Electric lines of force & their properties, flux, flux density. Statement and general equation of Ohms law - Resistances in series & parallel Specific resistance ,Principle of Wheatstone's bridge. Principle of potentiometer **6.2 ELECTRIC POTENTIAL AND ELECTRIC CAPACITANCE:** Principle of capacitance and its unit, condensers in series & parallel, (**Numericals on condensers)**	**04**	**08**
07	**SEMICONDUCTORS:** Classification of conductors,insulators,semiconductors on the basis of energy bands ,p-type & n-type semiconductor, p-n junction diode and biasing of p-n junction diode (forward and	**03**	**06**

	reverse)		
08	**MODERN PHYSICS.** **8.1 Photo electricity** Concept of photon**,** Plank's hypothesis, properties of photon, photo electric effect, Characteristics of photoelectric effect, work function, Einstein's photoelectric equation(no derivation), photoelectric cell- applications. **(Numerical on Energy of photon, work function, Photoelectric equation)** **8.2 X-rays** Introduction to x-rays, types of x-rays ,production of x-rays using Coolidge tube, minimum wavelength of x-rays,(no derivation) properties of x-rays, engineering, medical and scientific applications. **(Numerical on minimum wavelength of x-rays)**	**04**	**08**
	TOTAL	**48**	**80**

PRACTICALS

Skills to be developed

1) Intellectual skills-

_ Proper selection of measuring instruments on the basis of range, least count, precision and accuracy required for measurement.

_ Analyze properties of matter & their use for the selection of material.

_ To verify the principles, laws, using given instruments under different conditions.

_ To read and interpret the graph.

_ To interpret the results from observations and calculations.

_ To use these results for parallel problems.

2) Motor skills-

_ Proper handling of instruments.

_ measuring physical quantities accurately.

_ To observe the phenomenon and to list the observations in proper tabular form.

_ To adopt proper procedure while performing the experiment.

_ To plot the graphs.

List of Experiments:

1) To know your Physics Laboratory.

2) To use Vernier Calliper for the measurement of dimensions of given object.
3) To use Micrometer Screw Gauge for the measurement of dimensions (Thickness, Diameter) of given object.
4) To verify Hooke's Law by Searle's method and to calculate Young's modulus of elasticity of steel wire.
5) To verify Law of Parallelogram.
6) To determine coefficient of viscosity of given fluid (Glycerin) using Stoke's Method.
7) To determine the velocity of sound by using resonance tube.
8) Determination of specific resistance by Voltmeter-Ammeter method.
9) Detemination of Law of resistance in Parallel by meterbridge.
10) Comparision of E.M.F by Single Cell method.
11) Detemination of Law of resistance in series by meterbridge.

REFERENCE BOOKS:

1 Physics-I ,V. RajendranTata McGraw- Hill publication, New Delhi
2 Applied physics BY ,Arthur Beiser,Tata McGraw- Hill raw- Hill Publication, New Delhi
3 Engineering Physics by R.K.Gaur and S.L.Gupta Dhanpat Rai Publication New Delhi.
4 Fundamentals of Physics Resnick ,Halliday & Walker ,Wiley India Pvt. Ltd
5 Applied physics by G.B. Bhandarkar.Nirali publication.
6 Basic physics by Pawar and Sutar Nirali Publication
7 S Chand's Basic Physics

5G104- ENGINEERING CHEMISTRY

COURSE STRUCTURE:

Teaching scheme		**Evaluation scheme**						
TH	03		PT	TEE	TW	PR	OR	TOTAL

PR	02	MAX MARKS	20	80	25	25		150
TOTAL	05	DURATION	01	03				

RATIONALE:

Chemistry is a basic science subject which is essential to all engineering courses. It gives knowledge of engineering materials, their properties, related applications & selection of materials for engineering applications.

Due to technological progress there are hazardous effects on environment & human life. The core knowledge of environmental effects will bring awareness in students about the precautions & preventions to be taken to reduce the ill effects.

This subject will generate curiosity of carrying out further development in engineering field

COMPETANCEY STATEMENT:

The student will be able to:

1. Draw the orbital configuration of different elements.
2. Represent the formation of molecules schematically.
3. Describe the mechanism of electrolysis.
4. Identify the properties of metals & alloys related to engineering applications.
5. Identify the properties of non metallic materials, related to engineering applications.

6 Select a proper material for specific purpose.

Topic no	contents	HRS	MARKS
01	**Atomic structure** 1.1 Definition of Atom, element, molecule , introduction to different atomic theories, 1.2 Bohr's atomic theory, Fundamental Particles of Atom their Mass ,Charge,	**08**	**10**

	Location, 1.3 Atomic no, Atomic Mass no. numerical problems on it , orbit & orbitals, 1.4 Electronic configuration , electronic configuration of first 30 elements 1.5, Isotopes & Isobars, 1.6 Inert gases, Their characteristics ,electronic configuration 1.7 Molecule formation: valency, types of valency, electrovalency co valency. Its examples.Formation of Electrovalent compounds e.g. Nacl, $Cacl_2$ &$Mgcl_2$, formation of Covalent Compounds examples H_2O, Cl_2, Co_2,		
02	**Electrochemistry** 2.1 Definition & differentiation of Atom, Ion. 2.2 Ionisation & Electrolytic dissociation, Arrhenius Theory of Ionisation, Degree of Ionisation & factors affecting degree of ionization. 2.3 Introduction of Conductors, Insulators, Dielectrics, Electrolyte, NonElectrolyte, 2.4 Electrolysis, Electrolytic Cell, Electrodes. Mechanism of Electrolysis 2.5 Electrochemical Series for Cations & Anions, 2.6 Electrolysis of CuSO4 Solution by using Cu Electrode & Platinum Electrode 2.7 Faraday's first & second law of Electrolysis & numerical problems on it Applications of Electrolysis such as Electroplating & Electrorefining 2.8 Electrochemical Cells & Batteries , Types of cell Primary & secondary cell construction Working & Applications of Dry cell & Lead – Acid Storage	**06**	**12**

03	**METALLURGY** 3.1 Definition of Metallurgy, Mineral, Ore, Gangue, Flux & Slag, Occurrence of Metals, 3.2 Mechanical Properties of metals such as Hardness, Toughness, Ductility, Malleability, Tensile strength, 3.3 Stages of Extraction of Metals from its Ores in detail i.e. Crushing, Concentration, methods of concentration (physical and chemical) 3.4 Reduction of iron in blast furnace with chemical reactions, Reactions in zone of reduction and zone of absorption, 3.5 Alloys Definition of Alloy, Purposes of Making alloy. 3.6 Methods of Preparation of alloy such as fusion method & compression method 3.7 Classification of Alloys ,ferrous alloys & Non Ferrous alloys, their examples. 3.8 Composition, Properties & Applications of Alnico, Duralumin, Dutch Metal, German Silver / Nickel Silver, Gun Metal, Monel metal, Wood's Metal	**08**	**14**
04	**Corrosion of metals and its protection** 4.1 corrosion Definition of corrosion, Types of corrosion 4.2 Atmospheric corrosion or dry Corrosion, corrosion due to oxygen , different film formation , 4.3 Immersed Corrosion or Electrochemical Corrosion, oxygen absorption Mechanism , Hydrogen evolution mechanism 4.4 Protection of Metals from corrosion. Purification of Metals from corrosion, Alloy Formation, Cathode Protection Appling Protective Coatings like metal coating by Galvanising, Tinning, Electroplating.	**06**	**08**
05	**WATER** 5.1 Sources of water, impurities in water, 5.2 Hard water & soft water, types of hardness, causes of hardness, 5.3 Effects of hard water in boiler, scale & sludge formation in boiler its effects on boiler, 5.4 Effects of hard water in diff. industries and domestic purposes, 5.5 Softening of hard water by soda lime process, permutite process, ion exchange process, 5.6 Potable water & its condition for potability, 5.7 Different methods of purification of water,Examples	**07**	**10**

	chlorination,sterlisation		
06	**Non Metallic Materials** 6.1 Plastics Definition of Plastic, Formation of Plastic by Addition Polymerisation with example such as Polyethylene & PVC 6.2 Condensation Polymerisation with suitable example such as Bakelite plastic. 6.3Types of Plastics, Thermo softening & Thermosetting Plastic & difference between them 6.4 Compounding of Plastics – Resins, Fillers, binders ,Plasticizers, Accelerators, Pigments etc. .Engineering properties of plastic and its related uses. 6.5 Rubber Natural Rubber, Its Processing, Drawbacks of Natural Rubber, 6.6 Vulcanisation of Rubber with Chemical Reaction. 6.7 Synthetic Rubber its examples Buna –S & Buna –N rubber, Distinction Between Natural & synthetic rubber. 6.8 Properties of rubber such as Elasticity ,Tack, resistant to abrasion, Rebound capacity. 6.9 Engineering Applications of rubber based on their properties. 6.10 Thermal Insulating Materials Definition & Characteristics of Thermal insulators. Preparation of glasswool, Properties & Applications of Thermocole , glass wool, cork, & asbestos.	**07**	**18**
07	**Lubricants-** 7.1 Definition of lubricant, lubrication, 7.2 functions of lubricants ,need of lubrication 7.3 Classification of lubricants with examples, 7.4 Mechanism of Lubrication by Fluid Film, Boundary&Extreme Pressure, 7.5 Physical Characteristics of Lubricants Such as Viscosity, Viscosity Index, Oiliness, Volatility, Flash & Fire Point, Cloud & Pour Point. 7.6 Chemical Characteristics such as Acid Value , Neutralization Number, Emulsification, Saponification Value, Selection of proper Lubricants for Various Types of Machines.	**06**	**08**

List of practicals: (ANY 10 SHOULD BE PERFORM)

01) Orbital configuration of different elements (at least 10 elements)
02) To verify Faraday's first Law of electrolysis.
03) To determine neutralization point of acetic acid (weak acid) and ammonium hydroxide (Weak base). calculate the normality and strength of acetic acid.
04) To determine the equivalent point of precipitation titration of $BaCl_2$ with H_2SO_4 using Conductivity Meter. To find the normality and strength of $BaCl_2$

05) To find the normality & strength in grams per liter of the given solution (NaOH) with the help of standard hydrochloric acid.
06) To determine pH value of given solutions, water samples, by using pH paper, universal indicator and pH meter.
07) To determine the normality & strength of given hydrochloric acid solution by titrating it against standard potassium hydroxide solution.
08) To determine percentage of iron from steel by titration method.
09) To determine the hardness of potable water and boiler feeding water.
10) To determine the chloride content potable water and boiler feeding water.
11) Preparation of phenol formaldehyde plastic.
12) To determine the acid value of oil sample by neutralization method.
13) Qualitative analysis of given salt solutions, i.e. to determine one acidic and one basic radical from given salt solution. (At least 05 salt solutions.)

TEXT BOOKS:

S.No.	Name of Book	Author	Publication
1.	chemistryof engineering materials	S.S.Narkhede	Nirali publication
2.	chemistry of engineering materials	Shane patil	Tech-Max Publications
3	chemistry of engineering materials	Jawale	Mc vranda publication. Inc.
4	Basic chemistry	Dr.D.D.Jadhav	Tech-Max Publications

REFERENCE BOOKS:

S.No.	Name of Book	Author	Publication
1.	Engineering Chemistry	Jain & Jain	Dhanpat Rai and Sons Co.
2.	Engineering Chemistry	R.S. S. S. Dara	S.N. S. S. Chand Publication
3.	Environmental Chemistry & PollutionControl	S. S. Dara	S.Chand Publication

5G105 – WORKSHOP PRACTICE (WP)

COURSE STRUCTURE:

Teaching Scheme		Evaluation Scheme						
TH	00		PT	TEE	TW	PR	OR	Total
PR	03	Max. Marks	--	--	50	--	--	50
TOTAL	03	Duration	--	--	--	--	--	--

RATIONALE:

The knowledge of different basic tools and different processes such as smithy, forging, carpentry, welding, plumbing, fitting etc. is the basic requirement of the diploma technician. These are the basic & fundamental operations encountered in workshop. At this level it is essential to impart the practical feel of these basic operations & processes to the students. With this intention this course is being introduced.

COMPETENCY STATEMENTS:

1. To understand use of different hand tools and workshop processes.
2. To perform basic workshop processes such as smithy, forging, carpentry, welding, plumbing, fitting.

COURSE CONTENTS:

TERM WORK:

1) Smithy & Forging: - One job involving cutting, bending, drawing down/ up operations.
2) Carpentry: - One Job involving Different types of carpentry joints (min. two joints) used in furniture, wooden items with the use of teak wood, combination of wood & steel frames, plywood, sun mica.
3) Welding: - One job welded joint involving operations such as Lap, Butt welding with the help of Arc Welding machine
4) Fitting & Filling: - Fitting and filing one job involving filing, chamfering, drilling, tapping etc. operations
5) Plumbing: - One practical job on pipe fitting and threading

Job diary, drawing of different types of tools , operations are to be submitted by each candidate.

TEXT BOOK:

Sr.No	Title and Edition	Author	Publisher
1	Workshop technology Vol. 1	B.S. Raghuwanshi	
2	Workshop technology Vol. 1	S.K. Hajra Choudhary	
3	Production technology	R.K. Jain.	

5G106: ENGINEERING GRAPHICS (EG)

COURSE STRUCTURE:

Teaching Scheme		Evaluation Scheme						
TH	02		PT	TEE	TW	PR	OR	Total
PR	02	Max. Marks	--	--	50	50	--	100
TOTAL	04	Duration	--	--	--	2.00	--	--

RATIONALE:

Engineering drawing (Graphics) is the language of engineers. Often it is required to imagine the different objects from various directions, sound knowledge of engineering graphics will help the engineer to represent various objects and read various drawings used in workshop, industry and in various manufacturing processes.

COMPETENCY STATEMENT:

To understand the basic principles of Engineering Drawing

COURSE CONTENTS:

Topic No.	Content	Hours	Marks
1.	**Introduction** 1.1 Drawing Instruments and their uses 1.2 Letters and numbers (single stroke vertical) for main title, sub-title and normal use 1.3 Different types of lines, Convention of lines and their applications. 1.4 Scale (reduced, enlarged & full size), Plain scale and Diagonal scale. 1.5 Sheet sizes and layout, Geometrical constructions 1.6 Dimensioning, its methods, parallel and chain dimensioning, radius and diameter dimensioning, leader and its use, dimension with text	**04**	
2.	**Simple Drawing Practices** 2.1 Drawing of different circles with thin, thick, center line use, dividing circle into number of equal parts, dividing line into equal parts 2.2 Drawing pentagon, hexagon and rhombus, drawing correct arrows to dimension lines, drawing tangent to circle from given point	**04**	
3.	**Engineering Curves** 3.1 To draw ellipse by – • Arcs of circle method • Concentric circle method	**08**	

	• Oblong method 3.2 To draw parabola by – • Directrix focus method • Rectangle method 3.3 To draw hyperbola by – • Transverse axis & focus method. • Passing through a given point. (Rectangular hyperbola) 3.4 To draw involute of square, hexagon and circle. 3.5 To draw cycloid, epicycloid, hypocycloid.		
4.	**Orthographic Projections** 4.1 Converting pictorial view into orthographic views (First angle method of Projection), 4.2 Sectional orthographic projection of simple objects	**08**	
5.	**Isometric Projections** 5.1 Isometric projection of simple objects 5.2 Isometric projection of objects having circular holes	**08**	
	TOTAL	**32**	

LIST OF PRACTICAL/EXPERIMENTS:

A3 size sketch book should be used by the students. It is necessary to draw all the sheet problems in sketch book first and then redrawn on the sheets

1. Home assignment in Sketch book on lines, lettering, numbers and geometrical constructions which includes additional drawings given in chapter 1 & 2 **(No Sheet)**
2. Two sheets on Engineering curves, (Minimum 6 curves).
3. One sheet on Orthographic Projection, (Minimum 2 objects) by first angle method
4. One sheet on Isometric projection of simple object (Minimum 2 objects).

PRACTICAL EXAMINATION:

At the end of term practical examination of 50 marks of 2 Hours duration is compulsory to all students. External and Internal Examiners should set and assess the Question paper jointly as per following guidelines

a) Engineering curves (Solve any one out of two given) 12 marks
b) Geometrical construction & scales (Solve any one out of two given) 08 marks
c) Orthographic Projections (One Problem) 15 marks
d) Isometric projections (One Problem) 15 marks

TEXT BOOKS:

Sr. No	Title and Edition	Author	Publisher
1	Engineering Drawings	N. D. Bhatt	Charotar Publishing House
2	Engineering Drawings	Sidheshwar, Shastri	Tata Mc Graw Hill
3	Engineering Drawing	R.V.Mali	Vrinda Publication

5G107:- BASICS OF COMPUTER SCIENCE

COURSE STRUCTURE:

Teaching scheme		**Evaluation scheme**						
TH	1		PT	TEE	TW	PR	OR	TOTAL
PR	2	MAX MARKS			50	50		100
TOTAL	03	DURATION						

COMPETENCY STATEMENT (S):

- To understand working & use of Computer for day-to-day use.
- To use computer for word processing, accounting related applications
- To prepare professional presentations.
- To understand and use Internet.

RATIONALE:

With rapid development of Technology and competitive economy, computers play very important role in the diversified fields such as CAD, CAM, power generation, image processing, telecommunication modeling and simulation etc.

The built in characteristics of computers have made them inevitable in different applications areas. So it is essential for a Diploma Technician to have a knowledge regarding computers and develop a skill to handle different software's available. It is always essential for a technician to update their knowledge to cope up with the fast development in software's. Considering this in view and duties to be performed by Diploma Technician in professional life, following curriculum is suggested.

OBJECTIVES:

At the end of the course student should able to,

- Understand working of computers
- Get knowledge of various components of computers.
- Understand concept & functions of Operating System.
- Perform file management operations using My computer & Windows Explorer
- Print the letter using MS Word
- Perform worksheet operations using MS Excel
- To prepare professional presentations using MS PowerPoint
- Use Internet for Create E-mail id, receive & send E-mail with attachment
- Search for the information on Internet.

Topic no	Contents	HRS	MARKS
01	**Fundamentals** 1.1 Uses, Types of computer, Block Diagram showing components of computer, Input devices, output devices, CPU, Primary Memory, Secondary memory., processor and its speed, RAM, Monitor, Display card, Hard Disk, Floppy drives, CD drive. 1.2 Sound card, etc. (Use of each) Hard ware and software, Types of software. 1.3 Concept of Operating Definition, functions and examples of operating system (like DOS, WINDOWS, Linux,) used on different types of computers.	02	
02	**Dos & Windows (H-03)** 2.1 **DOS:** Bios, Power on self-test, Dos & its functions. Concept of file & directory, rules for file &directory names, Types of files-system files, data files, Program files, text files, Config.sys, Autoexec.bat, Batch files. File attributes, Wild cards. 2.2 **DOS commands:** Internal Commands: DATE, TIME, CLS, DIR, COPY, DEL, REN, CD, MD, RD, PROMPT, PATH, External Commands: FORMAT, CHKDSK, DISKCOPY 2.3 **WINDOW 98/2000/XP** **Introduction** : 2.3.1 Starting Windows, Desktop, Icons, Task bar, Short cuts, the start Button, arranging Windows, Shutting down windows. 2.3.2 Windows Explorer: Creating, renaming, deleting Folders/ file. 2.3.3 Copying, moving, deleting, renaming files, Using Send to, Search files and folders, Recycle bin 2.3.4 Windows Setting: Date format, adding printer. 2.3.5 Windows Accessories: Calculator, Notepad, paint, word pad.	03	
03	**Ms-Word** Introduction to word processing, Introduction to MS word. Opening, Saving, closing a file. Page setup: Changing Margins, layout, and paper size. Formatting Text: Tables: Insert table, enter and edit data into table. Printing: Print preview, selecting printer, and print options	03	
04	**Ms-Excel** 4.1 Introduction to electronic spreadsheet. Introduction to MS Excel.	03	

	4.2 Components of MS Excel window like Title bar, Menu bar, Formula Bar, Status bar, Worksheet area, Sheet Tabs, Columns, rows. Hiding and viewing Toolbars like Standard and formatting tool bars. Entering data, copying, moving, Editing cell entries use of auto fill Saving, closing and opening file. 4.3 Page setup: Changing Margins, layout, and paper size. Enter formula, copy formula using fill handle Inserting functions. Use of functions like SUM, AVERAGE, MIN, IF, COUNT, LOG, SIN, COS, ROUND, SQRT, PI etc. 4.4 Formatting data: Change number format, alignment, borders, font, size etc. Use auto Format, Restructuring worksheet: Inserting and deleting the columns and rows. 4.5 Changing column width, row height. Charts (Graphs): 4.6 Types of charts, creating and modifying charts, printing Charts.		
05	**PowerPoint :** Overview, Using design template and auto content wizard, creating presentation, slides and its types, slide operations, modifying & running presentation, adding & editing. objects, creating tables, charts & Diagram, save & print option, custom presentation, applying transition & animation effects.	02	
06	**Internet :** 6.1 Introduction: Uses of Internet, Resources required using Internet. 6.2 Internet Service Provider: Need & Duties of ISP, Connecting to Internet, Domain &addresses, 6.3 Internet Browsers, Search engines, Email, Chat,	03	

LIST OF PRACTICALS:
(If required specify minimum number of practical to be conducted from the following)

1. List and identify the peripheral devices of a PC. Connect the keyboard, mouse, printer, monitor, and scanner to a computer. Get the information about the manufacturers and prices of various components of a PC.

2. Dos: Use various Internal & External commands of DOS.

3. Windows

• Start and shutdown of windows. Starting different applications. Using applications like calculator, paint, word

• Observe various features of windows like menus, push buttons, drop down list, check boxes, option buttons etc.

• Perform file management operations such copying, deleting, renaming, creating folders, and renaming folders using My computer, Windows Explorer, searching files and folders.

• Change windows format such as wall paper, date & time format, Installing printer, installing & removing programs by using add /remove programs, change display properties

4. Microsoft Word

• Prepare a sample bio data
• Write an application for job
• Prepare a timetable in tabular format.

5. Microsoft Excel

• Create a sample result sheet of your class.
• Create salary sheet for Employees (Apply Excel formulae/ functions to solve problems.)
• Draw a chart (line, bar, pie etc) based on the data tabulated.

6. Internet

• Creation of email account
• Send E-mail, Receive E-Mail. (Use attachment)
• Management of email account.
• Searching information on internet

7. PowerPoint

• Creating PowerPoint presentation, running presentation.
• Applying design template, background, transition effects, animation to slide.
• Preparing custom presentations and using pack and go features.

REFERENCES:

Sr. No	Title of Book	Author and Publication
1	DOS made simple	Subhas Mehta Galgotia Publications
2	Fundamentals of Computers	P.K.Sihna BPB Publication
3	Teach Yourself Windows 98	Greg Perry Techmedia
4	Teach Yourself Windows 98	Cassel & Hart Techmedia
5	Windows 98 Bible	Alen Simpson BPB Publication
6	MS Office 2000	Ed Bott Woody Ceonhard Prentice Hall India
7	Microsoft Office	Ron Mansfield BPB Publications
8	Teach Yourself MS Office 97	Greg Perry Techmedia
9	DOS made easy	Herbert Schildt McGraw Hill
10	MS windows XP	Galgotiya Publications

5R201- ENGINEERING DRAWING (ED)

Teaching Scheme		Evaluation Scheme						
TH	02		PT	TEE	TW	PR	OR	Total
PR	04	Max. Marks			25	50		75
TOTAL	06	Duration			--	--	--	--

RATIONALE:

Engineering Drawing is the language of engineers and technicians. Always the engineers come across different types of drawings. It is therefore very important to understand the fundamentals and basic concepts involved in drawing.

COMPETENCY STATEMENT (S):

To prepare and interpret the production drawings as per I.S. code.

COURSE CONTENTS:

Topic No.	Content	Hours	Marks
1.	**Orthographic and sectional views** Using **First Angle** Projection Method only 1.1 Review of orthographic projections 1.2 Conversion of pictorial view into orthographic 1.3 Sectional orthographic views	**06**	
2.	**Isometric Projections** 2.1 Introduction 2.2 Isometric scale and its use 2.3Conversion of orthographic views into isometric view / projection (Including rectangular, cylindrical objects, representation of slots on sloping as well as plane surfaces)	**06**	
3.	**Projections of Lines and Planes** Use of **first angle method** of projections 3.1 Projection of points 3.2 Projection of Lines inclined to **one** reference plane only 3.3 Projection of Planes inclined to **one** reference plane only	**08**	
4.	**Projection of solids** Projection of following solids with their axes inclined to one reference plane only.(Use of first angle method of projections). 4.1Prism and pyramids: Triangular, Square, Pentagonal and Hexagonal types 4.2 Cylinder 4.3 Cones	**06**	

5.	**Section of solids** Use **First angle** projection method only and Axis of solid inclined to **one** reference plane and parallel to other reference planes 5.1 Sectional views of solids such as prism, pyramid, cone and cylinder	**03**	
6.	**Missing Views** 6.1 Draw missing view from the given Orthographic views - simple components using **First Angle** Projection Method only	**03**	
	TOTAL	**32**	

LIST OF EXPERIMENTS:

A3 size sketch book should be used by the students. It is necessary to draw all the sheet problems in sketch book first and then redrawn on the sheets

1. One sheet on Orthographic projections (2 problems)
2. One sheet on Sectional Orthographic projections (2 problems)
3. One sheet on Isometric projection (2 problems)
4. One sheet on projection of lines & planes (2+2 problems)
5. One sheet on projection of solids (2 problems)
6. One sheet on projection of sections of solids. (2 problems)

PRACTICAL EXAMINATION:

At the end of term practical examination of 50 marks of 2 Hours duration is compulsory to all students. External and Internal Examiners should set and assess the Question paper jointly as per following guidelines

- Orthographic/Sectional orthographic (One Problem) 14 marks
- Isometric projection with slots and holes (One Problem) 14 marks
- Lines and planes (One Problem out of two given) 10 marks
- Solid/section of solids/missing view (One Problem) 12 marks

AUTO-CAD Work:

In a few practical hours students should be made conversant with auto cad 2D and 3D regular solid drawings. Simple drawings should be demonstrated to the class with use of LCD projector

1. **One sheet** on Missing Views should be redrawn by using AUTO-CAD and its Print out A4 size should be attached in sketch book by all students.

TEXT BOOKS:

Sr. No	Title and Edition	Author	Publisher
1	Elementary Engineering Drawing	N.D.Bhatt ,	Charotar Publishing House
2	Engineering Drawing	Mali , Chaudhari,	Vrinda Publication
3	Engineering Drawing	Sidheswar Shastri ,	Tata Mc Graw Hill

5M202: MANUFACTURING PROCESSES (MP)

Teaching Scheme		Evaluation Scheme						
TH	02		PT	TEE	TW	PR	OR	Total
PR	04	Max.Marks	20	80	50	50	--	200
TOTAL	06	Duration	01	03	--	--	--	04

RATIONALE:

The knowledge of advanced engineering materials is essential for technicians. He should also be proficient in the selection and use of basic manufacturing processes. Presently many improvements have taken place in the manufacturing processes.

The diploma technicians are always in the contact with the various manufacturing process in practice. It is therefore very important to known the fundamentals of various types of the chip forming processes and the equipments used for the same. These will help the diploma technician to handle and improve the practical situation more effectively. Basics of the common chip forming processes used are introduced at this course.

COMPETENCY STATEMENTS:

1. To understand the mechanics of metal cutting
2. To Know the types chip forming processes
3. To know the various machines for chip forming processes
4. To the various types of plastics and plastics processes.

COURSE CONTENTS:

Topic No.	Content	Hours	Marks
1	**Mechanics Of Metal Cutting** 1.1 Tool geometry and tool signature, single point cutting tools 1.2 Chip formation, continuous chip, dis-continuous chip, Built-up edge, 1.3 Chip breaker, cutting tool materials, cutting fluids, 1.4 Single point, multi-edge cutting tools, twist drills.	**06**	**12**
2	**Metal Turning** 2.1 Introduction to center lathe, simple turning process, taper turning, screw cutting,lathe operations 2.2 Center lathe accessories, attachments, specification of lathe, 2.3 Capstan and turret lathes, automats, tooling set-ups, different attachments and accessories, tool layout.	**06**	**20**
3	**Shaping, Planing And Slotting** 3.1 Classification, principal parts of shaping machines,	**06**	**16**

	quick return mechanism, operation performed on shaper, Machining time calculations(simple numerical) 3.2 Horizontal shaping machines and their specifications, adjustment of stroke length and positioning of Ram. 3.3 Types of planning machines, principal parts of planning machines, operations performed on planning machines, specifications, cutting tools used 3.4 Description of slotting machines, specification, and operations performed, cutting tools used.		
4	**Drilling Machines** 4.1 Classification of drilling machines, principal parts, specifications, accessories, 4.2 Operations such as drilling, reaming, tapping, tapping attachment, deep drilling, step drilling, countersinking, counter boring, etc. 4.3 Types of drills, drill nomen-clatur	**06**	**12**
5	**Boring** 5.1 Introduction to boring machines, description of boring machines, standard specifications of boring machines, 5.2 Boring bars, boring heads, boring tools.	**03**	**09**
6	**Processes For Plastics** 6.1 Broad classification of plastics, common properties of plastics, thermosetting, thermo plastics. 6.2 Plastics processing methods – Compression moulding, transfer moulding, injection moulding, extrusion, calendaring. Blow moulding 6.3 Advantages and disadvantages of plastics, joining of plastics.	**05**	**11**
		32	**80**

TERM WORK:

Each student will be required to submit the following team work:

1) One job involving step, taper, grooving, chamfering, knurling, threading etc.
2) Plain and Angular shaping.
3) Casting by using pattern with core.(Group of five students)
4) Assignment on above topics.

TEXT BOOK:

Sr.No	Title and Edition	Author	Publisher
1	Workshop Technology Vol. 1	Hajra, Choudhary	Asia Publications Delhi
2	Workshop Technology Vol.1	Raghuwanshi,	Dhanpat rai and sons
3	Production Technology	R.K. Jain,	Khanna Publications

REFERENCE BOOK:

Sr.No	Title and Edition	Author	Publisher
1	Workshop Technology	Chapman (Vol. 1 & Vol. 2) ,	Arnold Publications
2	Plastic Technology	Milby	--
3	Plastic Technology –Theory Design & Manufacturing	William J. Patton	--

5M203: MEASUREMENT & CONTROL

COURSE STRUCTURE:

Teaching Scheme		Evaluation Scheme						
TH	03		PT	TEE	TW	PR	OR	Total
PR	02	Max.Marks	20	80	25	--	25	150
TOTAL	05	Duration	1.00	3.00	--	--	--	--

RATIONALE:

In practical field diploma engineer is often expected to measure various quantities/ parameters as a part of job. 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/ equipments it is essential that diploma engineer should have good proficiency of mechanical measurement.

COMPETENCY STATEMENT (S):

- To know various measuring instruments and their applications.
- To understand the working principles of various measuring instruments.

COURSE CONTENTS:

Topic No.	Content	Hours	Marks
1	**Measurement and measurement system** 1.1 Introduction,significance of mechanical measurements, methods of measurements, classification of instruments, functions of instruments and measuring systems. 1.2 Generalized measurement systems and its functional elements. 1.3 Basic standards and units. Primary, Secondary and working standards.(No derivations & Numerical)	**04**	**06**
2	**Instrument Characteristics** 2.1 Static terms & Characteristics, Range & Span, Accuracy & Precision, Reliability & Errors,Correction, Calibration. Hysteresis & Dead zone,Drift, Sensitivity, Threshold & Resolution,Repeatability & Reproducibility, Linearity. 2.2 Dynamic Terms & Characteristics, Speed of Response & Measuring Lag, Fidelity & Dynamic Error, Overshoot, Dead Time &	**04**	**06**

	Dead zone 2.3 Measurement of Errors Introduction, Classification of Errors like Instrumental Error, Environmental Error, Translational & Signal Transmission Error, Observation Error, Operational Errors. (No Derivations)		
3	**Introduction to control systems & Controllers** 3.1 Need of Control System, Manual Vs Automatic Control System, Advantages of Automatic Control System, Open Loop and Closed Loop Control System and their comparison, Concept of Feedback, Definition of Transfer Function 3.2 Basic types of control action like ON/OFF, Proportional, Integral, Derivative Type.Comparison of Pneumatic and Hydraulic Control System	**08**	**12**
4	**Electrical systems** 4.1 Introduction of A.C. and D.C. Servo Motor, Stepper Motor Servomechanism, Position Control System.	**04**	**06**
5	**Pressure Measurement** 5.1 Definition & Units of Pressure, Terminology of Pressure Measurement. 5.2 Low Pressure Measurement, McLeod Gauge, Thermal Conductivity Gauge, Ionization Gauge 5.3 High Pressure Measurement Manometers, Electrical Resistance Pressure Gauge (No Derivations & Numerical)	**04**	**08**
6	**Flow Measurement** 6.1 Definition of Flow, Different types of Flows, Classification of Fluid Flow, 6.2 Measurement Techniques Inferential & Positive Flow Meters, Cup & Vane Anemometers, Turbine Meter, Hot Wire Anemometer, Ultrasonic Flow Meter, (No Derivations & Numerical)	**04**	**06**
7	**Temperature Measurement** 7.1 Definition of Temperature, Utility of Temperature Measurement, Temperature Scales, Classification of Temperature Measuring Instruments 7.2 Liquid in Glass Thermometers. Thermocouples- Laws, Elements of Thermocouple System, Thermocouple Materials, Resistance Thermometer, Thermistors, Radiation & Optical Pyrometer. (No Derivations & Numerical)	**04**	**08**
8	**Strain Measurement** 8.1 Definition of Strain & Utility of Strain Measurement. Types of Strain Gauges & Gauge	**04**	**08**

	Factor, Strain Measurement Techniques, Strain Gauge Materials, 8.2 Resistance Strain Gauge- Bonded & Unbonded. Linear Variable Differential Transducer & Rotary variable Differential Transducer. (No Derivations & Numerical)		
9	**Force & Power Measurement** 9.1 Concept of Force, Work, Torque & Power, Force measurement by using scales- Platform and Pendulum Scale, Balances: Analytical and Electromagnetic balance, 9.2 Shaft power measurement –Mechanical brakes, Hydraulic dynamometer, Eddy Current dynamometer and Strain Gauge Transmission dynamometer. (No Derivations & Numerical)	**04**	**08**
10	**Speed Measurement** 10.1 Mechanical tachometer, Revolution Counter and timer, Hand speed indicator, vibrating reed tachometer Electrical tachometers: Drag cup Tachometer, Tacho-generator 10.2 Contact less electrical tachometer: Inductive pickup photoelectric, stroboscope. (No Derivations & Numerical)	**04**	**06**
11	**Miscellaneous Measurement** 11.1 Liquid level measurement, sight glass, Float gauge, float and shaft, bubbler or purge system, float operated rheostat 11.2 Sound Measurement, Introduction to Sound Measurement, Electromagnetic Microphone, Carbon Microphone	**04**	**06**
		48	**80**

TERM WORK:

It shall consist of journal, based on the following experiments, and introduced to develop report writing ability of students and integration of knowledge and skills by application to the field problems.

LIST OF EXPERIMENTS: (Any Ten)

1. Study of generalized measurement & its components with example like Bourdon Pressure gauge.
2. Study of different types of errors in any one measurement system
3. Calibration of pressure gauge using Dead weight Tester
4. Measurement Pressure by using any one method Bourdon Pressure, Diaphragm Pressure Gauge & McLeod Gauge
5. Measurement Flow by using any one Rotameter, Venturimeter.

6. Temperature Measurement by using anyone thermocouples, Thermistors.
7. Temperature measurement using Radiation / Optical pyrometer.
8. Displacement measurement using linear variable differential transducer.
9. Force measurement on load cell demonstrator
10. Speed measurement with Magnetic pickup transducer/ Stroboscope
11. An experiment on speed control of stepper motor.
12. An experiment on a level control system.
13. An experiment on ON-OFF temperature controller

TEXT BOOKS / REFERENCES:

Sr. No	**Title of Book**	**Author and Publication**
1	Mechanical measurements and instrumentation	A.K.Sawhney Dhanpat rai and sons,New Delhi
2	Mechanical measurements and Control	R.V.Jalgaonkar Everest Publishing house Pune
3	Mechanical and Industrial measurements	R.K.Jain Khanna Publications ,New Delhi
4	Instrumentation measurements and analysis	B.C.Nakra and K.K.Chaudhari Tata McGraw Hill, New Delhi
5	Industrial instrumentation and Control	S.K.Singh Tata McGraw Hill, New Delhi
6	Mechanical Measurements	S.L.Gavhale Nirali Prakashan Pune
7	Control System Engineering	Ogatta, Prentice Hall of India Pvt. Ltd.

5Q201-APPLIED MECHANICS

COURSE STRUCTURE:

Teaching Scheme		Evaluation Scheme						
TH	04		PT	TEE	TW	PR	OR	Total
PR	02	Max.Marks	20	80	50	--	--	150
TOTAL	06	Duration	1.00	3.00	--	--	--	--

RATIONALE: -

Civil engineering technician should be able to analyse behavior of components of structure under various types of loads, which will enable him to design the same. This course provides basic knowledge of principles, laws and theory for analysis.

COMPETENCY STATEMENTS: -

The student shall be able to :

1. Verify the laws, theorems of mechanics.
2. To check for equilibrium for a force system.
3. Apply principles, laws and theorems to analyze components under static and dynamic loads.
4. Understand use & application 0f simple lifting machines.

COURSE CONTENTS:-

Sr. No.	Name of the Chapter / topic / Content (Follow S.I. units)	Hours	Marks
1.	**Fundamental Concepts** 1.1 Definitions of Mechanics**,** Applied Mechanics, statics, dynamics, kinematics, kinetics, space, time, mass, particle, rigid body. Scalar & vector quantities with examples, Newtons laws. 1.2 Concept of force, definition, S.I.unit, representation of force as a vector, Bow's notation. Types of force(pull/tensile, push/ compressive)Law of transmissibility of force.	04	02
2.	**Resolution of a force** 2.1 Concept of system of forces: Coplanar, Non coplanar, collinear, concurrent, non-concurrent, parallel(like & unlike), general. 2.2 Resolution of a force, Resolution of a force into two components at any angle & at right angle ie. Orthogonal components.	04	06
3.	**Composition of forces** 3.1 Definition of composition of force, definition of resultant, Law of parallelogram of forces & Law of polygon of forces (No problems on Law of polygon of forces) 3.2 Resultant of collinear & concurrent force system 3.3 Concept of Moment of a force, magnitude, lever arm, types & sign convention, unit. Law of moment, Principal of	10	14

	moment/Verignon's theorem. Couple, characteristics of couple with example. 3.4 Resultant of parallel force system & non concurrent non parallel force system.		
4.	**Equilibrium** 4.1 Definition of equilibrium and equilibrant, properties of Equilibrant, relation between resultant & equilibrant. 4.2 Conditions of equilibrium for collinear, concurrent, parallel & non concurrent non parallel force system. 4.3 Concept of free boby , free body diagrams, Lami's Theorem & its applications such as cables. Problems with two unknowns only.	06	10
5.	**Beam reactions** 5.1 Definition of beam, types of beam: cantilevers, simply supported, over hanging, continuous, fixed beams, , types of supports: simple, fixed, hinged & roller, types of loads, point load, uniformly distributed load, uniformly varying load. 5.2 Support reaction of beams. Problems for reactions of simply supported, over hanging beams under different loading such as vertical and inclined concentrated loads, uniformly distributed load and combination of both. 5.3 Problems for reactions of simply supported beams with hinged & roller support under concentrated loads (vertical & inclined), uniformly distributed load and combination of both.	06	08
6.	**Friction** 6.1 Concept of friction, Definition of friction. Types of friction (static, dynamic, rolling, sliding), laws of friction, Defination of co-efficient of friction, angle of friction, angle of repose & relation between these. Advantages & disadvantages of friction. 6.2 Equilibrium of bodies on level plane, force (pull & push) applied horizontally & inclined. 6.3 Equilibrium of bodies on inclined plane, force applied Parallel to plane only. 6.4 Ladder friction. (with one surface smooth)	10	12
7.	**Centroid and center of gravity** 7.1 Definition of centroid, Centroid of triangle, square, rectangle, circle, semicircle, quarter circle. 7.2 Determination of centroid of Composite areas consisting of not more than above three standard areas. 7.3 Definition of Center of gravity, C.G. of simple regular solids, cube, cylinder, cone, sphere, hemisphere. 7.4 Determination of C.G. of solid objects made up of any two these regular solids.	10	12
8.	**Moment of Inertia** 8.1 Definition of M.I., radius of gyrations, parallel axis theorem & perpendicular axes theorem, Methods to calculate MI.	10	12

	8.2 Formulas for M.I. of square, rectangle, triangle, circle, semicircle, quarter circle & hallow square, rectangle, circular, laminas.(Derivation shall not be asked in the examination) 8.3 Determination of MI of sections such as I, channel, T, and angle section about centroidal & other axes & composite sections such as I section with plates & sections with combinations of not more than three standard figures.		
9.	**Simple Lifting Machines** 9.1 Definition of simple machine, load, effort, mechanical advantages, velocity ratio, input of a machine, output of a machine, efficiency, relation between MA, VR & efficiency. Ideal machine, ideal effort, ideal load, friction in machine, effort lost in friction, load lost in friction. 9.2 Law of machine, maximum mechanical advantages, maximum efficiency of machine, reversibility of machine, condition for reversibility of machine (no derivation), self locking machine (No numerical problems)	04	04
		64	80

TERM WORK: -

It shall consist of manual/journal, based on the following experiments, to develop the ability of students to integrate the knowledge and skills by application to the field problems.

Experiments: - Manual/Journal shall consist of following experiments :

1) To verify the law of polygon of forces.
2) To verify the law of moments.
3) To verify Lami's theorem.
4) To find beam reaction using beam reaction apparatus.
5) To verify the laws of friction with two different materials.
6) Determination of coefficient of friction & angle of repose for any two different surfaces.
7) Two assignments on graphical determination of R for parallel force system.(One for R & one for equilibrant)
8) Two assignments on graphical determination of R for non concurrent non parallel force system with verification of analytical calculations.
9) Simple machines: Comparison between various types of machines, to find M.A., V.R., efficiency , law of machine from graph, study nature of graph for P_i & P_f for any three following machines:
    a. Worm & worm wheel./ Differential axle and wheel
    b. Single / double purchase crab.
    c. Simple screw jack.
    d. Two sheave / three sheave pulley block.
    e Worm geared pulley block/Differential pulley block

TEXT BOOKS:

Sr no.	Title	Author	Publisher
01	Fundamental of Applied Mechanics	Dhade, Jamdar & Walawalkar	Pune Vidhyarthi Gruh, Pune.
02	Applied Mechanics	R. S. Khurmi	Dhanpat Rai & Sones, Delhi.
03	Applied Mechanics	S. Ramamruthum	Dhanpat Rai & Sones, Delhi.
04	Engineering Mechanics	K. L. Kumar	Tata McGraw HillCo., Delhi.
05	Applied Mechanics	I.B. Prasad	Khanna Publications, Delhi.

REFERENCE BOOKS:

Sr no.	Title	Author	Publisher
01	Engineering Mechanics	Beer & Johnston	Tata McGraw Hill Co., Delhi.
02	Engineering Mechanics	Timoshenko & Young	Tata McGraw Hill Co., Delhi.
03	Engineering Mechanics	F. L. Singer	Harper International Edition.

5M205: THERMAL ENGINNERING :

Teaching Scheme		Evaluation Scheme						
TH	03		PT	TEE	TW	PR	OR	Total
PR	02	Max .Marks	20	80	25	-	25	150
TOTAL	05	Duration	01	03	-	--		

RATIONALE:

Mechanical engineers have to work with various power producing & power absorbing devices like boilers, turbines, compressors, pumps etc. in order to understand the principles, construction & working of these devices, it is essential to understand the concept of energy, work, heat & conversion between them. Hence it is important to study the subject of Thermal Engineering which is a core subject.

Generation of Electrical power has become a very important aspect in modern world. Thermal power stations, steam generators have now developed very large application in process industry and power generation sector. Diploma Engineers always come across these devices utilizing heat energy. The efficiency of machines working on heat largely depends on heat leakages. Hence it is essential to get acquainted with heat transfer principles. Boilers find application in different process industries. Steam turbines and condensers are the major component of any steam power plant. Mechanical engineer should understand working and application of these devices. This course is being designed to cater the needs of these areas.

COMPETENCY STATEMENTS:

1. Know various sources of energy & their applications.
2. Apply fundamental concepts of thermodynamics to thermodynamic systems.
3. Understand various laws of thermodynamics.
4. Apply various Gas laws & ideal gas processes to various thermodynamic systems.
5. Explain construction & working of boilers, mountings & accessories.
6. Know Basics of heat transfer principles.

COURSE CONTENTS:

Topic No.	Content	Hours	Marks
1.	**Sources of energy** 1.1 Brief description of various sources of energy - Classification of energy sources - Conventional and Non-conventional - Renewable and Non-renewable energy sources 1.2 Thermal, Hydraulic and Nuclear 1.3 Solar, Tidal, Wind and Geothermal 1.4 Biogas, Biomass, Bio – diesel	**04**	**08**
2.	**Fundamental Concepts of thermodynamics** 2.1 Basic concept of pure substance, system and boundary. - Types of systems – open(flow), closed(non-flow) and isolated system - Properties of system -Intensive and Extensive with units - Concept of point function and path function - Concept of path, process (Reversible and irreversible), cycle 2.2 Work and Energy - Thermodynamic definition of work and heat - Difference between heat and work, P.E., K.E., Internal Energy, Flow work - Concepts of enthalpy, entropy, (**Simple Numericals)**	**07**	**12**
3.	**Laws of Thermodynamics** 3.1 Zeroth law, principle of conservation of energy, First law of thermodynamics, its mathematical equation for flow and non-flow processes, its limitations. Second law of thermodynamics. Kelvin Plank and Clausius statements and their equivalence 3.2 Application of Thermodynamic laws - SFEE and its application to open system like boiler, engine, turbine, pumps, condenser and compressor **(Simple numericals)** 3.3 Application of second law of thermodynamics to Heat engine, Heat pump and Refrigerator **(Simple numericals)** 3.4 Carnot Theorem, Carnot Engine, Carnot Cycle, Difficulties in Carnot engine design **(Simple numericals)**	**08**	**14**
4.	**Ideal Gases** 4.1 Concept of Ideal gas, Charles's law, Boyle's law, Avogadro's law, Characteristic gas constant and	**06**	**12**

	universal gas constant. 4.2 Ideal gas processes- Isochoric,Isobaric, Isothermal, Adiabatic, Polytrophic, Isentropic with representation of the processes on P-V and T-S diagram, Calculation of work done, Heat transfer, Change in internal energy in each process**, (Simple numericals)**		
5.	**Steam and Steam Boilers** 5.1 Generation of steam at constant pressure. Properties of steam and use of steam table Quality of steam and its determination with Separating, throttling and combined separating and throttling calorimeter **(No numericals)** 5.2 Vapour Process – - Constant pressure, constant volume, constant enthalpy, constant entropy **(Simple numericals using steam table)**, Rankine cycle. 5.3 Steam Boilers – - Classification of boilers Construction and working of Cochran boiler, Babcock and Wilcox boiler, High pressure boilers, Modern two pass oil fire package boilers, Lamont and Loffler boiler. 5.4Boiler mountings and accessories**.(to be covered in practical)**	**08**	**12**
6.	**Steam Turbines & Condensers** 6.1 Steam Nozzles – Types and applications of nozzles 6.2 Steam turbine – Classification of turbines, Construction & working of Impulse and reaction turbine. **(No velocity diagrams and numericals)** 6.3 Steam Condensers – Dalton's law of partial pressure, function and classification of condensers, construction and working of Jet and surface condensers 6.4 Sources of air leakage, concept of condenser efficiency, vacuum efficiency (No numerical) 6.5 Cooling Towers – Forced draught, natural draught and induced draught.	**08**	**12**
7.	**Heat Transfer** 7.1Modes of heat transfer – Conduction, convection and radiation 7.2 Heat transfer by conduction – Fourier's law, thermal conductivity, heat transfer through slab, heat temperature gradient, heat	**07**	**10**

	transfer through composite wall, heat transfer by convection. **(Simple numericals)** 7.3 Heat transfer by radiation – Thermal radiation, absorptivity, transmissivity, reflectivity, emissivity, black and grey bodies, Stefan Boltzmann law. 7.4 Heat Exchangers – Shell and tube, plate type, multi pass heat exchangers, materials used and application of heat exchangers		
	TOTAL	**48**	**80**

TERM WORK:

1. Collection of literature on conventional and non-conventional fuels and energies with their important properties (Five students in a group should be given the task of data collection)
2. Study of Constant pressure and constant volume processes by using chart or diagrammatic arrangement
3. Demo on energy conversion such as I.C. Engine, Compressor, Pump (it should include basic principle and write-up of each)
4. Study of Solar water heater and study of solar photovoltaic cell (Visit to one such system is necessary to understand details)
5. Study of water tube boiler with the help of model/chart
6. Study of fire tube boiler with the help of model/chart
7. Study of four mountings and two accessories with the help of model/chart
8. Study of bio gas plant
9. Experiment to measure following quantities.
    a. Pressure
    b. Temperature
    c. Flow rate
    d. Engine shaft speed using tachometer

TEXT BOOK:

Sr. No	Title and Edition	Author	Publisher
1.	A course in thermal engineering	V. M. Domkundwar	Dhanpat rai and Sons
2.	A course in thermal engineering	P. L. Ballaney	Khanna Publishers
3.	A text book of thermal engineering	R. S. Khurmi	S.Chand and Company
4.	Element of Heat engines Vol. I & II	Patel Karamchandani	Acharya Publications
5	Engg. thermodynamics	P. K. Nag	Tata McGraw Hill

5R206-DEVELOPMENT OF LIFE SKILLS

COURSE STRUCTURE:

Teaching Scheme		Evaluation Scheme						
TH	--		PT	TEE	TW	PR	OR	Total
PR	02	Max.Marks	--	--	25	--	25	50
TOTAL	02	Duration	--	--	--	--	--	--

RATIONALE:

Over a period of time, it has been observed that effectiveness and utility of diploma engineers at work place can be enhanced by imparting generic skills right from entry to the diploma education. The generic skills are lifelong skills which should be improved continuously during the period of education. The generic or life skills are necessary for diploma engineers for their professional career in future. These skills can be inculcated in diploma engineers by a combination of necessary theoretical inputs supplemented by practical assignments and practical exercises.The required theoretical content is divided into four logical units

(I) Information search
(II) Communication skills
(III) Self development
(IV) Task – Management

In the present course, main intention is to enhance the life skills via varied types of practical assignments and practical exercises. Basic approach is to give necessary theoretical inputs in short followed by the practice.

Course is designed by keeping self in focus with a clear objective of developing Generic Skills, to enhance the capabilities in the fields of searching, assimilating and using information on job. Developing self and managing given tasks, finally to present himself as a technocrat.

It is an effort to develop student to be successful in finding a practical and reaction solution to any problem he comes across. It covers more or less all aspects of life skills. The development of subject is progressively ascending parallel to development of study in polytechnic.

COURSE CONTENTS:

It is expected that the teacher should give theoretical inputs to students about following contents in 8-9 lectures. He should emphasize the importance of each content in practical assignments and practical exercises to be carried out in practical work. Overview of below contents is expected to be delivered to the students. Importance of these aspects is to be emphasized for practical assignments.

Sr. No.	Content to be covered	Hours
1	**Information Search** Information source –Primary, secondary, tertiary Print and non - print , documentary, Electronic Information center, Library , exhibition, Government Departments. Internet Information search – Process of searching, collection of data -questionnaire , taking Interview , observation method.	02
2	**Communication Skills & Presentation Skills** Techniques of communication skills, Body language **,**Dress like the audience **,**Posture, Gestures, Eye contact and facial expression. Presentation Skill –Stage fright,Voice and language – Volume, Pitch, Inflection, Speed, Pause Pronunciation, Articulation, Language,Practice of speech. Group discussion and Interview technique,Use of aids –OHP, LCD projector, white board	02
3	**Self Analysis & Self Development** Understanding self— Attitude, aptitude, assertiveness, self esteem, Confidence buildings. Concept of motivation. Stress Management, Health Management, Time management, Emotion-Concept, types, controlling, emotional intelligence. Creativity-Concept, factors enhancing creativity,	03
4	**Task Management** Introduction, Task identification,Task planning ,organizing and execution, Closing the task, Problem Solving, Working in Teams, Leadership in teams, Handling frustrations in group.SWOT analysis	02

LIST OF ASSIGNMENTS:

The Term Work Will Consist Of Following Assignments.

(Minimum 08 assignments)

1) Information search:- Visit your Institute's Library and enlist the books available on the topic given by your teacher. Systematically gather the information on the topic given by teacher along with refrences. Use of Internet also to be done in getting the information(Here group of five to six students should be given various technical topics for the information search.Students should be asked to collect Various Technical papers on related topics also)

2) Topic Presentation:- One recent topic related to technical advancement should be given to a group of five to six students. Group should search the necessary information from various sources and prepare a systemtic power point presentation. All such presentations should be delivered in front of class by groups. Presentations are to be evaluated by teacher.

3) Individual Speech: Topic will be given to the individual for a speech of 5 to 8 minutes.Here the individual speeches of students will be conducted and evaluated by group of students.

4) Group Discussion: Teacher should form group of six to eight students and give topics for group discussion. Group discussions should be carried out and evaluated by teacher

5) Visit to any one place like historical/office/farms/development sites etc and gather information through observation, print resources and interviewing the people and make a systematic record of same.

6) Prepare your individual time table for a week -
   a) List down your daily activities.
   b) Decide priorities to be given according to the urgency and importance of the activities.
   c) Find out your time wasters and mention the corrective measures.

7) Find out the causes of your stress that leads tension or frustration .Provide the ways to avoid them or to reduce them. Systematically record the same.

8) SWOT analysis:- Analyse yourself with respect to your strength and weaknesses, opportunities and threats. Following points will be useful for doing SWOT.
   a) Your past experiences,
   b) Achievements,
   c) Failures,
   d) Feedback from others etc.

9) Undergo a test on reading skill/memory skill administered by your teacher.

10) Form a group of 5-10 students and do a work for social cause e.g. tree plantation, blood donation, environment protection, camps on awareness like importance of cleanliness in slump area, social activities
   (One activity per group)

11) Conduct an interview of a personality and write a report on it.

12) Collect the technical information, Leaflets, Broachures on various products given by teacher.(Here products like MotorCycle, Cars, Trucks, Pumps,Cutting Tools, Computers etc to be given)

13) Arrange an exhibition, displaying flow-charts, posters, paper cutting, photographs etc on the topic given by your teacher

14) Collect information about various vehicle loan schemes,House loan schemes, Industry loan schemes from nationalized banks and make a record of it.

15) Prepare a typical loan repayment chart for a loan under following cases 1. Fixed rate of interest and 2. Reducing balance

16) Obtain information about BIS standard for a particular product.

NOTE:- THESE ARE THE **SUGGESTED ASSIGNMENT** FOR GUIDE LINES TO THE SUBJECT TEACHER. HOWEVER THE SUBJECT TEACHERS CAN SELECT ,DESIGN ANY ASSIGNMENT RELEVANT TO THE TOPIC, KEEPING IN MIND THE OBJECTIVES OF THIS SUBJECT.

Learning Resources:

Books :

Sr. No	Author	Title of the book	Publisher
1	Marshall Cooks	Adams Time management	Viva Books
2	E.H. Mc Grath , S.J.	Basic Managerial Skills for All	Pretice Hall of India, Pvt Ltd
3	Allen Pease	Body Language	Sudha Publications Pvt. Ltd.
4	Lowe and Phil	Creativity and problem solving	Kogan Page (I) P Ltd
5	Adair, J	Decision making & Problem Solving	Orient Longman
6	Bishop , Sue	Develop Your Assertiveness	Kogan Page India
7	Marion E Haynes	Make Every Minute Count	Kogan page India
8	Pearson Education Asia	Organizational Behavior	Tata McGraw Hill

5R207:PROFESSIONAL PRACTICES

COURSE STRUCTURE:

Teaching Scheme		Evaluation Scheme						
TH	--		PT	TEE	TW	PR	OR	Total
PR	02	Max.Marks			25	--		25
TOTAL	02	Duration			--	--	--	--

RATIONALE

Most of the diploma holders join industries. Due to globalization and competition in the industrial and service sectors the selection for the job is based on campus interviews or competitive tests.

While selecting candidates a normal practice adopted is to see general confidence, ability to communicate and their attitude, in addition to basic technological concepts.

The purpose of introducing professional practices is to provide opportunity to students to undergo activities which will enable them to develop confidence. Industrial visits, expert lectures, seminars on technical topics and group discussion are planned in a semester so that there will be increased participation of students in learning process.

COMPETENCY STATEMENTS

Student will be able to:

1. Acquire information from different sources
2. Prepare notes for given topic
3. Present given topic in a seminar
4. Interact with peers to share thoughts
5. Prepare a report on industrial visit, expert lecture

Sr. No.	Activities	Practical Hours
1	**Industrial Visits** Structured industrial visits be arranged and report of the same shall be submitted by the individual student, to form a part of the term work. The industrial visits may be arranged in the following areas / industries : Sugar Factory / Dairy / Chemical Industry / Thermal Power Plant ./ Automobile Industry i) Machine shop having CNC machines. ii) ST workshop / Auto service station iii) City water supply pumping station iv) Manufacturing unit to observe finishing and super finishing processes.	**06**
2	Lectures by Professional / Industrial Expert lectures to be organized from any two of the following areas: i) Interview Techniques. ii) Modern Boilers – Provisions in IBR iii) Applications of Sensors and Transducers iv) Alternate fuels – CNG / LPG , Biodiesel, Ethanol, hydrogen v) Piping technology	**03**
3	**Information Search :** Information search can be done through manufacturer's catalogue, websites, magazines, books etc. and submit a report any one topic. Following topics are suggested : i) Engine lubricants & additives ii) Automotive gaskets and sealants iii) Engine coolants and additives iv) Two and Four wheeler carburetor. v) Power steering vi) Filters vii) Different drives/Transmission systems in two wheelers. viii) Types of bearings – applications and suppliers. ix) Heat Exchangers x) Maintenance procedure for solar equipment. Tools holder on general purpose machines and drilling machines.	**05**
4	**Seminar :** Seminar topic shall be related to the subjects of fourth semester. Each student shall submit a report of at least 10 pages and deliver a seminar (Presentation time – 10 minutes)	**04**

5	**Case Study** A group of four students will prepare a write up on two case studies one each of an industry and an entrepreneur, analyse the case studies and draw inference.	**04**
6	**Event management-** Conduct an event like blood donation camp, poster/ paper presentation competition, industrial survey, RTO camp, other social activities, arranging expert lectures, conduct of interviews etc**.**	**05**
7	**Group Discussion : (Two topics)** The students shall discuss in group of six to eight students and write a brief report on the same as a part of term work. The topic for group discussions may be selected by the faculty members. Some of the suggested topics are xi) Solar Vehicles / Electric Vehicles. xii) Auto Vehicles – Comparison. xiii) Two stroke versus four stroke engines xiv) Recycling of plastics and other waste material xv) Attributes of product design xvi) Creativity and innovativeness xvii) Energy conservation in institutes xviii) Value engineering xix) Revolution in communication technology xx) Pneumatic tools and equipments xxi) Wear mechanisms	**05**
	TOTAL	**32**

5R208- MECHANICAL TECHNOLOGY (MT)

COURSE STRUCTURE:

Teaching Scheme		Evaluation Scheme						
TH	02		PT	TEE	TW	PR	OR	Total
PR	03	Max.Marks	20	80	25	--	25	150
TOTAL	05	Duration	01	03	--	--	--	04

RATIONALE:

Diploma engineers are always involved in the application of engineering processes in the manufacturing areas. In view this it is essential that the diploma engineers should be well exposed to the fundamental processes called non chip forming processes like welding, cold working and hot working, press work, pattern making, foundry processes. Diploma engineer of any branch should be able to visualize these processes in the field.

COMPETENCY STATEMENTS:

3. To understand various non chip forming processes.
4. To understand the application of the above processes.

COURSE CONTENTS:

Topic No.	Content	Hours	Marks
1	**Hot and Cold working processes** 1.1Methods of Hot working, Pipe & tube production, forging, extrusion, piercing, hot spinning, 1.2 Methods of cold working , cold rolling, shearing & blanking, wire drawing, spinning, embossing, stretch forging, squeezing, high pressure sheet metal forming.	05	15
2	**Press and Press work** 2.1 Introduction, types of presses, 2.2 Power press parts, power press driving mechanism, press size, press tools, 2.3 Methods of punch support, methods of die support, die accessories, types of dies and operations, press guard, 2.4 Types of press tools, press brake, press operations	06	15
3	**Welding** 3.1 classification of welding, 3.2 Study of welding methods – Arc welding, Gas welding, Resistance welding, Spot welding, butt welding, flash welding, seam welding, projection welding, thermit welding, inert gas arc welding, TIG welding, MIG welding, 3.3 Selection of welding methods for different materials such as cast steel, cast iron, carbon steel, stainless steel.Inspections,defects &remedies.	06	15

4	**Pattern Making** 4.1 Definition, Design consideration in pattern, pattern layout, pattern construction, 4.2 Pattern materials, selection of materials; Allowances, master pattern, function, types, core prints unserviceable parts as pattern; core boxes 4.3 Color code and preservation of pattern. Shrinkage / contraction Rule.	05	12
5	**Moulding** 5.1 Hand tools, and their uses, 5.2 Moulding machines and their types, 5.3 Moulding sand, characteristics, constituents of moulding sand, sand preparation & conditioning, sand testing equipments, core moulding, and solidification of metals. 5.4 Gravity die casting, slush casting, moulding procedure, gating risering, use of pads, exothermic material, use of chills, CO2 moulding, and chaplets.	05	12
6	**Foundry Engineering** 6.1 Introduction, furnaces used in foundry like coke fired, gas fired, cupola, 6.2 preparation of cupola, charging of cupola, jamming of cupola, Zone & reactions 6.3 defects in casting, causes & remedies, inspection of casting, hot metal handling equipments 6.4 special casting methods, permanent mould, hot chamber die casting m/c, cold chamber die casting m/c, centrifugal casting, true centrifugal, semi centrifugal, and centrifuging, investment casting, continuous casting.	05	11
		32	80

TERM WORK:

Every student is required to submit the term work as mentioned below-

1. Welding
   - 1.1 Fabrication job involving the operations of welded joints.
   - 1.2 Job involving spot welding.
2. Pattern Making
   - 2.1 Pattern with core prints and core box.
3. One job involving plain and step turning
4. Visits to industry involving operations like press work, hot & cold working, foundry and forging.
5. Journal based on shop tools, specifications, method of use & their maintenance, report of the industrial visits etc.

TEXT BOOK:

Sr.No	Title and Edition	Author	Publisher
1	Workshop technology Vol. 1	B.S. Raghuwanshi.	Dhanpat rai and sons
2	Workshop technology Vol. 1	S.K. Hajra Choudhary	publishing house
3	Production technology	R.K. Jain,	Khanna publishers

5G301-ENGLISH

COURSE STRUCTURE:

Teaching Scheme		Evaluation Scheme						
TH	02		PT	TEE	TW	PR	OR	Total
PR	02	Max.Marks	20	80	25	--		125
TOTAL	04	Duration			--	--	--	--

RATIONALE: English is the only language used all over the world. It is necessary to gain command over English languge .English is also developed as a language of International, Trade& Commerce, Library, Link language.
To help students to:
•Become competent in English Grammar and its usage.
•Write and speak English confidently correctly.
•Gain command over English language.
•Learn the modern methods of English such as sending, receiving emails to be competent with International trends.
•To use proper pronunciations

COMPETENCY STATEMENTS:
• To develop Theoretical concepts and practical implementations of English language.
• To develop writing skills.

List of Assignments:

1) Building of Vocabulary
Words from the glossary given at the end of each chapter, to be used to make sentences.

2) Applied Grammar
Identify the various parts of speech and insert correct parts of speech in the sentences given by the teachers.

3) Punctuation
Punctuate 20 sentences given by the teachers.

4) Tenses
List 12 tenses and give two examples for each tense.

5) Dialogue Writing
Write at least two dialogues on different situations.
(Conversation between two friends, conversation between two politicians etc.)

6) Idioms and Phrases

Use of Idioms and Phrases in sentences. (20Examples)

7) Biography

Write a short biography on your favorite role model approximately. (250 – 300) Words with pictures

TEXT BOOKS"

S.No.	Name of Book	Author	Publication
1.	Spectrum-A Text Book on English	--	MSBTE

REFERENCE BOOKS:

S.No.	Name of Book	Author	Publication
1.	English grammar and Composition	R.C.JAIN	Macmillan

5G302- COMMUNICATION SKILLS

COURSE STRUCTURE:

Teaching scheme		Evaluation scheme						
TH	01		PT	TEE	TW	PR	OR	TOTAL
PR	02	MAX MARKS	--	--	50	--	25	75
TOTAL	03	DURATION	--	--				

RATIONALE:
Language skills pertaining to English have been already introduced previously. With a view to achieve some command over a language & to develop communication skills is the main objective of this subject.

COMPETANCEY STATEMENT:
The student will be able to:

1. To develop Listening, Speaking, Reading and Writing skills.
2. Ability to engage & interact effectively with others.
3. To enable an individual to express perfectly.
4. To use appropriate body language.
5. To obtain acceptance & provide assistance, direction & leadership.

COURSE CONTENTS:

Topic no	contents	HRS	MARKS
01	**Introduction to Communication** 1.1 Definition, Importance Communication cycle/process 1.2 The Elements of communication	04	
02	**Types of Communication** 2.1 Verbal-Nonverbal, Formal – Informal, Upward-Downward,Vertical-Horizontal-Diagonal Communication.	02	
03	**Principles of Effective Communication :** 3.1 Principles of effective communication 3.2 Communication Barriers & how to overcome them	04	
04	**Non Verbal Communication** 4.1 Aspects of body language(gestures ,Postures etc.) 4.2 Pictorial Representation(tables,graphs, piechart etc.)	02	
05	**Formal Written Skills** 5.1 Office Drafting: Circular, notice & memo 5.2 Job Application 5.3 Business Correspondence: Inquiry , order letter & adjustment letter	04	

	TOTAL	**16**	

List of Experiments-

01 Communication Cycle (With the Help of Diagram) + any two communications Situations to be represented with the help of Communication Cycle. (Use Pictures)
02 Speech
03 conversation
04 Group discussion
05 Non-Verbal Communication:
Body Language: Five Illustrations of appropriate use of Body Language used on the part of student in formal and Informal setups. (Example- formal setup-classroom)
06 Seminar related on any topic.
07 Interview Techniques
08 Job Application & Effective Resume Writing

REFERENCE BOOKS:

S.No.	Name of Book	Author	Publication
1.	Text book of Communication skills	MSBTE	MSBTE
2.	Everyones guide to Effective Writing	Jayakaran	Apple
3	Developing Communication Skills	Krushnan Mohan,Meera Banarji	Macmillan
4	Professional Communication Skills	Pravi S R Bhatia	s. chand&co.

5R301- BASICS OF ELECTRICAL ENGINEERING AND ELECTRONICS

COURSE STRUCTURE:

Teaching scheme		Evaluation scheme						
TH	04		PT	TEE	TW	PR	OR	TOTAL
PR	02	MAX MARKS	20	80	50	--		150
TOTAL	06	DURATION	--	--				

RATIONALE:

The course aims to prepare the technicians to carry out the responsibilities related to electrical. A mechanical diploma holder employed in industry needs to operate and maintain industrial motors.

Today the industrial environment consists of systems with the combinations of , electrical and electronic controls. engineers always come across with these systems in operating sense. He is required to operate, maintain and run these systems. technicians should have fundamental knowledge of various electronic circuits, amplifiers, oscillators, digital fundamentals should be known to them. Considering the vital and inseparable place of this area this course is introduced.

COMPETENCY STATEMENT(S):

2.2 To know various fundamentals of electrical engineering.
2.3 To get familiar with electrical equipments
2.4 To know various electrical machines
2.5 To understand and operate various electronic circuits and devices.

OBJECTIVES

At the end of the course student should be able to,

- Understand the working of various industrial motors
- Realize importance of electrical safety
- Describe construction, working and application of transformer.

COURSE CONTENTS:

Chapter	Name of Topic	Hrs	Marks
01	**Fundamentals** 1.1 Structure of atom ,concept of current , emf, pd 1.2 Resistance & its properties 1.3 Laws of resistances & resistivity 1.4 Factors affecting the resistance, Effect of temperature on resistance, RTC 1.5 Ohm's law 1.6 Series & parallel combination of resistances, Division of currents in parallel branches, simple numericals 1.7 Kirchhoff's current and voltage law 1.8 Simple numerical based on ohm's law & Kirchoff's laws	**08**	**10**

	1.9 Capacitance, permittivity, series & parallel connections of capacitors, simple numerical. 1.10 Ammeter, voltmeter, wattmeter, energy meter, power factor meter, Frequency meter, CT , PT and their uses.		
02	**Magnetism & Electromagnetism** 2.1 Concept of magnetic lines of forces, magnetic field. 2.2 Flux, flux density, magnetic field intensity, MMF, reluctance, permeability. 2.3 Magnetic hysteresis, hysteresis loop, hysteresis loss. 2.4 Eddy currents & Eddy current loss. 2.5 Methods to minimize hysteresis & Eddy current loss. 2.6 Electric and magnetic circuit similarities & dissimilarities 2.7 Faraday's laws of electromagnetic induction 2.8 Lenz's law 2.9 Fleming's right hand, Left hand rule, its application. 2.10 Self and mutual inductance, coefficient of coupling	**06**	**08**
03	**A.C. Circuits** 3.1 Generation of alternating voltage ,wave forms & phasor representation. 3.2 RMS & average values 3.3 Phase & phase difference 3.4 series R-L, R-C, R-L-C circuits, voltage, impedance, power triangle. 3.5 Parallel a.c. circuits. 3.6 Simple numerical based on above topic. 3.7 Advantages of three phase over single phase, Phase Sequence. 3.8 Star & Delta connections	**08**	**10**
04	**Electrical Machine Fundamentals** 4.1 Construction & classification of d.c. machines 6.2 Working principle of d.c. generator & motor 6.3 Characteristics of d.c. motor 6.4 Construction & classification of single phae transformer 6.5 Working principle, e.m.f. equation, transformation ratio. 6.6 O.C. & S.C test of transformer, efficiency and regulation 6.7 Simple numerical on transformer efficiency. 6.8 Construction & Classification of three phase induction motor 6.9 Speed & Slip 6.10 Construction , Working principle , uses of single phase induction motor 6.11 Applications of all above machines in industry.	**06**	**08**
05	**Electrical safety** 7.1 Single line diagram of power system in industry 7.2 Safety precautions to avoid electric hazards. 7.3 Causes of electrical accidents, remedial action.	**04**	**04**
	ELECTRONICS		

06	**Electronic Devices** 6.1Introduction to electronic devices, their symbols, principle of working and testing procedure – Diode, Zener diode, Power diode, Varactor diode, Bipolar Junction Transistor (BJT), Field Effect Transistor(FET) - JFET & MOSFET, Uni-junction 6.2 Transistor(UJT), power devices – DIAC,TRIAC, SCR, Photo devices-, LDR, Photo diode, Photo transistor, LED & LED display (7 segment), Liquid crystal display(LCD),	**07**	**08**
07	**Power supply** 7.1 Circuit diagram and operation- Half wave, full wave & bridge rectifier. 7.2 Filters – L, C, L-C, π filter 7.3 Concept of unregulated power supply, regulated power supply line & load regulation 7.4 Principle of operation 7.5 block diagram and application of shunt regulated power supply, series regulated power supply 7.6 3 pin IC regulated, IC 723 adjustable power supply.	**07**	**08**
08	**Transistor** 8.1 Transistor as a switch and amplifier 8.2 single stage transistor amplifier CB, CE and CC configuration and their applications, 8.3 Oscillator – Requirement of oscillator circuit, Barkhauson's criteria of oscillator, circuit diagram and its application 8.4 Phase shift oscillator, Hartley oscillator, Colpitts oscillator, Crystal oscillator.	**05**	**07**
09	**OP Amp** 9.1 Block diagram, configurations and use of op amp as - Inverting, Non-inverting, Summing 9.2 use of op amp as - Voltage to current converter, current to voltage converter, differentiator 9.3 use of op amp as - Comparator, Wien bridge oscillator, Schmitt's trigger, Instrument amplifier.	**05**	**06**
10	**IC 555** 10.1 Block diagram, Multi vibrator circuit diagram and working for Mono stable, Bi stable and Astable Multivibrator 10.2 Analog to Digital Converters , Digital to Analog converter 10.3 Block diagram and working of –Welding control circuits – sequential timer Temperature control circuits using SCR, FWR Speed control circuits Level control circuit using variable capacitor and potentiometer.	**05**	**06**

11	**Sensors and conditioning circuits:** 11.1 Terminology, basic principles, principle and construction of different sensors 11.2 temperature sensors, pressure sensors, flow sensors, displacement sensors.	**03**	**05**
		64	**80**

LIST OF PRACTICALS:

ELECTRICAL (If required specify minimum number of practical to be conducted from the following)

1. To list the specifications of various electrical machines. (Workshop/ electrical laboratory, mechanical laboratory)
2. To draw single line diagram of electrical laboratory
3. To verify the Ohm;s law.
4. To study the effect of rise in temperature on resistance.
5. Starting and reversing of D.C shunt motor.
6. To determine the transformation ratio of single phase transformer.
7. To determine the regulation and efficiency of transformer by direct loading.
8. Starting and reversing 3- phase induction motor.
9. Safety precaution to be taken while performing maintenance of electrical system.
10. To verify the relations between V & I in a star & delta connection.

ELECTRONICS: (If required specify minimum number of practical to be conducted from the following)

11. To identify the electronic components of devices such as diodes, transistors, SCR, Diac, Triac.
12. To plot V-T characteristic of Zener Diode
13. To plot V-I characteristic of P-N junction diode.
14. Rectifier with filter
15. To Study inverting and non inverting amplifier.
16. To plot gain and frequency response of single stage amplification.
17. To measure the voltage of two I/P input summer circuit using operational amplifier.
18. multivibrator
19. To measure displacement using LVDT.
20. Sensors & Transducers

REFERENCES:

Sr. No	Title of Book	Author and Publication
1	A text book of electrical engineering	B.L.Theraja, S.Chand and Company
2	Electrical engineering	M.K.Chondekar, Pingala Prakashan
3	Applied electronics	R. S. Sedha, Prentice Hall
4	Instrumentation	Malvino , Tata McGraw Hill

5G304- ENVIRONMENTAL SCIENCE

COURSE STRUCTURE:

Teaching scheme		**Evaluation scheme**						
TH	02		PT	TEE	TW	PR	OR	TOTAL
PR	00	MAX MARKS			50	--		50
TOTAL	02	DURATION	--	--				

RATIONALE:
The course of environmental science aims at providing the knowledge of various recourses and pollutants, waste and preliminary treatment with re-cyclic aspect aspects.

OBJECTIVES:

The students will be able to;

- To understand the environment.
- To create the awareness.
- To know the recourses.
- To classify the types of waste.
- To classify the types of pollutants.
- Management of waste.

COURSE CONTENTS:

PART A			
Topic no	**contents**	**HRS**	**MARKS**
01	**Resources**: 1.1Engineering uses of natural and artificial resources such as water, Metals, wood, plastics, rubber and glass etc. 1.2 List various types of resources	**2**	
02	**Environment:** 2.1 Meaning of environment, scientific aspects, burning topic on environment science such as global warming, climate change, deforestation.aquatic life and tsunami effects etc.. 2.2 Activity web searching of burning topic on environmental hazard,poster competition/exhibition/slogan etc	**4**	
03	**Waste** 3.1 Different types of wastes, causes and effects of wastes on plants, animals and human life. 3.2 Listing causes and effect and risks of any one waste	**4**	
04	**Pollution**	**6**	

	4.1 Meaning of pollution and its types(air,water,sound) causes and its effects. 4.2 Pollution norms,rules and bye laws 4.3 Group discussion and conclusion		
PART B (Branch oriented) Diciplinewise examples to be covered			
05	**Mechanical waste** 5.1Identification of mechanical waste 5.2 Effects & risk of waste 5.3 Recycling and waste management. 5.4 Application & uses 5.5 Market survey of any one type of waste.	**7**	
06	**Treatments** 6.1 concept and need of treatment 6.2 Standards of pollution control board/industry for its disposal 6.3 Arrange visit to effluent treatment plant & prepare report.	**5**	
07	**Environmental Management** 7.1 Meaning of environmental Management 7.2 Management of any one type of waste. 7.3 Expert lecturer on a)Duties & citizen and role of government b)Environmental management assessment	**4**	
	Total	**32**	

NOTE: The term work will consist of the assignment work given by the subject teacher on the above topic contents.

REFERENCES:

Sr. No	Title of Book	Author and Publication
1	Air pollution	M.N. Rao and H.V.N. Rao Tata McGraw Hill
2	Automotive Mechanics	William H. Course, Tata McGraw Hill
3	Internal Combustion Engines	K.K. Ramlingam, Scitech
4	Water Supply and Sanitary Engineering	G.S. Bilgi Dhanpat Rai and Sons.
5	Elements of Environment Science and Engineering	P. Meenakshi, Prentice-Hall
6	A basic course in environmental studies	S.Deswal and A. Deswal, Dhanpat Rai and Sons.
7	Introduction to Environmental Engineering	P. Aarne Vesilind and Susan M. Morgan Thomson

5G305-INDUSTRIAL MANAGEMENT

COURSE STRUCTURE:

Teaching Scheme		Evaluation Scheme						
TH	03		PT	TEE	TW	PR	OR	Total
PR	02	Max.Marks	20	80	25	--	25	150
TOTAL	05	Duration	01	03	--	--	--	--

RATIONALE:

The diploma pass out is middle management cadre in the industrial organizational set up. A proper insight and understanding of Business Processes is therefore essential for All Polytechnic students. Management is a subject which deals with basics of Managerial science required to understand the processes in Industrial & Commercial environment. This will enable to become familiar and to understand various Business processes, Structures, their functioning and the role of technicians will have to perform.

Objective:

After completion of the curricula, the pass outs will able to:
1. Familiarize environment in the world of work
2. Appreciate the importance of management process in Business.
3. Identify various components of management.
4. Understand the role & responsibilities of a Technician in an Organization.
5. Appreciate the rules and regulations pertaining to work ethics and Social Responsibilities.

COURSE CONTENT:

Topic No	Name of Topic	Hours	Marks
01	**Overview Of Business** 1.1. Types of Business • Service • Manufacturing • Trade 1.2 Globalization • Introduction 1.3 Intellectual Property Rights (I.P.R.) Advantages & disadvantages with respective to India	(03) 01 01 01	06
02	**Evolution of Scientific Management** 2.1 Evolution of Management	(07)	12

	• Concept and definition of management • Levels of management • Administration & management • Scientific management by F.W.Taylor 2.2 Principles of Management (14 principles of Henry Fayol) 2.3 Functions of Management • Planning • Organizing • Directing • Controlling 2.4 Organizational Management • Introduction to Organization, • Types of organization: Line, Line & staff, Functional Project • Centralized & Decentralized, Authority & responsibility Span of Control 2.5 Forms of ownership • Proprietorship, Partnership, Joint stock, Co-operative Society, Govt. Sector	01 01 01 02 02	
03	**Human Resource Management** 3.1 Personnel Management: Definition and Functions 3.2 Staffing • Introduction to HR Planning • Recruitment Procedure 3.3 Personnel • Training & Development • Types of training • Skill Enhancement 3.4 • Leadership & Motivation • Maslow's Theory of Motivation • Front Line Supervisor • Group Dynamics. 3.5 Safety Management • Causes of accident • Safety precautions • Industrial hygiene 3.6 Introduction to Factory Acts • ESI Act • Workmen Compensation Act • Industrial Dispute Act. (Introductory approach only)	(09) 01 01 02 02 02 01	15
04	**Financial Management** 4.1 Objectives & Functions, 4.2. Capital Generation & Management • Types of Capitals	(09) 01 03	12

	• Sources of raising Capital 4.3 Budgets and accounts • Types of Budgets • Production Budget (including Variance Report) • Labour Budget • Introduction to Profit & Loss Account (only concepts) ; 4.4 Introduction to • Excise Tax • Service Tax • Income Tax • MOD-VAT • Custom Duty (Introductory approach only)	03 02	
05	**Materials Management** 5.1 Inventory Management -Meaning & Objectives. ABC Analysis Economic Order Quantity, Introduction & Graphical Representation. 5.2 Purchase Procedure, Objects of Purchasing, Steps in Purchasing 5.3 Modern Techniques of Material Management • Introductory treatment to JIT / SAP / ERP. (Introductory approach only)	(06) 03 02 01	10
06	**Marketing Management** 6.1 Introduction The Market, types of market, marketing process Selling vs. marketing, stress on customer centric approach. 6.2 Marketing Segmentation: benefits, marketing information system, Objectives of Marketing research, 6.3 Primary and Secondary data, Survey method, Uses of survey method, Types of survey, observation approach, panel research, experimental research, scope for marketing research in India. 6.4 Sales Promotion only concept**,** importance of advertisement in marketing, Media selection, channels of distribution, 6.5 Emergence of global marketing, international marketing environment, Multinational companies, procedure of export. (Introductory approach only)	(08) 01 02 02 02 01	13
07	**Project Management** 7.1 Project Management: Introduction ,CPM & PERT Technique Concept of Break Even Analysis (only introductory), Progress tracking with the help of bar charts.	(6) 03 03	12

	7.2 Quality Management Definition and concept of Quality , concept of Quality , Quality Circle, Quality Assurance, TQM, Kaizen, 5 'S', & 6 Sigma. (only introductory). (Introductory approach only)		
		48	80

List of Practicals:

The practical in management may consist of following task,

1.0 Case studies.
2.0 Guided Presentation.
3.0 Management Games.
4.0 Surveys.
5.0 Data collection, Presentation and Interpretation.
6.0 Role play/Group Discussions.

1.0 Case Study :
The case study approach may be applied to following subtopics of the curriculum.
The concern teacher may select similar suitable topics for case study.
(Any Two case studies and its presentation)

- Types of Business
- Intellectual Property Rights (I.P.R.)
- Forms of ownership
- Training & Development
- Leadership & Motivation
- Group Dynamics
- Industrial hygiene
- Sources of raising Capital
- Budgets and accounts
- MOD-VAT
- Modern Techniques of Material Management
- Marketing Segmentation
- Sales Promotion
- Quality Management

2.0 Guided Presentation (Any two)

- Centralized & Decentralized, Authority & responsibility
  Span of Control
- Skill Enhancement
- Safety Management
- Budgets
- JIT / SAP / ERP
- Advertisement in marketing,
- Media selection
- Global marketing
- Quality Management.

- Progress tracking

3.0 Management Games (Any two games from following areas or like wise)

- Human Resource Management
- Marketing Management
- Materials Management
- Project Management
- Lateral Thinking

4.0 Surveys (Any one survey from following areas or like wise)

- Training & Development
- Causes of accident
- Industrial Dispute
- Sources of raising Capital
- Inventory Management
- Customer centric approach by various business houses.
- Sales Promotion
- Product Mix
- Media selection
- Role of Multinational companies
- Impact of Quality Management parameters on project.

5.0 Data collection, Presentation and Interpretation
(Any one from following areas or like wise)

- Training & Development
- Capital Generation & Management
- Inventory Management
- Sales Promotion
- Media selection
- International marketing environment
- Channels of distribution
- Project Management
- Quality Management Parameters.

6.0 Role play/Group discussion
(Any one from following areas or likewise)

- Training
- Recruitment procedure
- Inventory management
- Market identification and sales promotion
- Project management team building

REFERENCES :

Sr. No	Title of Book	Author and Publication
1	Industrial Organization and Management	O.P.Khanna, Dhanpat Rai and Sons
2	Industrial Organization and Management	Banga and Sharma, Khanna Publications
3	Modern Business Organization & Management	S.A.Sherlekar & V.A. Sherlekar, Himalaya Publications
4	The process of Management	W.H.Newman,Prentice-hall of india pvt ltd,new delhi

NON EXAM: 5G311 TO 5G328

Course Structure:

Teaching Scheme		Evaluation Scheme						
TH	0		PT	TEE	TW	PR	OR	Total
PR	02	Max.Marks						
TOTAL	02	Duration						

ANY ONE OF THE FOLLOWING COURSES

COURSE CODE	COURSE TITLE
5G311	Personality Development
5G312	EDP(Civil Engg)
5G313	Hobby Electronics
5G314	Spoken English
5G315	German
5G316	French
5G317	Yoga
5G318	Music-Instrumental
5G319	Two wheeler Maintenance
5G320	EDP(Electrical Engineering)
5G321	Electrical Maintenance
5G322	Electronics Maintenance
5G323	Computer Maintenance
5G324	Japanese
5G325	Music-vocal
5G326	Aerobics
5G327	Indian classical dance
5G328	Sewing Machine Maintenance

NON EXAM:5G311 TO 5G328

Course Structure:

Teaching Scheme		Evaluation Scheme						
TH	0		PT	TEE	TW	PR	OR	Total
PR	02	Max.Marks						
TOTAL	02	Duration						

ANY ONE OF THE FOLLOWING COURSES

COURSE CODE	COURSE TITLE
5G311	Personality Development
5G312	EDP(Civil Engg)
5G313	Hobby Electronics
5G314	Spoken English
5G315	German
5G316	French
5G317	Yoga
5G318	Music-Instrumental
5G319	Two wheeler Maintenance
5G320	EDP(Electrical Engineering)
5G321	Electrical Maintenance
5G322	Electronics Maintenance
5G323	Computer Maintenance
5G324	Japanese
5G325	Music-vocal
5G326	Aerobics
5G327	Indian classical dance
5G328	Sewing Machine Maintenance

5G303- ENTREPRENEURSHIP DEVELOPMENT

COURSE STRUCTURE:

Teaching Scheme		Evaluation Scheme						
TH	02		PT	TEE	TW	PR	OR	Total
PR	02	Max.Marks			25	--	25	50
TOTAL	04	Duration			--	--	--	--

RATIONALE:

The post liberalization industrial and economic scenario in India makes it imperative that a more dynamic and pragmatic approach be adopted to create new, first generation entrepreneurs on a large scale.

This would help in tackling the problem of unemployment and contribute to the creation of new entrepreneurs. Using knowledge & advanced technology as their strategic tools those who can take on the increased competition in the domestic as well as global markets are innovators and entrepreneurs in true sense. This can be achieved only if more and more people are motivated and convinced to choose entrepreneurship as a career and put their energies and resources to a productive use.

The student community also needs to explore the emerging opportunities. It is therefore necessary to inculcate the entrepreneurial values during their educational tenure. This will help the younger generation in changing their attitude and take the challenging growth oriented tasks instead of waiting for white- collar jobs.

This subject will help in developing the awareness and interest in entrepreneurship and create employment for others.

Objectives:

Students will be able to

1) Appreciate the importance of entrepreneurship.
2) Identify entrepreneurship opportunity.
3) Get primary information to start any business.
4) Acquire entrepreneurial values and attitude.
5) Use the information to prepare project report for business venture.
6) Develop awareness about enterprise management.

Course Contents:

Topic No	Name of Topic	Hours	Marks
01	**Basic Concepts** 1.1. Concept, Classification & Characteristics of Entrepreneur. Creativity and Risk taking, Concept of Creativity & Qualities of Creative person. Risk Situation, Types of risk & risk takers. 1.2 Business Idea Methods and techniques to generate business idea 1.3 Transforming Ideas in to opportunities transformation involves Assessment of idea & Feasibility of opportunity, SWOT Analysis.	5	
02	**Information And Support Systems** 2.1 Information Needed and Their Sources. Information related to project, Information related to support system, Information related to Procedures and formalities. 2.2 Support Systems: • Small Scale Business Planning, Requirements. • Govt. & Institutional Agencies, Formalities • Statutory Requirements and Agencies. • Government Support and subsidies to entrepreneur.	5	
03	**Market Assessment** 3.1 Marketing -Concept and Importance 3.2 Market Identification, Survey Key components (Market Segmentation) 3.3 Market Assessment	5	
04	**Business Finance & Accounts** **4.1 Business Finance** • Cost of Project • Sources of Finance • Assessment of working capital • Product costing • Profitability • Break Even Analysis • Financial Ratios and Significance 4.2 **Business Account** Accounting Principles, Methodology • Book Keeping • Financial Statements • Concept of Audit, • Trial Balance • Balance Sheet	6	

05	**Business Plan & Project Report** 5.1 Business plan steps involved from concept to commissioning Activity Recourses, Time, Cost 5.2 **Project Report** 1) Meaning and Importance 2) Components of project report/profile (Give list) 5.3 **Project Appraisal** 1) Meaning and definition 2) Technical, Economic feasibility 3) Cost benefit Analysis	6	
06	**Enterprise Management And Modern Trends** 6.1 Enterprise Management: - 1) Essential roles of Entrepreneur in managing enterprise 2) Product Cycle: Concept And Importance 3) Probable Causes Of Sickness 4) Quality Assurance, Importance of Quality, Importance of testing 5) Industrial zones and SEZ. 6.2 E-Commerce , Concept and process 6.3 Global Entrepreneur: role and opportunities.	5	
	TOTAL	**32**	

Practical:

The practical task may be divided in following heads

1. Literature survey – MSFC/IDBI/MSSIDC/CIDBI/MSME/DIC/ ROLE OF DIFFERENT COMMERCIAL BANKS etc.
2. Administration of ready made tools like questionnaires, opinionnaire, Interview schedule for product identification purpose (decision making process).
3. Development of “Business Ideas”.
4. Visit to MCED/MITCON- gong through the product related library.
5. Preparation of Preliminary / Detailed project report in the formats recommended by MCED/MITCON.
6. At least one case study of successful entrepreneur..

Text Books

Sr. No	Title of Book	Author and Publication
1	Entrepreneurship Development	TTTI, Bhopal.
2	The Seven Business Crisis& How to Beat them	V.G.Patel
3	A handbook of New Entrepreneurs	P.C.Jain ,Dhanpat Rai and Sons
4	Entrepreneurship development	E.Gorden, K. Natrajan.
5	New Initiatives in Enterprenuership Education And training	Gautam Jain, Debmuni Gupta

6	www.ediindia.org.	
7	Entrepreneurship Theory and Practice	J.S.Saini,B.S.Rathore
8	Enterpreneurship Development and management	A.K.Singh, Laxmi Publications
9	The Beermat Enterpreneur	Southon, Pearson Education limited

5R401- FLUID POWER

COURSE STRUCTURE:

Teaching Scheme		Evaluation Scheme						
TH	03		PT	TEE	TW	PR	OR	Total
PR	02	Max.Marks	20	80	25	--	25	150
TOTAL	05	Duration			--	--	--	--

RATIONALE:

Oil Hydraulic systems & pneumatic systems are widely used in all fields of engineering as clean source of motive power. Low cost automation systems with the use of pneumatics have become popular as manufacturing aids.

Diploma engineers come across such systems in all segments of industries.

Hence the subject will give the students basic skills and knowledge, which will be directly needed in the industrial environment.

COMPETENCY STATEMENT (S):

- To know the various properties of fluid.
- To understand the flow through pipes and losses in relation to practical applications.
- To understand working of different types of turbines & pumps.
- To know the different components of hydraulic & pneumatic circuits.
- To understand working of different components and their use in circuits.
- To prepare different circuits using above components

Objectives:

The student will be able to.

- Understand the basic fluid mechanics and principles governing them.
- Identify various components of hydraulic & pneumatic systems.
- Know the working principle of various components used for hydraulic & pneumatic systems.

- Select appropriate components required for simple hydraulic and pneumatic circuits.

- List probable causes of faults or defects in the components of hydraulic & pneumatic circuits.

Course Contents:

Topic No	Name of Topic	Hours	Marks
01	**Basic Concepts** 1.1.Mass density, weight density, specific volume, specific gravity, Viscosity - dynamic and kinematics, Newton's law of viscosity 1.2 Pressure, units, pressure head, Pascal's law, positive and negative pressure. Manometers- simple, U-tube, simple differential	4	4
2	**Fundamentals Of Fluid Flow** 2.1 Types of flows, concept of discharge, continuity equation, 2.2 Bernoulli's equation, assumptions, application of equation in pipes & nozzles. 2.3 Applications- venturimeter, pitot tube, simple numerical	4	8
3	**Flow through pipes** 3.1 Laws of fluid friction, Reynolds number, Major losses, Darcy-Weisbatch equation, Chezy's formula, simple numerical. 3.2 Minor losses - entry, exit, accessories such as sudden enlargement, contraction, bends, valves, elbows, numerical. 3.3 Hydraulic Gradient Line (HGL), Total Energy Line (TEL) , pipes in series, equivalent pipe, parallel pipes, 3.4 Power transmission through pipes, max. efficiency of transmission Water hammer in pipes - causes, effects and remedial measures.	5	10
4	**Turbo machinery:** 4.1 Pumps: Construction and working of centrifugal, reciprocating, jet and submersible Pump, multistage pumps, cavitations, air vessels.Priming of pumps. 4.2 Turbines:Hydraulic power plant layout, classification of turbines, construction and working of Impulse, reaction and axial flow turbine. Governing of turbines. Selection of turbines.	7	12
5	**Introduction to oil hydraulic systems** 5.1 Practical applications of hydraulic systems. 5.2 General layout of oil hydraulic systems. 5.3 Merits and limitations of oil hydraulic system	3	3
6	**Components of Hydraulic systems** 6.1 Pumps – construction and working of Vane pump, gear pump, Gerotor pump, screw pump, piston pump only.		

	6.2 Valves – Construction, working and symbols of Pressure control valves – pressure relief valve, pressure reducing, pressure unloading, Direction control valves – Poppet valve, spool valve, 3/2, 4/2 D.C. valves, Sequence valves. Flow control valves – pressure compensated, non pressure compensated flow control valve. 6.3 Actuators- Construction, working and symbols of Rotary Actuators - Hydraulic motors. Linear Actuators – Cylinders - single acting, double acting. 6.4 Accessories – Pipes, Hoses, fittings, Oil filters, Seals and gaskets, Accumulators. (Types, construction, working principle and symbols of all components)	6	10
7	**Hydraulic Circuits** 7.1 Meter in, Meter out circuits 7.2 Bleed off circuit 7.3 Sequencing circuit 7.4 Hydraulic circuits for Milling machine, Shaper machine, Motion synchronization circuit.	6	10
8	**Introduction to pneumatic Systems** 8.1 Applications of pneumatic system 8.2 General layout of pneumatic system 8.3 Merits and limitations of pneumatic systems	2	3
9	**Components of pneumatic system** 9.1 Compressor **–** Reciprocating & Rotary compressors. Control Valves – Pressure regulating 9.2 valves, Flow Control valves, Direction Control Valves. 9.3 Actuators –Rotary - Air motors, Types, construction, working principle 9.4 Linear- Cylinders- Types, construction & working principle 9.5 Accessories – Pipes, Hoses, Fittings, FRL unit 9.6 (Types, construction, working principle and symbols of all components)	5	10
10	**Pneumatic Circuits** 10.1 Speed control circuits. 10.2 Sequencing circuits 10.3 Roller operated 10.4 Stroke control circuit, 10.5 Time delay circuit, its application in vacuum handling, 10.6 Dual control, 10.7 Intermediate stopping of piston, 10.8 Mechanical press.	6	10
	TOTAL	**48**	**80**

LIST OF PRACTICALS/EXPERIMENTS:
(Any twelve to fourteen from the following list)

1. To find out mass density, weight density, and specific gravity of liquids and Compare them.
2. To study different types of manometers and gauges used in the laboratories.
3. Calculation of pressure with the help of manometers.
4. Calculation of actual discharge.
5. Study of layout for a hydroelectric power station.
6. Study and demonstrating working of Pumps and turbines.
7. To measure the flow by using venturimeter.
8. To determine loss of head per unit length of different materials.
9. To determine minor losses of head in pipe joints.
10. To find efficiency of a centrifugal pump.
11. To find efficiency of a reciprocating pump.
12. To study different types of turbines.
13. To study different elements of hydraulic and pneumatic systems and their symbols.
14. To study and develop circuits (four) on hydraulic trainer.
15. To study and develop circuits (four) on pneumatic trainer.

REFERENCES:

Sr. No	Title of Book	Author and Publication
1	Fluid mechanics and hydraulic machinery	Modi & Seth, Standard book house Delhi
2	Fluid mechanics and hydraulic machinery	R. K. Bansal, Laxmi publications (P) limited
3	Hydraulics	R.S. Khurmi, S.Chand and Company
4	Hydraulics	Jagdish Lal , Metropolitan Book Company Pvt Limited
5	Industrial Hydraulics	Pippenger and Hicks, McGraw Hills Book Company
6	Pneumatics and Hydraulics	Harry L. Stewart , D.B.Taraporewala and Sons And companu
7	Hydraulics & Pneumatics	Andrew Parr ,Jaico Publishing house
8	Pneumatic systems	S.R. Mujumdar, Tata MC Graw Hills

5R402: MACHINE DRAWING (MD)

COURSE STRUCTURE:

Teaching Scheme		Evaluation Scheme						
TH	02		PT	TEE	TW	PR	OR	Total
PR	04	Max. Marks	20	80	50	--	25	175
TOTAL	06	Duration	1.00	4.00	--	--	--	--

RATIONALE:

Machine Drawing is the language of engineers and technicians. A mechanical engineering technician has to work in different situations like supervision of production, maintenance of machines, inspection work, prepare drawing of objects etc. He has to interpret the parts drawings and assembly drawings.

COMPETENCY STATEMENT (S):

To prepare and interpret the production drawings as per I.S. code.

COURSE OBJECTIVES:

Student should able to,

1 Understand the curves of interpenetration of solids
2 Understand development of surfaces
3 Use proper welding and machining symbol.
4 Use proper limits,
5 Use IS Conventions.
6 Read the given drawing.
7 Prepare assembly drawing from given components drawing.
8 Prepare production drawing.

CONTENTS:

Topic No.	Content	Hours	Marks
1.	**Development of surface of solids:** 1.1 Development of lateral surface of following rectangular solids like Cone Cylinder Pyramids and Prisms 1.2Development of funnel, Chimney, pipe bends and composite solids	**06**	**08**
2.	**Curves of Interpretation** Curves of Interpretation of the surface of solids in following cases – 2.1 Cylinder with cylinder when- i)Axes at 90^0 and intersecting. ii)Axes at 90^0 and offset. 2.2 Cylinder with cone when – i)Axis of cylinder is parallel to H.P. and V.P. and perpendicular and intersecting the axis of cone. 2.3 Prism with Prism	**06**	**12**

	i)Axes at 90^0 and intersecting. ii)Axes at 90^0 and offset		
3.	**Limits, Fits and Tolerances** 3.1 Characteristics of surface roughness- Indication of machining symbol showing direction of lay, roughness grades, machining allowances, manufacturing methods. 3.2 Introduction to ISO system of tolerance, dimensional tolerances, elements of interchangeable system, hole & shaft based system, limits, fits & allowances. Types and selection of fit. Calculations of tolerances 3.3 Geometrical tolerances, tolerances of form and position and its geometric representation. 3.4 Direction of Lays	**04**	**08**
4.	**Assembly to Details** Detailed part drawings of the following with all necessary requirements specified on drawings 4.1 Oldham, Flexible coupling and Universal coupling 4.2 Tool Post, Tail stock ,Foot step bearing 4.3 Screw Jack, Plummer Block, Steam stop valve	**06**	**18**
5.	**Details to Assembly** Assembly drawings of the following with all necessary requirements specified on drawings 5.1 Oldham and Universal coupling 5.2 Flexible coupling, Tool Post, Tail stock 5.3 Foot step bearing, Screw Jack, Plummer Block 5.4 V-belt pulley with shaft, Drill jig	**06**	**18**
6.	**Conventional Representation** 6.1 Welded Joints – Representation of the welds and preparation of working drawing showing the sizes of weld lengths, flash finish with supplementary symbols etc. **6.2** Conventions used in machine drawing for representing – Long and Short break in pipes, rods, shafts. Ball and roller bearing, springs, gears, cocks and valve 6.3 C.I., M.S., Brass, Bronze, Aluminum, Rubber materials. 6.4 Various types of sections like revolved, offset, full, half removed, partial local and broken sections 6.5 Standard conventions representing following –Pipe fitting on elbows, bends, plugs, lay out nipple, couplings, red sockets	**02**	**08**
7	**Free hand Sketches** Industrial drawings are to be used for reading and sketching 7.1 Different types of threads and thread profile, bolts, nuts, etc. 7.2 Keys of the following types – Sunk key, taper key, woodruff key, cone key, 7.3 Couplings – Flange, Muff, Flexible, Oldham	**02**	**08**

	Joints – Cotter, Knuckle 7.4 Pulleys – Flat belt, V-belt, fast & loose types I.C. engine piston, connecting rod, gland and stuffing box, 7.5 Journal bearing,Pedestal bearing, Plummer block bearing and foot step bearing.		
		32	**80**

LIST OF PRACTICALS:

A3 size sketch book should be used by the students. It is necessary to draw all the sheet problems in sketch book first and then redrawn on the sheets

1. One sheet on development of surfaces (2 problems)
2. One sheet on curves of interpenetration (2 problems)
3. One sheet on Assembly to details
4. One sheet on Details to assembly
5. One sheet on production drawing (Selecting most common from the following). Hexagonal Nut, Hexagonal Bolt, Spur Gear, V-Belt Pulley, Flywheel, Show on the sheet – Tolerance, Surface finish, Part No. Machining Sequence.
6. Sketch book work on conventional specification like Long and Short break in pipes, rods, shafts. C.I., M.S., Brass, Bronze, Aluminum, Rubber materials. Ball and roller bearing, cocks and valve, revolved, offset, half removed, partial local and broken sections. **(No sheet)**
7. Sketch book work on Free hand sketching on keys, couplings, joints bolts etc. **(No sheet)**
8. AUTO-CAD work : Revision of all 2D cad tools should be taught to students in one practical session and then **One sheet** on Assembly to details (i.e. Sheet no. 3) should be redrawn by using CAD. Print out A4 size should be attached in sketch book by all students.

REFERENCES:

Sr. No	**Title and Edition**	**Author**	**Publisher**
1	Machine Drawing	N. D. Bhatt	Charotar Publishing House
2	Machine Drawing	Mali & Choudhary	Vrinda Piblications
3	Engineering Drawing	Sidheshwar and shastri,	Tata Mc Graw Hill

5R403: PROJECT

Teaching Scheme		Evaluation Scheme						
TH	00		PT	TEE	TW	PR	OR	Total
PR	04	Max.Marks	--	--	100	--	50	150
TOTAL	04	Duration	--	--	--	--	--	--

RATIONALE:

In practice the diploma technicians come across problems of varied nature. He/she will have to solve the problems involving drawings, designs, manufacturing, installation, testing and maintenance of machines. In order to cultivate the systematic methodology for problem solving using acquired technical knowledge & skills, this subject is introduced.

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

COMPETENCY STATEMENT (S):

- Design the related machine components & mechanism.
- Convert innovative or creative idea into reality.
- Understand & interpret drawings & mechanisms
- Select the viable, feasible & optimum alternative from different alternatives.
- Us of skills learnt in workshop practical.
- Assemble parts or components to form machine or mechanisms.
- Classify & analyze the information collected.
- Implement the solution of problem effectively.

NOTES:

1) Project group size: Maximum 6 students
2) Project report will be of minimum 40 pages unless otherwise specified.
3) Project diary should be maintained by each student.

CONTENTS:

A batch of maximum 6 students will select a problem and then plan, organize & execute the project work of solving the problem in a specified duration. Student is expected to apply the knowledge & skills acquired. Batch may select any one problem / project work from following categories.

a) Fabrication of small machine / 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.

b) Design & fabrication of mechanisms, machines, Devices, etc. Report involving aspects of designing & fabricating should be prepared & submitted .

c) Development of computer program for designing and /or drawing of machine components, Simulation of movement & operation, 3D modeling, pick & place robots etc.

d) Industry sponsored projects- project related with solving the problems identified by industry should be selected. One person / engineer from industry is expected to work as co- guide along with guide from institution.

e) Literature survey based projects: - Project related with collection tabulation, classification, analysis & presentation of the information. Topic selected must be related

with latest technological developments in mechanical or mechatronics field, and should not be a part of diploma curriculum. Report should be of min 60 pages.

f) Investigative projects- Project related with investigations of causes for change in performance or structure of machine or component under different constraints through experimentation and data analysis.

g) Maintenance based projects: - 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.

h) Industrial engineering based project: Project based on work study, method study, methods improvement, leading to productivity improvement, data collection, data analysis and data interpretation be undertaken.

i) Low cost automation projects: Project based on hydraulic/pneumatic circuits resulting into low cost automated equipment useful in the identified areas.

j) Innovative/ Creative projects – Projects related with design, develop & implementation of new concept for some identified useful activity using PLC, robotics, non-conventional energy sources, CIM, mechatronics, etc.

k) Environmental management systems projects: Projects related with pollution control, Solid waste management, liquid waste management, Industrial hygiene, etc, Working model or case study should be undertaken.

l) Market research/ survey based projects: Projected related with identification of extent of demand, sales forecasting, Comparative study of marketing strategies, Comparative study of channels of distribution, Impact of variables on sales volume, etc. The project involves extensive survey & market research activities information to be collected through various mechanisms/tools & report is prepared.

m) Project based on use of appropriate technology particularly benefiting rural society or economically weaker section.

n) Project can be selected other than the area specified above. Project should provide viable and feasible solution to the problem identified. Report should be of min 50 pages.

Teaching Methodology:

1. Conducting literature Survey.
2. Discussion within batch
3. Discussion with guide

REFERENCES:

Sr. No	Title of Book	Author and Publication
1	Project Management and team work	Karl Smith Tata McGraw Hill
2	Project Management	Cliffored gray & Erik Lasson Tata McGraw Hill

JOURNALS/ MAGAZINES:

1) Popular mechanics
2) Machine Design
3) Mechanical Engineering (ASME)
4) Automotive Mechanics
5) Innovative ACR
6) Invention intelligence

5R404: SEMINAR

Teaching Scheme		Evaluation Scheme						
TH	--		PT	TEE	TW	PR	OR	Total
PR	02	Max.Marks	--	--	50	--	50	100
TOTAL	02	Duration	--	--	--	--	--	--

RATIONALE:

It is found that the students are lacking in the communication and presentations. To improve this ability this course is introduced.

COMPETENCY STATEMENT (S):

- To improve communication skills
- To prepare professional presentations.
- To understand advance technologies.

OBJECTIVES:

At the end of the course student should able to-

- Acquire information from different sources
- Prepare notes for given topic
- Present given topic in a seminar
- Interact with peers to share thoughts
- Prepare a report on industrial visit, expert lecture

CONTENTS:

Seminar on any advanced technical topic to be presented by individual student in a batch of 20 students. A separate topic be selected by an individual student.

Information search can be done through manufacturer's catalogue, websites, magazines, books etc. and submit a report any one topic.

Following topics are suggested:

- Engine lubricants & additives
- Automotive gaskets and sealants
- Engine coolants and additives
- Two and Four wheeler carburetor.
- Power steering
- Filters
- Different drives/Transmission systems in two wheelers.
- Types of bearings – applications and suppliers.
- Heat Exchangers
- Maintenance procedure for solar equipment.
- Electronic fuel injection systems.
- Exhaust gas analysis.
- Vehicle testing.
- Transducer application in automobiles.
- Environmental pollution & control.
- Quality systems

- Industrial safety
- Aircraft technology
- Ship Technology
- Alternative fuels
- Alternative energy sources
- Refrigeration & Air conditioning
- Types of bearing
- Automobile saftey

NOTE:Above topics are given for reference,Teacher may give other topics related to mechanical engineering

5M405: HEAT POWER ENGINEERING (HPE)

COURSE STRUCTURE:

Teaching Scheme		Evaluation Scheme						
TH	03		PT	TEE	TW	PR	OR	Total
PR	02	Max .Marks	20	80	25	--	25	150
TOTAL	05	Duration	01	03	---	--	---	--

RATIONALE:

1. The demand of various thermal energy conversion devices is increasing in alarming rate. Much efforts are being made to develop efficient energy converting devices and reduce friction, wear that are also present in the conventional one.
2. I.C. Engines are one of the major contributors of air pollution. Hence pollution control devices provided in I.C. Engines play a vital role in protecting the environment.
3. Use of air compressor is increasing. There is large scope for energy saving in air compressors. Hence it is necessary to understand thermodynamic aspects of air compressor. Gas turbines are used for power generation and for jet propulsion.
4. Considering the scope of maintenance work, it is necessary for a diploma to understand fundamentals of refrigeration & air conditioning.

COMPETENCY STATEMENTS:

1. Air standard cycles on which the I.C. Engines are designed.
2. Total details parts of I.C. Engines; it's fault finding and its power generation capacity.
3. Working of different pneumatic tools, air compressor.
4. Construction and working of various types of steam turbines.
5. Working of gas turbines and its application.
6. Refrigeration & Air-conditioning processes and their application

COURSE CONTENTS:

Topic No.	Content	Hours	Marks
1	**I.C. Engines** 1.1 Theoretical Power cycles - Carnot, Otto, Diesel, Dual, Brayton cycle. Representation on P-V, T-S diagram. Simple numericals on Otto and diesel cycle only. 1.2 Classification of I.C. Engines 1.3 Two stroke and four stroke engines Construction, working, comparison and valve timing diagram. 1.4 Scavenging	**08**	**14**
2	**Air Compressor** 2.1 Introduction Classification of air compressor	**12**	**20**

	Definitions Compression ratio, free air delivered, compressor capacity, free air delivered, swept volume uses of compressed air Single stage and two stage compressor 2.2 -Reciprocating air compressor -Construction and working of single stage and two-stage compressor -Work done power required, efficiency-volumetric, isothermal and mechanical without clearance volume -Two-stage compressions, perfect and imperfect inter cooling (simple numericals) Advantages of multi staging 2.3 - Rotary compressor Construction and working of screw, lobe vane, centrifugal compressor. (No numericals) Comparison and applications of reciprocating and rotary compressors Purification of air to remove oil, moisture and dust 2.4- Methods of energy saving in air compressor.		
3	**Gas Turbine and Jet Propulsion** 3.1 Classification and application of gas turbine. 3.2 Constant volume and constant pressure gas turbine. - Closed and open cycle gas turbines and their comparison 3.3 Methods to improve thermal efficiency of gas turbine Regeneration, inter cooling, reheating using T – S diagram 3.4 Jet propulsion Turbo jet and Turboprop engines, Ram jet, pulse jet 3.5 Rocket propulsion Solid propellants and liquid propellants, components of liquid propellants, rocket engines.	**10**	**18**
4	**Refrigeration and Air Conditioning** 4.1 Introduction Principles of Refrigeration, COP of heat pump and Refrigerator, Tones of Refrigeration, Air Refrigeration 4.2 Vapour compression system Vapour compression Refrigeration cycle, its components, representation on P- H and T-S diagram (simple numericals) Applications – Water cooler, domestic refrigerator, Ice plant and cold storage. 4.3 Psychrometry Properties of air, Dalton's law of partial pressure, Psychometric chart and processes (No numericals) 4.4 Air conditioning systems Definition and classification of air conditioning systems.	**12**	**18**

5	**Power Plant** 5.1 Site selection 5.2 General layout of thermal, gas , hydraulic, and nuclear power plant. 5.3 Types of nuclear power plants – BWR, PWR, FBR, CANDU type , 5.4 MHD power generation 5.5 Fuel cells.	**06**	**10**
		48	**80**

LIST OF PRACTICALS:

1. Dismantling and assembly of petrol and diesel engine.
2. Trial on single / multi cylinder I.C. Engine and prepare heat balance sheet.
3. Dismantling and assembly of Air compressor.
4. Visit website –
   http://library.think.quest.org
   http://www.grc.nasa.goe
   and prepare a brief report of gas turbine and jet propulsion.
5. Dismantling, cleaning, assembly of fuel injector pumps and fuel injector.
6. Conducting market survey for two wheeler and four wheeler and refrigerator to collect data of specification, models, price, etc.
7. Trial on refrigeration test rig for calculation of COP.
8. Study of window air conditioner.
9. Dismantling and assembly of hermetically sealed compressor.

REFERENCE BOOKS:

Sr. No	**Title of Book**	**Author and Publication**
1	A Textbook of Thermal Engineering	R.S. Khurmi S. Chand and Company
2	Heat Engines – Vol. I,II,III	Patel Karamchandani , Acharya Publication
3	Thermal Engineering	P.C. Ballany, Khanna Publisher
4	Refrigeration and Air Conditioning	Domkundwar , Arora., Dhanpat Rai and Sons

5R406-THEORY OF MACHINES

COURSE STRUCTURE:

Teaching Scheme		Evaluation Scheme						
TH	03		PT	TEE	TW	PR	OR	Total
PR	02	Max. Marks	20	80	25	--	25	150
TOTAL	05	Duration	1.00	3.00	--	--	--	--

RATIONALE:

Fundamental knowledge of various mechanisms and machines help in understanding the working of mechanical devices. This curriculum primarily aims at focusing the basic concepts of mechanisms of machine parts. Analysis of forces and motion of machine parts helps the designer to design more effectively.

Knowledge of working of flywheel and governor give the basic idea of storing energy in flywheel and controlling speed of the engine.

Study of the machine part like cam relates its application in the various machineries.

COMPETENCY STATEMENT (S):

- **To understand working & application of simple mechanisms.**
- **To compute velocity and acceleration of various links in mechanism.**
- **To understand working of governors, flywheel, bearing and cam.**

COURSE CONTENTS:

Topic No.	Content	Hours	Marks
1	**Simple mechanisms** 1.1Introduction, Kinematic link, Types of links. Concept of Machine and Structure, Difference between machine and structure. Kinematic pairs and types. Types of constrained motions 1.2 Concept of Kinematic chain, mechanism and Inversion, Inversions of Four bar chain: Beam engine, coupling rod, Watt's indicator mechanism 1.3 Inversions of Single Slider crank chain: Pendulum pump, oscillating cylinder, Rotary internal combustion engine, Quick return mechanism 1.4 Inversions of Double slider crank chain: Elliptical trammel, Oldham's coupling	**08**	**12**
2	**Velocity and Acceleration Diagrams** 2.1 Relative Velocity method Velocity and acceleration of a point on a link, concept of linear and angular velocity, centripetal and tangential acceleration, angular acceleration 2.2 Drawing of velocity and acceleration diagrams for simple mechanisms by relative velocity method	**10**	**18**

	2.3 Instantaneous centre of Rotation (ICR) method: Concept of ICR, Types of Instantaneous centers, Kennedy's theorem, circle diagram to locate Instantaneous centers, finding of velocity of various points by ICR method for Slider crank mechanism and four bar mechanism 2.4 Klein's construction for velocity and acceleration of piston in slider crank mechanism Problems on drawing of velocity & acceleration diagrams		
3	**Cams and Followers** 3.1Definition of cam and follower, types of cams and follower, cam terminology 3.2 Motions of follower , simple harmonic, uniform velocity, uniform acceleration & retardation, their displacement , velocity, acceleration diagram 3.3 Introduction to circular arc and tangent cam 3.4 Drawing the profiles of cam for given follower and type of motion with offset and without offset. Problems on drawing of cam profile.	**08**	**12**
4	**Power Transmission** 4.1 Need of power transmission, classification of drives, relative merits and demerits of Belt drives vs Gear drives 4.2 Belt drives, types of belts, concept of velocity ratio, length of belt, ratio of tensions, initial tension, centrifugal tension, law of belt, comparison of V-belt and flat belt, concept of timing belt 4.3 Power transmitted by belt drive, condition for maximum power transmission 4.4 Gears: Gear terminology, types of gears, Gear ratio, spur, helical, bevel, spiral, herringbone, rack and pinion types, and law of gearing 4.5 Gear trains: Simple, compound and epicyclic gear trains, their velocity ratios Simple numerical on power transmission and gear trains	**10**	**15**
5	**Friction in Bearings** 5.1 Types of friction, coefficient of friction 5.2 friction of pivot and color bearing, conical bearing with their theories of uniform pressure and uniform wear condition, derivations Simple numerical on uniform pressure and uniform wear condition	**04**	**09**

6	**Flywheel and Governor** 6.1 Flywheels: Functions of Flywheel, concept of turning moment (T-Ɵ) diagram for four stroke internal combustion engine, multi cylinder engine, 6.2 Fluctuation of energy, coefficient of fluctuation of energy, fluctuation of speed and importance of flywheel in engine and machines 6.3 Governors: Function of governor, types of governors as centripetal and inertia 6.4 Governor terminology, comparison with flywheel 6.5 Forces on reciprocating parts of engine, piston effort, crank pin effort, crank effort, thrust on bearing, etc.	**04**	**08**
7	**Balancing and Vibrations** 7.1 Concept of balancing, balancing of single rotating mass. Need of balancing, process of balancing 7.2 Concept and terminology used in vibration, causes of vibrations in machines, their harmful effects and remedies	**04**	**06**
		48	**80**

LIST OF PRACTICALS / EXPERIMENTS:

1. Study of Shaper's quick return mechanism and finding of ratio of angle of cutting stroke to the angle of return stroke for quick return mechanism with the help of model
2. Study of one each inversion of four bar and single slider crank and double slider crank mechanism with the help of their working models
3. Drawing the Velocity and acceleration diagrams by relative velocity method for simple mechanisms (Two problems)
4. Drawing the velocity diagram by Instantaneous center method of four bar mechanism
5. Klein's constructions for velocity and acceleration for slider crank mechanism
6. Drawing profile of cam having knife edge follower and with different type of motions (01 problem without offset and 01 problem with offset)
7. Drawing profile of cam having roller follower and with different type of motions (01 problem without offset and 01 problem with offset)
8. Determine the radius of rotation of fly-ball for different speed of governor and draw a graph between radius of rotation versus speed
9. Study of bicycle free wheel sprocket mechanism with the help of working model
10. Determination of Gear ratio by using any gear box and velocity ratio for any belt drive in the lab

REFERENCES:

Sr. No	Title and Edition	Author	Publisher
1	Theory of machines	Khurmi	S Chand and company
2	Theory of machines	Ballani	Khanna Publishers
3	Theory of machines	Jagdishlal and Shah	
4	Theory of machines	Rattan	Tata McGraw Hill
5	Theory of machines	B.L.Singhal	Nirali Publications

5R407 – 3 D MODELING (3DM)

COURSE STRUCTURE:

Teaching Scheme		Evaluation Scheme						
TH	01		PT	TEE	TW	PR	OR	Total
PR	02	Max. Marks	--	--	50	--	50	100
TOTAL	03	Duration	--	--	--	--	--	--

RATIONALE:

With rapid development of Technology and competitive economy, computers play very important role in the 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 achieve skill in operating different software's available such as Pro-E, Catia, Solid Work, and Edge Cam etc. It is always essential for a technician to update their knowledge to cope up with the fast development in software's. Considering this in view and duties to be performed by Diploma Technician in professional life, curriculum for three Dimensional modeling is suggested.

Solid Works and Pro Engineer are the most widely used software in industries.

COMPETENCY STATEMENTS:

1. To understand working of 3-D Environment
2. To understand concept of Sketching
3. To understand and do Part modeling
4. To apply the Features Extrude, Cut, Revolve, Rib
5. To apply the Features Sweep, Loft, Pattern
6. To make assembly of the parts designed
7. To draw and plot views of the parts/assemblies prepared.

COURSE CONTENTS:

Topic No.	Content	Hours	Marks
1	***Introduction to Pro-Engineer GUI*** 1.1 Tool bars: Standard Toolbar, Sketch Toolbar, Relationship Toolbar, View Toolbar, Drawing Toolbar, Feature Toolbar and Annotation Toolbar. 1.2 Feature Manger Design Tree: Design Manager, Property Manager, and Configuration Manager. Selection Method: Selection from Design Tree, Graphic Area.	**02**	
2	**Sketching** 2.1 Sketch Plane, grid, units, edit and modify sketch. 2.2 Sketch relations: Adding and changing geometric	**03**	

	relations 2.3 Dimensioning: Vertical, horizontal, aligned, angular, circular sketches. 2.4 Reference Geometry: Creating axis, creating reference planes		
3	**Part Modeling** 3.1 Creating Features such as extrude, Cut Extrude, Holes, Revolve, Shell, Loft, Sweep, 3.2 Modifying a feature using daft, Fillet, Chamfer, and Hole Wizard. 3.3 Creating Feature Pattern: Circular Pattern, Rectangular Pattern, Through Sketch	**03**	
4	**Editing and modifying part model** 4.1 Feature Manager Design Tree, Editing a Feature definition, 4.2 Editing sketch of the part model, Move and copy Features, 4.3 Suppress, Rollback, 4.4 Part colour, Mass properties.	**03**	
5	**Assembly** 5.1 Assembly Toolbar, Feature Manager design tree conventions, 5.2 Mate components, align, concentric, parallel. Calling part model into assembly from library	**03**	
6	**Drawing** 6.1 Creating Drawings: standard templates, Sheet setup, 6.2 Adding drawing views: standard three views, Sectional views, auxiliary views, detailed views. 6.3 Annotations: adding dimensions, notes, centre marks, Bill of Material, 6.4 Page Setup, Print selection, print preview, and Print Solid-Works document	**02**	
	TOTAL	**16**	

TERM WORK:

Understand the 3-D environment.

1. Drawing the sketches of the machine parts (Min. 08)
2. Creating parts using features extrude, cut, rib. (Min. 8)
3. Creating parts using revolve, chamfer, fillet, sweep, loft, draft. (Min. 04)
4. Part modeling using reference axis and planes, editing and modifying the parts, patterns circular and rectangular.(Min. 04)
5. Creating assemblies of the parts designed. (Min. 04)
6. Creating drawing views of the parts and the assemblies. (Min. 04)
7. Plotting the Drawings with dimension and annotations. (Min. 02)

TEXT BOOK:

Sr.No	Title and Edition	Author	Publisher
1.	3 D Modeling using Solid Works	-	Lab Manual Developed by G. P. Aurangabad
2.	Pro Engineer Tools and Tutorials	-	Pro Engineer Resource center

REFERENCE BOOK:

Sr.No	Title and Edition	Author	Publisher
1.	3 D modeling by Pro Engineer wildfire 4	Roger Toogood	Schroff Developement corp.
2.	Design Modeling with Pro Engineer	-	Schroff Developement corp.

5M408: COMPUTER INTEGRATED MACHINING (CIM)

Teaching Scheme		Evaluation Scheme						
TH	01		PT	TEE	TW	PR	OR	Total
PR	02	Max.Marks	--	--	50	--	25	75
TOTAL	03	Duration	--	--	--	--	--	--

RATIONALE:

The need of today's manufacturing industrial world is based on best quality & precision oriented shorter manufacturing cycle time .To satisfy this need the use of CAD/CAM & automation is inevitable. To satisfy industrial need, diploma engineer should be able to understand the concept of automation and use of CAD/CAM technology. The prerequisites of this subject have been introduced in earlier subjects such as engineering graphics, engineering drawing & mechanical engineering drawing.

COMPETENCY STATEMENTS:

1. To understand the fundamentals & use CAD.
2. To conceptualize drafting and modeling in CAD.
3. To plan CNC part programming and prepare part program.
4. To operate CNC machine.
5. To understand the concept of automation and FMS

COURSE CONTENTS:

Topic No.	Content	Hours	Marks
1	**Introduction to CAD/CAM** 1.1 Use of Computers in industrial manufacturing. Product Cycle, 1.2 CAD/CAM, CAD/CAM hardware and basic structure, CPU, Memory, I/O devices, Storage devices and system configuration	02	
2	**Geometric Modelling** 2.1 Requirement of geometric modelling, Types of geometric models. 2.2 Geometric construction method-sweep, 2.3 solid modelling- Primitives & Boolean operations, Free formed surfaces (Classification of surface only) (No numerical treatment)	02	
3	**Introduction to computer numerical Control** 3.1 Introduction - NC, CNC, DNC 3.2 Advantages, disadvantages and Application of CNC. 3.3 Classification of CNC system, depending on feedback control 3.4 Motion control system - point to point, straight line, Continuous path (Contouring).	02	

	3.5 The coordinate system in CNC, Axis identification of lathe and milling 3.6 Constructional details of CNC machine.		
4	**Part programming** 4.1 Fundamentals of part programming, 4.2 Types of part programming, Manual part programming and computer aided part programming (APT). 4.3 NC–Words, Programming format, simple part programming 4.4 Use of canned cycles, subroutines and do loops.	**03**	
5	**Industrial Robotics** 5.1 Introduction, physical configuration, basic robot motions, 5.2 Technical features such as - work volume, precision and speed of movement, weight carrying capacity, drive system, End effectors, robot sensors. 5.3 Application – Material transfer, machine loading, welding, spray coating, processing operation, assembly, inspection.	**04**	
6	**Automation** 6.1 Basic elements of automated system, advanced automation functions, 6.2 Various levels of automation and comparison 6.3 Flexible manufacturing system, Introduction, FMS equipment, FMS application, 6.4 Introduction to CIM	**03**	
	TOTAL	**16**	

TERM WORK:

1. Two assignments on simple part programming.
2. Four assignments on cad-cam 2D
3. Two assignment on cad-cam 2D isometric
4. Two assignment on cad Geometric modeling
5. Two assignments of Part programming using canned cycles, subroutines and do loops for turning component.
6. Two assignments of Part programming using canned cycles, subroutines and do loops for turning component.
7. Manufacturing one turning and one Milling component on CNC.
8. Assignment on robot Application.(Take example from industry)
9. Assignment on Automation in manufacturing.(Take example from industry)

5M409: ADVANCED MANUFACTURING PROCESS (AMP)

Teaching Scheme		Evaluation Scheme						
TH	03		PT	TEE	TW	PR	OR	Total
PR	04	Max.Marks	20	80	25	--	25	150
TOTAL	07	Duration	01	03	--	--	--	04

RATIONALE:

Technicians engaged in engineering production should be competent in the selection and use of the machining processes, machines and tools. Today so many production processes and machines of advanced nature have been developed that it is really a problem to select a right machine and manufacturing process for a particular applications. The diploma technician should get the basic details of the machines used in the engineering practice. A good understanding of these machines will lead to better visualization of the practical problems encountered on the production shop floor.

Automation has been playing a important role in the engineering applications. It is also important for the diploma technicians to get the fundamentals of these machines. Present course will help the students to get fundamentals of the machines and various machining processes, process planning, cost evaluation of product and maintenance of machines.

COMPETENCY STATEMENTS:

1. To knowledge of the various advanced machining processes such as milling, grinding, broaching.
2. To understand working principle and applications of the above processes.
3. To understand non conventional machining processes
4. To understand the importance of automation and the various automatic machines.
5. To understand process planning and cost estimation of product.
6. To knowledge of various machine maintenance.

COURSE CONTENTS:

Topic No.	Content	Hours	Marks
1	**Milling Machines:** 1.1 Types of milling machines, principles of working operations performed & tools used, 1.2 Description and construction of universal milling machine, milling operations, milling cutters, 1.3 Universal dividing head, different types of indexing methods, helical milling, and tool geometry for plain milling cutter, Machining time calculation	08	14
2	**Finishing and super finishing processes** **2.1 Grinding machines –** 2.1.1 Types of grinding machines, Grinding process 2.1.2 grinding wheels, 2.1.3 abrasive materials, bonding, 2.1.4 Selection of grinding wheels, dressing, types of dressers,trueing,loading & glazing **2.2 Super Finishing –** 2.2.1 Buffing, honing, lapping, plating, burnishing & super finishing.	07	13
3	**Gear Production Machines** 3.1 Gear tooth elements, introduction to gear shaping, working principles of shaping machines, gear shaping cutters, 3.2 Introduction of gear hobbing cutters, working principles of gear hobbing machines, 3.3 Gear finishing methods, gear grinding, lapping, shaving.	07	13
4	**Broaching** 4.1 Introduction to broaching operation, types of broaching machines, 4.2 Broaching tools, applications of broaching.	06	10
5	**Non conventional Machining Processes** 5.1 Introduction to non-conventional machining processes, classification,selection criteria 5.2 Working principles of machining processes, applications and advantages like AJM, USM, EBM,CHM, EDM, LBM, IBM, PAM etc.	08	10
6	**Automatic machines** 6.1 Introduction to automatic machines, classification, automation strategies, 6.2 Semiautomatic machines, multi tool center lathe, machining centers, SPM, transfer machining and its advantages, 6.3 Mechanically integrated transfer lines, programmed control machine tools.	06	10

7	**Process planning and cost evaluation** 7.1 Introduction 7.2 Requirements and steps in process planning 7.3 Planning the operation sequence 7.4 Process planning sheet 7.5 CAPP 7.6 Cost evaluation of product, estimating labor cost	**06**	**10**

TERM WORK:

1) Eccentric turning- one job
2) Gear Cutting – One job involving boring, gear cutting and keyway cutting.
3) Group of five students undergone training for machine maintenance of available in workshop and preparation of maintenance sheet.
4) Tutorials – Minimum five tutorials based on theory.
5) Journal consisting of process sheet for each component of composite project indicating selection of speed, feed, tools, etc. and processing time with probable job involving use of different basic machining operations and cost estimation of product.

5M410: TOOL ENGINEERING

COURSE STRUCTURE:

Teaching scheme		Evaluation Scheme						
TH	03		PT	TEE	TW	PR	OR	TOTAL
PR	02	Max. Marks	20	80	25	--	25	150
TOTAL	05	Duration	1.00	3.00				

RATIONALE:

The diploma holders are constantly dealing with various cutting tools, tool holders as a part of manufacturing task. He is expected to select the tool material, tool geometry on the basis of technical as well as economic parameters. To select proper tool as per the requirement of process. He should be able to understand tool geometry.

COMPETENCY STATEMENT:

1 To make students conversant with various aspects of cutting tools, their application, geometry.

2. To know about various types of tool materials ant their properties.

3. To select proper tool as per requirement of the process.

4. To select proper required tools from product catalogue.

COURSE CONTENTS:

Topic No	Content	Hours	Marks
1	**MACHINABILITY:** 1.1Machinability, 1.2 Fundamentals of machining, 1.3 Machining aspects of cutting tool. 1.4 Evaluation of materials for Machinability of the work material to be machined. 1.5 Factors affecting machinability.	**03**	**04**
2	**MECHANICS OF TOOL CUTTING:** 2.1 Definitions: Shear plane, cutting ratio, shear angle, rake angle, flank, rake face. 2.2 Mohr's circle, significance of various forces acting in Merchants Force circle, oblique cutting, coefficient of friction, 2.3 Temperature in metal cutting, factors affecting temperature, cutting conditions.	**04**	**07**
3	**TOOL WEAR & TOOL LIFE:** 3.1 Types of tool wear- Attrition wear, diffusion wear, abrasive wear, electrochemical wear, chemical wear, plastic deformation, thermal cracking, 3.2 geometry of tool wear, flank wear, crater wear. 3.3 Tool life: graphs to estimate tool life, relationship between tool life and cutting speed, Taylor's equation to calculate tool life,	**04**	**08**

	3.4 simple numericals on tool life.		
4	**CUTTING TOOL MATERIAL:** 4.1 Essential properties of tool materials 4.2 HSS, Carbon tool steels 4.3 Cemented carbides, ceramics, diamond tools, UCON, cubic boron nitride. 4.4 Cutting fluids Types, Chacteristics.	**03**	**08**
5	**TURNING TOOLS:** 5.1Geometry of single point cutting tool, 5.2 use of nomogram to decide auxiliary angles. 5.3 Types of turning tools- carbide tipped brazed tools, disposable insert type, 5.4 Resolution of forces, factors influencing cutting force, 5.5 cutting force calculations, Power and force calculations. 5.6 Chip control methods, surface finish, nomogram to determine surface finish. 5.7 Boring tools, geometry, boring tool holders, types of boring bars- adjustable boring bar, damped boring bars, line boring bars, boring head, boring and feeding head, 5.8 Tool wear compensation.	**08**	**14**
6	**DRILLING:** 6.1Nomenclature of drilling tool, 6.2factors influencing torque and thrust in drilling. Forces acting on drilling tool. 6.3Types of drills- low helix, step drills, subland drills, core drills, micro drills with oil hole, carbide drills, indexable inserts, spade drills. 6.4 Counterboring, types of counter bores- solid,interchangeable pilot, interchangeable cutter, step, subland., 6.5Spot facing- back spot facing., Counter sinking- Three flute.	**06**	**10**
7	**REAMERS:** 7.1 Nomenclature of reamers, 7.2 types of reamers- hand reamers, taper ream cutting reamers, block reamers, PERA reamers, reamers, expanding reamers, 7.3 bushings and floating holders for reamers.	**04**	**04**
8	**MILLING CUTTERS :** 8.1 Nomenclature of milling cutter, 8.2 types of milling cutter- plain, side, saws, angle, face, shell, end mills, form, sprocket milling, spline thread solid carbide type, brazed tip, inserted brazed tip, index able insert type, carbides for milling.	**06**	**07**

9	**HOBBING & SHAPING:** 9.1 Principle of hobbing process, 9.2 Nomenclature of gear hob, 9.3 principle of gear shaping, 9.4 nomenclature of gear shaper cutter	**04**	**06**
10	**Press Tools** 10.1 Fundamentals of die cutting operations, 10.2 Cutting action in punch and die operations, Die clearance, 10.3 Types of die construction, 10.4 pilots , strippers and pressure pads, 10.5 Strip layout, 10.6 Blanking and piercing die construction, 10.7 Determining of blank size.	**06**	**12**

PRACTICALS:

1. Demonstration of chip formation.
2. Collection of various types of chips samples.
3. Demonstration of tool clamping mechanism.
4. Demonstration of ISO nomenclature for tool holders and Inserts.
5. Demonstration of various angles on cutting tools. Determination of tool signature of a given tool.
6. Collection of tool catalogues of various cutting tools manufacturer. Demonstration of selection of tools from those catalogues
7. Design of boring bar.
8. Collecting of printouts on cutting fluids, diamond tools, tool materials like M35, ASP30 etc from internet.

REFERENCE BOOKS:

Sr. No	**Title of Book**	**Author and Publication**
1	Production Technology	HMT, Tata MCGraw Hill Publication Company limited
2	Production Technology	. R.K.Jain, S.Chand and Company limited
3	Tool Design	A.S.T.M.E Handbook
4	Tool Design	Donaldson Tata MCGraw Hill Publication Company limited

5R411- MECHANICAL ENGINEERING MATERIALS

COURSE STRUCTURE:

Teaching Scheme		Evaluation scheme						
TH	03		PT	TEE	TW	PR	OR	Total
PR	02	Max.Marks	20	80	25	--	25	150
TOTAL	05	Duration	1.00	3.00	--	--	--	--

RATIONALE:

Mechanical Engineering Materials is a core technology subject in Mechanical Engineering Discipline. A Mechanical Engineering diploma holder deals with various materials required for cutting tools, Dies, Gears, Bearings and many other applications. Knowledge of selection of proper tool materials, heat treatments for specific materials, ferrous and non- ferrous materials and their alloys for various engineering application, as well as insulating, refractory and plastic materials as per the requirements is essential.

COMPETENCY STATEMENT(S):

Select the proper materials for the different engineering applications considering their structure-property-application relationships.

Contents: Theory

Chapter	Name of the Topic	Hours	Marks
1.	**Engineering Materials and their Properties** 1.1 Classification of engg material as amorphous & crystalline, ferrous & non ferrous 1.2 Introduction to non metallic materials like polymers,rubber,plastic,ceramics,abrasive,adhesive & insulating materials such as cork,asbestos,composite material 1.3 Unit cell & space lattice with particular reference to iron 1.4 Properties of metals such as elasticity,toughness,tensile strength,ductility,hardness etc	**04**	**06**
2.	**Equilibrium diagrams** 2.1 Definition of phase, pure metal, alloy 2.2 Solid solution-Substitutional & interstitial 2.3 Solidification of pure metal & alloy with the help of cooling curves 2.4 Equilibrium diagram for isomorphous,eutectic,peritectic & eutectoid systems	**04**	**06**

3.	**Iron-carbon diagram & steels, cast iron** 3.1 Iron carbon diagram-Study of various phases, three reactions of iron carbon diagram i.e. eutectic, eutectoid & peritectic, critical temperature on iron carbon diagram. 3.2 Concept of steel & cast-iron on diagram as hypereutectoid steel, eutectoid steel, hypereutectoid steel, hypoeutectic cast iron eutectic cast iron, hypereutectic cast iron 3.3 Classification of plain carbon steel as low, medium and high carbon steel	**06**	**10**
4.	**Heat Treatment of Steels** 4.1 Transformation in steel on heating-Conversion of pearlite to austenite,TTT curves for steels, transformation of austenite to pearlite,bainite & martensite.critical cooling rate, continuous cooling rates & isothermal cooling 4.2 Hardening-purpose, hardening temp range, conventional hardening,martempering,structure of martensite & properties 4.3 Tempering-low temperature, medium temperature, high temperature tempering processes, purpose of each 4.4 Annealing- Purpose of annealing, processes like full annealing, isothermal annealing, spherodising annealing. Annealing temperature range 4.5 Normalizing-Purpose of normalizing, normalizing process, normalizing temperature range 4.6 Subzero treatment-Purpose of subzero treatment, retained austenite &its effect 4.7 Surface hardening-Necessity of surface hardening of steels, surface hardening methods such as flame hardening, induction hardening with application. Case hardening methods such as carburizing,nitriding,cyaniding	**12**	**18**
5.	**Alloy steels** 5.1 Effect of alloying element on Iron-carbon diagram,TTT diagram 5.2 Properties & uses of common alloying elements, effect on properties of steel 5.3 Examples of alloy steels- free cutting steels, stainless steel & its types, tool steels, heat treatment of tool steel, spring steel, properties & application	**05**	**10**
6.	**Specification of steels & cast iron** 6.1 Indian standard and American standard(AISI), British specifications.(only En1,En8,En24,En31,En42) 6.2 selection steels for various components like- Wood cutting saw, hack saw blade,drills,milling cutter, cold blanking die, hot forging die, cold drawing die, jaw crusher plates, bulldozer plates, household utensils, dental instruments, leaf spring,gears,ball bearing, camshaft & crankshaft	**04**	**06**

7	**Cast irons** 7.1 Classification of cast iron 7.2 Structure, properties & application of white & grey cast iron 7.3 Production of malleable, nodular cast iron 7.4 Structure, properties & application of Malleable & Nodular cast iron	**04**	**08**
8	**Manufacturing of steels** 8.1Classification of methods for Manufacturing of steels(only introduction) 8.2 Manufacturing of steel by Induction furnace method	**03**	**04**
9	**Non ferrous metals/alloys** 9.1 Properties & application of copper & copper alloys such as brass, tin bronze 9.2 Aluminum & aluminum alloys(LM series only) 9.3 Bearing material	**04**	**08**
10	**Powder Metallurgy** 10.1 Description of powder metallurgy process-powder making,blending,compacting,sintering,infiltration & impregnation 10.2 Advantages & limitations of powder metallurgy 10.3 Application of powder metallurgy	**02**	**04**
	Total	**48**	**80**

TERM WORK:
It shall consist of journal, based on the following experiments

List of Practical (Any Ten)

1. Demonstration of metallurgical microscope and study of electron microscope.
2. Preparation of specimen.
3. Study of iron-carbon diagram and TTT diagram.
4. Demonstration of Muffle furnace & study of different types of furnace
5. Study of temperature measuring devices like pyrometers, thermocouples,
6. Jomny and quench test.
7. Study of micro structures of following,

   Pure iron, 0.2, 0.4, 0.8 & 1.2 carbon steels. White, gray, malleable, nodular, cast irons and hardened steels
8. End color coding of steels.
9. Collect following data on commonly used steels & cast-iron

   a) Size availability b)Prices c)Recommended heat treatment d)Applications

10. Collect following information from internet/magazines/manuals/cataloges
    i) Aerospace material
    ii) Ship building material
    iii) Engg application of non ferrous material
11. Visit to metallurgical industry/lab to study different testing procedure such as hardness measurement, spectro analysis, and preparation of mounting for micro structural observation, Specimen preparation, study different furnaces & heat treatment

REFERENCE BOOKS:

SR NO	Title & edition	Author	Publication
01	A Text Book of Material Science and Metallurgy	O.P.Khanna	Dhanpat Rai and Sons [1999]
02	Material Science And Metallurgy	Dr.V.D. Kodgire	Everest Publishing House [1990]
03	Material Science and Engineering	R.K.Rajput	S.K.Katari and Sons [2002 reprint 2003]
04	Material Science and Processes	S.K.Hazra and Choudhari	Indian Book Distribution Co. [1982]
05	Engineering Materials Properties and Selection	Kenneth G. Budinski and Micheal K. Budinski	Pearson Education, New Delhi
06	ASME Material Manuals	ASME	
07	Introduction to Physical metallurgy	Sidney H. Avner	Tata Mc Graw Hill edition (2^{nd})

5Q202- STRENGTH OF MATERIALS (SOM)

COURSE STRUCTURE:

Teaching Scheme		Evaluation Scheme						
TH	03		PT	TEE	TW	PR	OR	Total
PR	02	Max.Marks	20	80	25	--	25	150
TOTAL	05	Duration	1.00	3.00	--	--	--	--

RATIONALE: -

Civil engineer should be able to analyze behavior of materials and structures under various types of loads. This course enables to understand different types of forces and corresponding effects on materials and structural elements under various types of loads so that suitable material of suitable strength can be selected for the structural components.

COMPETENCY STATEMENTS: -

1. To study development of different types of stresses and strains in structural elements due to various types of actions viz. tension, compression, shearing, bending, twisting, temperature change etc.
2. To investigate the strength of structural elements of different materials under various types of loadings.
3. Testing of materials used in civil engineering structures to find their properties, behavior and failure patterns under different loading condition conforming to BIS standards.

COURSE CONTENTS:-

	Name of the Chapter / topic (Follow S.I. units)	**Hours**	**Marks**
1.	**Simple Stress & Strain** **1.1.** Definition of stress, strain, Hooke's law, Modulus of elasticity, Classification of stresses, strains, sign conventions. Lateral strain, Poisson's ratio **1.2.** Stress-strain curve for mild steel and HYSD bar, Yield stress/ Proof stress, Ultimate stress, Breaking stress and Percentage elongation. **1.3.** Bars of uniform and stepped cross sections under axial load, Composite sections under axial load, modular ratio, equivalent area.	**05**	**08**
2.	**Shear stress and shear strain** **2.1.** Concept of shear load, shear stress, shear strain, modulus of rigidity **2.2.** State of simple shear, complementary shear stress, punching shear **2.3.** Relation between modulus of elasticity, modulus of rigidity (No derivation of formula)	**05**	**06**
3.	**Volumetric strain**	**06**	**08**

	3.1. Concept of biaxial stresses, triaxial stresses **3.2.** Volumetric strain, formula for volumetric strain and change in volume due to uni-axial, biaxial and tri-axial stresses, bulk modulus, relation between modulus of elasticity and bulk modulus (No derivation of formula) **3.3.** Relation between modulus of elasticity, modulus of rigidity and bulk modulus(No derivation of formula)		
4.	**Temperature Stresses and strains** **4.1.** Free deformation of a simple bar due to temperature variation, thermal coefficient **4.2.** Development of temperature stress **4.3.** Temperature stresses in bars of uniform section - deformation prevented partially and fully	**03**	**06**
5.	**Shear Force and Bending Moment in beams** **5.1.** Types of beams, types of loading, types of supports **5.2.** Concept of shear force and bending moment, sign conventions. **5.3.** Point of contraflexure **5.4.** Relation between bending moment, shear force and rate of loading **5.5.** Shear force and bending moment diagrams for cantilever beam, simply supported beam, simply supported beam with overhang(s) subjected to point loads, uniformly distributed loads and couple	**8**	**14**
6.	**Shear stresses in beams** **6.1.** Shear stress equation with meaning of terms in equation, shear stress distribution for solid rectangular and solid circular sections. **6.2.** Relation between max. shear stress and average shear stress for rectangular and circular solid sections	**03**	**06**
7.	**Bending Stresses in Beams** **7.1.** Bending of different types of beams(elastic curves) and development of bending stresses and their nature, neutral axis. **7.2.** Theory of simple bending, assumptions in theory of simple bending, flexural formula with meaning of all terms, section modulus, bending stress distribution diagram, moment of resistance. **7.3.** Application of theory of bending to symmetrical and unsymmetrical cross sections of beam viz. rectangular, hollow rectangular,circular,hollow circular, I- section, T-section, angle section, channel section	**06**	**10**
8.	**Direct & Bending Stresses** **8.1.** Concept of direct load & eccentric load **8.2.** Tension & short compression members subjected to eccentric load with eccentricity about one principle axis only, maximum and minimum stress, resultant stress distribution diagrams **8.3.** Rectangular section subjected to load eccentric about	**07**	**12**

	one/both axes **8.4.** Condition for no tension, middle third rule, core of the section and limit of eccentricities for rectangular and circular sections **8.5.** Determination of resultant stresses for dam with upstream face vertical. Conditions of stability of dam section.		
9.	**Torsion** **9.1.** Theory of pure torsion-assumptions **9.2.** Torsion equation, moment of resistance, polar modules **9.3.** Shear stress distribution across solid and hollow circular shaft. **9.4.** Strength of circular shafts & hollow circular shafts, No problems on comparison of circular & hollow circular shafts in terms of weight, strength **9.5.** Power transmitted by shaft	**05**	**10**

TERM WORK: -

It shall consist of journal, based on the following experiments

Experiments: - Journal shall consist of any 10 experiments form the following list.

1) Tension test on mild steel specimen - to calculate weight per meter length, yield stress, ultimate stress and percentage elongation to check suitability of material as per BIS requirement
2) Tension test on deformed steel (tor steel) - to calculate weight per meter length, proof stress, ultimate stress and percentage elongation to check suitability of material as per BIS requirement.
3) Compression test on timber- to find the crushing strength along the grain and across the grain/ compression test on Metals
4) Flexural test on timber beam - to plot load deflection curve, to calculate the maximum bending stress at elastic limit, to calculate modulus of elasticity
5) Flexural test on roofing tiles and flooring tiles – to check their suitability as per BIS requirement
6) Field tests and Compression test on bricks - to calculate crushing strength and to classify the bricks as per BIS standards
7) Abrasion test on flooring tiles.
8) Water absorption test on bricks, roofing tiles and flooring tiles.
9) Shear test on any two metals
10) Cold bent test on mild steel and deformed steel.
11) Brinell hardness / Rockwell hardness test
12) Izod impact and Charpy impact test.
13) Torsion Test on mild steel and cast iron.

TEXT BOOKS"

S.No.	Name of Book	Author	Publication
1.	Strength of Materials	Ramamrutham	Dhanpatrai publishing Co.
2.	Strength of Materials	R.S. Khurmi	S. Chand & Co., N. Delhi
3.	Strength of Materials	Sunil Deo	

REFERENCE BOOKS:

SR.No.	Name of Book	Author	Publication
1.	Strength of Materials	Powpov	
2.	Strength of Materials	S.S. Ratan	Tata McGraw hill
3	Strength of Materials	Alfred P. Poorman	Mc Graw Hill Book Co. Inc.
4	Mechanics of Materials	Ferninand P. Beer, E.Russel Johnson	Mc Graw Hill Book Co. Inc.

5R412-INDUSTRIAL VISIT

COURSE STRUCTURE:

Teaching Scheme		Evaluation Scheme						
TH	00		PT	TEE	TW	PR	OR	Total
PR	02	Max.Marks			50	--	--	50
TOTAL	02	Duration			--	--	--	--

COMPETENCY STATEMENT (S):

- To expose students to industry and industry environment
- To inculcate ability of developing observation of various practices adopted in industry.
- To Practically observe the manufacturing processes.
- To get acquainted with the advanced technologies in industries.
- To cope up with latest knowledge in the industries.
- To observe and record details of industry as regards layout, organizational structure, manufacturing processes, equipment details and layouts, and quality practices followed in industry.
- To systematically write a detailed report about visit.

RATIONALE:

The purpose of introducing industrial visits is to provide opportunity to students to observe the practical manufacturing environment prevailing in industries, which will enable them to correlate the theoretical concepts from curriculum to practical realities.

Due to globalization and rapid technical advancements, the technologies followed in industries are rapidly changing. There are significant changes in the manufacturing processes adopted along with new concepts of quality enhancements. By industrial visits students will get a chance to observe these advancements.

OBJECTIVES:

At the end of the course student should be able to-

- Acquire information from different sources.
- Prepare structured format of industrial visit concerned to industry to which the visit is arranged
- Interact with peers to share thoughts.
- Prepare a report on industrial visit.

IMPORTANT NOTE:

Industrial visits of short and long duration can be arranged by the faculty as per convenience and need of the present days. It is expected that the students will be exposed to industrial atmosphere for at least duration of 32 hours. This may comprise of a total of all short and long duration visits.

It is expected that the faculty should design a structured visit format depending on the production of the industry to be visited before the visit is undergone and should distribute to all the students.

The task of report writing and evaluation is expected to be completed in 16 hours duration.

CONTENTS:

1. Structured Visits (H-02)

Structured industrial visits be arranged to any of the following:

i) Nearby Petrol Pump. (Fuel, oil, product specifications)
ii) Automobile Service Station (Observation of Components / aggregates)
iii) Engineering Workshop (Layout, Machines)
iv) Dairy Plant / Water Treatment Plant
v) Manufacturing organizations for observing various manufacturing processes including heat treatment
vi) Material testing laboratories in industries or reputed organizations
vii) Auto workshop / Garage
viii) Plastic material processing unit
ix) ST workshop / City transport workshop
x) Manufacturing unit to observe finishing and super finishing processes.
xi) City water supply pumping station.
xii) Sugar Factory / Dairy / Chemical Industry / Thermal Power Plant.
xiii) Machine shop having CNC machines.
xiv) ST workshop / Auto service station.
xv) Automobile manufacturing / auto component manufacturing units to observe the working of SPM.
xvi) Refrigeration and air conditioning manufacturing / servicing units / industries / workshops.
xvii) Automobile service stations for four wheelers.
xviii) Co-ordinate measuring machine to observe its construction working specifications and applications.
xix) Auto Engine Testing unit to gather details regarding the testing procedures/parameters etc.
xx) Wheel Balancing unit for light and/or heavy motor vehicles.
xxi) Food processing unit.
xxii) Textile industry machinery manufacturing / servicing units.
xxiii) Hydro electric and Thermal power plants.
xxiv) Automotive Research Association of India, Pune , Central Iinstitute of Road Transport, Pune, Vehicle Research and Development establishment , Ahmednagar.
xxv) Engine testing; exhaust gas analysis and vehicle testing.
xxvi) PWD workshop.
xxvii) Safety museum at Central Labour Institute, Saion, Mumbai.
xxviii) Material Handling System, quality control charts / production record / layout flow systems / Facilities / Hydraulic & pneumatic systems / Working of Boilers and steam engineering applications.
xxix) Auto / Electronic equipment manufacturing industry.
xxx) Cement / Sugar / Chemical / Textile / Steel rolling mills / extrusion industries.

xxxi) Material handling in mines or ports.
Earth Moving Equipment Maintenance Shop.

2. Report Writing (H-01)

The students should collect the structured visit format from the faculty. The report shall be submitted by individual student in structured format given by the faculty after the industrial visits. This report will form a part of the term work.

Teaching Methodology:

1. Preparing for the industrial visits.
2. Acquiring permissions from the organization.
3. Conducting the industrial visits.
4. Report writing.

5M414: POWER PLANT ENGINEERING (ELECTIVE-I)

COURSE STRUCTURE:

Teaching Scheme		Evaluation Scheme						
TH	04		PT	TEE	TW	PR	OR	Total
PR	02	Max.Marks	20	80	25	--	25	150
TOTAL	06	Duration			--	--	--	--

Rationale:

The consumption of electrical energy per capita is universally accepted as a scale for measuring the living standard of a country. The demand for energy is increasing day by day and existing power generation capacity is inadequate to meet this increasing demand. Industries are expected to generate their own power and supply the excess power to national grid. Alternate energy sources are also harnessed to meet the increasing demand. Diploma engineers should know the layout, components of different power plants and economic aspects of power plants. They are also expected to deal with issues of power generation, utilization and conservation keeping these views in mind present course is introduced.

Objectives:

Students should be able to:

1. Get familiar with present and future power scenario of India.
2. Calculate efficiency of power generation cycles.
3. Understand working of high pressure boilers, coal and ash handling systems of power plant.
4. Draw layout, understand the working and compare different power plants.
5. Enlist sources of waste heat and explain method of heat recovery.
6. Explain constructional features of non conventional energy source devices.
7. Appreciate economical and operational aspects of power plants.

Content: -Theory

Chapter	Name of the Topic	Hours	Marks
01	**Introduction to power plant** 1.1 Power scenario in India 1.2 Types of power plants – Hydro, Nuclear, Thermal, Future trends in power sector. 1.3 Analysis of steam cycles- Carnot, Rankine, Reheat cycle, Regenerative cycle, Methods of reheating, Advantages and disadvantages of reheat cycle, 1.4 Gas turbine cycle	**08**	**10**
02	**Steam power plant** 2.1 Layout of steam power plant, general features of selection of site 2.2 High pressure boilers – Construction and working of Sub-critical and Super-critical boilers. 2.3 Coal and ash handling system- equipments for in plant handling of coal such as belt conveyor, screw conveyor, bucket elevator, Coal crushing, Pulverized fuel handling system, Ball mill, Pulverized fuel and their advantages, Multi retort stoker, Pulverized fuel burner, Hydraulic and pneumatic ash handling, Electrostatic precipitator. 2.4 Boiler Feed water treatment 2.5 Environmental aspects of steam power plant - water pollution, air pollution, emission standard and its control	**12**	**16**
03	**Nuclear power plant** 3.1 Fusion and fission reaction, layout and general criteria for selection of site. 3.2 Elements of nuclear power station, layout, types of nuclear reactors. 3.3 Nuclear fuels, coolant & moderators. 3.4 Working of PWR, BWR, CANDU, BREEDER,GCR,SGR,LMFBR type reactor. 3.5 Safety precautions and waste disposals. 3.6 Nuclear power plants in India.	**14**	**16**
04	**Gas turbine power plant** 4.1 General Layout, selection of site, Gas turbine power plants in India. 4.2 components of gas turbine plants, gas turbine Fuels. 4.3 Environmental impact of gas turbine power plant.	**04**	**10**

05	**Sources of waste heat** 5.2 Heat recovery forms & methods – Sensible and latent Heat recovery. 5.3 Use of waste heat- Agricultural, green house, Animal shelter, Aqua cultural uses, process heating. 5.4 waste Heat recovery boilers	**06**	**10**
06	**Non conventional power generation plants** 6.1 Geothermal power plant- types, economical justification 6.2 Tidal power plant- factors affecting suitability of site, working of different tidal power plants, advantages and disadvantages 6.3 Wind power plant- different types, advantages and Disadvantages. 6.4 Solar power plant 6.5 Magneto Hydro dynamics power plant 6.6 Small hydro power plant 6.7 Introduction to Plasma technology	**10**	**08**
07	**Economics and operational aspects** 7.1 Prediction of load, selection of types of generation, number of generating units. 7.2 Load duration curves, cost analysis, elements, controlling the cost of power plant (simple numerical) 7.3 Major electrical equipments in power station- generator, step-up transformer, switch gear, electrical motors	**10**	**10**
	Total	**64**	**80**

Practical:

Skills to be developed:

Intellectual skills:

1. Understand working of various power plants
2. Understand constructional features and working of devices used in non conventional energy sources
3. Understand economical and operational aspects of power plants
4. Calculate the efficiency of power generation cycles

Motor skills:

1. List technical details of components and subsystems of power plants
2. Draw layouts of different power plants
3. Operate devices using solar energy inputs

Assignments:

1. Visit to steam power plants/nuclear power plants/wind power plants/ Hydro power plants and prepare a report.

2. Collect information & Technical details of nuclear power plants.
3. Collect information & Technical details of Steam power plants.
4. Collect information & Technical details of Solar & Wind power plants.
5. Study of economic and operational aspects of power plants (simple numerical).
6. Assignment on Coal & Ash Handling system.
7. Assignment on Waste Heat recovery systems.
8 Information collections on geothermal, tidal & magneto hydro plant.

Learning Resources:

1. **Books**:

Sr. No.	Author	Title	Publisher
01	P. K. Nag	Power plant engineering	Tata McGraw Hill
02	Fredrick T. Mosse	Power plant engineering	East-West press
03	A. Chkrabarti and M. L. Soni	A text book of Power System Engineering	Dhanpat Rai and Co
04	Arora and Domkundwar	A course in power plant engineering	Dhanpat Rai and Co
05	R.K. Rajput	Power plant engineering	

2. Computer Based Training Packages/Computer Aided Instructions Packages/CDs:

1. Power Plant Familiarization Vol-I to IV.
   - Ash Handling System.
   - Gas Turbine and combined cycle power plant.
   - Power Station Safety.
   - Environmental pollution & pollution control.
   - Pulverizers and feeders.
   - Renewable energy sources,

(Developed by National Power Training Institute , South Ambazari Road, Nagpur)

5M415: MATERIALS MANAGEMENT

COURSE STRUCTURE:

Teaching Scheme		Evaluation Scheme						
TH	04		PT	TEE	TW	PR	OR	Total
PR	02	Max.Mar-ks	20	80	25	--	25	150
TOTAL	06	Duration			--	--	--	--

COMPETENCY STATEMENT:

- To understand the concept of the materials management, Purchase management, its formalities, inventory management, and its practices in industry.

RATIONALE:

Material plays a vital role in industrial cost. An effective management of materials plays a direct role in cost saving and its reduction. Modern industries involve a wide range of materials. Material management involves various elements like purchasing, stores and inventories. The subject gives an inside into various subsystems of material management, existing practices and key features to manage the materials effectively.

COURSE OBJECTIVES:

After completion of the course student should be able to –

1. Know about materials management concept and function.
2. Understand about types of materials in industries.
3. Know about purchasing and purchasing functions in industry.
4. Know about various inventories and inventory control.
5. Understand about stores and stores management.

COURSE CONTENTS:

1	**Management Concept:** Various definitions of managements, difference between management, administration and organization, functions of management, scientific management, principles of scientific management.	**6**	**8**
2	**The Organization:** Definition and Scope of organization, Steps in organisation, Necessity of organisation, Types of organisation structure like line, functional, line and staff organisation, their advantages, limitations and applications	**6**	**8**

3	**Material Management concept and scope :** Organization and importance of materials management, scope of materials management, classes of material, functions of materials department, variety reduction in materials management.	**9**	**12**
4	**Purchasing Management :** Importance, objectives and principles of purchasing, centralize and decentralized purchasing, purchasing cycle, condition of contract, pricing theory, negotiation, make or bye decision, purchasing budget. Vender development, organization of purchase department	**10**	**12**
5	**Inventory Management :** Definition, objectives, need and importance of inventory management, Selective controls, classification methods ABC – analysis, XYZ – analysis, HML Classification, VED, SDE, SOS classification. Economic Ordered Quantity, its calculation, ordering point, safety stock, etc. Types of inventories – Raw material, functions of Raw materials. Spare parts inventory and its management; work in process inventory, finished good inventory. Inventory cost, carrying cost involving insurance taxes, obsolescence, wages and salaries cost of overstocking, stock out costs. Concept of stock level & control – effect of low stock holding and high stock holding, fixing of stock level minimum and maximum level. JUST IN TIME techniques, need of it in modern production industry, related economics, advantages and disadvantages, logistics and applications.	**14**	**16**
6	**Stores Management:** Stores function, receipts and inspection, storage of materials-general care and preservation. Warehouse design considerations, stores records and account, stock verification, over stock and scrap management. Store department and organization, duties of storekeeper, centralize and decentralized stores, types of store, codification concepts for store items standardization and reduction method. Safety and security aspects in stores, issue systems.	**12**	**14**

7	**Computers in materials management:** Advent of computers, data / input / output, electronic data processing (EDP), ideal areas for computerization, requirements for a good information system, concept of management information system with reference to materials management.	**7**	**10**
	TOTAL	**64**	**80**

EXPERIMENTS:

1) Assignment on management
2) Assignment on organization
3) Assignment on recent trends in material management (Today's Industrial scenario)
4) Assignment on role & scope of purchase management in the industry
5) Assignment on Inventory management (Take case study of a specific industry)
6) Assignment on store management (cover advances in store management)
7) Visit store department of a industry & prepare a report
8) Assignment on advance softwares, MIS systems in material management.

REFERENCE BOOKS :

Sr. No	**Title of Book**	**Author and Publication**
1	Industrial Engineering & Management	O. P. Khanna, Dhanpat Rai and Sons
2	Industrial Management & Organization	Banga and Sharma, Khanna Publications
3	Production planning & Control of Industrial Management	Jain & Agarwal, Khanna Publications
4	Integrated Approach to Material Management	N. M.Shah

5M416: REFRIGERATION AND AIR CONDITIONING

COURSE STRUCTURE:

:-

Teaching Scheme		Evaluation Scheme						
TH	04		PT	TEE	TW	PR	OR	Total
PR	02	Max.Marks	20	80	25	--	25	150
TOTAL	06	Duration			--	--	--	--

Rationale:

The 21st century predicts revolutionary developments in Refrigeration and Air Conditioning. Refrigeration and Air conditioning is one of the most important job areas for diploma holders in Mechanical Engineering. Considering the wide and increasing use of Refrigeration and Air conditioning for domestic, commercial and industrial applications and the challenges put by the use of Refrigeration and air conditioning equipments in present stage, it is absolutely necessary that Diploma Engineers should learn this subject. They should know the processes, equipments, systems of Refrigeration and Air Conditioning with their functioning, maintenance, repairs and measures to meet the challenges of the near future in this area.

Objectives:

The student should be able to: -

1. Describe types, working principles and construction of Refrigeration and Air Conditioning systems.
2. Calculate performance of refrigeration and air conditioning system.
3. Use various charts and tables used in refrigeration and air conditioning.
4. Enlist properties of refrigerants, their applications and effects on environment.
5. Identify various components and controls used in refrigeration and air conditioning.
6. Describe various air conditioning systems and their applications.
7. Estimate cooling and heating loads.
8. Identify and describe different components of air distribution system.

Contents: **Theory**

Chapter	Name of the Topic	Hours	Marks
01	**Basics of Refrigeration** 1.1 Definition of refrigeration. 1.2 Necessity of refrigeration 1.3 Methods of refrigeration:- Ice refrigeration Refrigeration by expansion of air Refrigeration by throttling of gas Vapour refrigeration system Steam jet refrigeration system Non conventional methods of refrigeration like Vortex tube, Pulse tube refrigeration, solar refrigeration 1.4 Concept of heat engine, heat pump and refrigerator. 1.5 Unit of refrigeration, C.O.P. and refrigerating effect. 1.6 Major application areas of R.A.C. like domestic, commercial and industrial.	**06**	**10**
02	**Refrigeration Cycles** 2.1 Reversed Carnot Cycle and its representation on PV and TS diagram. 2.2 Air Refrigeration Cycles: - -Bell Coleman air refrigerator, it's representation on PV and TS diagram, types and applications like air craft refrigeration using simple air cooling system.. - (Simple numerical on Reversed Carnot cycle.) 2.3 Vapour Compression Cycle (V.C.C): - -principle, components, Representation on P-H and T-S diagram, effects of wet compression, dry compression, calculation of COP, Effect of superheating, under cooling, suction pressure and discharge pressure, Actual V.C.C., (simple numerical), Methods of improving COP (no description). -Introduction to multistage V.C.C., its necessity, advantages. 2.4 Vapour Absorption system : - Principle, components and working of aqua- ammonia system (simple & practical) Li-Br Absorption System Electrolux Refrigeration System, Desirable properties of Refrigerant and absorbent used in Vapour Absorption System. Comparison of above Refrigeration Cycles.	**16**	**14**
03	**Refrigerants** 3.1 Classification of refrigerants. 3.2 Desirable properties of refrigerants. 3.3 Nomenclature of refrigerants.	**04**	**06**

	3.4 Selection of refrigerant for specific applications. 3.5 Concept of Green House Effect, Ozone depletion, Global warming, ODP & GDP of Refrigerents. 3.6 Eco-friendly refrigerants like R-134a, hydrocarbon refrigerants etc.		
04	**Equipment selection** 4.1 Components of Vapour Compression Refrigeration System 4.1.1 Compressors: - Classification, Construction and working of open type, hermetic, centrifugal, rotary, screw and scroll compressor and their applications. 4.1.2 Condensers: Classification, description of air cooled and water cooled condensers, comparison and applications - Evaporative condensers. 4.1.3 Expansion devices: - Types: - Capillary tube, automatic, thermostatic and their applications 4.1.4 Evaporators and chillers: - Classification of evaporators Construction and working of Bare tube, Plate surface, finned, shell and tube, flooded and dry expansion evaporator - Capacity of evaporator and their applications - Classification of chillers - Construction and working of dry expansion Chillers and flooded chillers and their applications. 4.2 Selection criteria for Vapour compression refrigeration system components for the following applications: Water coolers, ice plants, cold storage, domestic refrigerator	**16**	**14**
05	**Psychrometry** 5.1 Definition and necessity of air conditioning. 5.2 Properties of Air, Dalton's law of partial pressure 5.3 Psychrometric chart 5.4 Psychrometric processes, Bypass Factor, ADP, concept of SHF, RSHF. 5.5 Adiabatic mixing of Air streams (simple numericals) 5.6 Simple numerical using Psychrometric chart 5.7 Equipments used for Air- conditioning like humidifier, dehumidifier, filter, heating and cooling coils.	**06**	**12**
06	**Air- conditioning systems** 6.1 Classification of A.C. systems 6.2 Industrial and commercial A.C. systems 6.3 Summer, winter and year round A.C. systems 6.4 Central and unitary A.C. systems	**06**	**08**

	6.5 Application areas of A.C. systems		
07	**Comfort conditions and cooling load calculations** 7.1 Thermal exchange of body with environment 7.2 Factors affecting human comfort 7.3 Effective temp. and comfort chart 7.4 Components of cooling load- sensible heat gain and latent heat gain sources	**04**	**08**
08	**Air distribution systems** 8.1 Duct systems: - - Closed perimeter system, extended plenum system, radial duct system, duct materials, requirement of duct materials, losses in ducts 8.2 Fans and Blowers: - - Types, working of fans and blowers 8.3 Air distribution outlets: - - Supply outlets, return outlets, grills, diffusers 8.4 Insulation: - - Purpose, properties of insulating material, types of insulating materials, methods of applying insulation.	**06**	**08**
	Total	**64**	**80**

Practical:
Skills to be developed:

Intellectual skills:
1. Identify various components of refrigeration and air conditioning equipment
2. Analyse cooling load based on application.
3. Interpret psychometric chart to find various properties of air.
4. Observe working of test rigs and calculate coefficient of performance.

Motor skills:
1. Handle various tools used for refrigeration and air conditioning plant maintenance
2. Use of temperature, pressure, energy measuring devices
3. Draw the layout of central Air conditioning plant
4. Perform cooling load calculations for different air conditioning applications
5. Select and use of different types of insulating material and setting procedures for applying insulations

List of Practical (Any 8)

1. Trial on water cooler test rig.
2. Study of various tools in refrigeration and air conditioning practice.
3. Demonstration of domestic refrigerator in View of construction, operation and controls used.
4. Demonstration of various controls like L.P./H.P. cut outs, thermostat, overload protector, solenoid valve used in RAC.

5. Identification of components of 'hermetically sealed compressor' for its study after dismantling and assembly.
6. Visit to repair and maintenance workshop in view of use of various tools and charging procedure.
7. Cooling load calculations for cabin, classrooms, laboratory, canteen and dairy plant, milk storage, small freezers (minimum one).
8. Trial on A.C. test rig.
9. Visit to central A.C. plant in view of ducting system, insulation system and Air distribution system (e.g. frozen food industry/ice- cream industry/mushroom plants/textile industries).
10. Trouble shooting of domestic refrigerator/window air- Conditioner.
11. Study of water cooler with identification of components.
12. Study of vapour absorption refrigerator.
13. Dismantling & assembly of Reciprocating Refrigeration Compressor.
14. Study of Split Air conditioner by dismantling & assembling.

Reference Books:

Sr. No	Author	Tit;e	Publisher
01	R.S.Khurmi	Refrigeration and Air Conditioning	S.Chand and Co
02	Arrora and Domkundwar	Refrigeration and Air Conditioning	Dhanpat Rai and Sons
03	Manohar Prasad	Refrigeration and Air Conditioning	New Age Publications
04	P.N.Ananthanarayanan	Refrigeration and Air Conditioning	Tata McGraw Hill
05	Roy Dossat	Principles of Refrigeration	Pearson Education
06	Edwin P. Anderson	Commercial Refrigeration	Taraporevala Sons & Co
07	Audel	Practical Refrigeration	Taraporevala Sons & Co

5M417: AUTOMOBILE ENGINEERING (ELECTIVE – I)

COURSE STRUCTURE:

Teaching Scheme		**Evaluation scheme**						
TH	04		PT	TEE	TW	PR	OR	Total
PR	02	Max.Marks	20	80	25	--	25	150
TOTAL	06	Duration	1.00	3.00	--	--	--	--

RATIONALE:

Automobile engineering, a technology subject, has applications of various subjects taught earlier. All the major global players in Automobile sector have launched their product in India. Automotive sector has major employment potential for diploma holders. Automobile servicing in particular offers good job opportunities at village, town & city level.

This course in Automobile Engineering will make student understand & apply the knowledge about various system, subsystems & their inter-relationships.

COMPETENCY STATEMENT:

"To understand different systems/components of the automobile vehicles with the view maintenance and operation of the automobiles."

COURSE CONTENTS:

Topic No.	**Content**	**Hours**	**Marks**
01	**Introduction of Automobile** 1.1 Classification of automobiles 1.2 Vehicle layout & types-Front engine rear wheel, Rear engine rear wheel, Front engine front wheel, Four wheel drive 1.3 Chassis components 1.4Frame & Frameless construction-Function, Types of frame	**05**	**08**

02	**Power plant(Engine)** 2.1 Engine classification-According to no. of cylinders, arrangement of cylinders. 2.2 Types of automobiles power plants-petrol,diesel,gas turbine,rotary piston engine,electric vehicle 2.3 Engine components-construction,function & material Cylinder block, cylinder head,crankcase,oil pans, cylinder liners,gaskets,piston,piston pin, piston rings, connecting rod,crankshaft,valve & valve mechanism, timing gears,camshaft,inlet &exhaust manifold, exhaust muffler	**10**	**12**
03	**Auto Engine Systems** 3.1 Fuel feed system of petrol & diesel engine 3.1.1 mixture requirement in petrol engine, modern carburetor, different systems in carburetor,solex carburetor,MPFI system & its components 3.1.2 mixture requirement in diesel engine, electrical pump, rotary fuel pump, fuel injector,governors,glow plug, common rail direct injection system(CRDI) 3.2 Cooling systems-Air cooling systems, liquid pressurized systems & components 3.3 Lubrication system- Different types like splash & pressurized, oil pumps, filters	**10**	**12**
04	**Electrical systems** 4.1 Battery-principle & construction, rating of battery, charging methods, maintenance free battery 4.2 Ignition system-construction & working of electronic ignition systems	**06**	**06**
05	**Automobile Transmission** 5.1Clutch- necessity, construction & working of coil spring, diaphragm spring clutch,multi plate clutch 5.2Gear box- Synchromesh gear box, torque converter, overdrive 5.3Final drive- propeller shaft& joints, action & need of differential, differential lock 5.4Axle- front axle& types of rear axle	**06**	**06**
6	**Steering Systems** 6.1 Steering geometry-camber,castor,king pin inclination,toe-in,toe-out,understeering,oversteering,turning radius 6.2 Steering Gear box- rack &pinion type,recirculating ball type, worm & roller type 6.3 Wheel balance procedure 6.4 power steering (hydraulic & electrical)	**06**	**08**

7	**Brakes** 7.1 Classification of brakes 7.2Principle construction & working of drum & disc brake 7.3 Construction & working of hydraulic, air braking systems, power brakes 7.4 Concept of anti lock braking system	**06**	**08**
8	**Wheels tyres & Suspension** 8.1 Types of wheels 8.2 Tubeless tyre & radial ply tyre 8.3Types of suspension-rigid axle suspension, independent suspension such as Macpherson strut, wishbone types 8.4Telescopic hydraulic & gas filled shock absorber	**06**	**08**
9	**Environmental vehicle pollution & control-** 9.1 Effect of vehicle pollution 9.2 Content of exhaust gases in petrol & diesel 9.3Emission control measures such as positive crankcase ventilation, exhaust gas recirculation(EGR),catalytic converters	**04**	**04**
10	**Advances in automobiles** 10.1 Automobiles running on LPG & CNG, 10.2 Hybrid vehicles, Gasoline direct injection engine 10.3 Concept of automatic gear box	**05**	**08**
	Total	**64**	**80**

TERM WORK: It shall consist of journal, based on the following experiments

Experiments**:**

1	Study of automobile chassis & location of different systems, components on the chassis
2	To dissemble & assemble four stroke engine. Observe & sketch various components
3	To dissemble & assemble solex carburetor & study different systems.
4	Study & analysis of MPFI system of car like Maruti,indica or Hyundai
5	Study of Magneto ignition system of two wheeler ,Observe & sketch various components
6	Demonstration of single plate coil spring & diaphragm spring type clutch
7	To study the synchromesh gear box by assembling & dissembling
8	Open the steering gear box; observe the components & assemble. Observe steering linkages. Draw the Sketches
9	Observe & draw layout of hydraulically operated braking system
10	Observe & study of different suspension systems
11	To take trial on petrol & diesel exhaust gas analyzer & analyze the results
12	Visit to four- wheeler service station & prepare a report

13	Mini project :- Collect following information from Internet/magazine/company manuals etc a) New models launched in last 3 years. study modern features in these vehicles b) Safety devices in modern automobiles c) Pollution norms-Euro & bharat stage

Reference Books:

Sr. No.	Title & edition	Author	Publisher
01	Automobile Engineering Vol. I and Vol. II	Kirpal Singh	Standard Publication
02	Automobile Engineering	K. K. Jain and R.B. Asthana	Tata McGraw hill
03	Automobile Engineering	R.B. Gupta,	Satya Prakashan New Delhi
04	Automotive Mechanics	W.H.Crouse&Anglin	Tata McGraw hill
05	Automobile Mechanics	SRINIVASAN	Tata McGraw hill
06	Automotive Technology	H.M.Sethi	Tata McGraw hill
07	Automobile Engineering	G.B.S. Narang	Khanna Publication
08	Auto Mechanics	Harold T. Glenn	Bennett & Mckknight
09	Automobile Mechanics	Joseph Heilter, East West Press Pvt. Limited	

5R418-ADVANCED ENGINERING MATHEMATICS

COURSE STRUCTURE:

Teaching Scheme		Evaluation Scheme						
TH	04		PT	TEE	TW	PR	OR	Total
PR	02	Max. Marks	20	80	25		25	150
TOTAL	06	Duration	1.00	3.00	2.00	--	---	--

RATIONALE:

The subject is classified under basic sciences and intends to teach students basic facts, concepts and principles of mathematics, as a tool to analyze Engineering problems. Mathematics lies down the foundation to understand core technology subjects.

COMPETENCY STATEMENTS:

To inculcate the practice of mathematic
Comprehend the principles of other subjects
Solve problems by using analytical and systematic approach.

COURSE CONTENTS:-

Topic No	Name of the Chapter / topic (Follow S.I. units)	Hours	Marks
1	**Matrices** 1.1 Elementary row and column transformations 1.2 Rank of matrix 1.3 Echelon or normal matrix 1.4 Inverse of a matrix by elementary transformations 1.5 Linear Equations solution of homogeneous and non homogeneous equations 1.6 Linear dependence and independence 1.7 Linear and orthogonal transformations 1.8 Eigen values and Eigen victors 1.9 Cayley – Hamilton Theorem	16	20
2	**Complex numbers** 2.1 Introduction to number system. 2.2 Definition and examples of complex numbers. 2.3 Algebra of complex numbers(addition, subtraction, multiplication and Division) 2.4 Powers of the imaginary numbers " i " 2.5 Representation of complex numbers in a plane (Armand diagram) 2.6 Modulus and Amplitude of complex numbers. 2.7 Polar from of complex numbers. 2.8 Rules regarding modulus and amplitude of product, quotient and power of complex numbers. 2.9 Exponential form of complex numbers.	14	16

	2.10 Powers of complex numbers De Moivres Theorem. 2.11 Roots of complex numbers. 2.12 Circular functions of complex numbers. 2.13 Hyperbolic functions. 2.14 Relation between Hyperbolic and circular functions. 2.15 Real and imaginary parts of circular and hyperbolic functions of complex numbers		
3	**Successive Differentiation** 3.1 $\boldsymbol{n^{th}}$derivative of standard function. 3.1. 1 $\boldsymbol{e^{ax}}$ 3.1.2 log (ax + b). 3.1.3 $\boldsymbol{(ax \pm b)^{-1}}$, $\boldsymbol{(ax \pm b)^{n}}$, $\boldsymbol{(ax \pm b)^{-n}}$ 3.1.4 $\boldsymbol{sin(ax \pm b), cos(ax \pm b)}$ 3.1.5 $e^{ax}\sin(bx \pm c), e^{ax}\cos(bx \pm c)$. 3.2 Leibnitz's Theorem	12	16
4	**Partial Differentiation** 4.1 Partial derivatives of first and higher order. 4.2 Total differential coefficients, total differentials. 4.3 Differentiation of complex and implicit function. 4.4 Euler's theorem on homogenous function with two and three independent Variable (without proof). 4.5 Deductions from Euler's theorem.	12	16
5	**Solution of Algebraic Equation** 5.1 Introduction 5.2 Iterative Method 5.3 Starting and Stopping Iterative Method 5.4 Bisection method 5.5 Regula Falsi Method 5.6 Newton – Raphson Method	10	12
		64	80

LIST OF EXPERIMENTS:

1) Two experiments on each chapter,each experiment contains five examples.

TEXT BOOKS:

S.No.	Name of Book	Author
1	Higher Engineering Mathematics	B.S.GREWAL
2	Applied Mathematics Vol. I	P.N.WARTIKAR
3	Introductory Methods of Numerical Analysis	S.S. Sastry

5M501 DESIGN OF MACHINE ELEMENTS

Teaching Scheme		Evaluation Scheme						
TH	04		PT	TEE	TW	PR	OR	Total
PR	02	Max.Marks	20	80	25	--	25	150
TOTAL	06	Duration	1.00	4.00	--	--	--	--

RATIONALE:

The mechanical engineering students should posses the knowledge of elementary basic design principles involved in design of machine parts and components. The course introduces simple design of machine elements like joints, couplings, levers, springs, etc. The student will be supposed to maintain and sometimes modify the existing designs of machine parts and components. Fundamental knowledge of engineering mechanics, strength of materials, engineering materials and theory of machines is essential. Considering all these, this course is being introduced at this level.

COMPETENCY STATEMENTS:

To select, assemble and design simple machine elements/parts for various applications and draw cad drawing

COURSE CONTENTS:

Topic No.	Content	Hours	Marks
1	**REVISION OF FUNDAMENTALS OF MECHANICS** 1.1 Definition of Stress, Strain, Design Considerations. 1.2 1.2 Significance of Stress – Strain diagram for various materials. 1.3 Study of mechanical properties of materials. 1.4 Types of fracture, fatigue, endurance limit, Types of induced stresses. 1.5 Theories of failure, Maximum principle stress theory and Maximum shear stress theory.	**06**	**04**
2	**DESIGN CONSIDERATIONS** 2.1Stress concentration, meaning, causes and remedies. 2.2 Working stress.Factor of safety, Principle Stresses. 2.4 Selection of materials and manufacturing processes. 2.5 Commercial designations of materials and Specifications, use of Design Data Book.	**08**	**08**
3	**FORCE CONSIDERATIONS** 3.1 Design of machine parts subjected to direct load, 3.2 Design of knuckle joint, cotter joint; turn buckle,	**10**	**13**

	foundation bolt, etc. 3.3 Design of machine parts subjected to bending such as levers, bell crank lever, lever loaded safety valve, bearing cap. 3.4 Design of machine parts subjected to direct and bending stress such as C – clamp, frames, and offset links.		
4	**SHAFT, KEYS AND COUPLINGS** 4.1 Design of shaft on the basis of rigidity and stiffness. 4.2 Design of keys, Types of keys, Assembly using different keys. 4.3 Design of couplings such as Muff coupling, Flange coupling, and flexible coupling. 4.4 Design of propeller shafts. 4.5 Design of shaft subjected to combined bending and twisting and empirical treatment.	**10**	**14**
5	**DESIGN OF FASTENERS** 5.1 Stresses in screwed fasteners. 5.2 Bolts of uniform strength. 5.3 Design of bolts for cylinder cover. 5.4Design of eccentrically loaded bolts. 5.5 welded joints subjected to axial forces and eccentric forces in the plane of weld.	**08**	**10**
6	**POWER SCREWS** 6.1 Thread forms and their application, selection of threads from load considerations. 6.2 Design of power screws on maximum principle and shear stress theory 6.3 Self locking, efficiency and overhauling of screw jack.	**06**	**09**
7	**SPRING DESIGN** 7.1 Types of springs and their applications. 7.2 Design of helical spring. 7.3 Design of leaf spring.	**06**	**10**
8	**BEARINGS** 8.1Types of bearings, bearing selection and mounting. 8.2 Commercially available bearings in the market. 8.3 Bearing materials and their application. 8.4 Oil seals and packing.	**06**	**06**
9	**ERGONOMICS & AESTHETIC CONSIDERATION IN DESIGN** 9.1 Ergonomics of Design – Man –Machine relationship. 9.2 Design of Equipment for control, environment & safety. 9.3 Aesthetic considerations regarding shape, size, color & surface finish.	**04**	**06**
		64	**80**

LIST OF PRACTICALS:

1) Design any one joint (i.e. Cotter joint, Knuckle joint) used in actual practice and its drawing.
2) Design any one type of lever and its drawing and coupling design and drawing.
3) Design of screw jack and its drawing.
4) CAD drawing of any one of the above three drawings.

TEXT BOOK:

Sr.No	Title and Edition	Author	Publisher
1.	Machine Design	R.S.Khurmi	S.Chand and Co. New Delhi
2.	Machine Design	P.V.Mandke	Nirali Publication, Pune
3.	Machine Design	R.K.Jain	Khanna Publication
4.	Elements of Machine Design	Pandya and Shah. Charotar Publication House	Charotar Publication House
5.	Introduction to Machine Design	V.B.Bhandari	Tata Mc- Graw Hill

5R502- METROLOGY AND QUALITY CONTROL

COURSE STRUCTURE:

Teaching scheme		**Evaluation Scheme**						
TH	03		PT	TEE	TW	PR	OR	TOTAL
PR	02	Max. Marks	20	80	25	25	---	150
TOTAL	05	Duration	1.00	3.00				

RATIONALE:

The course Engineering Metrology and quality control makes the student to understand the process of measurement, the measuring instrument and its care and maintenance. The student should also understand the concept of quality control needed in any industry. Also the student should be able to use various measuring instruments, select the appropriate instrument for a particular application.

COMPETENCY STATEMENT:

- To use various types of measuring instruments and inspection gauges.
- To understand the various quality control and quality management techniques and practice them.
- To develop an ability of problem solving and decision making**.**
- To develop quality consciousness amongst the students.

COURSE CONTENTS:

Topic No	Content	Hours	Marks
1	**Fundamentals Of Metrology**: Definition of metrology, 1.1 Needs of inspection, 1.2 Common terminology used such as accuracy, precision, sensitivity, magnification errors, and sources of errors. 1.3 Line standard, end standard and wavelength standard. 1.4 Concept of calibration.	**03**	**06**
2	**Limits, Fits & Gauges**: 2.1 Basic terminology of limits and Fits. 2.2 Types of fits, hole basis system and shaft basis system of fits. 2.3 Types of gauges – Plug gauges, snap gauges, ring gauges and relation gauges. 2.4 Taylor's principle of gauge design. 2.5 Simple numerical on tolerance calculations.	**04**	**08**
3	**Angular Measurement**: 3.1 Concept of angular measurement,	**04**	**06**

	3.2 Construction & working of bevel protractor, sine bar, angle gauges, clinometers, autocollimator, angle dekkor.		
4	**Comparators** 4.1 Characteristics of a good comparator, 4.2 Principle of comparators, operation of various comparators. 4.3 Dial indicator as mechanical comparator, 4.4 Pneumatic comparator – Solex and high pressure dial type, 4.5 Electric comparators, 4.6 Relative merits and demerits of various comparators.	**04**	**06**
5	**Screw Thread & Gear Measurement::** 5.1 Terminology of screw thread, 5.2 Errors in threads, 5.3 Measurement of various parameters, of screw threads such as major diameter, minor diameter, effective diameter, pitch using instruments – screw thread micrometer, floating carriage micrometer, 5.4 Gear terminology, 5.5 Measurement of chordal thickness, addendum using gear tooth vernier, Parkinson gear tester,	**06**	**12**
6	**Surface Finish Measurement**: 6.1 Terminology, 6.2 Importance of surface finish, 6.3 Symbol representing surface finish on drawing, 6.4 Principle & operation of stylus probe instrument 6.5Tomlinson surface meter and Taylor-Hobson surface Talysurf.	**04**	**06**
7	**Testing Techniques**: 7.1 Straightness testing by straight edge & autocollimator, 7.2 Flatness testing by optical flats, 7.3 Various cases of square ness testing, parallelism testing by using dial indicator, circularity testing (Roundness testing) using dial indicator. 7.4 Machine Tool Testing:- Alignment test to be carried out on lathe machine and drilling machine	**04**	**08**
8	**Basic Concepts Of Quality**: 8.1 Definitions of quality, quality characteristics, 8.2 Need of quality control, quality of design, quality of performance, and quality of conformance. 8.3 Quality function cost of quality, value of quality, quality control. 8.4 Quality assurance – concept, quality	**05**	**06**

	mindedness, quality audit. 8.5 Quality circle – concept, purpose, function.		
9	**Introduction To SQC & Other Control Techniques**: 9.1 Basic statistical concepts like mean, mode, median, standard deviation, dispersion, Process capability and indices - C_p, C_{pk}, 9.2 Concept of variable data & attribute data, control charts for variables and attributes, 9.3 Acceptance sampling, concept, sampling plans, O.C. curve, 9.4 Q.C. tools such as ISHIKAWA diagram scatter diagram, Parato diagram.	**06**	**10**
10	**Introduction to Quality management system:** 10.1 TQM, 10.2 ISO 9001:2000, 10.3 QS 14000, 10.4 TS 16949	**04**	**06**
11	**Recent Trends in Metrology** 11.1 Introduction to CMM 11.2 Working principle, 11.3 Purpose, 11.4 Advantages, 11.5 Classification of CMM, 11.6 Multi Gauging Inspection. 11.7. Online Inspection.	**04**	**06**
		48	**80**

PRACTICALS:

1. Use of basic measuring instruments such as vernier caliper, vernier height gauge, vernier depth gauge, outside micrometer, inside micrometer for measurement of actual jobs from industry.
2. Use of slip gauge to find unknown gap.
3. Set the sine bar for given angle and verify the angle by bevel protractor.
4. Use of dial indicator as mechanical comparator. 50 jobs manufactured on any machine by single operator for a particular dimension is checked as per job drawing with tolerances e.g. O.D. of shaft within 10 microns.
5. Use of screw thread micrometer and floating carriage micrometer (Two wire method) to measure effective diameter.
6. Use of surface finish testing machine to observe surface finish (Ra) values for specimens of grinding finish, lapping finish, honing finish, turning, milling, shaping.
7. Use of gear tooth vernier for chordal thickness and addendum measurement.
8. Use of optical flat for flatness testing.
9. To draw a frequency histogram for a set of 50 readings measured for a particular quality characteristic on 50 jobs from industry. Calculation of standard deviation, process capability.

10. To draw X & R chart for a given data of 50 readings actually measured in industry.
11. To draw P & C chart for the data taken in the industry.
12. Use of internet for SPC software's.
13. Visit to industry to understand various quality management systems.

REFERENCES:

Sr. No	Title of Book	Author	Publication
1	Engineering Metrology	R. K. Jain	, Khanna publications, 2004
2	Engineering Metrology	P.K.Sihna	, BPB Publication, 2001
3	Metrology	M. Mahajan,	Dhanpat Rai & co.,2000
4	Statistical Quality Control	M. Mahajan,	M. Mahajan, Dhanpat Rai & co.,2000
5	Handbook of Industrial Metrology		ASTME
6	Quality Planning & Analysis	J. M. Juran,	Tata Mc Graw hill 1985
7	IS Codes		
	IS 919-1993 Limit, fits & tolerances IS 2029-1962 Dial gauges IS 2909-1964 Guide for selection of fits IS 2984-1966 Slip gauges		

5M503: PRODUCTION ENGINEERING

COURSE STRUCTURE:

Teaching scheme		**Evaluation Scheme**						
TH	03		PT	TEE	TW	PR	OR	TOTAL
PR	02	Max. Marks	20	80	25	--	25	150
TOTAL	05	Duration	1.00	3.00				

RATIONALE:-

In changing industrial scenario the importance of productivity is becoming more and more critical. A diploma engineer working at lower level management in industries, they play a vital role in above aspects. Developing a positive attitude in employees towards the productivity is crux of industrial engineer.

A supervisor can achieve highest level of productivity by using proper workplace layout, proper methods of processing. At the same time principles of motion economy reduces stress and fatigue in workers.

COMPETENCY STATEMENT:-

1. To gain expertise in specialized aspects of industrial engineering system.
2. To design workplace using 5S principles, conduct method study,
3. able to apply motion economy principles, able to apply techniques of work measurement,
4. able to convince the workers the importance of work study in improving productivity.

COURSE CONTENTS:

Topic No	Content	Hours	Marks
1	**BASIC CONCEPTS OF PRODUCTIVITY:-** 1.1 Definition, productivity measurement at national, industrial and enterprise level, 1.2 benefits of higher productivity, 1.3 various productivity measurement approaches such as total productivity , total factor productivity ,return on investment 1.4 Productivity of materials, productivity of land, buildings, machines and manpower, factors contributing to productivity improvement.	**05**	**06**
2	**TECHNIQUES FOR PRODUCTIVITY MEASUREMENT:-** 2.1 Work content and ineffective time, 2.2 improving productivity by reducing work content, 2.3 improving productivity by reducing ineffective time, 2.4 role of management, supervisor, worker in work study	**06**	**06**
3	**METHOD STUDY:-** 3.1 Definition, 3.2 objectives,	**07**	**12**

	3.3 procedure of method study, 3.4 process chart symbols, 3.5 flow process chart, 3.6 travel chart, 3.7 Multiple activity chart, 3.8 string diagram. 3.9 Questioning technique 3.10 primary questions, secondary questions.		
4	**MOTION STUDY:-** 4.1 Principles of motion economy, 4.2 use of human body , 4.3 arrangement of work place , 4.4 Introduction to 5s , 4.5 SIMO chart, 4.6 Therbligs, 4.7 Memo & Micro motion study,	**06**	**12**
5	**WORK MEASUREMENT:-** 5.1 Purpose, 5.2Techniques of work measurement such as Work sampling , 5.3 PTS (predetermined time standards) , 5.4 Standard data	**05**	**11**
6	**TIME STUDY:-** 6.1 Definition, Objectives 6.2 Time study equipment- stop watch, time study board, time study forms. 6.3 Selecting the job, 6.4 Selecting the worker	**05**	**11**
7	**LOCATING AND CLAMPING METHODS:** 7.1 Introduction. 7.2Basic principles of location. 7.3 Locating from plane surface 7.4 Locating from circular surface. 7.5 Locating from irregular surface. 7.6 Locating methods and devices. 7.7 Basic principles of clamping. 7.8 Clamping devices.	**08**	**10**
8	**INTRODUCTION TO FIXTURES:** 8.1 Introduction, 8.2 types of fixtures- vice fixtures, 8.3 lathe fixtures- chucks, face plate fixtures 8.4 Milling fixtures- single piece milling, string milling, , progressive milling	**03**	**06**
9	**INTRODUCTION TO DRILL JIGS:** 9.1 Introduction, definition, 9.2 types of drill jigs- leaf jigs, box and tumble jig, template jigs, plate jig , Universal or pump jigs,	**03**	**06**
		48	**80**

PRACTICALS:

1. Collecting information about productivity on Internet, from NPC(National Productivity council).
2. .Case study on increasing productivity of a small work place.
3. Conducting method study for particular operation and alternative method should be suggested.
4. Conducting time study on operator.
5. To study advanced manufacturing techniques- kaizen, Poke Yoke.
6. Above practical should be conducted in respective industries so that students get acquainted with emerging trends in Industrial Engineering.
7. Submit 2D drawing of any one type of drill jig.
8. Submit 2D drawing of any one type of fixture.
9. Submit 2D drawing of different types of locating devices.
10. Submit 2D drawing of different types type of clamping devices.
11. Use of software for calculation of total time.

REFERENCE BOOKS:

Sr. No	Title of Book	Author	Publication
1	Introduction to Work-study	ILO,	Oxford publication
2	Work study	M.S.Mahajan	Vrinda prakashan
3	Industrial organization and supervisory management	O.P. Khanna,	Dhanpat Rai and Sons
4	Tool Design	Donaldson	Tata MCGraw Hill Publication Company limited

5R504: INTERNAL COMBUSTIONS ENGINES (ICE)

COURSE STRUCTURE:

Teaching Scheme		Evaluation Scheme						
TH	04		PT	TEE	TW	PR	OR	Total
PR	02	Max.Marks	20	80	25	--	25	150
TOTAL	06	Duration	01	03	--	--	--	--

RATIONALE:

The rise in the civilization is closely related to phenomenal improvements in the transportation. In the developments of transportation, I.C. engines occupy very important position. The Internal Combustion engines have provided a small power unit in the personalized transport and revolutionized the living habits to greater extent. Besides personalized transportation, The I.C. engines provide power to heavy and military vehicles, ships and aircrafts, generator sets, machines.

Considering the vital importance of the I.C. engines, it is utmost necessary to give exposure to the diploma engineers as regards the important and basic aspects of I.C. engines. Diploma engineers come across the I.C. engines in his/her all the while in the operating areas of Production, Maintenance, and Processing etc.

Present course is designed to give exposure to fundamental aspects of I.C. engines. Basic engines and their types are being covered in details. Fuel feed systems of S.I. and C.I. engines are also being covered including carburetion, Fuel injection aspects. Recent systems like M.P.F.I. are also covered. Various sub systems like Ignition, Cooling, and Lubrication etc are also covered.

Combustion systems in both the S.I. and C.I. engines are covered with emphasis on detonation Knock, Octane rating and Cetane Rating, I.C.engine fuels like conventional fuels along with Alternative fuels like Methanol, Ethanol, LPG, CNG, Bio-Diesel etc are also covered. Testing and performance aspects are also covered.

Advances in I.C. engines like Wankel engines, Stratified charge I.c. engines, direct injection gasoline engines, variable compression ratio engines are also being covered.

Most important area of Air pollution and emission control is covered with analysis of pollutants and controls systems

COMPETENCY STATEMENTS:

1 Understand various types of the I.C. engines and systems.
2 Understand the fundamentals of combustion processes in S.I. and C.I. engines.
3 Understand about various types of conventional and alternative fuels used in I.C. engines.
4 Get the basics of testing of I.C. engines and able to compare and analyze the performance of engines.
5 Understand about modern advances in I.C.engines.
6 Get the concept of various recent developments in I.C. engines.
7 Know about emissions from I.C. engines, their nature and pollution caused by them and various emission measuring devices like the exhaust gas analyzers of petrol and diesel types. Various control measures.

COURSE CONTENTS:

Topic No.	Content	Hours	Marks
1	**ENGINES AND TYPES** 1.1 Types of engines, I, C, Engine classification, 1.2 Two stroke & Four stroke engines - Petrol & Diesel engine, their construction and working - Valve timing diagrams, Comparison 1.3 I.C. engine applications	**06**	**06**
2	**AIR STANDARD CYCLES** 2.1 Ideal or air standard cycles 2.2 Assumptions 2.3 Otto cycle, Diesel cycle ,Dual combustion cycle Joule - Calculation of cycle efficiency, mean effective pressures of cycles. (Simple Numericals) 2.4 Actual cycles, difference between actual cycle and fuel air cycle.	**04**	**06**
3	FUEL FEED SYSTEMS IN I.C. ENGINES **A) S.I. ENGINES:** 3.1 Properties of Air-fuel mixtures Mixture requirements for starting, Idling, slow speed and acceleration 3.2 Carburetor - Working and limitations of simple carburetor - Working of Carter, Solex & S.U. carburetors 3.3 Multi Port Fuel Injection System (M.P.F.I.) - Concept of Petrol injection - Lucas MPFI system - Fuel injection system components like Fuel injector, Fuel pump, Throttle sensor, Oxygen sensor, Engine coolant sensor, Manifold absolute pressure sensor, Mass air flow sensors. - Limitations of MPFI systems. - Introduction to direct fuel injection petrol engines. **B) C.I. ENGINES:** 3.4 Fuel injection systems- -Requirements and Types of Injection systems -Conventional plunger type fuel pump, Rotary fuel pump, -Fuel injectors, Types of nozzles.	**12**	**16**

4	**I.C. ENGINE SYSTEMS** 3.1 **Ignition System:** -Types of ignition systems -Working of Battery and Magneto ignition systems, Electronic ignition systems with and without contact breakers 3.2 **Cooling system:** -Need of cooling systems -Types of cooling systems as Air-cooling systems, liquid and pressurized liquid cooling systems. -Relative Advantages and disadvantages. 3.3 **Lubrication system:** **-**Need of lubrication system **-**Different lubrication systems like splash, modified splash and pressurized lubrication systems **-**oil pumps, filters, crank case ventilation **-**types of lubricants, lubricant additives and their advantages	**10**	**12**
5	**COMBUSTION IN I.C.ENGINES** 5.1 Combustion in S.I. engines: -Introduction - Stages of combustion - Effects of engine parameters on ignition lag, flame propagation 5.2 - Abnormal combustion - Detonation or Knocking - Theories of detonation - Effect of engine variables on knocking - Disadvantages and Control of detonation. - Pre ignition - Octane rating of fuel, 5.3**.** Combustion in C.I. Engines: Air-fuel ratio in C.I. engines Stages of combustion Delay period or ignition lag, 5.4 Diesel knock Methods of controlling diesel knock 5**.**5 C.I. engine combustion chambers Principles of combustion chamber design as Open, Swirl, Man chambers Cold starting of CI engines.	**08**	**11**

6	**I.C.ENGINE FUELS** 6.1 Introduction 6.2 Structure of Petroleum 6.3 Products of refining process 6.4 Fuels for SI engines 6.5 Octane number requirements (ONR) 6.6 Diesel fuels 6.7 Non –petroleum fuels 6.8 Additives 6.9 Alternative fuels Alcohols, Bio- diesel	**04**	**06**
7	**TESTING AND PERFORMANCE OF I.C.ENGINES** .1 Introduction .2 Performance parameter 7.3. Basic Measurements - Measurements of speed, fuel consumption, air consumption, exhaust smoke, B.P.,I.P. & F.P. - Willan's line method, Morse test & Motoring test 7.4 Efficiencies and Specific Fuel Consumption (SFC's) 7.5 Heat balance and heat balance sheet. (Simple Numericals)	**08**	**09**
8	**ADVANCES IN I.C.ENGINES** 8.1 Elementary introduction to Wankel engine 8.2 Stratified charge engine (Direct Injection Engines) 8.3 Variable compression ratio engines 8.4 Stirling engines 8.5 Supercharging of I.C. engines. - Introduction - Objectives of supercharging - Supercharging limits - Methods of supercharging	**04**	**06**
9	**ENVIRONMENTAL AIR POLLUTION AND CONTROL** 9.1 Introduction 9.2 Pollutants from petrol engines - Sources of pollution - Exhaust emissions - Effect of engine maintenance on exhaust emissions 9.3 Petrol engine emission control – - Engine design modifications - Exhaust gas oxidation methods - Exhaust emission control by fuel variations - Blow by control - Control of Oxides of nitrogen by Exhaust Gas Recirculation Method (EGR) - Total emission package - Thermal reactor package, Catalytic converter, package 9.4 Diesel emission Diesel smoke & control	**08**	**08**

	- Diesel odour & control 9.5 Exhaust gas analyzers for petrol and diesel engines - Construction and working		
	TOTAL	**64**	**80**

TERM WORK:

1. To dismantle and assemble four stroke petrol engine.
2. To dismantle and assemble four stroke diesel engine.
3. To dismantle and assemble two stroke petrol engine.
4. Trial on four-stroke petrol engine with variable loading.
5. Trial on four stroke diesel engine with variable loading.
6. To dissemble and assemble Solex carburetor.
7. To dissemble and assemble SU carburetor.
8. To study and analyze MPFI system car like Maruti ,Hundai,Indica etc
9. To study Battery and Magneto Ignition systems.
10. To take a trial on petrol and diesel exhaust gas analyzer and analyze the results.
11. To study EGR systems in engines

REFERENCES:

SR No	Title of Book	Author and Publication
1	Internal Combustion Engines	Mathur and Sharma, Dhanpat Rai
2	Internal Combustion Engines	Ganeshan,TMH
3	Internal Combustion Engines	Maleev
4	High Speed Internal Combustion Engines	Ricardo
5	Internal Combustion Engines	Obert TMH
6	Automobile Engineering	Kirpal singh Vol I and Vol II
7	Automobile Engineering	R.P.Sharma ,S.CHAND
8	Diesel Engines	- Heissler –SAE publications

5M505: ADVANCED MANUFACTURING SYSTEMS (AMS)

COURSE STRUCTURE:

Teaching Scheme		Evaluation Scheme						
TH	04		PT	TEE	TW	PR	OR	Total
PR	02	Max.Marks	20	80	25	--	25	150
TOTAL	06	Duration			--	--	--	--

RATIONALE:

In the current scenario of globalization and liberation manufacturers have to be very competitive. To be competitive, companies should attempt to be best in the field of quality, price, delivery speed, delivery reliability, flexibility and innovation. Organizations should therefore aim to maximize performance in these areas in order to maximize competitiveness. In this view it is important for the Diploma Engineers to understand fundamental concepts, principles and applications of advanced manufacturing systems which enable him to work as a engineer in competitive industrial environment.

COMPETENCY STATEMENTS:

1. To understand different manufacturing systems used by industries.
2. To study these manufacturing systems for productivity improvement, quality improvement, cost reduction, waste elimination with suitable examples from industries.
3. To prepare assignments on these advanced manufacturing systems.
4. To understand and use these systems in the institute work shop and laboratories in the institute.

COURSE OBJECTIVES:

Student should able to,

1. Understand concept of various advanced manufacturing systems.
2. Understand background and philosophy of Lean Production.
3. Understand concept of workplace management
4. Study the various advanced manufacturing systems tool and their applications.
5. Study TWO case studies of industry where these systems are implemented.

COURSE CONTENTS:

Topic No.	Content	Hours	Marks
01	**Manufacturing processes** 1.1 Introduction to WCM 1.2 Need of WCM 1.3 Mass production 1.4 Inventory in mass production. 1.5 Modern industrial inventory control practices 1.6 Plant layouts	**10**	**10**
02	**Lean manufacturing system** 1.1 Concept of Lean manufacturing 1.2 steps for implementing the lean manufacturing system . 1.3. Types of waste and identification of waste 1.4 Value stream mapping 1.5 Benefits of lean manufacturing	**15**	**20**
03	**Tools of lean manufacturing** 2.1 Kanban system 2.1.1 Single kanban system 2.1.2 Dual kanban system 2.2 Just in time manufacturing : 2.2.1 Introduction JIT. 2.2.2 Single piece flow of material 2.2.3 Pull and Push manufacturing 2.2.4 Cellular manufacturing.	**15**	**20**
04	**Elements of Lean Manufacturing** 3.1 TPM and TQM 3.1 Workplace organization- 5 S 3.3 Concept of kaizen with industrial applications. 3.4 POKA-YOKE – Mistake proof manufacturing. 3.4.1 Identification of simple poke-yoke techniques. 3.4.2 Development of Poka- yoke techniques 3.5. Concept of SMED with industrial examples.	**24**	**30**
	Total	**64**	**80**

Teaching Methodology:

- Lecture method without media.
- Lecture method-using media.
- Demonstration using LCD projector.

- **Teaching Resources:** Overhead projector, LCD projector.
- **Implementation strategy:**
- In order to improve the teaching-learning process and understanding of advanced manufacturing systems subject, students may be taken to various industries where these systems are implemented and the case studies are presented before the students. Also the students should prepare ONE case studies on the various manufacturing systems studied and present them in front of all students.

Experiments:

1 Assignments on WCM
2 Assignments on Lean manufacturing system
3 Assignments on industrial examples of JIT
4 Assignments on Kan-Ban system
5 Assignments on TPM policy of any industry
6 Assignments on concept of TQM
7 Assignments on practical examples & implementations of 5S
8 Assignments on Poke yoke(Take practical examples)
9 Assignments on Cellular Mfg

REFERENCES:

Sr. No	Title of Book	Author and Publication
1	World Class Manufacturing	Richard j. Schonberger, The Free Press,1996.
2	Just- in Time Manufacturing	Korgaonkar M.G., Macmillan India ltd.,1992
3	Automation, Production Systems & Computer Integrated Manufacturing	Mikell P. Groover, Pearson Education, Inc., 2001
4	Lean Thinking.	James Womack And Danial Jones,Free Press Revised Edition 2003
5	Lean Production Simplified	PascalL Dennis, Productivity Press ,2007

5R506: ALTERNATIVE ENERGY SOURCES

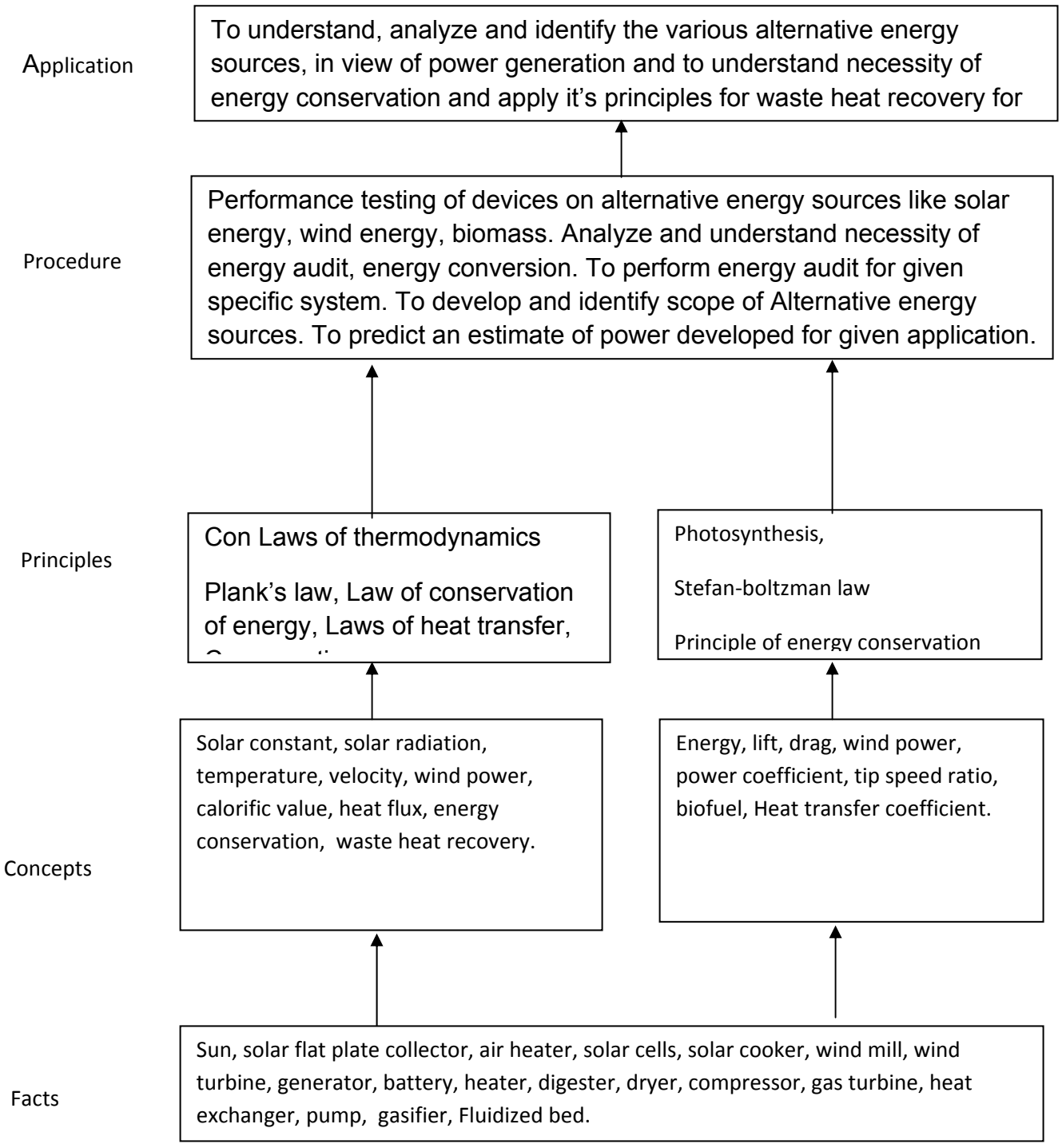
Course Structure:

Teaching Scheme		Evaluation Scheme						
TH	04		PT	TEE	TW	PR	OR	Total
PR	02	Max.Marks	20	80	25	--	25	150
TOTAL	06	Duration	1.00	3.00	--	--	--	--

RATIONALE:

In the power generation sector, alternative energy is the only answer to environmental concerns. Working with renewable and inexhaustible sources, alternative energy solutions are present in many energy plans around the world. Technicians in the near future will need to be familiar with a variety of alternative energy solutions, their implementation & installation. Solar and Wind energy plays an important role in alternative energy sources. Recently significant advances are made in utilization of solar energy in heating & electrical energy conversion applications. Solar operated devices are used in daily life of common people. Solar operated cars, bikes & vehicles are having great potential in future. Wind mills for power generation are also developed significantly. Hybrid units comprised of wind & solar energy are also developed. Energy from biomass & bio fuels is also having good potential. Engineers will have to work with alternate energy systems & equipments in future. Considering the growing potential of alternate energy sources, present course is introduced. This course will give introduction to alternate energy sources with their conversion, conservation & applications. Important topics like energy management & energy audit are also covered.

Concept Structure:



Objective:

Students should be able to:

1. Develop awareness for effective utilization of alternative energy sources.
2. Identify different components of solar energy and wind energy devices.
3. Identify and analyze biomass plant.
4. Identify and apply energy conservation techniques for commonly used power absorbing and generating devices.
5. Apply principles of energy conservation and energy management techniques.

COURSE CONTENT:

Topic No	Name of Topic	Hours	Marks
1	**Introduction to Energy Source** 1.1 Major sources of energy: Renewable and Non-renewable. 1.2 Primary and secondary energy sources. 1.3 Energy Scenario in India and world 1.4 Need and genesis of AES.	**8**	**7**
2	**Solar Energy** 2.1 Principle of conversion of solar energy into heat and electricity 2.2 Solar Radiation: Solar Radiations at earth's surface 2.3 Solar Radiation Geometry: Declination, hour angle, altitude angle, incident angle, zenith angle, solar azimuth angle 2.4 Applications of Solar energy • Construction and working of typical flat plate collector and solar concentrating collectors and their applications, • advantages and limitations • Space heating and cooling. • Photovoltaic electric conversion. • Solar distillation, Solar cooking and furnace. • Solar pumping and Green House. • Agriculture and Industrial process heat. (no derivations and numerical	**10**	**14**
3	**Wind Energy** 3.1 Basic Principle of wind energy conversion. 3.2 Power in wind, Available wind power formulation, Power coefficient, Maximum power 3.3 Main considerations in selecting a site for wind mills. 3.4 Advantages and limitations of wind energy conversion. 3.5 Classification of wind mills 3.6 Construction and working of horizontal and vertical	**10**	**12**

	axis wind mills, their comparison 3.7 Main applications of wind energy for power generation and pumping. (No mathematical treatment)		
4	**Energy from Biomass** 4.1 Common species recommended for biomass. 4.2 Methods for obtaining energy from biomass 4.3 Thermal classification of biomass a) Gasified, b) Fixed bed and fluidized 4.4 Application of gasifier 4.5 Bio-diesel production and application Agriculture waste as a biomass 4.6 Biomass digester Comparison of Biomass with conventional fuels	**10**	**12**
5	**Energy Conservation** 5.1 Energy conservation and Management:-Global and Indian energy market 5.2 Energy scenario in various sectors and Indian economy, Need and importance of energy conservation and management 5.3 Concept of Payback period, Return on investment (ROI), Life cycle cost. 5.4 Sankey diagrams, specific energy consumption	**6**	**10**
6	**Energy Conservation Techniques** 6.1 Distribution of energy consumption, Principles of energy conservation, 6.2 Energy audit , Types of audit , Methods of energy conservation, Cogeneration and its application , Combined cycle system. 6.3 Concept of energy management, Study of different energy management techniques like, Analysis of input 6.4 Reuse and recycling of waste - Energy education Conservative technique and energy audit	**10**	**12**
7	**Economic approach of Energy Conservation** 7.1 Costing of utilities like steam, compressed air, electricity and Water. 7.2 Ways of improving boiler efficiency, Thermal insulation, Critical thickness of insulation, Waste heat recovery systems, their applications, criteria for installing unit. 7.3 An introductory approach of energy conservation in compressed air, refrigeration, air conditioning, pumps and fans.	**10**	**13**
		64	**80**

Experiments:

1) To collect information about global and Indian energy market.

2) To collect commercial information on solar flat plate collector used for water heating.
3) To study construction and working of photo voltaic cell.
4) To study construction, working and maintenance of solar cooker.
5) Visit to plant of solar heating system for hotel/hostel/railway station etc.
6) To study construction and working of horizontal axis wind mill or to visit a nearest wind farm.
7) To visit a biomass/ biogas plant of municipal waste or else where.
8) Perform energy audit for workshop/Office/Home/SSI unit.
9) Study of various waste heat recovery devices.

Text Books:

Sr. No	Title of Book	Author and Publication
1	Non conventional energy Resources	Dr B.H.Khan Tata McGraw Hill
2	Non conventional energy sources	G. D. Rai Khanna publication
3	Solar energy	S. P. Sukhatme Tata McGraw Hill
4	Solar energy	H. P. Garg Tata McGraw Hill
5	Power plant engineering	Arrora Domkundwar Dhanpat Rai and co.
6	The energy sector	P.H. Henderson India- Oxford University Press
7	Industrial energy conservation	D. A. Ray Pergaman Press
8	Non-conventional energy source	K. M. Mittal
9	Energy resource management	Krupal Singh Jogi Krupal Singh Jogi

CASSETTES/CD/WEBSITES:

1. CDs developed by National Power Training Institute, (Under the ministry of Power, Government of India) Opposite VNIT, South Ambazari road, Nagpur
2. Website of Bureau of Energy and Efficiency.(www.bee-india.nic.in)
3. Website for Akshay Urja News Bulletin. (www.mnes.nic.in)

5M507: MARKETING MANAGEMENT

Teaching Scheme		Evaluation Scheme						
TH	04		PT	TEE	TW	PR	OR	Total
PR	02	Max.Marks	20	80	25	--	25	150
TOTAL	06	Duration	1.00	3.00	--	--	--	--

RATIONALE:

The Marketing Management is having its own importance in the management studies. In fact, it is the area of management which required due consideration as it decides the future of the business. Hence every students of diploma programme in engineering should study the marketing management if he wants know more about it.

OBJECTIVES:

At the end of the course, student should be able to –

- Understand functions of management.
- Understand the organization and its types.
- State concepts of markets.
- State functions of marketing management.
- State the importance, objectives and process of marketing research.
- Explain the importance of sales promotion in marketing.
- Understand emergence of global marketing and procedure of export.

COMPETENCY STATEMENT (S):

- To understand the principles and practices of marketing.

COURSE CONTENT:

Topic No	Name of Topic	Hours	Marks
1	**Management Concept** Various definitions of managements, difference between management, administration And organization, functions of management, scientific management, principles of scientific management.	**6**	**8**
2	**The organization** Definition and Scope of organization, Steps in organization, Necessity of organization, Types of organization structure like line, functional, line and staff organization, their advantages, limitations and applications.	**6**	**8**
3	**Market & Marketing Management:** The Market, types of market, kinds of goods, modern definition of marketing, marketing process, marketing, functions, concepts of marketing, benefits of marketing concept, selling vs. marketing concept, marketing management, responsibilities of marketing management, marketing mix, elements of marketing mix, marketing organization, system approach for marketing.	**12**	**12**

4	**Market Segmentation:** Market segmentation, benefits of market segmentation, segmentation success criteria, and bases for market segmentation, People oriented approach, product oriented approach.	**4**	**6**
5	**Marketing Information & Marketing Research:** Information system, information management, marketing information system, characteristics of information system, components of information system, marketing research, elements of marketing research, importance of Marketing research, Areas of Marketing research, Objectives of Marketing research, Marketing research process, Methods of data collection, Primary and Secondary data, Survey method, Uses of survey method, Types of survey, observation approach, panel research, experimental research, scope for marketing research in India.	**10**	**16**
6	**Sales Management:** Sales Marketing, functions of sales management, duties and responsibilities of sales manager, importance of sales organization, sales forecasting, uses of sales forecasting, methods of forecasting.	**4**	**8**
7	**Sales promotion & distribution:** What is a sale Promotion? Objectives of Promotion, Uses of promotion, limitations of promotion, kinds of promotion, joint promotion, definition of advertising, importance of advertisement in marketing, Media selection, channels of distribution, Role of channel of distribution, channel decision, Middle men in distribution, Wholesale Vs Retail trade.	**6**	**12**
8	**Global Marketing:** Emergence of global marketing, international marketing environment, Multinational companies, foreign trade, difficulties in foreign trade, procedure of export, export promotion measures in India.	**6**	**10**
	TOTAL	**64**	**80**

LIST OF EXPERIMENTS:

1 Case study of a a real market shop- visit, data collection & presentation
2 Expert lectures – 2 nos
3 Data collection of best practices followed by multinationals
4 Watching video films & writing report
5 Seminar on related topic
6 Developing attitude & aptitude through management games
7 Script writing for advertisement/ sales/ marketing
8 Marketing of Institute
9 Visit to exhibition for collection of data & Information regarding marketing strategies, broachers, pamphlets and writing a report.
10 Assignment on market segmentation
11 Assignment on recent trends in global marketing

REFERENCES:

Sr. No	Title of Book	Author and Publication
1	Modern Business Organization & Management	S.A. Sherlekar & V.A. Sherlekar., Himalaya Publications
2	Readings in Marketing Management	Bellur & Berkman
3	Marketing Research Theory & Practice	Bellur
4	Marketing Management	S.A. Sherlekar, Himalaya Publications
5	Marketing Management	Philip Kolter, Prentice Hall of India

5R508 – C PROGRAMMING

COURSE STRUCTURE:

Teaching Scheme		Evaluation Scheme						
TH	04		PT	TEE	TW	PR	OR	Total
PR	02	Max. Marks	20	80	25	--	25	150
TOTAL	06	Duration	01	03	--	--	--	--

RATIONALE:

In advanced age of computer, it becomes essential to understand how to give instructions to computers. This course intends to expose a student to the basic principles of programming through a structured programming language like 'C'. Study of this course would enable the students to learn any advanced Object Oriented Language.

COMPETENCY STATEMENTS:

1. To use and work in a programming environment.
2. To enhance logical thinking.
3. To develop 'C' programs for simple applications.
4. To interpret 'C' programs
5. To solve problems using 'C'.
6. Implementing 'C' functions.

COURSE CONTENTS:

Topic No.	Content	Hours	Marks
1	**Steps in program development** 1.1 Programming process, 1.2 Algorithm 1.3 Flowcharting & different symbols	**06**	**06**
2	**Study of 'C' as a programming language** 2.1 History of 'C' 2.2 Introduction to 'C' 2.3 Basic structure 'C' program, sample 'c' program 2.4 Execution of 'C' program	**03**	**08**
3	**Constant variables and data types** 3.1 Character set 3.2 Key words and identifiers 3.3 Constants 3.4 Data types 3.5 Variables and declaration of variables	**06**	**12**
4	**Operators and Expressions**	**07**	**10**

	1 Arithmetic, relational, logical operators 4.2 Assignment, increment and decrement operators 4.3 Conditional and special operators 4.4 Bit wise operators 4.5 Arithmetic expressions 4.6 Evaluation of expressions 4.7 Type conversion in expressions		
5	**Managing input and output operator** 5.1 Reading a character 5.2 Writing a character 5.3 Formatted input 5.4 Formatted output	**03**	**08**
6	**Decision making, branching and looping** 6.1 Decision making with IF statement 6.2 Simple IF statement, 6.3 IFELSE statement, 6.4 Nesting of IF ELSE statement 6.5 Else IF ladder 6.6 SWITCH statement 6.7 GOTO statement 6.8 WHILE statement 6.9 DO statement 6.10 FOR statement	**10**	**12**
7	**Functions** 7.1 User defined functions, 7.2 A multifunction program, 7.3 The form of 'C' function 7.4 Return value and their types 7.5 Calling a function 7.6 Category of functions 7.7 No arguments and no return value 7.8 Arguments with return value 7.9 Nesting of functions and recursion	**10**	**10**
8	**Arrays** 8.1 One, two, multidimensional arrays	**10**	**06**
9	**Strings** 9.1 Declaring and initializing strings 9.2 Reading string form a terminal 9.3 Writing strings to screen 9.4 Comparison of two strings 9.5 String handling functions 9.6 Table of strings	**09**	**08**
		64	**80**

TERM WORK:

1. Demonstration of Turbo C compiler, creating a program, compiling and linking, executing programs.
2. Programs based on declaring variables and assigning values to variables.
3. Preparing at least 5 Programs based on expressions and operators.

4. Programs using printf( ), scanf( ), getch( ). Putch( ).
5. Programs using control statements such as IF Statement, SWITCH statement, GOTO statement.
6. Programs using loop controls such as WHILE loop, DO WHILE lloop, FOR loop.
7. Programs using functions.
8. Programs using arrays.
9. Programs using string operations such as comparison, concatenation, copying counting, and append.

TEXT BOOK:

Sr.No	Title and Edition	Author	Publisher
1.	Let us 'C'	Yashwant Kanitkar	BPB publications
2.	Programming in 'C'	Balguruswamy	Tata Mc- Graw Hill
3	'C' for engineers	Prakash khanale, Madhuri Joshi	-

REFERENCE BOOK:

Sr.No	Title and Edition	Author	Publisher
1.	Introduction to 'C' programming	Denis Ritchie and Kerninghan	Prantice Hall Publications
2.	Introduction to 'C' programming	Byron Gotfried	Tata McGraw Hill

5M509: PRODUCTION PLANNING AND CONTROL

COURSE STRUCTURE:

Teaching scheme		**Evaluation Scheme**						
TH	04		PT	TEE	TW	PR	OR	TOTAL
PR	02	Max. Marks	20	80	25	--	25	150
TOTAL	06	Duration	1.00	3.00				

RATIONALE:-

In changing industrial scenario the importance of productivity is becoming more and more critical. A diploma engineer working at lower level management in industries, they play a vital role in above aspects. Developing a positive attitude in employees towards the productivity is crux of industrial engineer.

A supervisor can achieve highest level of productivity by using proper workplace layout, proper methods of processing. At the same time principles of motion economy reduces stress and fatigue in workers.

COMPETENCY STATEMENT:-

1. To Understand the functions of PPC
2. To Understand types of production
3. Application to apply plant layout principles
4. Application and use sales forecasting techniques.
5. To gain expertise in specialized aspects of production planning and control.

COURSE CONTENTS:

Topic No	Content	Hours	Marks
1	**INTRODUCTION** 1.1Definition, 1.2Importance, 1.3Objectives of PPC	**06**	**04**
2	**FUNCTIONS OF PPC** 2.1 Different functions of PPC such as Materials, Methods, Machines & Equipments, Routing, Estimating, Loading & Scheduling, Dispatching, Expediting, Evaluating, Inspection.	**06**	**08**
3	**MANUFACTURING SYSTEMS** 3.1 Types of production systems, 3.2 Job Production, 3.3 Batch production, 3.4 Continuous production, 3.5 Advantages, Disadvantages of each types, 3.6 Examples.	**06**	**08**
4	**PRODUCTION PROCEDURE** 4.1 Production cycle,	**06**	**06**

	4.2 Co-ordination of production decisions.		
5	**ORGANISATION** 5.1Organization Structure of PPC, 5.2Centralized and Decentralized PPC.	**06**	**06**
6	**PRODUCT DEVELOPMENT & DESIGN** 6.1 Effect of competition of design; 6.2 long range planning, 6.3 Product analysis, 6.4 Marketing Aspects, 6.5 Product characteristics, 6.6 Three S's.	**06**	**12**
7	**SALES FORECASTING & ESTIMATING** 7.1 Definition and Concept, Need of sales forecasting, 7.2 Basic elements of forecasting, 7.3 Sales fore casting techniques, 7.4 Simple numerical based on Moving average, Correlation analysis, Line regret ion methods, 7.5 Economic batch quantity concept and simple numerical	**10**	**14**
8	**PLANT LAYOUT** 8.1 Purpose of planned layout, 8.2 Effects of plant layout on production, 8.3 Flow systems, 8.4 Types of layouts, 8.5 Advantages and Disadvantages of each type.	**08**	**10**
9	**EVALUATION OF MATERIALS & PROCESSES** 9.1 Value analysis tests, 9.2 Efficient utilization & Selection of materials, 9.3 Selection of processes, 9.4 Design for production.	**06**	**06**
10	**OTHER CONTROL TECHNIQUES** 10.1 Line balancing, 10.2 Routing, 10.3 Scheduling, 10.4 Line of balance.	**04**	**06**
		64	**80**

PRACTICALS:

1. Visit to the industry to understand the various types of production.
2. Visit to the industry to understand types of layout.
3. Prepare a prototype model of the plant layout of industry visited.
4. Select any product and enlist product characteristics, marketing aspects.
5. Use of internet for sales forecasting techniques.
6. Assignment on recent trends in PPC(Today's industrial scenario)
7. Assignment on control techniques(Take practical examples)
8. Assignment on selection of material & effective utilization(Take examples from industries)

REFERENCE BOOKS:-

Sr. No	Title of Book	Author	Publication
1	Introduction to Work-study, fifth Edition	ILO,	Oxford publication
2	Elements of Production Planning and Control	Samuel Eilon	. Universal publishing Corporation ISBN 81-85027-09-9
3	Industrial Engineering and management, Revised and Enlarged Edition	O.P. Khanna,	Dhanpat Rai and Sons

MECHANICAL ENGINEERING

EQUIVALANCE SUBJECT FROM 3RD to 4th REVISION

Exiting Curriculum					New Curriculum					Diff. in credit	
Course code	Course name	Theory credits	Practical credits	Total Credits	Course code	Course name	Theory credits	Practical credits	Total Credits	Plus	Minus
GE151	Communication skill	2	2	4	4G301	English	3	2	5	1	
GE152	Basic Mathematics	4	0	4	4G101	Basic Mathematics(BMT)	4	0	4	0	
GE153	Engineering Mathematics	4	0	4	4G102	Engineering Mathematics (EMT)	4	0	4	0	
GE154	Basics Science	3	2	5	4G104	Engineering Chemistry	4	2	6	1	
GE155	Applied Science	3	2	5	4G103	Engineering Physics	4	2	6	1	
GE156	Workshop Practice	0	4	4	4G105	Work Shop Practice (WP)	0	3	3		1
GE157	Engineering Graphics	1	2	3	4G106	Engineering Graphics (EGR)	2	2	4	1	
GE158	Basics of computer systems	1	2	3	4G107	Basics of Computer System (BCS)	1	2	3	0	
ME251	Workshop Technology	2	4	6	4M208	Mechanical Technology	2	3	5		1
ME252	Electrical Engineering	2	2	4	4M301	Basics of electrical Engineering and Electronics	4	2	6		2
ME253	Basic Electronics	2	2	4							
ME254	Engineering Drawing	2	4	6	4M201	Engineering Drawing	2	4	6		0

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ME255	Engineering Mechanics	3	2	5	4M204	Applied Mechanics	4	2	6	1	
ME256	Theory of Machines	4	2	6	4M406	Theory of Machines	3	2	5		1
ME257	Thermal Engineering	3	2	5	4M205	Thermal Engineering	3	2	5	0	
ME258	Manufacturing Processes	2	4	6	4M202	Manufacturing Processes	2	4	6	0	
ME259	Strength Of Materials	3	2	5	4M412	Strength Of Materials	4	2	6	1	
ME260	Fluid Power	3	2	5	4M401	Fluid Power	3	2	5	0	
ME261	Machine Drawing	2	4	6	4 M402	Machine Drawing	2	4	6	0	
GE371	Material Management	3		3	4M415	Material Management	4	2	6	3	
GE372	Financial Management	3		3	4G305	Industrial Management	3	2	5	2	
GE373	Marketing Management	3		3	4G305	Industrial Management	3	2	5	2	
GE374	Production Management	3		3	4G305	Industrial Management	3	2	5	2	
GE375	Industrial Management	3		3	4G305	Industrial Management	3	2	5	2	
ME376	Mechanical Measurement	2	2	4	4M203	Measurement & Controls	3	2	5	1	
ME377	Computer Aided Drafting	1	4	5		No equivalent subject					
ME378	3-D Modeling	1	3	4	4M407	3-D Modeling	1	4	5	1	
ME379	Mechanical Engineering Materials	3	2	5	4M411	Mechanical Engineering Materials	3	2	5	0	
ME380	Industrial Visits	0	4	4	4M413	Implant Training	0	4	4	0	
ME451	Production Processes	3	4	7	4M202	Manufacturing Processes	2	4	6		1

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ME452	Entrepreneurship Development	3	3	6	4G303	No equivalent subject					
ME453	Heat Power Engineering	4	2	6	4M405	Heat Power Engineering	3	2	5		1
ME454	Tool Engineering	4	2	6	4M410	Tool Engineering	3	2	5		1
ME455	Design of Machine Elements	4	2	6	4M501	Design of Machine Elements.	4	2	6	0	
ME456	Seminar	0	3	3	4M404	Seminar	0	2	2		1
ME457	Project	0	4	4	4M403	Project	0	4	4	0	
ME458	Automobile Engineering	3	2	5	4M418	Automobile Engineering	4	2	6	1	
ME459	Mechanical Estimation and Costing	3	2	5		Any other subject					
ME460	Refrigeration and Airconditioning	3	2	5	4M416	Refrigeration and Air-conditioning	4	2	6	1	
ME461	Industrial Engineering	3	2	5	4M503	Production Engineering	3	2	5	0	
ME462	Power Plant Engineering	3	2	5	4M414	Power plant Engineering	4	2	6	1	
ME463	Mechatronics	3	2	5		No equivalent subject					
ME551	CNC Machines	2	4	6	4M408	Computer Integrated Machining	2	3	5		1
ME552	Advanced Manufacturing Processes	3	4	7	4M409	Advanced Manufacturing Processes	3	4	7	0	
ME553	Metrology and Quality Control	4	3	7	4M502	Metrology and Quality Control	3	4	7	0	
ME554	IC Engines	3	2	5	4M504	IC Engines	4	2	6	1	

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ME555	Advance Manufacturing Systems	3	0	3	4M505	Advance Manufacturing Systems	4	2	6	3	
ME556	Industrial Pollution and Control	3	0	3	4G304	No equivalent subject					
ME557	Alternate Energy Sources	3	0	3	4M506	Alternate Energy Sources	4	2	6	3	
ME558	Computational Techniques	3	0	3		No equivalent subject					
ME559	Industrial Psychology	3	0	3		No equivalent subject					
ME560	Industrial Laws	3	0	3		No equivalent subject					
NEW COURSES ADDED IN 4TH REVISION					4M206	Development of life skills	2	2	4		
					4M207	Professional Practices	0	3	3		
					4G302	Communication Skill	2	2	4		
					4G303	Entreprenurship Develpoment	2	2	4		
					4M417	Advance Mathematics	4	2	6		
					4M507	Marketing Management	4	2	6		
					4M508	C-Programming	4	2	6		
					4M509	Production Planning & Control	4	2	6		

CONCERN TEACHER DEPT.COORDINATOR HOD CDC INCHARGE

EQUIVALANCE SUBJECT FOR 4th to 5th REVISION

3rd revision		4th revision					5th revision					difference	
Course code	Course name	Course code	Course name	TH cr	PR cr	Total Cr	Course code	Course name	TH cr	PR cr	Total Cr	Plus	Minus
GE151	Communication skill	4G301	English	3	2	5	5G301	English	2	2	4		-1
GE152	Basic Mathematics	4G101	Basic Mathematics(BMT)	4	0	4	5G101	Basic Mathematics(BMT)	4	0	4		
GE153	Engineering Mathematics	4G102	Engineering Mathematics (EMT)	4	0	4	5G102	Engineering Mathematics (EMT)	4	0	4		
GE154	Basics Science	4G104	Engineering Chemistry	4	2	6	5G104	Engineering Chemistry	3	2	5		-1
GE155	Applied Science	4G103	Engineering Physics	4	2	6	5G103	Engineering Physics	3	2	5		-1
GE156	Workshop Practice	4G105	Work Shop Practice (WP)	0	3	3	5G105	Work Shop Practice (WP)	0	3	3		
GE157	Engineering Graphics	4G106	Engineering Graphics (EGR)	2	2	4	5G106	Engineering Graphics (EGR)	2	2	4		
GE158	Basics of computer systems	4G107	Basics of Computer System (BCS)	1	2	3	5G107	Basics of Computer System (BCS)	1	2	3		
ME251	Workshop Technology	4M208	Mechanical Technology	2	3	5	5R208	Mechanical Technology	2	3	5		
ME252	Electrical Engineering	4M301	Basics of electrical Engineering and Electronics	4	2	6	5R301	Basics of electrical Engineering and Electronics	4	2	6		
ME253	Basic Electronics												
ME254	Engineering Drawing	4M201	Engineering Drawing	2	4	6	5R201	Engineering Drawing	2	4	6		

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ME255	Engineering Mechanics	4M204	Applied Mechanics	4	2	6	5Q201	Applied Mechanics	4	2	6		
ME256	Theory of Machines	4M406	Theory of Machines	3	2	5	5R406	Theory of Machines	3	2	5		
ME257	Thermal Engineering	4M205	Thermal Engineering	3	2	5	5M205	Thermal Engineering	3	2	5		
ME258	Manufacturing Processes	4M202	Manufacturing Processes	2	4	6	5M202	Manufacturing Processes	2	4	6		
ME259	Strength Of Materials	4M412	Strength Of Materials	4	2	6	5Q202	Strength Of Materials	3	2	5		
ME260	Fluid Power	4M401	Fluid Power	3	2	5	5R401	Fluid Power	3	2	5		
ME261	Machine Drawing	4 M40 2	Machine Drawing	2	4	6	5R402	Machine Drawing	2	4	6		
GE371	Material Management	4M415	Material Management	4	2	6	5M415	Material Management	4	2	6		
GE372	Financial Management	4G305	Industrial Management	3	2	5	5G305	Industrial Management	3	2	5		
GE373	Marketing Management	4G305	Industrial Management	3	2	5	5G305	Industrial Management	3	2	5		
GE374	Production Management	4G305	Industrial Management	3	2	5	5G305	Industrial Management	3	2	5		
ME376	Mechanical Measurement	4M203	Measurement & Controls	3	2	5	5M203	Measurement & Controls	3	2	5		
ME378	3-D Modeling	4M407	3-D Modeling	1	4	5	5R407	3-D Modeling	1	2	3		
ME379	Mechanical Engineering Materials	4M411	Mechanical Engineering Materials	3	2	5	5R411	Mechanical Engineering Materials	3	2	5		
ME380	Industrial Visits	4M413	Implant Training	0	4	4	5R412	Industrial visit	0	2	2		-2

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ME451	Production Processes	4M202	Manufacturing Processes	2	4	6	5M202	Manufacturing Processes	2	4	6		
ME453	Heat Power Engineering	4M405	Heat Power Engineering	3	2	5	5M405	Heat Power Engineering	3	2	5		
ME454	Tool Engineering	4M410	Tool Engineering	3	2	5	5M410	Tool Engineering	3	2	5		
ME455	Design of Machine Elements	4M501	Design of Machine Elements.	4	2	6	5M501	Design of Machine Elements.	4	2	6		
ME456	Seminar	4M404	Seminar	0	2	2	5R404	Seminar	0	2	2		
ME457	Project	4M403	Project	0	4	4	5R403	Project	0	4	4		
ME458	Automobile Engineering	4M418	Automobile Engineering	4	2	6	5M418	Automobile Engineering	4	2	6		
ME460	Refrigeration and Airconditioning	4M416	Refrigeration and Air-conditioning	4	2	6	5M416	Refrigeration and Air-conditioning	4	2	6		
ME461	Industrial Engineering	4M503	Production Engineering	3	2	5	5M503	Production Engineering	3	2	5		
ME462	Power plant Engineering	4M414	Power plant Engineering	4	2	6	5M414	Power plant Engineering	4	2	6		
ME555	CNC Machines	4M408	Computer Integrated Machining	2	3	5	5M408	Computer Integrated Machining	1	2	3		-2
ME552	Advanced Manufacturing Processes	4M409	Advanced Manufacturing Processes	3	4	7	5M409	Advanced Manufacturing Processes	3	4	7		
ME553	Metrology and Quality Control	4M502	Metrology and Quality Control	3	4	7	5M502	Metrology and Quality Control	3	2	5		-2
ME554	IC Engines	4M504	IC Engines	4	2	6	5R504	IC Engines	4	2	6		
ME555	Advance Manufacturing Systems	4M505	Advance Manufacturing Systems	4	2	6	5M505	Advance Manufacturing Systems	4	2	6		

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ME557	Alternate Energy Sources	4M506	Alternate Energy Sources	4	2	6	5M506	Alternate Energy Sources	4	2	6		
NEWLY ADDED IN 4TH & 5TH REVISION		4M206	Development of life skills	2	2	4	5R206	Development of life skills	0	2	2		-2
		4M207	Professional Practices	0	3	3	5R207	Professional Practices	0	2	2		-1
		4G302	Communication Skill	2	2	4	5G302	Communication Skill	1	2	3		-1
		4G303	Entreprenurship Develpoment	2	2	4	5G303	Entreprenurship Develpoment	2	2	4		
		4M417	Advance Mathematics	4	2	6	5M417	Advance Mathematics	4	2	6		
		4M507	Marketing Management	4	2	6	5M507	Marketing Management	4	2	6		
		4M508	C-Programming	4	2	6	5M508	C-Programming	4	2	6		
		4M509	Production Planning & Control	4	2	6	5M509	Production Planning & Control	4	2	6		

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LIST OF NEW SUBJECTS INDUCTED IN REVISED CURRICULUM

- Engineering Physics and Chemistry (Common subjects separated).
- Measurement and controls.
- Development of Life skills
- Professional Practice.
- Basics of Electronics and Electrical Engineering.
- Environmental science
- Computer Integrated Machining
- Industrial Visit
- Advanced Mathematics
- Production Planning and Control
- Production Engineering.

LIST OF SUBJECTS DELETED IN REVISED CURRICULUM

- Computational Techniques
- Industrial Psychology
- Industrial Laws
- Industrial Pollution and Control
- Mechanical Estimation and Costing
- Mechatronics
- Computer Aided Drafting
- Financial Management
- Production Management
- Basic Electronics
- Electrical Engineering
- Basics Science
- Applied Science

LIST OF DEGREE SUBJECTS

S. N	Course Code	Course Name	Teaching Scheme				Examination Scheme					
			Th	Pr	Cr	Term	PT	Th	Pr	Tw	Or	Total
1	5R411	Mechanical Engineering Materials	3	2	5		20	80	0	25	25	150
2	5R403	Project	0	4	4		0	0	0	100	50	150
3	5R404	Seminar	0	2	2		0	0	0	50	50	100
4	5M410	Tool Engineering	3	2	5		20	80	0	25	25	150
5	5R407	3 D Modeling	1	2	3		0	0	0	50	50	100
6	5M409	Advance Manufacturing Processes	3	4	7		20	80	0	25	25	150
7	5M405	Heat power Engineering	3	2	5		20	80	0	25	25	150
8	5M501	Design of machine elements	4	2	6		20	80	0	25	25	150
9	5M502	Metrology and Quality Control	3	2	5		20	80	25	25	0	150
10	5M503	Production Engineering	3	2	5		20	80	0	25	25	150
11	5R504	IC Engines	4	2	6		20	80	0	25	25	150
12	5M505 to 5M509	Elective (Group B)	4	2	6		20	80	0	25	25	150
			31	28	59		900		800			1700

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