GUJARAT TECHNOLOGICAL UNIVERSITY

DIPLOMA IN MECHANICAL ENGINEERING

TEACHING SCHEME (w. e. f. Jan' 12)

SEMESTER- VI

SUB. CODE	SUBJECT	TEACHING SCHEME (HOURS)-FOR TEACHERS			TEACHING-LEARNING SCHEME FOR STUDENTS			CREDITS
		Theory	Tutorial	Practical	Theory	Tutorial	Practical	
2361901	Computer Aided Design And Computer Aided Manufacturing (CAD/CAM)	3	0	0	3	0	0	3
2361902	Computer Graphics And Computer Aided Manufacturing (CG/CAM)	0	0	4	0	0	4	4
2361903	Industrial Engineering	3	0	0	3	0	0	3
2361904	Industrial Engineering Practice	0	0	2	0	0	2	2
2361905	Industrial Management	3	0	0	3	0	0	3
2361906	Project-II	0	0	6	0	0	12	12
Group-1	Elective I -Theory	3	0	0	3	0	0	3
	Elective I - Practices	0	0	2	0	0	2	2
Group-2	Elective II-Theory	3	0	0	3	0	0	3
	Elective II - Practices	0	0	2	0	0	2	2
		15	**0**	**16**	**15**	**0**	**22**	**37**

LIST OF THE ELECTIVE SUBJECTS: SELECT **ANY ONE** FROM EACH GROUP.

Sr. No.	Sub. Code	**Any One From Group -1**
		Elective –I
1	**2361907**	Refrigeration And Air Conditioning
2	**2361909**	Advance Manufacturing System
3	**2361911**	Advance Machine Design
4	**2361913**	Production Management And Information Systems
5	**2361915**	Fabrication Technology
6	**2361929**	Automobile Engineering

Sr. No.	Sub. Code	**Any One From Group -1**
		Elective Practices –I
1	**2361908**	Refrigeration And Air Conditioning Practice
2	**2361910**	Advance Manufacturing System Practice
3	**2361912**	Advance Machine Design Practice
4	**2361914**	Production Management And Information Systems Practice
5	**2361916**	Fabrication Technology Practice
6	**2361930**	Automobile Engineering Practice

Sr. No.	Sub. Code	Any One From Group -2 Elective –II
1	2361919	Power Plant Engineering
2	2361921	Mechatronics
3	2361923	Advance Industrial Engineering
4	2361925	Operations Management
5	2361927	Foundary Technology
6	2361917	Hydraulic And Pneumatic Devices

Sr. No.	Sub. Code	Any One From Group -2 Elective Practices –II
1	2361920	Power Plant Engineering Practice
2	2361922	Mechatronics Practice
3	2361924	Advance Industrial Engineering Practice
4	2361926	Operations Management Practice
5	2361928	Foundary Technology Practice
6	2361918	Hydraulic And Pneumatic Devices Practice

GUJARAT TECHNOLOGICAL UNIVERSITY
DIPLOMA IN MECHANICAL ENGINEERING
SEMESTER- VI

Subject Name: **Computer Aided Design and Computer Aided Manufacturing (CAD/CAM)**
Subject Code: **2361901**

Sr. No.	Subject Content	Hrs.
1	**INTRODUCTION TO COMPUTER AIDED DRAFTING / DESIGN (CAD) AND COMPUTER AIDED MANUFACTURING (CAM).** 1.1 Know the objectives of learning this subject. 1.2 Need, Scope & importance of CAD/CAM in industries. 1.3 Need of attitude, knowledge & skill required for application of CAD/CAM. 1.4 History, concept and definitions of CAD and CAM. 1.5 Need, salient features, benefits and functional areas of CAD. 1.6 Design steps and reasons for implementing CAD system.	**2**
2	**HARDWARE AND SOFTWARE IN CAD SYSTEM.** 2.1 CAD workstation: Block diagram, concept, definition, classification and functions, configuration. 2.2 System requirements for modeling and analysis for AutoCAD, Pro/E, Solid edge, Inventor and other in current trend. 2.3 Graphics: Types and features of graphic terminals. 2.4 Input and output devices: types, configuration, applications and installation. 2.5 Familiarize with various cords and ports. 2.6 Graphic packages : Types, features, system requirements and applications ; GUI- concept ,meaning & features; Graphic standards such as GKS, PHIG, IGES. 2.7 2D and 3D geometric transformations. 2.8 Geometric modeling: Types, features, comparison and applications. 2.9 Animation concept, need and applications. 2.10 CAD/CAM interfacing-concept, standards, hardwares and protocols. **Note :** Geometric transformation example/s (application type) of 4-5 marks out of total 70.	**7**
3	**3D MODELING.** 3.1 Difference between 2D and 3D. 3.2 Axes nomenclature. 3.3 Surfaces-types and applications. 3.4 Solid modeling-methods and applications. 3.5 Feature based modeling-concept, meaning and applications. 3.6 Parametric modeling-concept, meaning and applications.	**13**

	3.7 Constraints- concept, meaning , common constraints and their utilities. 3.8 Dimensional relationships-concept, meaning and utility. 3.9 Model tree – concept, applications and benefits. 3.10 File types in various CAD softwares. 3.11 Features of various CAD softwares in context of 3D modeling,analysis, exchange of files ,etc. 3.11 3D surface and solid modeling- constructing, viewing, editing and modifying/redefining commands in various CAD softwares. . 3.12 Assembly modeling methods and commands in various CAD softwares (For 5 to 8 components only) . 3.13 Creating orthographic drawings in various CAD softwares. **Note :** 1. Various CAD softwares include AutoCAD + Pro/E or Solidedge. 2. 3D model making questions (application type) of 8-10 marks out of total 70.	
4	**COMPUTER AIDED MANUFACTURING.** 4.1 Computer Numerical Control (CNC): Introduction, types & classification, features, specifications, benefits and applications. 4.2 Salient constructional features of CNC machines differing from conventional machines (Such as ball screw, anti-friction slides, step/ servomotors, encoder, decoder, feedback system, etc.). 4.3 CNC tooling- types, working and applications. 4.4 Working of Automatic Tool Changer (ATC) and Automatic Pallet Changer (APC). 4.5 Types, standards and applications of qualified tools. 4.6 Work holding and loading devices.	**4**
5	**CNC PART PROGRAMMING.** 5.1 CNC axes, motion nomenclature and coordinate systems. 5.2 Various positions like machine zero, home position, work piece zero, programme zero . 5.3 Machine control systems-types and applications. 5.4 ISO G and M codes for turning and milling-meaning and applications of important codes. 5.5 Various compensations in CNC part programmes. 5.6 CNC part programming: Structure of part programme. 5.7 Simple part programming for turning using ISO format having straight turning, taper turning (linear interpolation) and convex/concave turning (circular interpolation). 5.8 Simple part programming for milling using ISO format including linear and circular interpolations. 5.9 Macros, fixed cycle, canned cycles, subroutines. 5.10 Interfacing softwares for auto part programming – concept, features and applications. **Note :** CNC part programme making questions (application type) of 12-14 marks out of total 70.	**11**

6	**RECENT TRENDS IN CAD/CAM.** 6.1 Adaptive control- Definition, meaning, block diagram, sources of variability, applications. 6.2 Direct Numerical Control (DNC)- Definition, meaning, block diagram and applications. 6.3 Flexible Manufacturing System (FMS)- concept , evaluation , main elements and their functions , layout and its importance , applications. 6.4 Robotics- definition of robot, classification and types of robot, elements of robot, applications. 6.5 Computer Integrated Manufacturing(CIM)- Concept, definition, areas covered, benefits.	**5**
	Total	**42**

Notes:

A. FOR STUDENTS.

a. It is advised that student download this copy of syllabus and plan to achieve the objectives of learning this subject.

B. FOR PAPER SETTER/MODERATOR.

a. Refer GTU syllabus and do not take reference of previous TEB question papers.
b. Ask the questions from each topic having marks weightage proportionate to hours allotted to that topic.
c. Optional questions must be asked from the same topic. That is weightage of compulsory attendance part of questions will be equal to proportionate to hours allotted to each topic.
d. Marks ratio of knowledge: comprehension: application types questions must be 30:30:40 respectively.
e. Submit solution / answer keys along with distribution of marks in each question for the paper being submitted.

Reference Books:

1. Automation, production system and computer integrated manufacturing — Nikell Groover, PHI Publi.
2. Mastering in Auto cad — George Ommura, (BPB publication)
3. CNC machines — Pabla & M. Adithan.
4. CAD/CAM/CIM — P. Radhakrishnan & S.Subramanayan (New Age International)
5. Computer Aided Manufacturing — Rao, Tiwari and Kundra, TMGH publi.
6. Mechatronics — HMT (Published by TMGH)
7. Computer aided design and manufacturing — Dr.Sadhusingh (KP)

Additional Reference:

1. Computer integrated design & Manufacturing	Bedwoth, Wolfe and Anderson, MGH(1) public
2. Numerical control and computer aided manufacturing	T.K.Kundra & P.A. Rao (TMH Publication)
3. Computer Integrated Manufacturing	S.K.Vajpayee , (PHI Publication)
4. Technology of computer aided design and Manufacturing	S. Kumar and A. K. Jha (Dhanpatrai & Sons)
5. Computer Numerical Control	Hans B. Keif, T. Fredric Waters Glencoe M. Publi

GUJARAT TECHNOLOGICAL UNIVERSITY

DIPLOMA IN MECHANICAL ENGINEERING

SEMESTER- VI

Subject Name: Computer Graphics and Computer Aided Manufacturing (CG/CAM)

Subject Code: 2361902

NOTE: - Following are the minimum experiences required, but the college can do more experiences if possible.

LABORATORY EXPERIENCES :			
Experience Type	**Experience Number**	**Description of Laboratory Experience**	**Hrs.**
Preparatory	1	1. Appreciate main objectives of learning this subject: a. Develop the ability to model given assembly using AutoCAD, Pro/E, Solidedge and other similar softwares. b. Develop the ability to prepare CNC programmes for given jobs. 2. Recall and strengthen know-how for engineering drawing fundamentals, constructional features of conventional machine tools and various machining processes.	2
Demonstration and study	2	Study advance constructional features of CNC turning and machining centers.	2
	3	Interfacing of CAD and CAM.	2
CAD performance (Practice in both AutoCAD and Pro/E or Solidedge. Write steps of modeling including stepwise sketch, position of UCS/selection of references, name and options of commands, dimensional values, etc.)	4	Surface modeling of given simple models (2 models. Select such simple components which will cover commonly used surfaces).Take printouts.	6
	5	Solid modeling of given models (5-8 components of one simple assembly. Select such assembly which will cover all commonly used commands/features of software). Take printouts.	12
	6	Assembly of components modeled at experience number 5. Also set orthographic views of components and assembly. Take printouts.	6

CAM performance (Write dimensional mode, zero position, tool selection, cutting parameters selection, G/M code programme and other machine setup).	7	Preparation and execution of simple part programme for turning. (3 jobs- 1 with simple straight and taper turning , 1 including circular interpolation and 1 job which includes threading and subroutine/canned cycle/macro.	10
	8	Preparation and execution of simple part programme for milling. (3 jobs- 1 with simple straight contour , 1 including circular interpolation and 1 job which includes drilling/tapping and subroutine/canned cycle/macro.	8
	9	Simulation-Do and observe the simulation of one each job of turning and milling…	2
Download and Seminar Presentation, (Copy downloaded content and seminar of whole batch In one /one set of CD/DVD)	10	a) Prepare and present seminar individually in your batch. (Seminar topic has to be given by teacher). b) Download individually visual aids, movies, content and other related content for the given case/situation. (Case/situation has to be given by teacher-preferably from emerging/ recent trends).Present and discuss the same in your batch.	4
Industrial / Exhibition visits	11	Visit at least two related industries. Also visit any related exhibition/s.	-
Live Learning and Shop Talk.	12	Each student will discuss with group/batch and write : a) His/Her own experience in performing subject practicals. b) He/She has faced technical problems during performance of experiences and solutions found. c) Extent to which he/she has achieved the main objective and skill level of subject learning mentioned at experience number 1.	2
Assignments (Home Assignment)	13	Solve the given assignments. One assignment must be on preparation of chart / diagram / poster / graph / drawing / etc on half imperial size of drawing sheet.(For subject CAD/CAM).	-
		Total	**56**

Notes:

A. FOR STUDENTS.

a. It is advised that student download this copy of syllabus and plan to achieve the objectives of learning this subject.
b. Attach copy of syllabus as part of term work.

B. FOR STUDENTS AND SUBJECT TEACHER/S.

a. Term work report content of each experience should also include following.
   i. Experience description / data and objectives.
   ii. Skill/s which is / are expected to be developed in student after completion of experience.
   iii. Steps / procedure to execute experience.
b. Term work report of student of regular mode should exclude Distance Learning manual, photocopies, printed content (except visual aids), etc. Focus should be on developing the term work as original efforts of students.
c. Term work content of industrial visit report should also include following.
   i. Brief details of industry visited.
   ii. Type, location, products, rough layout, human resource, etc of industry.
   iii. Details, description and broad specifications of machineries/ processes observed.
   iv. Safety norms and precautions observed.
   v. Student's own observation on Industrial environment, productivity concepts, quality consciousness and quality standards, cost effectiveness ,culture and attitude.
   vi. Any other details / observations asked by accompanying faculty.
d. Term work should also include experience logbook duly certified by subject teachers.
e. Term work is to be defended (along with term work) with practical examination by external and internal examiners .Practical examination will include followings:
   i. Viva
   ii. Writing the modeling steps of any one given 3D object and preparing the same in CAD software.
   iii. Writing the CNC programme of given component and performing operation/simulation of the same programme on machine.

Reference Books:

1. Automation, production system and computer integrated manufacturing	Nikell Groover, PHI Publi.
2. Mastering in Auto cad	George Ommura, (BPB publication)
3. CNC machines	Pabla & M. Adithan.
4. CAD/CAM/CIM	P. Radhakrishnan & S.Subramanayan (New Age International)
5. Computer Aided Manufacturing	Rao, Tiwari and Kundra, TMGH publi.
6. Mechatronics	HMT (Published by TMGH)
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Additional Reference:

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5. Computer Numerical Control	Hans B. Keif, T. Fredric Waters Glencoe M. Publi

GUJARAT TECHNOLOGICAL UNIVERSITY
DIPLOMA IN MECHANICAL ENGINEERING
SEMESTER- VI

Subject Name: **Industrial Engineering**
Subject Code: **2361903**

Sr. No.	Subject Content	Hrs.
1	**INTROUCTION TO INDUSTRIAL ENGINEERING.** 1.1 Know the objectives of learning this subject. 1.2 Need, Scope & importance of Industrial Engineering in industries. 1.3 Need of attitude, knowledge & skill required for application of Industrial engineering. 1.4 Productivity – Concept, importance and ways to enhance it. 1.5 Work study-Definition and techniques. 1.6 Importance of human factors in application of work study techniques. 1.7 Role of work study in productivity improvement.	**2**
2	**TECHNIQUE OF WORK STUDY.** 2.1 Objectives of method study. 2.2 Steps in method study. 2.3 Methods of recording data for method study job with the help of standard symbols, charts and forms. 2.4 Use of questioning technique in analyzing data for method study job. 2.5 Develop and improve the method, based on analysis of problem. 2.6 Motion economy and its importance. 2.7 Design of efficient work place layout using motion economy. 2.8 Chart used for analyzing work place layout. 2.9 Role and scope of micro motion study techniques. 2.10 Presentation of work elements into therbligs. 2.11 Preparation and use of SIMO chart. 2.12 Use of film in micro motion study. 2.13 Plant layout : - Definition, types, applications, advantages and limitations. 2.14 Material handling equipments-Classification and uses. 2.15 Effect of method study on plant layout and material handling. 2.16 Work measurement- - Concept - Need for time study equipment and forms. - Situation which requires time study. - Process of time study. - Concept and applications of rating. - Time study allowances. - Determination of standard time for a given job. - Concept of work sampling.	**12**

	- Other work measurement methods. **Note** : Question/s on preparing chart/s from given data (application type) of 5-7 marks out of total 70, question/s on determining standard time from given data (application type) of 5-7 marks out of total 70.	
3	**JOB EVALUATION, ENRICHMENT, WAGES AND INCENTIVES.** 3.1 Concept of job analysis, job specification, job description, job evaluation and job enrichment. 3.2 Different methods of job evaluation. 3.3 Wages : Principle and types. 3.4 Incentives : Definition, purpose, types , applications and role of incentives in wage plans. **Note** : Question/s (application type) of 4-6 marks out of total 70.	**3**
4	**INTRODUCTION TO QUALITY ASSURANCE (Q.A).** 4.1 Definition of quality, quality control(QC),quality assurance(QA), statistical quality control (SQC) and reliability. 4.2 Historical development of QA and its stages. 4.3 QA tools. 4.4 Concept of probability and normal distribution. 4.5 Concept of variability, SQC tools and statistical fundamentals. **Note** : Problem question/s based on normal distribution (application type) of 4-6 marks out of total 70.	**4**
5	**CONTROLS CHARTS FOR VARIABLES AND ATTRIBUTES.** 5.1 Statistical basis for control charts- Variables and attributes. 5.2 Control charts for variables-X bar-R chart bar-σ(sigma) chart. 5.3 Control charts for attributes-Different types of P-charts-chart. 5.4 Concept and applications of process capability. **Note** : Preparing control chart/s from given data (application type) of 5-7 marks out of total 70.	**6**
6	**STATISTICAL TOLERENCING.** 6.1 Definition and principle of statistical tolerencing. 6.2 Situation which leads to statistical tolerencing. 6.3 Calculation of overall tolerance from given data of components.	**2**

7	**ACCEPTANCE SAMPLING.** 7.1 Quality control of in coming raw material and components. 7.2 Concepts of random sampling. 7.3 Sampling plans : definition, types(Single, double and multiple) 7.4 QC curve.	**2**
8	**RELIABILITY.** 8.1 Concept, definition, difference between reliability and quality control. 8.2 Factors affecting and improving reliability.	**2**
9	**ERGONOMICS.** 9.1 Introduction. 9.2 Psycho-physiological data. 9.3 Enthrocometry. 9.4 Normal and Maximum work area. 9.5 Location of control Knobs, visual displays. 9.6 Fatigue in industry, environmental requirements, effect of Illumination, noise, temperature, humidity.	**2**
10	**EMERGING TRENDS IN INDUSTRIAL ENGINEERING.** 10.1 ISO 9000-Concept, series, features, importance and applications. 10.2 Six sigma-Concept, importance, calculation and applications. 10.3 Total Quality Control (TQC)and Total Quality Management (TQM) –Concept, features, importance and applications. 10.4 KAIZEN-History, concept, applications and advantages. 10.5 Reengineering-Concept, need, advantages and limitations.	**7**
	Total	**42**

Notes:

A. FOR STUDENTS.

a. It is advised that student download this copy of syllabus and plan to achieve the objectives of learning this subject.

B. FOR PAPER SETTER/MODERATOR.

a. Refer GTU syllabus and do not take reference of previous TEB question papers.
b. Ask the questions from each topic having marks weightage proportionate to hours allotted to each topic.
c. Optional questions must be asked from the same topic. That is weightage of compulsory attendance part of questions from each topic will be equal to marks proportionate to hours allotted to each topic.
d. Marks ratio of knowledge: comprehension: application types questions must be 30:30:40 respectively.
e. Submit solution / answer keys along with distribution of marks in each question for the paper being submitted.

Reference Books:

1.	Industrial Engineering and Industrial Management	Pulela
2.	Learning Package in Industrial Engineering	TTTI, Bhopal
3.	Handbook of Industrial Engineering	Gavriel & Salvendy
4.	Work Study	I.L.O.
5.	Industrial Engineering	R.C.Patel
6.	Industrial Engineering	Dalale-Mansurali

Additional Reference Books:

1.	Inspection and Quality Control	N.P.C.
2.	An Introduction to Productivity	N.P.C.
3.	Method Study	N.P.C.
4.	Work Measurement	N.P.C.
5.	Plant Layout and Material Handling	N.P.C.
6.	A Laboratory Manual in Industrial Engineering	TTTI, Bhopal
	Work Study	Curry
7.	Work Study and related Management service	Dennis A.White
		move
8.	Principles of Work study	J .Walker Morris
9.	Motion and Time Study	Mandel
10.	Motion and Time Study	R.M.Barnes

GUJARAT TECHNOLOGICAL UNIVERSITY
DIPLOMA IN MECHANICAL ENGINEERING
SEMESTER- VI

Subject Name: **Industrial Engineering Practice**
Subject Code: **2361904**

NOTE: - Following are the minimum experiences required, but the College can do more experiences if possible.

LABORATORY EXPERIENCES :			
Experience Type	**Experience Number**	**Description of Laboratory Experience**	**Hrs.**
Preparatory	1	3. Appreciate main objective of learning this subject: Develop action based thinking which leads to reduce cost & waste and enhance quality & productivity of existing / new methods/ processes. 4. Recall and strengthen know-how for orthographic projections and various machining processes.	2
Performance	2	Prepare operation process chart (OPC) for given assembly(Take physical assembly of 4 to 5 components. Students will prepare drawings as home assignment).	2
	3	Prepare flow process chart and flow diagram for given assembly for OPC.	2
	4	Prepare man and machine chart for given situation.	2
	5	Calculate co-efficient of co-relation for time study person using performance rating technique.	2
	6	Calculate standard time for a given job using decimal minute stop watch techniques.	2
	7	Select the data source and prepare a frequency distribution curve.	2
	8	Construct X bar -R chart for given process.	2
	9	Construct P-chart for given process.	2
	10	Construct C-chart for given product.	2
	11	Decide about acceptance or rejection of a given lot of particular product using single sampling or double sampling plan.	2
Download and Seminar Presentation, (Copy downloaded content and seminar of	12	a) Prepare and present seminar individually in your batch. (Seminar topic has to be given by teacher). b) Download-internet/collect from reference books individually visual aids, movies, content and other related content for the given case/situation. (Case/situation has to be given by teacher-preferably from emerging/ recent trends).Present and discuss the same in your batch.	4

whole batch In one /one set of CD/DVD)			
Industrial Visit	13	Visit at least two related industries.	-
Live Learning and Shop Talk.	14	Each student will discuss with group/batch and write : a) His/Her own experience in performing subject practicals. b) He/She has faced technical problems during performance of experiences and solutions found. c) Extent to which he/she has achieved the main objective and skill level of subject learning mentioned at experience number 1.	2
		Total	**28**

Notes:

A. FOR STUDENTS.

a. It is advised that student download this copy of syllabus and plan to achieve the objectives of learning this subject.
b. Attach copy of syllabus as part of term work.

B. FOR STUDENTS AND SUBJECT TEACHER/S.

a. Term work report content of each experience should also include following.
    i. Experience description / data and objectives.
    ii. Skill/s which is / are expected to be developed in student after completion of experience.
    iii. Steps / procedure to execute experience.
b. Term work report of student of regular mode should exclude Distance Learning manual, photocopies, printed content (except visual aids), etc. Focus should be on developing the term work as original efforts of students.
c. Term work content of industrial visit report should also include following.
    i. Brief details of industry visited.
    ii. Type, location, products, rough layout, human resource, etc of industry.
    iii. Details, description and broad specifications of machineries/ processes observed.
    iv. Safety norms and precautions observed.
    v. Student's own observation on Industrial environment, productivity concepts, quality consciousness and quality standards, cost effectiveness ,culture and attitude.
    vi. Any other details / observations asked by accompanying faculty.
d. Term work should also include experience logbook duly certified by subject teachers.
e. Term work is to be defended (along with term work) with practical examination by external and internal examiners .Practical examination will include followings:
    i. Viva

ii. Explanation of procedure of any one performance type experience.
iii. Performance of any one experience from experience number 2-11 except experience covered in ii above.

Reference Books:

1.	Industrial Engineering and Industrial Management	Pulela
2.	Learning Package in Industrial Engineering	TTTI, Bhopal
3.	Handbook of Industrial Engineering	Gavriel & Salvendy
4.	Work Study	I.L.O.
5.	Industrial Engineering	R.C.Patel
6.	Industrial Engineering	Dalale-Mansurali

Additional Reference Books:

1.	Inspection and Quality Control	N.P.C.
2.	An Introduction to Productivity	N.P.C.
3.	Method Study	N.P.C.
4.	Work Measurement	N.P.C.
5.	Plant Layout and Material Handling	N.P.C.
6.	A Laboratory Manual in Industrial Engineering	TTTI, Bhopal
	Work Study	Curry
7.	Work Study and related Management service	Dennis A.White
		move
8.	Principles of Work study	J .Walker Morris
9.	Motion and Time Study	Mandel
10.	Motion and Time Study	R.M.Barnes

GUJARAT TECHNOLOGICAL UNIVERSITY
DIPLOMA IN MECHANICAL ENGINEERING
SEMESTER- VI

Subject Name: **Industrial Management**
Subject Code: **2361905**

Sr. No.	Subject Content	Hrs.
1	**INTRODUCTION TO INDUSTRIAL MANAGEMENT.** 1.1 Know the objectives of learning this subject. 1.2 Need, Scope & importance of Industrial Management in Industries. 1.3 Need of attitude, knowledge & skill required for application of Industrial Management. 1.4 System- concept , definition, types, parameters , variables and behavior. 1.5 Management – definition and functions. 1.6 Features and need of various laws , regulations and acts such as factory act , minimum wages act , etc.	4
2	**ORGANISATION STRUCTURE AND ORGANISATIONAL DYNAMICS.** 2.1 Organization structure-definition, goals, factors considered in formulating structure. 2.2 Concept, meaning and importance of division of labor, scalar & functional processes, span of control, delegation of authority, centralization and decentralization in industrial management. 2.3 Types, advantages, disadvantages and applications of organization structure. 2.4 Organizational culture and climate –meaning , differences and factors affecting them. 2.5 Moral-factors affecting moral. 2.6 Relationship between moral and productivity. 2.7 Effect of high and low moral. 2.8 Job satisfaction- factors influencing job satisfaction. 2.9 Case study and analysis of any two related situations.	8
3	**MATERIALS MANAGEMENT.** 3.1 Material management-definition, functions, importance, relationship with other departments. 3.2 Purchase - objectives, purchasing systems, purchase procedure, terms and forms used in purchase department. 3.3 Storekeeping- functions , classification of stores as centralised and decentralized with their advantages, disadvantages and application in actual practice. 3.4 Functions of store keeper, types of records maintained by store, various types and applications of storage equipments, need and general methods for codification of stores.	12

	3.5 Definition of inventory control, objectives of inventory control, derivation for expression for Economic Order Quantity (EOQ), ABC analysis, other modern methods of analysis, various types of inventory models such as Willson's inventory model, replenishment model and two bin model. 3.6 Material Requirement Planning(MRP)-concept ,applications and brief details about software packages available in market. 3.7 Waste control- need and ways to reduce material wastage, recycle/reuse, 3.8 Case study and analysis-study and analyze any two related cases. **Note** : Examples (2 to 3) from 3.5 above(application type) of 8-10 marks out of total 70.	
4	**PRODUCTION, PLANNING AND CONTROL (PPC):** 4.1 PPC-meaning, phases, importance and objectives. 4.2 Explain in detail the functions of PPC along with necessary forms used in it, softwares available in market and their features. 4.3 Types of productions, calculation of Economic Batch Quantity (EBQ), critical ratio scheduling and Gantt charts. 4.4 Given the data, schedule the production using Gantt chart. **Note** : Example from 4.3 above(application type) of 4-6 marks out of total 70.	6
5	**CRITICAL PATH METHO AND PRE EVALUATION REVIEW TECHNIQUE (CPM/PERT).** 5.1 CPM & PERT-meaning, features, difference, applications. 5.2 Understand different terms used in network diagram. 5.3 Draw network diagram for a real life project containing 10-15 activities, computation of LPO and EPO. 5.4 Determination of critical path on network. 5.5 Floats, its types and determination of floats. 5.6 Crashing of network, updating and its applications. **Note** : Examples (1 to 2-application types) of 8-10 marks out of total 70.	8
6	**VALUE ANALYSIS (VA) :** 6.1 VA-definition, terms used, process, importance and methods. 6.2 VA flow diagram. 6.3 Case study and analysis of any three related cases which can be studied/analyzed under VA application. **Note** : Question/s (application type) of 4-6 marks out of total 70.	4
	Total	**42**

Notes:

A. FOR STUDENTS.

a. It is advised that student download this copy of syllabus and plan to achieve the objectives of learning this subject.

B. FOR PAPER SETTER/MODERATOR.

a. Refer GTU syllabus and do not take reference of previous TEB question papers.
b. Ask the questions from each topic having marks weightage proportionate to hours allotted to that topic.
c. Optional questions must be asked from the same topic. That is weightage of compulsory attendance part of questions will be equal to proportionate to hours allotted to each topic.
d. Marks ratio of knowledge: comprehension: application types questions must be 30:30:40 respectively.
e. Submit solution / answer keys along with distribution of marks in each question for the paper being submitted.

Reference Books:

1. Learning Package on Industrial Management — TTTI, Bhopal
2. What every supervisor should know — Lester R.
3. CPM & PERT principles and Applications — L.S.Srinath
4. Modern Production Management — Buffa
5. Materials Management — N. Nair
6. Industrial Engineering & Management — O. P. Khanna

Additional Reference Books:

1. System Analysis — O.Optner
2. Value Analysis — Mikes

GUJARAT TECHNOLOGICAL UNIVERSITY
DIPLOMA IN MECHANICAL ENGINEERING
SEMESTER- VI

Subject Name: **Project -II**
Subject Code: **2361906**

NOTE: Either OPTION-A or OPTION-B is to be undertaken. (ANY ONE).

OPTION- A.

INDUSTRY BASED-IDP SOLUTION

Student will continue to work on the same IDP/UDP of V semester. It is to be noted that solution **should not be:**

i. On paper.
ii. In form of only suggestions.
iii. In form of theoretical approach only.
iv. Repetitive.

To undertake this option, following conditions should be satisfied.

1. It will be absolutely necessary to have feasible and implementable approach.
2. Industry certificate permitting implementation of IDP.
3. IDP outcome must be physical and must be at related industry place.
4. IDP outcome must be measurable and acceptable to grant the term for this subject.

EX. NO.	EXPERIENCE TYPE	EXPERIENCE TITLE	HOURS	
			TEACHER+ (OUT OF TOTAL)	STUDENT ++ (TOTAL)
1	PREPARATORY	Appreciate the main objectives of learning this subject. 1. Familiarize with various problem solution techniques. 2. Integrate the knowledge and skill for executing the project. 3. Identify and solve various problems in project execution. 4. Develop the ability to: a. Plan , monitor and control any given set of tasks with cost-quality & productivity Consciousness. b. Utilize the available resources in efficient and effective manner.	02	02

		c. Lead and communicate the team effectively. 5. Recall and strengthen know-how for engineering drawing fundamentals, various machining processes and primary managerial skills. 6. Explore your innovative and creative ability.		
2	STUDY	Study and prepare content for the technological knowledge and approach required to solve the IDP at industry place.	09	09
3	IDP/UDP SOLUTION	Solution of IDP/UDP at industry place. The report for this experience should include following. a) V semester's project term work. b) Literature survey. c) Details of Various solution approaches thought and executed. d) Details of solution achieved. (Consider requirement of project report.) e) Problems encountered during execution of IDP/UDP solution and solution adopted. f) Day to day logbook.(Suggested as per Annexure-I.) g) Photographs/clips of "work in progress".	62	144
4	PRESENTATION	Prepare and deliver power point presentation for the solution in presence of batch. Also discuss important events and outcome.	05	05
5	PROJECT REPORT	Documentation of final project report which includes following. a) Title page-(Suggested as per Annexure-II.) b) Certificate –As per Annexure-III. c) Certificate from industry (Permission and completion). d) Index. e) Preface. f) Objectives, syllabus. g) IDP/UDP-title. h) Content for the technological knowledge required to solve the IDP/UDP at industry place. i) Details of Various solution approaches thought and executed. j) Details of solution achieved. k) Description/specifications/parameter	06	08

		of processes/etc. of resources (specifically materials, methods and machines) used for solution. l) Photographs/clips of "work in progress". m) Problems encountered during execution of IDP/UDP solution and solution adopted. n) Presentation. o) Day to day logbook. p) Expected benefits. q) Project report of semester V- separately.		

+	Equivalent periods for teachers. This is not necessary to arrange the periods on weekly basis. The periods are to be arranged on the basis of need and convenience. Total hours are 84 which includes required content teaching, guidance and counseling at industry-institute, guidance and counseling through telephone/email/net, follow-up at industry, industry visits, coordination with industry, follow-up for project progress, taking presentations, guidance and counseling for project preparation, etc..
++	Equivalent periods for students. This also includes working on project work individually or in group, as per guidance received. This also includes self preparation of project work.

OPTION- B.

INSTITUTE-IN HOUSE WORKSHOP BASED UDP SOLUTION.

Student will carry out the project work at in-house workshop & taking the support of industry. It is preferable that Project-II be in line with IDP/UDP selected in V semester.

It is to be noted that **UDP must be:**

i. Innovative in nature.
ii. Feasible and implementable.
iii. Working in nature when solved/manufactured.

EX. NO.	EXPERIENCE TYPE	EXPERIENCE TITLE	HOURS	
			TEACHER+ (OUT OF TOTAL)	STUDENT ++ (TOTAL)
1	PREPARATORY	Appreciate the main objectives of learning this subject. 1. Familiarize with various problem solution techniques. 2. Integrate the knowledge and skill for executing the project. 3. Identify and solve various problems in project execution. 4. Develop the ability to: a. Plan , monitor and control any given set of tasks with cost-quality & productivity consciousness. b. Utilize the available resources in efficient and effective manner. c. Lead and communicate the team effectively. 5. Recall and strengthen know-how for engineering drawing fundamentals, various machining processes and primary managerial skills. 6. Explore your innovative and creative ability.	02	02
2	SELECTION / REFINING OF PROJECT / UDP	1. Literature survey. Use internet search, print mediums, expert field consultation, visits to industry/ exhibition, etc. for project/UDP selection/refining. 2. Selection of project / UDP. The project/UDP should be: a. Innovative in nature. b. Feasible using the infrastructure of the Institute. c. To give practice for drawing/ drafting. d. Incorporating major manufacturing processes. e. Non repetitive in nature. f. Able to develop the generic as well as technology related skills. g. Having measurable and analytical end results. h. Working in nature. 3. The Project-II should not be: a. Readymade. b. Assembly of readymade parts. c. Cleaning/oiling type maintenance.	05	15

		NOTE: Project / UDP, selected individually or in group and approved by batch faculty, has to be undertaken for execution. Preparation of report includes following. i) Literature survey (Internet, print, visits, etc). ii) Details of various feasible projects/UDPs considered. iii) Selection criteria. iv) Assembly Drawing/Sketch of project/UDP finalized. v) Parts/material lists.		
3	STUDY	MS Project-features, approaches to prepare master schedule, analysis.(study , Learning).	02	04
4	PLANNING	List activities and prepare master schedule using MS Project. Take the print and attach with Project report. (Suggested list of activities is attached herewith in Annexure - IV).	02	04
		Prepare work allocation matrix along with provision of follow-up remarks and notes.(Suggested format of work allocation matrix with provision of follow-up is attached herewith in Annexure -V).	02	02
5	PROJECT PREPARATION	Execute project preparation activities as per work allocation matrix. Maintain logbook regularly covering requirements of project report preparation.	60	128
6	PRESENTATION OF PROJECT	Prepare and deliver power point presentation for the project/UDP in presence of batch. Also discuss important events and outcome.	05	05
7	PREPARATION OF PROJECT REPORT.	Documentation of final project report which includes following in sequence. a) Title page-(Suggested as per Annexure-II.) b) Certificate –As per Annexure-III. c) Index. d) Preface/Acknowledgement. e) Objectives, syllabus. f) Project / UDP-title. g) Selection, description and working of project-Literature surveyed. h) Concepts and understanding of MS project, CPM and PERT. i) List of activities and work allocation matrix along with follow-up along with project schedule made in MS-Project. j) Assembly and detail production drawings. k) Workshop layout with dimensions. l) List and specifications of materials, machineries, equipments and tools used for project execution. m) Bill of material with make or buy decision. n) Specifications of bought out parts. o) Process sheets.	06	08

		p) Flow process charts. q) Specification and consumption of consumables. r) Details of inspection / testing carried out. s) Details of rework / rectifications carried out. t) Cost estimation. u) Monitoring and control report/sheet. v) Notes on troubleshooting. w) Notes on individual achievement of skills / experience /problems / solutions. x) References. y) Day to day logbook.(Suggested as per Annexure-I.) z) Moments at work-photographs in action. Photographs/clips for "work in progress".		

+	Periods for teachers are to be arranged in regular time table. However periods may be arranged on flexi based (as per need) and should be total 84 hours/term.
++	This includes market/industry survey/study, industrial visits, self preparation of drawings-layouts-specifications, preparation of schedules, doing special operations at outside if required, estimations, costing, individual preparations, project report preparation, etc. as per guidance of teacher.

NOTE FOR OPTION A & OPTION B.

FOR STUDENTS:

a) It is advised that student download this copy of syllabus and plan to achieve the objectives of learning this subject.
b) Attach copy of syllabus as part of term work.

GENERAL:

1. Prepare the report with A4 size paper,30mm left margin,20mm top, bottom and right margins, Arial font of size 14 for titles and size 12 for detail content, single spacing, prepared in MS Word, print on both side of paper.
2. Term work report of student of regular mode should exclude Distance Learning manual, photocopies, pre-printed content, etc. Focus should be on developing the term work as original efforts of students.
3. Term work (hard copy) should also include experience logbook duly certified by workshop instructors (as applicable), Industry/Market/Field personnel (as applicable) and subject teachers. Suggested format as per Annexure-I may be used.
4. Term work has to be defended (along with term work of V semester and VI semester) by Practical / Oral examination to be conducted by external and internal examiners. Power Point Presentation is also to be included.

ANNEXURE-I

FORMAT FOR DAY TO DAY LOG BOOK

ENROLLMENT NUMBER OF THE STUDENT :	
NAME OF THE STUDENT :	
INSTITUTE :	

DATE:	DETAILS OF WORK CARRIED OUT.	INITIAL OF STUDENT.	INITIAL OF INDUSTRY/ INSTITUTE GUIDE AND INSTRUCTOR/WORKMAN.

ANNEXURE-II
TITLE PAGE

< NAME AND ADDRESS OF INSTITUTE>

TERM WORK REPORT

SUBJECT : PROJECT – II

SUBJECT CODE : 2361906

DISCIPLINE : MECHANICAL ENGINEERING

ENROLMENT NUMBER :

NAME OF STUDENT :

DIVISION / BATCH :

SUBMISSION

SUBMITTED - V SEM. : <DATE>

SUBMITTED-VI SEM. : <DATE>

ANNEXURE-III
CERTIFICATE

CERTIFICATE

THIS IS TO CERTIFY THAT
SHRI / KUM

……

HAS SATISFACTORILY COMPLETED HIS / HER TERMWORK IN THE SUBJECT
PROJECT - II (2361906)
WITHIN THE PRESCRIBED TIME LIMIT AND PRESCRIBED BOUNDARY.

DATE: *STUDENT*

DATE: *INSTITUTE / INDUSTRY GUIDE*

DATE: *HEAD OF DEPTT.*

DATE: *PRINCIPAL*

ANNEXURE-IV

SUGGESTED LIST OF ACTIVITIES AFTER PROJECT IS SELECTED AND FINALISED.

1) Selection, description and working of project.
2) Learning with Critical Path Method concepts, types of activities (specifically dependent , independent and concurrent).
3) Preparing master schedule and work allocation matrix in group.
4) Project monitoring and control, record keeping.
5) Preparing and maintaining logbook.
6) Preparing finalized master schedule in MS Project.
7) Preparing conceptual sketch of assembly of project.
8) Preparation of assembly and detail drawings (This must be production drawings with suitable scale along with dimensions, tolerances, surface roughness symbols, heat treatment / other treatments required, material , quantity per assembly for components drawings ,etc.
9) Collecting data and specifications of available resources-mainly material and machineries / equipments/facilities and tools.
10) Preparation of bill of material.

11) Make or Buy decision.
12) Specifications of bought-out parts.
13) Preparation of process planning (sheets) for all components in standard format.
14) List, quantity and specification of consumables.
15) Preparation of cost estimation.
16) Preparation of list of required tools-cutting tools, jigs, fixtures, measuring instruments and other tools along with necessary specifications and sketches if required.
17) Identifying and locating required resources like material, machineries/equipments / facilities and tools.
18) Preparing plant layout.
19) Manufacturing of components.
    a. <name of component 1>
    b. <name of component 2>
    d. <name of component 3>
    e. ..
    n. <name of component n>
20) Preparation of flow process charts.

21) Details of inspection carried out.
22) Assembly.
23) Details of testing carried out.
24) Rework / rectification activities if required.
25) Costing.
26) Preparation of notes on troubleshooting.
27) Preparation of notes individually on :
    a. Extent to which he/she has achieved the main objectives and skill level of subject learning mentioned at experience number 1.
    b. Own experience in executing project.
    c. He/ She has faced technical problems during execution of project and solutions found.
28) Preparation of list of references.

29) Preparation of project report.
30) Presentation.

ANNEXURE – V
WORK ALLOCATION MATRIX (SUGGESTED)

ENROLMENT NO. OF STUDENT: **NAME OF STUDENT:**
BATCH:

ENROLMENT NUMBERS OF GROUP STUDENTS.....

ACTIVITY NO.	SHORT DESCRIPTION OF ACTIVITY	WHO WILL PERFORM?	PLANNED DATES		ACTUAL DATES		WHO HAS / HAVE PERFORMED?	REASON/S FOR ANY DELAY / DEVIATION FROM PLANNING	INITIAL OF TEACHER
			STARTING	ENDING	STARTING	ENDING			
1	Selection, description and working of project.								
2	Learning with Critical Path Method concepts, types of activities (specifically dependent, independent and concurrent).								
3	Preparing master schedule and work allocation matrix in group.								
4	Project monitoring and control, record keeping.								
5	Preparing and maintaining logbook.								
6	Preparing finalized master schedule in MS Project.								
7	Preparing conceptual sketch of assembly of project.								
8	Preparation of assembly and detail drawings.								
9	Collecting data and specifications of available resources-mainly material and machineries / equipments/facilities and tools.								

10	Preparation of bill of material.								
11	Make or Buy decision.								
12	Specifications of bought-out parts.								
13	Preparation of process planning (sheets) for all components in standard format.								
14	List, quantity and specification of consumables.								
15	Preparation of cost estimation.								
16	Preparation of list of required tools-cutting tools, jigs, fixtures, measuring instruments and other tools along with necessary specifications and sketches if required.								
17	Identifying and locating required resources like material , machineries /equipments / facilities and tools.								
18	Preparing plant layout.								
19	Manufacturing of components.								
	Component 1								
	Component 2								
	Component 3								
	Component n								

20	Preparation of flow process charts.								
21	Details of inspection carried out.								
22	Assembly.								
23	Details of testing carried out.								
24	Rework / rectification activities if required								
25	Costing.								
26	Preparation of notes on troubleshooting.								
27	Preparation of notes individually on : a. Extent to which he/she has achieved the main objectives and skill level of subject learning mentioned at experience number 1. b. Own experience in executing project. c. He/ She has faced technical problems during execution of project and solutions found.								
28	Preparation of list of references.								
29	Preparation of project report.								
30	Presentation.								

GUJARAT TECHNOLOGICAL UNIVERSITY

DIPLOMA IN MECHANICAL ENGINEERING

SEMESTER- VI

Subject Name: **Refrigeration and Air Conditioning (Elective-I)**
Subject Code: 2361907

Sr. No.	Subject Content	Hrs.
1	**INTRODUCTION.** 1.1 Know the objectives of learning this subject. 1.2 Need, Scope & importance of Refrigeration and Air-conditioning (RAC). 1.3 Need of attitude, knowledge & skill required for application Of RAC. 1.4 Refrigeration and Air conditioning: Importance, concept, basic principle, cycle of operation, need, classification and definition, Unit used.	2
2	**REFRIGERATION SYSTEMS.** 2.1 Bell- Coleman cycle, representation on P-V and S-T diagram. 2.2 C.O.P. 2.3 Types of refrigeration systems and their applications. 2.4 Simple vapour absorption system, working principle (NH3- H2O)and applications.	2
3	**VAPOUR COMPRESSION REFRIGERATION SYSTEM (VCRS).** 3.1 Simple, standard vapour compression cycle and its analysis on P-h chart. 3.2 Calculations of refrigerating effect, work done and C.O.P., wet and dry compression, simple examples. 3.3 Effect of different parameters on vapour compression cycle. 3.4 Practical vapour compression system. 3.5 VCRS components, types, their construction, material of construction, specifications, working, common troubles -their causes and remedies , applications, (components include compressor (Reciprocating, Rotary, Screw and scroll),condensers(Air cooled and water cooled),evaporators(Dx type, flooded, shell and tube type) ,expansion devices (Automatic, thermostatic and capillary tube, High side float valve) and others. 3.6 Application of refrigeration and air conditioning in domestic and industrial context. 3.7 Ice Plant, cold storage, water cooler, domestic refrigerator, deep freezer, dessert cooler, window and split air conditioners- cycle and block diagram, components, working, common troubles-their causes and remedies.	12

	Note : Question/s to calculate COP/RE/WD, remedies for specific trouble/s, etc(applications type) of 10-12 marks out of 70.	
4	**REFRIGERANTS.** 4.1 Primary and secondary refrigerant. 4.2 Classification. 4.3 Designation 4.4 Need of new refrigerants. 4.5 Desirable properties of refrigerants. 4.6 Properties of R 22, R 134a and R717.	2
5	**THERMAL INSULATION.** 5.1 Types of Insulation and their applications. 5.2 Salient features of thermocol & fiber glass.	2
6	**APPLIED PSYCHOROMETRY.** 6.1 Psychrometric properties of air such as Dry Bulb Temperature (DBT),Wet Bulb Temperature(WBT), Dew Point Temperature (DPT), absolute humidity, relative humidity, specific humidity, humidity ratio, degree of saturation, specific volume, enthalpy, familiarization with tables of psychometric properties of air, simple calculations. 6.2 Psychometric charts and their use. 6.3 Psychometric processes-sensible heating, sensible cooling, addition and removal of latent heat, adiabatic mixing of air streams, cooling and dehumidification, heating and humidification, adiabatic saturation, solution of problems using psychometric chart. 6.4 Psychrometry- sensible heat factor(SHF) and its determination with the help of psychometric chart, condition line room apparatus and coil apparatus dew point and their determination with the help of chart, estimation of dehumidified air quantity, bypass and contact factor. 6.5 Human Comfort-body temperature regulation, environmental influence on comfort, effective temperature and factors affecting it. 6.6. Comfort chart and its limitations. 6.7 Instruments for measuring psychometric properties-sling psychrometer dew point psychrometer,organic hygrometer, aspiration psychrometer-working and applications. **Note** : Question/s to plot any simple process, calculating/plotting SHF, BF,CF, etc. applications type) of 8-10 marks out of 70.	10

7	**INTRODUCTION TO COOLING LOADS.** 7.1 Types, classification and normal values of cooling loads. 7.2 Design conditions. 7.3 Over all heat transfer co-efficient and its calculation. 7.4 Flywheel effect of building material. 7.5 Effect of wall construction on cooling load. 7.6 Concept of IHG and ICL. 7.7 Heat gain through glass. 7.8 Air infiltration and load due to it. **Note** : Question/s to calculate OHTC (applications type) of 4-5 marks out of 70.	3
8	**AIR CONDITIONING AND AIR HANDLING SYSTEMS.** 8.1 Working principles and working of central plant and packaged plant. 8.2 Air filtration -various types, principles of working of different air filters. 8.3 Fans -classification, types, working, selection method, terminology used in fans, applications. 8.4 Velometer and pitot tube : their construction and working. 8.5 Duct design, installation and commissioning- estimation of duct size by equal friction method with the help of charts and tables, estimation of losses in ducts, different material & layouts ,installation and commissioning steps and precautions . 8.6 Air Distribution-importance, terms used, different types of outlets, grill register, diffusers, location of outlets. **Note** : Question/s on selection based on given set of conditions(applications type) of 4-5 marks out of 70.	7
9	**REFRIGERATION AND AIR CONDITIONING SERVICING.** 9.1 Tube operations-service tools and special tools-applications and specifications. 9.2 System operation such as-vacuumization, leak detection, charging the system, pumping down, etc.-process, equipments used and their specifications.	2
	Total	42

Notes:

A. FOR STUDENTS.

a. It is advised that student download this copy of syllabus and plan to achieve the objectives of learning this subject.

B. FOR PAPER SETTER/MODERATOR.

a. Refer GTU syllabus and do not take reference of previous TEB question papers.
b. Ask the questions from each topic having marks weightage proportionate to hours allotted to that topic.
c. Optional questions must be asked from the same topic. That is weightage of compulsory attendance part of questions will be equal to proportionate to hours allotted to each topic.
d. Marks ratio of knowledge: comprehension: application types questions must be 30:30:40 respectively.
e. Submit solution / answer keys along with distribution of marks in each question for the paper being submitted.

Reference Books:

1	Principle of Refrigeration	Dossat R.J. Prentice Hall, USA
2	Basic Refrigeration and air conditioning(2nd Edition)	P.N. Anantha narayan Tata Mc Graw Hill
3	Refrigeration and Air conditioning	Domkundwar Dhanpat Rai & Sons
4	Refrigeration and Air conditioning	Khurmi & Gupta S. Chand, New Delhi
5	Refrigeration and Air conditioning	C.P. Arora Tata Mc Graw Hill
6	Refrigeration & Air conditioning	M. Prasad Wilely Easter, Delhi
7	Refrigeration & Air Conditioning	P.S. Desai L.F.Rajput Atul PRakashan
8	Refrigeration & Air Conditioning -	L.R.D.C., A'bad

Additional Reference Books:

1.	Refrigeration and Air conditioning	P.L. Balleney Khanna Publishers
2	Ind. Refrigeration Handbook	Stoecker Mc Graw Hill, USA
3	Modern Refrigeration & Air Conditioning	Althouse etc Galgotia Book source New Delhi
4	Fundamental of refrigeration	Longely Delmar Pub. USA
5	Refrigeration & Air conditioning	ARI P.H.I., USA
6	Handbook of Air conditioning	Wang Mc Graw Hill
7	Air Conditioning Lang	CBS Pub. Co. Delhi
8	Heating, Ventilation and air	

	conditioning	Clifford Reston Pub. USA
9	Air conditioning (4th Edition)	Jones Edward Arnold
10	Air conditioning Principles & Systems	Pita John Wilely USA
11	Refrigeration & air conditioning	Trott Mc Graw Hill Uk
12	HVAC Principles & applications	Mull Mc Graw Hill USA
13	Principles of Heating, Ventilation and air conditioning	Howell saucer coad Ashree 1998
14	HVAC Systems Duct Design -	SMACNA, USA
15	HVAC Systems	Monger Prentice Hall, USA
16	HVAC Systems Design Hand Book	Hains& Wilson Mc Graw Hill USA
17	Fan Application Manual -	AMCA, USA
18	Cooling Towers	Gurney & Cotter Maclaren & Sons , UK
19	ASHRAE Handbook Fundamentals	-ASHRAE
20	ASHRAE Handbook Refrigeration	-ASHRAE
21	ASHRAE Handbook Applications	- ASHRAE
22	ASHRAE Handbook System and Applications	-ASHRAE
23	Prashitan and vatanukulan	A.K. Mehta Uni. Text Book Board, AHN
24	Refrigeration & Air Conditioning	Whitman Johnson Tomczyk Delmar Pub. Co. USA

GUJARAT TECHNOLOGICAL UNIVERSITY

DIPLOMA IN MECHANICAL ENGINEERING

SEMESTER- VI

Subject Name: **Refrigeration and Air Conditioning Practice (Elective Practice -I)**

Subject Code: **2361908**

NOTE:- Following are the minimum experiences required, but the college can do more experiences if possible.

LABORATORY EXPERIENCES :			
Experience Type	**Experience Number**	**Description of Laboratory Experience**	**Hrs.**
Preparatory	01	1. Appreciate main objectives of learning this subject: a. Familiarize with refrigeration and air conditioning applications. b. Identify simple and common faults in commercially available refrigeration and air conditioning equipments/systems and repair the same. 2. Strengthen know how for fundamental thermodynamic units, systems and cycles.	2
Study and demonstration	02	Vapour Compression Refrigeration System (VCRS) components-compressor, condenser, expansion devices and evaporators-types, construction, working, common troubles, their causes and remedies.	4
	03	Domestic refrigerator, window air conditioner and split air conditioner.	2
	04	Air handling equipments/elements.	2
Performance	05	Tubing Operations.	6
	06	Leak detection, evacuation of system refrigerant and re-filling the same.	2
	07	Determination of COP of water cooler / any VCRS based system.	2
	08	Determination of properties of air by using different instruments	2
Tutorial and report making	09	Simple cooling load	-

Download and seminar presentation, (Copy downloaded content and seminar of whole batch In one /one set of CD/DVD)	10	a) Prepare and present seminar individually in your batch. (Seminar topic has to be given by teacher). b) Download individually visual aids, movies, content and other related content for the given case/situation. (Case/situation has to be given by teacher)Present and discuss the same in your batch.	6
Industrial visit	11	Visit cold storage plant, ice plant and air-conditioning plant.	-
Service centre visit	12	Visit at least two related refrigerator/air conditioner service centers and get the details for common troubles and their remedies.	-
Assignments (Home Assignment)	13	Solve the given tutorials and assignments. One assignment must be on preparation of chart / diagram / poster / graph / drawing / etc on half imperial size of drawing sheet. (For subject RAC).	-
		Total	28

Notes:

A. FOR STUDENTS.

a. It is advised that student download this copy of syllabus and plan to achieve the objectives of learning this subject.
b. Attach copy of syllabus as part of term work.

B. FOR STUDENTS AND SUBJECT TEACHER/S.

a. Term work report content of each experience should also include following.
    i. Experience description / data and objectives.
    ii. Skill/s which is / are expected to be developed in student after completion of experience.
    iii. Steps / procedure to execute experience.
b. Term work report of student of regular mode should exclude Distance Learning manual, photocopies, printed content(except visual aids), etc. Focus should be on developing the term work as original efforts of students.
c. Term work content of industrial visit report should also include following.
    i. Brief details of industry visited.
    ii. Type ,location, products, rough layout, human resource, etc of industry.
    iii. Details, description and broad specifications of machineries/ processes observed.
    iv. Safety norms and precautions observed.

v. Student's own observation on Industrial environment, productivity concepts, quality consciousness and quality standards, cost effectiveness ,culture and attitude.
vi. Any other details / observations asked by accompanying faculty.

d. Term work should also include experience logbook duly certified by subject teachers.
e. Term work is to be defended (along with term work) with practical examination by external and internal examiners .Practical examination will include followings:
   i. Viva
   ii. Calculate various performance parameters based on given set of conditions. (like COP, RE, WD, OHTC, SHF, BF, CF, etc.)
   iii. Perform any one experience from experience number 5 to 8.

Reference Books:

1	Principle of Refrigeration	Dossat R.J. Prentice Hall, USA
2	Basic Refrigeration and air conditioning(2nd Edition)	P.N. Anantha narayan Tata Mc Graw Hill
3	Refrigeration and Air conditioning	Domkundwar Dhanpat Rai & Sons
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5	Refrigeration & Air conditioning	ARI P.H.I., USA
6	Handbook of Air conditioning	Wang Mc Graw Hill
7	Air Conditioning Lang	CBS Pub. Co. Delhi
8	Heating, Ventilation and air conditioning	Clifford Reston Pub. USA
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10	Air conditioning Principles & Systems	Pita John Wilely USA
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15	HVAC Systems	Monger Prentice Hall, USA
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17	Fan Application Manual -	AMCA, USA
18	Cooling Towers	Gurney & Cotter Maclaren & Sons , UK
19	ASHRAE Handbook Fundamentals	-ASHRAE
20	ASHRAE Handbook Refrigeration	-ASHRAE
21	ASHRAE Handbook Applications	- ASHRAE
22	ASHRAE Handbook System and Applications	-ASHRAE
23	Prashitan and vatanukulan	A.K. Mehta Uni. Text Book Board, AHN
24	Refrigeration & Air Conditioning	Whitman Johnson Tomczyk Delmar Pub. Co. USA

GUJARAT TECHNOLOGICAL UNIVERSITY

DIPLOMA IN MECHANICAL ENGINEERING

SEMESTER- VI

Subject Name: **Advance Manufacturing System (Elective-I)**
Subject Code: **2361909**

Sr. No.	Subject Content	Hrs.
1	**INTRODUCTION TO ADVANCE MANUFACTURING SYSTEM (AMS).** 1.1 Know the objectives of learning this subject. 1.2 Need, Scope & importance of AMS in industries. 1.3 Need of attitude, knowledge & skill required for application of AMS. 1.4 Recall evolution of transformation & manufacturing systems. 1.5 Concept, components, working and features of Computer Numerical Control (CNC) machine.	3
2	**GROUP TECHNOLOGY (GT).** 2.1 GT - concept, definition, need, scope, & benefits. 2.2 GT- codification systems , types, importance, part families, part classification and coding systems, examples/case study. 2.3 GT Layout -concept, need, importance, comparison with conventional layout with examples/case study, benefits. 2.4 Computer Aided Process Planning (CAPP) - conventional process planning & examples, CAPP- concept, types, features, methods and importance. **Note** : Question/s to prepare features and coding of given component/s (application type) of 5-6 marks out of total 70.	8
3	**CELLULER MANUFACTURING.** 3.1 Concept and definition, application and benefits. 3.2 Part family and cell formation. 3.3 Composite component and key machine concepts. 3.4 Cell layout and design. 3.5 Job and tool movement within cell. 3.6 Types of cell: manual and automatic cell, assembly cell, comparison of cell and Flexible Manufacturing Cell (FMC). **Note** : Question/s to prepare cell layout from given data (application type) of 4-6 marks out of total 70.	4

4	**JUST IN TIME (JIT).** 4.1 JIT concept, meaning, definition, need and reasons to include this concept in AMS. 4.2 Unnecessary elements in conventional manufacturing system with reference to JIT with suitable engineering examples/ case study. 4.3 JIT implementation requirement. **Note** : Question/s to based on related short case (application type) of 3-4 marks out of total 70.	3
5	**FLEXIBLE MANUFACTURING SYSTEM (FMS).** 5.1 Flexible Manufacturing Unit (FMU), turn-mill centres, multiple centres, advanced machining centres, etc. 5.2 Transfer line- concept, meaning, features & examples. 5.3 Flexible Manufacturing System (FMS) -concept, meaning & benefits, major elements and their role. 5.4 FMS : layout concept, system, tool handling system, material handling principle and system. 5.5 Automated Guided Vehicles (AGV) in FMS- concept, definition, types, functions. 5.6 Signal flow diagram, line balancing, Automated Storage and Retrieval System (AS/RS), case examples of FMS for specific components/group of components. **Note** : Question/s to prepare conceptual FMS layout of given components/groups (application type) of 8-10 marks out of total 70.	9
6	**ROBOTICS.** 6.1 Introduction 6.2 Robots-concept, definition, economic justification, benefits. 6.3 Robots-types, classification, various terminology,specification criterion. 6.4 Axes nomenclature, elements, control, for each type of robots. 6.5 Sensors- types, classifications, working and applications. **Note** : Question/s to select/justify sensors for given data (application type) of 3-4 marks out of total 70.	6
7	**INTEGRATION OF COMPUTER AIDED DESIGN (CAD) WITH COMPUTER AIDED MANUFACTURING (CAM).** 7.1 Concept, meaning, importance and benefits. 7.2 Activities involved in integration of CAD with CAM. 7.3 Features and applications of software packages having CAD/CAM integration. 7.4 Interfacing: types, standards, features & applications.	3

8	**COMPUTER INTEGRATED MANUFACTURING (CIM).** 8.1 Concept, definition, areas covered and benefits. 8.2 CIM: need, block diagram & explanations, importance & features of each terms involved. 8.3 Computer Aided Inspection- concept, benefit, types, working and examples, Coordinate Measuring Machine (CMM) - its working and applications. 8.4 Protocols in CIM- their features, functions and applications.	3
9	**CONCURRENT ENGINEERING (CE).** 9.1 Introduction 9.2 Concept, meaning, terminology, definitions and objective in CE. 9.3 Parallel processing & CE team. 9.4 Schemes, their definition and exemplification for CE.	3
	Total	42

Notes:

A. FOR STUDENTS.

a. It is advised that student download this copy of syllabus and plan to achieve the objectives of learning this subject.

B. FOR PAPER SETTER/MODERATOR.

a. Refer GTU syllabus and do not take reference of previous TEB question papers.
b. Ask the questions from each topic having marks weightage proportionate to hours allotted to that topic.
c. Optional questions must be asked from the same topic. That is weightage of compulsory attendance part of questions will be equal to proportionate to hours allotted to each topic.
d. Marks ratio of knowledge: comprehension: application types questions must be 30:30:40 respectively.
e. Submit solution / answer keys along with distribution of marks in each question for the paper being submitted.

Reference Books:

1.	CAD/CAM/CIM	P.Radha krishnan & S.subra narayan (New Age Intentional)
2.	Computer Integrated Design & Manufacturing	Bedworth, Wolfe and Anderson (McGraw Hill Internationa publication)

3.	Mechatronics	HMT
4.	Introduction to Robotics	Arthur J. Critchlow (Mc Millan publication)
5.	Robotics for engineers	Yorom Koran (Mc G.H. Publication)
6.	Computer aided manufacturing	Rao, Tiwari & Kundra (TMGH Publication)
7.	Computer aided design and manufacturing	Dr.Sadhusingh (KP)

Additional Reference Books:

1.	Computer Integrated Manufacturing	S.K.Vajpayee (PHI Publication)
2.	Automation, Production and Computer integrated Manufacturing	Mikell P. Groover, (PHI publication)
3.	Mechatronics	Bradleg and Offers (Chapman and Hall publication)
4.	Practical Robotics	Willium C. Burns Jr. & Janet Evans worthington (PHI publication)
5.	Computer automated Manufacturing	John H. Powers Jr. (Mc GH Publication)
6.	CAD/CAM/FOF,	Vol I,II, & III Juneja, Pujara & Sagar TMGH)
7.	Production and operations management	Chase/Aquilano (Irwin publication)

GUJARAT TECHNOLOGICAL UNIVERSITY

DIPLOMA IN MECHANICAL ENGINEERING

SEMESTER- VI

Subject Name: **Advance Manufacturing System Practice (Elective Practice -I)**

Subject Code: **2361910**

NOTE:- Following are the minimum experiences required, but the college can do more experiences if possible.

LABORATORY EXPERIENCES :			
Experience Type	**Experience Number**	**Description of Laboratory Experience**	**Hrs.**
Preparatory	1	1. Appreciate main objectives of learning this subject: a. Strengthen the fundamentals of machining processes and computers. b. Familiarize with advance manufacturing systems. c. Appreciate the need of higher mental ability and skill level to work with advance systems. 2. Recall and strengthen know-how for various machining processes and industrial management functions.	2
Study and demonstration	2	Various sensors and their applications.	2
	3	Flexible manufacturing system with protocols.	2
	4	Various robotics applications.	2
Performance	5	Develop GT codes in suitable part coding system for approximately 12 to 15 components. Ask each student to bring at least one component (having more than 5-6 operations) and also ask him/her to draw it and make the process plan including details of tools required.. Then the data will be interchanged by batch students. Also prepare feature matrix for all components. (Note : Collection of parts and making drawing and process plan as home assignment.)	4
	6	a) Learn fundamentals of any one database software operation. b) Prepare database for experience number 5 and analyse this database for formation of various groups.	4
	7	a) Prepare block diagram/structure for any group developed in exercise no.6 for use in Computer Aided Process Planning (CAPP). b) Estimate the time for each operation of each component	4

		of group. c) Assuming data on quantity of each component of group , calculate total time for each process.	
	8	Develop conceptual FMS model for any one group formed in experience number 6. Also explain steps & procedure for model. This exercise should be held in a group of 3-4 students & group should represent seminar for the model developed. Develop at least three models in a batch.	4
Download and seminar presentation, (Copy downloaded content and seminar of whole batch In one /one set of CD/DVD)	9	a) Prepare and present seminar individually in your batch. (Seminar topic has to be given by teacher). b) Download individually visual aids, movies, content and other related content for the given case/situation. (Case/situation has to be given by teacher-preferably from emerging/ recent trends).Present and discuss the same in your batch.	4
Industrial visits	10	Visit at least two related industries.	-
Assignments (Home Assignment)	11	Solve the given tutorials and assignments. One assignment must be on preparation of chart / diagram / poster / graph / drawing / etc on half imperial size of drawing sheet.(For subject AMS).	-
		Total	**28**

Notes:

A. FOR STUDENTS.

a. It is advised that student download this copy of syllabus and plan to achieve the objectives of learning this subject.
b. Attach copy of syllabus as part of term work.

B. FOR STUDENTS AND SUBJECT TEACHER/S.

a. Term work report content of each experience should also include following.
    i. Experience description / data and objectives.
    ii. Skill/s which is / are expected to be developed in student after completion of experience.
    iii. Steps / procedure to execute experience.
b. Term work report of student of regular mode should exclude Distance Learning manual, photocopies, printed content (except visual aids), etc. Focus should be on developing the term work as original efforts of students.
c. Term work content of industrial visit report should also include following.
    i. Brief details of industry visited.

ii. Type ,location, products, rough layout, human resource, etc of industry.
iii. Details, description and broad specifications of machineries/ processes observed.
iv. Safety norms and precautions observed.
v. Student's own observation on Industrial environment, productivity concepts, quality consciousness and quality standards, cost effectiveness ,culture and attitude.
vi. Any other details / observations asked by accompanying faculty.

d. Term work should also include experience logbook duly certified by subject teacher/s.
e. Term work is to be defended (along with term work) with practical examination by external and internal examiners .Practical examination will include followings:
   i. Viva
   ii. Developing GT codes of given components.
   iii. Developing conceptual FMS model based on given set of data.
   iv. Explaining working of specified item/machines/systems/ robot/ etc.

Reference Books:

1.	CAD/CAM/CIM	P.Radha krishnan & S.subra narayan (New Age Intentional)
2.	Computer Integrated Design & Manufacturing	Bedworth, Wolfe and Anderson (McGraw Hill Internationa publication)
3.	Mechatronics	HMT
4.	Introduction to Robotics	Arthur J. Critchlow (Mc Millan publication)
5.	Robotics for engineers	Yorom Koran (Mc G.H. Publication)
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3.	Mechatronics	Bradleg and Offers (Chapman and Hall publication)
4.	Practical Robotics	Willium C. Burns Jr. & Janet Evans worthington (PHI publication)
5.	Computer automated Manufacturing	John H. Powers Jr. (Mc GH Publication)
6.	CAD/CAM/FOF,	Vol I,II, & III Juneja, Pujara & Sagar TMGH)
7.	Production and operation mgt.	Chase/Aquilano (Irwin publication).

GUJARAT TECHNOLOGICAL UNIVERSITY
DIPLOMA IN MECHANICAL ENGINEERING
SEMESTER- VI

Subject Name: **Advance Machine Design (Elective-I)**
Subject Code: **2361911**

Sr. No.	Subject Content	Hrs.
1	**INTRODUCTION.** 1.1 Know the objectives of learning this subject. 1.2 Need, Scope & importance of Advance Machine Design (AMD). 1.3 Need of attitude, knowledge & skill required for application of AMD. 1.4 Machine design-meaning, objectives and methodology adopted in industries. 1.5 Design considerations-codes and standards, reliability, design economics, safety, productivity, etc.	3
2	**DESIGN BASICS.** 2.1 Plastic deformation, its effect on strength when cold worked. 2.2 Familiarity with: flexure strength in cylinder, rotating ring, stress in press and shrink fits, temperature effect, contact stress, area moment, method to find deflection- simple cases- examples, Castigliano's theorem- simple cases and examples. 2.3 Statistical considerations in design-meaning, simple cases of applications. 2.4 Familiarity with failure of ductile and brittle materials, stress in crack area, stress intensity factors. 2.5 Variable loading-SN diagram of steel, endurance limit, fatigue strength, endurance limit modifying factors, fluctuating stresses, fatigue strength in fluctuating stresses, Goodman, Soderberg and Geber criteria(simple examples on these), flexural endurance limit. **Note**: one simple example (application) from 2.5 of 3-4 marks.	5
3	**DESIGN OF WELDED JOINTS.** 3.1 Recall welded joints particularly fillet and butt joints. 3.2 Stresses in welded joints under direct, bending and torsional loading, strength of welded joints, simple examples on welded joints. **Note**: one simple example (application) of 4-6 marks.	4

4	**DESIGN OF GEARS.** 4.1 Gears-types, classification, terminology and applications. 4.2 Design steps and design of spur gears, examples. **Note**: one simple example (application) of 4-6 marks.	4
5	**DESIGN OF CLUTCH AND BRAKE.** 5.1 Clutch- types, terminology and applications. 5.2 Brake- types, terminology and applications. 5.3 Design steps and examples for plate and cone clutch. 5.4 Design steps and examples for shoe brake. **Note**: one example (application) of 6-8 marks.	6
6	**DESIGN OF CONNECTING ROD.** 6.1 Design steps for connecting rod, crank shaft, piston and gudgen pin.	4
7	**COMPUTER AIDED DESIGN.** 7.1 CAD softwares and programming languages. 7.2 Introduction to C++: 1. Fundamentals and features of object oriented programming. 2. Structure of C++, library and header files. 3. Keywords, constants, variables, strings, expressions, operators and manipulators. 4. Input, output and assignments statements. 5. Control statements for looping and decision making. 6. Structure and functions. 7.3 Simple design programmes using C++. **Note:** one simple programme (application) of 5-7 marks.	12
8	**TRENDS IN DESIGN.** 8.1 Stress analysis and photo analysis for actual stress, stress pattern in loaded components, stress components, photo elastic effect, polariscope. 8.2 Finite Element Analysis (FEA)-introduction, applications. 8.3 Industrial and visual design- introduction to basic elements and concept of visual design, study of geometry of elements in products and its applications in object drawing, significance of form in structural strength of products. 8.4 Design optimization-concept, meaning, need and importance. 8.5 Concurrent engineering-design aspect meaning, objectives, need, importance and design schemes-DFA, DFM.	4
	Total	42

Notes:

A. FOR STUDENTS.

a. It is advised that student download this copy of syllabus and plan to achieve the objectives of learning this subject.
b. Design data book by K.Mahadevan & B.Reddy (CBS Publication) is also permitted in theory examination.

B. FOR PAPER SETTER/MODERATOR.

a. Refer GTU syllabus and do not take reference of previous TEB question papers.
b. Ask the questions from each topic having marks weightage proportionate to hours allotted to that topic.
c. Optional questions must be asked from the same topic. That is weightage of compulsory attendance part of questions will be equal to proportionate to hours allotted to each topic.
d. Marks ratio of knowledge: comprehension: application types questions must be 30:30:40 respectively.
e. Submit solution / answer keys along with distribution of marks in each question for the paper being submitted.
f. Design data book by K.Mahadevan & B.Reddy (CBS Publication) is also permitted in theory examination.

Reference Books:

1.	Machine design	Khurmi and Gupta.
2.	Design data book	PSG College & Technology, Coimbtore.
3.	Handbook of machine design	G.N.Maitra & L.G.Prasad
4.	Turbo C++	Robert Lafore
5.	Design fundamentals	R.G.Scott
6.	Design data book	Mahadevan and Reddy
7.	Mechanical Engineering Design	J.E.Shigle, R.Mische

Additional Reference Books:

1.	Machine design	TVS Mucthy, N.Shanmugam
2.	Theory of elasticity	S.Timoshanko
3.	Fundamentals of finite element method	Grandin
4.	Graphic diagrams	Herdeg
5.	Production, treatment and finishes	John D.Deadle, McMillan
6.	Design Management	Farr Michael
7.	Computer Aided Design and Mfg.	Anderson, Wolfe & Bedworth.

GUJARAT TECHNOLOGICAL UNIVERSITY

DIPLOMA IN MECHANICAL ENGINEERING

SEMESTER- VI

Subject Name: **Advance Machine Design Practice (Elective Practice -I)**
Subject Code: **2361912**

NOTE:- Following are the minimum experiences required, but the college can do more experiences if possible.

LABORATORY EXPERIENCES :			
Experience Type	**Experience Number**	**Description of Laboratory Experience**	**Hrs.**
Preparatory	01	1. Appreciate main objectives of learning this subject: a. Strengthen the fundamentals of theory of machine, strength of material and machine design. b. Design for simple parameters. c. Select appropriate machine elements. d. Prepare simple design using C++. e. Read/interpret/refer design data book.	2
Design and reports	02	Welded joint, spur gear, plate clutch, cone clutch, shoe brake and connecting rod.	14
C++ programmes	03	Prepare at least four C++ programmes based on simple design parameters.	8
Download, seminar presentation, (Copy downloaded content and seminar of whole batch In one /one set of CD/DVD)	04	a) Prepare and present seminar individually in your batch. (Seminar topic has to be given by teacher). b) Download individually visual aids, movies, content and other related content for the given case/situation. (Case/situation has to be given by teacher)Present and discuss the same in your batch.	4
Industrial Visit	05	Visit at least two industries having CAD facilities and get familiarity with design softwares, simulation and optimization.	-

Assignments (Home Assignment)	06	Solve the given tutorials and assignments. One assignment must be on preparation of chart / diagram / poster / graph / drawing / etc on half imperial size of drawing sheet.(For subject AMD).	-
		Total	28

Notes:

A. FOR STUDENTS.

a. It is advised that student download this copy of syllabus and plan to achieve the objectives of learning this subject.
b. Design data book by K.Mahadevan & B.Reddy (CBS Publication) is also permitted in practice examination.
c. Attach copy of syllabus as part of term work.

B. FOR STUDENTS AND SUBJECT TEACHER/S.

a. Term work report content of each experience should also include following.
    i. Experience description / data and objectives.
    ii. Skill/s which is / are expected to be developed in student after completion of experience.
    iii. Steps / procedure to execute experience.
b. Term work report of student of regular mode should exclude Distance Learning manual, photocopies, printed content(except visual aids), etc. Focus should be on developing the termwork as original efforts of students.
c. Term work content of industrial visit report should also include following.
    i. Brief details of industry visited.
    ii. Type ,location, products, rough layout, human resource, etc of industry.
    iii. Details, description and broad specifications of machineries/ processes observed.
    iv. Safety norms and precautions observed.
    v. Student's own observation on Industrial environment, productivity concepts, quality consciousness and quality standards, cost effectiveness ,culture and attitude.
    vi. Any other details / observations asked by accompanying faculty.
d. Term work should also include experience logbook duly certified by subject teachers.
e. Term work is to be defended (along with term work) with practical examination by external and internal examiners .Practical examination will include followings:
    i. Viva
    ii. Preparing simple C++ programmes for given parameters.
    iii. Simple design-anyone from experience number 02.

f. Design data book by K.Mahadevan & B.Reddy (CBS Publication) is also permitted in practice examination.

Reference Books:

1.	Machine design	Khurmi and Gupta.
2.	Design data book	PSG College & Technology, Coimbtore.
3.	Handbook of machine design	G.N.Maitra & L.G.Prasad
4.	Turbo C++	Robert Lafore
5.	Design fundamentals	R.G.Scott
6.	Design data book	Mahadevan and Reddy
7.	Mechanical Engineering Design	J.E.Shigle, R.Mische

Additional Reference Books:

1.	Machine design	TVS Mucthy, N.Shanmugam
2.	Theory of elasticity	S.Timoshanko
3.	Fundamentals of finite element method	Grandin
4.	Graphic diagrams	Herdeg
5.	Production, treatment and finishes	John D.Deadle, McMillan
6.	Design Management	Farr Michael
7.	Computer Aided Design and Mfg.	Anderson, Wolfe & Bedworth

GUJARAT TECHNOLOGICAL UNIVERSITY

DIPLOMA IN MECHANICAL ENGINEERING

SEMESTER- VI

Subject Name: **Production Management and Information Systems (Elective-I)**

Subject Code: 2361913

Sr. No.	Subject Content	Hrs.
1	**INTRODUCTION.** 1.1 Know the objectives of learning this subject. 1.2 Need, Scope & importance of Production Management and Information Systems (PMIS). 1.3 Need of attitude, knowledge & skill required for application of PMIS. 1.4 Production Management – Concept, need and definition. 1.5 Types of production, their merits and demerits. 1.6 Layouts : - types, features, applications. 1.7 System approach to production management. 1.8 Functions of production management.	4
2	**DEMAND FORECASTING.** 2.1 Demand forecasting.- definition, importance, types for new products & established products ,their features and applications. 2.2 Time series analysis: features, types (This includes simple average, simple moving average, weighted moving average and exponential smoothing), advantages and disadvantages of each type, method of forecasting for each type, examples of each type. 2.3 Forecast of error, sources of errors, measurement of error and methods of fitting a trend line.(This includes hand fitting & least square methods.). 2.4 Decomposition of time series: Seasonal variations, seasonal index, decomposition using least square regression, deseasonalized demand, method, examples. **Note** : Two problem questions of 6-8 marks out of total 70.	6
3	**AGGREGATE PRODUCTION PLANNING AND CAPACITY REQUIREMEN PLANNING(CRP).** 3.1 Major production/operation planning activities, terminology, meaning and definition. 3.2 Aggregate production planning:Concept, goals, interrelationship in production system. 3.3 Types of production plan, factors affecting them, examples 3.4 CRP : Concept, need and meaning; method, decision variables, suitable mechanical engineering examples.	6

	Note: One problem question from CRP of 4-6 marks out of total 70.	
4	**RESOURCE PLANNING & SCHEDULING.** 4.1 Definition, aim, purpose & types. 4.2 Information necessary for scheduling. 4.3 Material Requirement Planning (MRP) - definition, need, procedure, example. 4.4 Master Production Schedule (MPS) - concept, need, information flow, preparation steps; suitable preparation with example. 4.5 Estimation of shop loads. 4.6 Planning and scheduling system: scheduling techniques such as Gantt chart, Mile-stone chart, analytical method, Johnson method, Jackson's method, slotting technique, etc. 4.7 Short interval scheduling. 4.8 Critical ratio scheduling. 4.9 Manufacturing resource planning (MRP-II) : concept, meaning, definition, scope, importance and applications. 4.10 Enterprise Resource Planning (ERP): concept and definition, information on software available. **Note**: One problem question from scheduling of 4-5 marks out of total 70.	8
5	**SYSTEM CONCEPT.** 5.1 Data-types. 5.2 Information : types, its economics. 5.3 Information system : need, concept, definition, features and objectives ; examples supporting features & objectives.	3
6	**DATA MANAGEMENT.** 6.1 Data management-concept, need, basic terminology used. 6.2 Data base : definition, meaning, importance, approach and architecture. 6.3 Objectives of database organizations. 6.4 Data models : meaning, relationship and association, drawing schema, bubble chart & tree structure for suitable mechanical engineering application. 6.5 Data Base Management System (DBMS) - definition, scope, importance, awareness about current software packages & their features , Relational Data Base Management System (RDBMS) - concept, definition, features and applications. 6.6 Conceptual preparation steps/ procedure for creating, storing, editing & retrieval of database structure based on latest available database management software packages. (any one from dbase or Fox pro or MS Access or Oracle).	6

	Note : Software(dbase or Fox pro or MS Access or Oracle) based specific questions should be part of practical/ oral examination and should not be asked in theory examination.	
7	**INFORMATION SYSTEMS.** 7.1 Role of computers in information systems. 7.2 Management Information System (MIS) ; concept, definition, need & applications. 7.3 Computer aided information systems related to mechanical engineering-take at least five varieties (such as inventory records, production schedule, tool issues, inspection and quality control reports, efficiency and utility reports, maintenance records, etc..) : need, importance, design considerations, software selection criteria, examples. 7.4 Information communication :- communication process ; computer networks and its types, structures, need and applications, protocols - types, features, applications. 7.5 Communication media – types, features, benefits for industrial environment, working (this includes Internet and Intranet, E-mail, etc.). 7.6 Decision Support System (DSS): concept, definition and need. **Note** :One application question to design MIS and prepare database of 10-12 marks out of 70.	9
	Total	42

Notes:

A. FOR STUDENTS.

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B. FOR PAPER SETTER/MODERATOR.

a. Refer GTU syllabus and do not take reference of previous TEB question papers.
b. Ask the questions from each topic having marks weightage proportionate to hours allotted to that topic.

c. Optional questions must be asked from the same topic. That is weightage of compulsory attendance part of questions will be equal to proportionate to hours allotted to each topic.
d. Marks ratio of knowledge: comprehension: application types questions must be 30:30:40 respectively.
e. Submit solution / answer keys along with distribution of marks in each question for the paper being submitted.

Reference Books:

1. Computer database organization	Jame's Martin, by PHI publication
2. Production and operations management	Everette, Adam,Jr. and Ronald J. Ebert, (PHI publication)
3. Production and operations management	Chase/Aquiline, Irwin publication
4. Management information system	S.Sadagopan (PHI publication)
5. Production and operations management	S.N.Charry (TMGH publication)
6. Modern production & operations management	Elwood S. Buffa and Rakesh K. Sarin(John willy& sons publication)
7. Operations research	S.D.Sharma

Additional Reference Books:

1. New information technology	Edited Alan Burns, Ellis Harword ltd.
2. Managing product and operations	Martin K. Star (PHI publication)
3. Production and operations management	Ray Wild Cassel.
4. Books on database software taken for study and practice.	
5. Production and operations management	N.G.Nair, TMGH publication.

GUJARAT TECHNOLOGICAL UNIVERSITY

DIPLOMA IN MECHANICAL ENGINEERING

SEMESTER- VI

Subject Name: **Production Management and Information Systems Practice (Elective Practice-I)**

Subject Code: **2361914**

NOTE:- Following are the minimum experiences required, but the college can do more experiences if possible.

LABORATORY EXPERIENCES :			
Experience Type	**Experience Number**	**Description of Laboratory Experience**	**Hrs.**
Preparatory	01	1. Appreciate main objectives of learning this subject: a. Develop the ability to analyze the objectives and constraints for given situation / task. b. Develop the ability to plan available resources optimally. c. Appreciate the need of higher mental ability and skill level to work with complex systems. d. Integrate use of information technology. 2. Recall and strengthen know-how for various mathematical, statistical and managerial fundamentals.	2
Problem solving (Each student should be given different data / values for same kind of problem/s)	02	Demand forecasting problem solutions (One from time series analysis, one from least square and one from exponential smoothing).	4
	03	Aggregate production planning preparation based on given suitable data.	2
	04	Capacity requirement planning preparation based on given suitable data.	2
	05	Solve sequencing problem for given situation using Johnson and Jackson method.	2
Study and preparation	06	Study (any one from Fox pro or MS Access or Oracle)database software . Develop at least two specific mechanical engineering information system using database software.	8
	07	Study MS Project and prepare Gantt chart & milestone chart for given suitable data.	4

Download and seminar presentation, (Copy downloaded content and seminar of whole batch In one /one set of CD/DVD)	08	a) Prepare and present seminar individually in your batch. (Seminar topic has to be given by teacher). b) Download individually visual aids, movies, content and other related content and present the same for the given case/situation. (Case/situation has to be given by teacher)Present and discuss the same in your batch.	4
Assignments (Home Assignment)	09	Solve the given tutorials and assignments. One assignment must be on preparation of chart / diagram / poster / graph / drawing / etc on half imperial size of drawing sheet.(For subject PMIS).	-
		Total	28

Notes:

A. FOR STUDENTS.

a. It is advised that student download this copy of syllabus and plan to achieve the objectives of learning this subject.
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    i. Experience description / data and objectives.
    ii. Skill/s which is / are expected to be developed in student after completion of experience.
    iii. Steps / procedure to execute experience.
b. Term work report of student of regular mode should exclude Distance Learning manual, photocopies, printed content(except visual aids), etc. Focus should be on developing the term work as original efforts of students.
c. Term work should also include experience logbook duly certified by subject teachers.
d. Term work is to be defended (along with term work) with practical examination by external and internal examiners .Practical examination will include followings:
    i. Viva
    ii. Solving given problems.
    iii. Developing simple information system and preparing database using selected software for given case.

Reference Books:

1. Computer database organization	Jame's Martin, by PHI publication
2. Production and operations management	Everette, Adam,Jr. and Ronald J. Ebert, (PHI publication)
3. Production and operations management	Chase/Aquiline, Irwin publication
4. Management information system	S.Sadagopan (PHI publication)
5. Production and operations management	S.N.Charry (TMGH publication)
6. Modern production & operations management	Elwood S. Buffa and Rakesh K. Sarin(John willy& sons publication)
7. Operations research	S.D.Sharma

Additional Reference Books:

1. New information technology	Edited Alan Burns, Ellis Harword ltd.
2. Managing product and operations	Martin K. Star (PHI publication)
3. Production and operations management	Ray Wild Cassel.
4. Books on database software taken for study and practice.	
5. Production and operations management	N.G.Nair, TMGH publication.

GUJARAT TECHNOLOGICAL UNIVERSITY

DIPLOMA IN MECHANICAL ENGINEERING

SEMESTER- VI

Subject Name: Fabrication Technology (Elective –I)
Subject Code: 2361915

Sr. No.	Subject Content	Hrs.
1	**INTRODUCTION.** 1.1 Know the objectives of learning this subject. 1.2 Need, Scope & importance of Fabrication Technology (FT) in industries. 1.3 Need of attitude, knowledge & skill required for application of FT. 1.4 Distinguish between fabrication work and manufacturing process. 1.5 Fabrication processes-types, features, merits and demerits and applications. 1.6 Fabrication materials-types, their standards (BIS, JIS, EN, ASME, ASTM, etc..) their methods of designations, properties, applications (for coded and non coded practices) and selection criteria. 1.7 Consumables-types: classification: features; standards their codes, designation method, applications and selection criteria. 1.6 Weldability-concept, meaning, definition and factors affecting it and its importance. 1.7 Power source-classification, advantages, limitations,features, applications & selection criteria.(Introductory). **Note** : Question/s to select/justify codes, materials, power source, etc. of given data (application type) of 5-6 marks out of total 70.	6
2	**FABRICATION DRAWING INTERPRETATION.** 2.1 Welding symbols & their different standards. (Including BIS/ASME etc.) 2.2 Piping symbol & their different standards (including BIS/ASME etc.) 2.3 Structural drawing- features & interpretation. 2.4 Process equipment drawings-features & interpretation.	4
3	**ADVANCE WELDING AND CUTTING PROCESSES.** 3.1 Advance Welding processes-types, definitions, working, principle, variables/parameters, power source, tools, equipments, consumables, applications and selection criteria. (This includes MMAW, SAW,MIG, FCAW, TIG, RESISTANCE, PLASMA, LASER, BEAM, ELECTRO BEAM, UNDER WATER, and other in trend.) 3.2 Cutting processes-types, working, features, applications and selection criteria. **Note** : Question/s to select/justify process/es and specify parameters etc. of given data (application type) of 10- 12 marks out of total 70.	

4	**EDGE PREPARATION.** 4.1 Edge preparation-need and advantages, types, methods & applications. 4.2 Types of welded joint, their applications. 4.3 Equipments/machines used for edge preparation, their working & features. 4.4 Set up, fit up and alignment of pressure vessels.	3
5	**INSPECTION, TESTING AND QUALITY CONTROL.** 5.1 Common weld defects, their causes and remedies; 5.2 Codes used in fabrication work (such as ASME, TEMA, BIS, etc.)-importance, use 5.3 Weld quality-concept, meaning, definition, importance and factors affecting it. 5.4 Modes of inspection of weld work. 5.5 Testing methods-types, features, standards, working, applications & selection criteria. 5.6 Quality control for fabrication work-need, importance, approach & advantages. 5.7 Third party inspection- concept, need, and agencies. **Note** : Question/s to select/justify testing method for given requirements (application type) of 5-6 marks out of total 70.	8
6	**WELDING METALLURGY.** 6.1 Welding Metallurgy & its analysis. 6.2 Preheating-need, method, application. 6.3 Post heating-need, method, application. 6.4 Post weld heat treatment-need, methods, applications, and selection criteria. 6.5 Welding heat flow diagram-concept, importance, applications. 6.6 Thermal distortion-concept, meaning, definition, causes,effect and types. 6.7 Methods and equipments used to control thermal distortion. 6.8 Methods of relieving thermal stresses. **Note** : Question/s to select/justify method of give data (application type) of 5-6 marks out of total 70.	7
7	**SURFACE FINISHING AND COATING.** 7.1 Surface finishing on weld part-need, importance, methods & procedure. 7.2 Surface coating-need, benefits, methods and procedures.	4
8	**WELDING SAFETY.** 8.1 Need 8.2 Precautions and measures. 8.3 Safety norms for welding applications.	2
	Total	42

Notes:

A. FOR STUDENTS.

a. It is advised that student download this copy of syllabus and plan to achieve the objectives of learning this subject.

B. FOR PAPER SETTER/MODERATOR.

a. Refer GTU syllabus and do not take reference of previous TEB question papers.
b. Ask the questions from each topic having marks weightage proportionate to hours allotted to that topic.
c. Optional questions must be asked from the same topic. That is weightage of compulsory attendance part of questions will be equal to proportionate to hours allotted to each topic.
d. Marks ratio of knowledge: comprehension: application types questions must be 30:30:40.
e. Submit solution / answer keys along with distribution of marks in each question for the paper being submitted.

Reference Books:

1. Basic Welding and fabrication	W.Kenoyen Pitman
2. Welding and Welding Technology	Richared L. Littlo Mc. Grawffiee Book Co.
3. Modern Welding Technology	Howard B Cary Prentic Hall Inc.
4. Welding Processes & Procedures	Learl love ---do---
5. Modern welding	Althouse Trunquist The Good Heart Hillcox Co. Inc.
6. Arc Welding theory and Practice	Raymold J. Sacks Affiliated Cast West press Post Ltd., New Dehli

Additional Reference Books:

1. Metals hand Book Vol. 6	Welding & Brazing American Society for Metals
2. Metal cutting science & Production Technology	K.C.Jain & L. N. Agrawal Khanna Publi.Dehli
3. Repairs of Industrial Equipment	G.Pechlias MIR Publishers

GUJARAT TECHNOLOGICAL UNIVERSITY

DIPLOMA IN MECHANICAL ENGINEERING

SEMESTER- VI

Subject Name: **Fabrication Technology Practice (Elective Practice-I)**
Subject Code: **2361916**

NOTE:- Following are the minimum experiences required, but the college can do more experiences if possible.

LABORATORY EXPERIENCES :

Experience Type	Experience Number	Description of Laboratory Experience	Hrs.
Preparatory	01	1. Appreciate main objectives of learning this subject: a. Read and interpret given fabrication drawing. b. Develop the skill to prepare simple weld joints. c. Familiarize with various welding codes and standards. 2. Recall and strengthen know-how for orthographic projections , various drafting/welding symbols and fundamentals of metallurgy.	2
Demonstration and study	02	Interpretation of various industrial fabrication drawings having welding symbols and standards(including BIS/ASME etc.). Drawings of piping, structure and process equipments be taken.	2
	03	Welding equipments and consumables.	2
	04	Weld defects- types, causes and remedies.	2
	05	Preparation of three complex jobs, each one of arc, gas & spot welding. This includes followings. (a) Selection of process & process parameters. (b) Selection of consumables. (c) Edge preparation if applicable. (d) Process. (e) Post process treatments. (f) Inspection and testing.	14
Reports	06	Prepare a report on any one given advance welding technique. Specifically include working principle, specifications of equipments used and applications with process parameters. Separate topic will be assigned to each student by teacher.	2

Industrial visit	07	Visit at least two related industries.	-
Download and seminar presentation, (Copy downloaded content and seminar of whole batch In one /one set of CD/DVD)	08	a) Prepare and present seminar individually in your batch. (Seminar topic has to be given by teacher). b) Download individually visual aids, movies, content and other related content for the given case/situation. (Case/situation has to be given by teacher)Present and discuss the same in your batch.	4
Assignments (Home Assignment)	09	Solve the given tutorials and assignments. One assignment must be on preparation of chart / diagram / poster / graph / drawing / etc on half imperial size of drawing sheet.(For subject FAB.TECH.).	-
		Total	**28**

Notes:

A. FOR STUDENTS.

a. It is advised that student download this copy of syllabus and plan to achieve the objectives of learning this subject.
b. Attach copy of syllabus as part of term work.

B. FOR STUDENTS AND SUBJECT TEACHER/S.

a. Term work report content of each experience should also include following.
    i. Experience description / data and objectives.
    ii. Skill/s which is / are expected to be developed in student after completion of experience.
    iii. Steps / procedure to execute experience.
b. Term work report of student of regular mode should exclude Distance Learning manual, photocopies, printed content(except visual aids), etc. Focus should be on developing the term work as original efforts of students.
c. Term work content of industrial visit report should also include following.
    i. Brief details of industry visited.
    ii. Type ,location, products, rough layout, human resource, etc of industry.
    iii. Details, description and broad specifications of machineries/ processes observed.
    iv. Safety norms and precautions observed.
    v. Student's own observation on Industrial environment, productivity concepts, quality consciousness and quality standards, cost effectiveness ,culture and attitude.

vi. Any other details / observations asked by accompanying faculty.

d. Term work should also include experience logbook duly certified by subject teachers.
e. Term work is to be defended (along with term work) with practical examination by external and internal examiners .Practical examination will include followings:
    i. Viva.
    ii. Interpretation of given fabrication drawing.
    iii. Preparing given job.

Reference Books:

1. Basic Welding and fabrication	W.Kenoyen Pitman
2. Welding and Welding Technology	Richared L. Littlo Mc. Grawffiee Book Co.
3. Modern Welding Technology	Howard B Cary Prentic Hall Inc.
4. Welding Processes & Procedures	Learl love ---do---
5. Modern welding	Althouse Trunquist The Good Heart Hillcox Co. Inc.
6. Arc Welding theory and Practice	Raymold J. Sacks Affiliated Cast West press Post Ltd., New Dehli

Additional Reference Books:

1. Metals hand Book Vol. 6	Welding & Brazing American Society for Metals
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3. Repairs of Industrial Equipment	G.Pechlias MIR Publishers

GUJARAT TECHNOLOGICAL UNIVERSITY

DIPLOMA IN MECHANICAL ENGINEERING

SEMESTER- VI

Subject Name: **Automobile Engineering (Elective –I)**
Subject Code: **2361929**

Sr. No.	Subject Content	Hrs.
1	**INTRODUCTION.** 1.1 Know the objectives of learning this subject. 1.2 Need, Scope & importance of Automobile Engineering (AE) in industries. 1.3 Need of attitude, knowledge & skill required for application of AE. 1.4 Automobile-definition, classification, parts, description/ specification, performance parameters , Indian and international manufacturers. 1.5 Vehicle –types of bodies, important dimensions and specification parameters.(including earth moving machineries.) 1.6 Chassis- components and their function, classification.	3
2	**ENGINE SYSTEMS.** 2.1 Internal combustion engines-types and classification used in automobile, thermodynamic cycles used, main parts/elements , fuel used and general arrangement sketch for each, performance parameters , applications and selection criteria. 2.2 Fuels-types, properties and applications. 2.3 Need and working of various types of LPG/CNG kits. 2.4 Air, fuel and exhaust gases circuits and working for petrol and diesel engines. 2.5 Carburetor-functions, types, sketch, elements , working, essential features, specifications, limitations and applications. 2.6 Petrol injection -functions, types, sketch, elements, working, comparison with carbureted fuel supply, merits, limitations and applications. 2.7 Fuel injection system for CI engines-functions, types, sketch, elements, working and applications. 2.8 Fuel injection systems for LPG and CNG-functions, types, sketch and working. 2.9 Fuel injection pump and fuel injector-functions, types , specifications and applications. 2.10 Engine lubricants-types, standards/designations, properties and applications. 2.11 Lubrication-main parts of engine required lubrication, types, sketch, working and applications. 2.12 Engine cooling system-need, types, sketch, elements , working and performance parameters.	12

	2.13 Supercharging and turbo charging- concept , need and applications. **Note** : Application type (selection of spares/consumables/ etc) question/s of 6-8 marks out of 70.	
3	**TRANSMISSION AND SUSPENSION SYSTEMS.** 3.1 Introduction and requirement of transmission system. 3.2 Transmission system-types(electrical & electromagnetic, hydraulic and mechanical) and sub types, general arrangement, elements and working. 3.3 Main units (clutch, transmission, drive line and driving axle),their sub units, functions and essential features. 3.4 Clutch- principle of operation, types, sketch/arrangement , working and applications. 3.5 Gear box- important terminology in context of automobile engineering (including first/second/third/reverse/neutral gear), types and sub types, sketch/arrangement, working and applications. 3.6 Drive line – types (including propeller shaft, universal joint, sprockets, chains),sketch/arrangement, elements, working and applications. 3.7 Driving axle- types (including final, differential, half shaft, etc), sub types, constructional sketch/arrangement, elements, working and applications. 3.8 Rear axle-functions, types and working. 3.9 Suspension –introduction, functions and requirements, elements - their types and working. 3.10 Suspension system- types, components, sketch/ arrangement , working and applications. 3.11 Wheels- essential requirements , types and applications. 3.12 Need and methods of wheel balancing. 3.13 Tyres- essential requirements , types and applications. **Note** : Application type (selection of spares/consumables/ etc) question/s of 4-6 marks out of 70.	10
4	**CONTROL SYSTEMS.** 4.1 Steering system- purpose, functions, general arrangement, basic parts and working. 4.2 Steering gears- types, sketch/arrangement, working and applications. 4.3 Power steering- types, sketch/arrangement, elements , working and applications. 4.4 Front and rear axle- functions, types and working, stub axle-functions their shapes and working. 4.5 Braking system- functions, requirements, classification and types- sketch/arrangement, elements, working and applications. **Note** : Application type (selection of spares/consumables/ etc) question/s of 3-5 marks out of 70.	6

5	**ELECTRICAL SYSTEMS.** 5.1 Major systems (starting, charging, ignition and lighting), their subcomponents and functions. 5.2 Common troubles and their remedies for electrical systems.	2
6	**REPAIRS AND MAINTENANCE.** 6.1 Preventive maintenance steps for various automobiles. 6.2 Requirements for running automobiles (like changing lubricants, engine tuning, noise level, regular checking of brake shoes and other parts, regular checking of various alignments, cleaning and adjustment, etc .) 6.3 Fault tracing methods and tools/equipments/ devices/ instruments used for fault tracing. 6.4 Common troubles, their causes and remedies. 6.5 Tools/equipments/devices used for carrying out preventive/breakdown maintenance and their applications. 6.6 Standard operative conditions for test. **Note** : Application type (identifying troubles and suggesting remedies) question/s of 4-6 marks out of 70.	6
7	**STANDARDS AND CERTIFICATIONS.** 7.1 Various emission standards and parameters for Pollution Under Control (PUC) certification. 7.2 Various tests and certificates requirements for on-road condition. 7.3 Insurance-need, types, various agencies and documents required. 7.4 Valuation-need and considerations.	3
	Total	42

Notes:

A. FOR STUDENTS.

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B. FOR PAPER SETTER/MODERATOR.

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b. Ask the questions from each topic having marks weightage proportionate to hours allotted to that topic.
c. Optional questions must be asked from the same topic. That is weightage of compulsory attendance part of questions will be equal to proportionate to hours allotted to each topic.

d. Marks ratio of knowledge: comprehension: application types questions must be 40:30:30.
e. Submit solution / answer keys along with distribution of marks in each question for the paper being submitted.

Reference Books:

1. Automobile Engineering — R.K.Rajput (Laxmi Publications)
2. Automobile Engineering — KIRPAL SINGH

GUJARAT TECHNOLOGICAL UNIVERSITY

DIPLOMA IN MECHANICAL ENGINEERING

SEMESTER- VI

Subject Name: **Automobile Engineering Practice (Elective Practice –I)**
Subject Code: **2361930**

NOTE:- Following are the minimum experiences required, but the college can do more experiences if possible.

LABORATORY EXPERIENCES :			
Experience Type	**Experience Number**	**Description of Laboratory Experience**	**Hrs.**
Preparatory	01	1.Appreciate main objectives of learning this subject: a. Read/interpret given automotive arrangement drawings. b. Dismantle , assembly and align/ balance various automotive arrangements. c. Identify and rectify simple and common troubles. 2.Strengthen know how for fundamental theory of machines and thermal engineering concepts.	2
Study and demonstration	02	Various automotive systems.	4
Performance	03	Performance tests (including SFC and BHP) for petrol and diesel engines.	4
	04	Performance tests (including SFC and BHP) for gas based engine.	2
	05	Dismantling, assembly and alignment of engine, transmission , control and steering systems of any one vehicle.	6
	06	Preventive maintenance of two wheeler.	2
	07	Wheel balancing.	2
Industrial Visit	08	1. Visit at least one automotive manufacturer. 2. Visit at least one service centre.	-
Download, seminar presentation, (Copy downloaded content and seminar of whole batch In one /one set of	09	a) Prepare and present seminar individually in your batch. (Seminar topic has to be given by teacher). b) Download individually visual aids, movies, content and other related content for the given case/situation. (Case/situation has to be given by teacher)Present and discuss the same in your batch. c) Each student should prepare and present one real case which focus on troubles and remedies.	6

CD/DVD)			
Assignments (Home Assignment)	10	Solve the given tutorials and assignments. One assignment must be on preparation of chart / diagram / poster / graph / drawing / etc on half imperial size of drawing sheet.(For subject AIE).	-

Notes:

A. FOR STUDENTS.

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B. FOR STUDENTS AND SUBJECT TEACHER/S.

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    i. Experience description / data and objectives.
    ii. Skill/s which is / are expected to be developed in student after completion of experience.
    iii. Steps / procedure to execute experience.
b. Term work report of student of regular mode should exclude Distance Learning manual, photocopies, printed content(except visual aids), etc. Focus should be on developing the termwork as original efforts of students.
c. Term work content of industrial visit report should also include following.
    i. Brief details of industry visited.
    ii. Type ,location, products, rough layout, human resource, etc of industry.
    iii. Details, description and broad specifications of machineries/ processes observed.
    iv. Safety norms and precautions observed.
    v. Student's own observation on Industrial environment, productivity concepts, quality consciousness and quality standards, cost effectiveness ,culture and attitude.
    vi. Any other details / observations asked by accompanying faculty.
d. Term work should also include experience logbook duly certified by subject teachers.
e. Term work is to be defended (along with term work) with practical examination by external and internal examiners .Practical examination will include followings:
    i. Viva
    ii. Interpret/read given simple automotive system.
    iii. Dismantle/assemble/align given automotive case.

Reference Books:

1. Automobile Engineering — R.K.Rajput (Laxmi Publications)
2. Automobile Engineering — KIRPAL SINGH

GUJARAT TECHNOLOGICAL UNIVERSITY

DIPLOMA IN MECHANICAL ENGINEERING

SEMESTER- VI

Subject Name: **Power Plant Engineering. (Elective-II)**
Subject Code: **2361919**

Sr. No.	Subject Content	Hrs.
1	**INTRODUCTION TO POWER PLANT ENGINEERING (PPE).** 1.1 Know the objectives of learning this subject. 1.2 Need, Scope & importance of PPE in industries. 1.3 Need of attitude, knowledge & skill required for application of PPE. 1.4 Sources of energy. 1.5 Power plants-concept, types and energy conversion in each type. 1.6 Central and captive power plants. 1.7 National grid. 1.8 Basic elements of various power plants (Steam power plant,diesel engine power plant, Gas turbine power plant.) 1.9 Technical data of basic elements of different power plants and over all specifications of power plant.	2
2	**STEAM POWER PLANT CYCLES.** 2.1 Parameters of power cycles and their importance(such as thermal efficiency, work ratio, mean effective pressure,specific steam consumption). 2.2 Carnot cycle for gas and vapour as working fluid. 2.3 Simple Rankine cycle. 2.4 Methods of improving Rankine cycle efficiency. 2.5 Reheat cycle and Regenerative cycle. **Note** : Problem questions (application type) of 4-6 marks out of 70.	4
3	**STEAM GENERATING UNIT.** 3.1 Schematic diagram of modern thermal power plant. 3.2 Various circuits of modern thermal power plant. 3.3 High pressure boilers such as Lamount boiler, Benson boiler, Loeffler boiler, Schmidt	4

	Hartman boiler. 3.4 Super heaters, air pre heaters. 3.5 Boiler furnaces. 3.6 Pulverized fuel system. 3.7 Different types of draft system in boilers. 3.8 Parameters related to power plant performance.	
4	**STEAM PRIMEMOVERS.** 4.1 Concept of prime mover and steam turbine. 4.2 Governing of steam turbine. 4.3 Starting and stopping procedure of steam turbine. 4.4 Performance of steam turbine. **Note** : Problem questions (application type) of 3-5 marks out of 70.	3
5	**STEAM CONDENSERS AND COOLING TOWERS.** 5.1 Working principle of surface condenser. 5.2 Parameters for condenser performance. 5.3 Purpose and working of cooling towers. **Note** : Problem questions (application type) of 3-5 marks out of 70.	3
6	**STEAM POWER STATION CONTROLS.** 6.1 Effect of load variation in steam plant. 6.2 Area control system and Centralized control system. 6.3 Basic elements & requirement of control system. 6.4 Compressed air control system and electrical control system. 6.5 Various control parameters and instruments used in modern station control room. 6.6 Feed water control system in modern power station. 6.7 Steam temperature control. 6.8 Purpose of various records maintained in steam power plant. **Note** : Question/s (application type) of 4-6 marks out of 70.	4
7	**DIESEL ENGINE POWER PLANT.** 7.1 Application of I.C. engine. 7.2 Advantages and disadvantages of diesel engine as a prime mover. 7.3 Essential elements of diesel power plant and their function. 7.4 Explanation of various systems of diesel power plant.	4

8	**GAS TURBINE POWER PLANT.** 8.1 Concept of Brayton cycle. 8.2 Advantages of gas turbine over diesel engine as prime mover. 8.3 Methods of improving performance of gas turbine plant. 8.4 Important components of gas turbine power plant and their functions. 8.5 Essential auxiliaries of gas turbine power plant. 8.6 Governing system. 8.7 Fuel supply system of gas turbine plant. **Note** : Question/s (application type) of 4-6 marks out of 70.	4
9	**NUCLEAR POWER PLANT.** 9.1 Basic nuclear physics fundamentals. 9.2 Nuclear fuels. 9.3 Basic elements of a nuclear reactor. 9.4 Classification of nuclear reactor. 9.5 Schematic diagrams and working and comparison of pressurized water reactor, Boiling water reactor, CANDU type reactor. 9.6 Criteria for location of nuclear power plant. 9.7 Comparison of nuclear plant with steam power plant. 9.8 Units of radiation. 9.9 Safe dose of radiation recommended by physicists. 9.10 Effect of radiation. 9.11 Disposal of nuclear waste. 9.12 Technical details of nuclear power plants in India. **Note** : Question/s (application type) of 4-6 marks out of 70.	8
10	**HYDEL POWER PLANT.** 10.1 Purpose of multi-purpose hydro project. 10.2 Advantages and disadvantages of hydro power station considering the economic factor. 10.3 Basic elements of hydro power plant. 10.4 Classification of Hydro-electric power plant. 10.5 Water turbine used in Hydro power plant. 10.6 Factors for selecting hydraulic turbines. 10.7 Auxiliaries attached with Hydro-power plant. 10.8 Governing of water turbine. 10.9 Stages of starting and stopping of turbine of hydro-electric power station.	3

11	**POWER PLANT ECONOMICS.** 11.1 Cost of power. 11.2 Economics of power generation and distribution. 11.3 Economics in plant selection.	3
	Total	42

Notes:

A. FOR STUDENTS.

a. It is advised that student download this copy of syllabus and plan to achieve the objectives of learning this subject.

B. FOR PAPER SETTER/MODERATOR.

a. Refer GTU syllabus and do not take reference of previous TEB question papers.
b. Ask the questions from each topic having marks weightage proportionate to hours allotted to that topic.
c. Optional questions must be asked from the same topic. That is weightage of compulsory attendance part of questions will be equal to proportionate to hours allotted to each topic.
d. Marks ratio of knowledge: comprehension: application types questions must be 30:30:40 respectively.
e. Submit solution / answer keys along with distribution of marks in each question for the paper being submitted.

Reference Books:

1	A course in power plant engineering	S.C.Arora ,S.Domkundwar Dhanpatrai & sons, N. Delhi.
2	Power plant engineering	H.B.Keswani STD Book House Delhi
3	Power plant engineering	P.C.Sharma.
4	Power plant engineering	Mahesh Verma Metro Book ,New Delhi
5	Power plant engineering	M.M.Wakil Mc Graw Hill Publication
6	Course material in power plant engineering	(D.L.Mode)-LRDC Gujarat.

Additional Reference Books:

1.	Power plant engineering	F.T.Morse Attiliated East West press,New Delhi.
2	Power plant Technology	G.D.Rai --
3	Nuclear Power plant	Lofftness D.Van Nostrand,Co.Inc N. York.

GUJARAT TECHNOLOGICAL UNIVERSITY

DIPLOMA IN MECHANICAL ENGINEERING

SEMESTER- VI

Subject Name: **Power Plant Engineering Practice (Elective Practice -II)**
Subject Code: **2361920**

NOTE:- Following are the minimum experiences required, but the college can do more experiences if possible.

LABORATORY EXPERIENCES :			
Experience Type	**Experience Number**	**Description of Laboratory Experience**	**Hrs.**
Preparatory	1	1. Appreciate main objectives of learning this subject: a. Strengthen the fundamentals of thermodynamics. b. Develop the ability to analyze the performance of power plant equipment for optimizing their efficiency. c. Understand governing control systems, waste control , economic operation ,pollution control and safety norms for all power plants. 2. Recall and strengthen know-how for thermodynamic units and cycles.	2
Study , demonstration(use of models, cut sections or movies may be used) and presentation. (Each experience may be assigned to two students and they may be asked to prepare and present (Power point) to batch.	2	High pressure boilers.	2
	3	Various furnaces in power plants.	2
	4	Basic elements of various power plants.	2
	5	Coal and ash handling system of modern thermal power station.	2
	6	Governing systems of steam turbine.	2
	7	Control systems of steam power plant.	2
	8	Diesel power plant.	2
	9	Gas-turbine power plant.	2
	10	Nuclear reactors.	2
	11	Nuclear power plant.	2
	12	Hydro - power plant.	2
Download, seminar presentation, (Copy downloaded content and	13	a) Prepare and present seminar individually in your batch. (Seminar topic has to be given by teacher). b) Download individually visual aids, movies, content and other related content for the given case/situation. (Case/situation has to be given by teacher-preferably from emerging/ recent trends).Present and discuss	4

seminar of whole batch In one /one set of CD/DVD)		the same in your batch.	
Industrial visits	14	Visit at least three related power plants. Visit to power plants in Gujarat can be arranged at the following power plants. i. Dhuvaran thermal/gas turbine power plant. ii. Torrent , Sabarmati power plant. iii. Gas turbine power plant Torrent, Vatva. iv. Ukai Hydro/thermal power plant. v. Kakrapar Nuclear power project. vi. Tarapur atomic power plant Boisar. vii. Bhabha atomic research centre Trombay. Visit to outside Gujarat power station or research centre can be done with prior permission of DTE if opportunity is given.	-
Assignments (Home Assignment)	15	Solve the given tutorials and assignments. One assignment must be on preparation of chart / diagram / poster / graph / drawing / etc on half imperial size of drawing sheet.(For subject PPE).	-
		Total	28

Notes:

A. FOR STUDENTS.

a. It is advised that student download this copy of syllabus and plan to achieve the objectives of learning this subject.
b. Attach copy of syllabus as part of term work.

B. FOR STUDENTS AND SUBJECT TEACHER/S.

a. Term work report content of each experience should also include following.
    i. Experience description / data and objectives.
    ii. Skill/s which is / are expected to be developed in student after completion of experience.
    iii. Steps / procedure to execute experience.
b. Term work report of student of regular mode should exclude Distance Learning manual, photocopies, printed content(except visual aids), etc. Focus should be on developing the term work as original efforts of students.
c. Term work content of industrial visit report should also include following.
    i. Brief details of industry visited.
    ii. Type ,location, products, rough layout, human resource, etc of industry.

iii. Details, description and broad specifications of machineries/ processes observed.
iv. Safety norms and precautions observed.
v. Student's own observation on Industrial environment, productivity concepts, quality consciousness and quality standards, cost effectiveness ,culture and attitude.
vi. Any other details / observations asked by accompanying faculty.

d. Term work should also include experience logbook duly certified by subject teachers.
e. Term work is to be defended (along with term work) with practical examination by external and internal examiners .Practical examination will include followings:
   i. Viva
   ii. Solving given tutorial.
   iii. Explaining working of specified power plant.
   .

Reference Books:

1	A course in power plant engineering	S.C.Arora ,S.Domkundwar Dhanpatrai & sons, N. Delhi.
2	Power plant engineering	H.B.Keswani STD Book House Delhi
3	Power plant engineering	P.C.Sharma.
4	Power plant engineering	Mahesh Verma Metro Book ,New Delhi
5	Power plant engineering	M.M.Wakil Mc Graw Hill Publication
6	Course material in power plant engineering	(D.L.Mode)-LRDC Gujarat.

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1.	Power plant engineering	F.T.Morse Attiliated East West press,New Delhi.
2	Power plant Technology	G.D.Rai --
3	Nuclear Power plant	Lofftness D.Van Nostrand,Co.Inc N. York.

GUJARAT TECHNOLOGICAL UNIVERSITY

DIPLOMA IN MECHANICAL ENGINEERING

SEMESTER- VI

Subject Name: **Mechatronics (Elective-II)**
Subject Code: 2**361921**

Sr. No.	Subject Content	Hrs.
1	**INTRODUCTION.** 1.1 Know the objectives of learning this subject. 1.2 Need, scope & importance of Mechatronics in industries. 1.3 Need of attitude, knowledge & skill required for application of Mechatronics. 1.4 Systems, measurement systems and control systems. 1.5 Basic elements of close loop control systems. 1.6 Sequential and microprocessor based controllers, automatic camera-block diagram, working and applications.	3
2	**BASIC ELECTRONICS.** 2.1 Fundamentals of electrical quantities-voltage, current , resistance, work , power, direct current (dc) and alternating current (ac). 2.2 Passive components used in electronics-resistor, capacitor, and inductor, combination of these. 2.3 Transformers-types, working and applications. 2.4 Semiconductors-intrinsic and extrinsic. 2.5 Diodes-types, working and applications. 2.6 Rectifiers- types, working and applications. 2.7 Transistors- types, working and applications. 2.8 Integrated circuits-concept and basic structure. 2.9 Number systems, logic gates, Boolean algebra and De Morgan laws. **Note** : Question/s (application type-selection of components, designing logic gate circuit, etc.) of 4-6 marks out of 70.	6
3	**SENSORS AND TRANSDUCERS.** 3.1 Performance terminology. 3.2 Static and dynamic characteristics. 3.3 Types , construction, working and applications of : - Displacement , position and proximity sensors. - Velocity and motion. - Force.	8

	- Fluid pressure. - Liquid flow and liquid level. - Temperature. - Light. 3.4 Selection criteria of sensors. 3.5 Digital to Analog Conversion (DAC) and Analog to Digital Conversion (ADC)- circuit, working and applications. **Note** : Question/s (application type-selection and justification of sensors, etc.) of 4-6 marks out of 70.	
4	**MECHANICAL ACTUATION SYSTEMS.** 4.1 Basics of mechanical actuation systems: types of motion, kinematic chains, cams, gear trains, ratchet and pawl, belt and chain drives, bearings fundamentals, arrangements/ working, applications. 4.2 Pneumatic and hydraulic actuation systems: fundamentals; sketch and working of directional control valves, pressure control valves, cylinders and process control valves , rotary actuators; working / arrangements and applications. **Note** : Question/s (application type-selection and justification of ele. actuation systems) of 4-6 marks out of 70.	6
5	**ELECTRICAL ACTUATION SYSTEMS.** 5.1 Electrical systems for actuators. 5.2 Mechanical switches and relays –types, functions and applications. 5.3 Solid state switches-types, working and applications. 5.4 Solenoids – concept and applications. 5.5 Basic principle, types, constructional features, operational (input/output) parameters, selection criteria and applications of : - DC motors. - AC motors. - Stepper motors. - Servo motors. **Note** : Question/s (application type-selection and justification of ele. actuation systems) of 4-6 marks out of 70.	8
6	**INTERFACINGS.** 6.1 Interfacings-concept and need. 6.2 Interface requirements. 6.3 Microprocessor-general block diagram , elements, working, selection and examples of	6

	applications. 6.4 Microcontroller-general block diagram, elements, working, types/examples/ versions/ families and their features,selection and examples of applications. 6.5 Programmable Logic Controller (PLC)-basic structure, elements , working, input/output processing and programming, logic functions, selection and examples of applications. 6.6 Serial and parallel interface.	
7	**MECHATRONIC SYSTEMS.** 7.1 Traditional and mechatronic system design. 7.2 Simple mechatronic design-timed switch , windscreen , bathroom scales. 7.3 Develop at least two simple mechatronic system for given set of input and output conditions. **Note** : Question/s (application type-design of simple mechatronic systems) of 8-10 marks out of 70.	5
	Total	42

Notes:

A. FOR STUDENTS.

a. It is advised that student download this copy of syllabus and plan to achieve the objectives of learning this subject.

B. FOR PAPER SETTER/MODERATOR.

a. Refer GTU syllabus and do not take reference of previous TEB question papers.
b. Ask the questions from each topic having marks weightage proportionate to hours allotted to that topic.
c. Optional questions must be asked from the same topic. That is weightage of compulsory attendance part of questions will be equal to proportionate to hours allotted to each topic.
d. Marks ratio of knowledge: comprehension: application types questions must be 30:30:40 respectively.
e. Submit solution / answer keys along with distribution of marks in each question for the paper being submitted.

Reference Books:

1. Mechatronics HMT(TMGH).
2. Mechatronics W.Bolton(Pearson Education).

GUJARAT TECHNOLOGICAL UNIVERSITY

DIPLOMA IN MECHANICAL ENGINEERING

SEMESTER- VI

Subject Name: **Mechatronics Practice (Elective Practice -II)**
Subject Code: **2361922**

NOTE:- Following are the minimum experiences required, but the college can do more experiences if possible.

LABORATORY EXPERIENCES :			
Experience Type	**Experience Number**	**Description of Laboratory Experience**	**Hrs.**
Preparatory	01	1. Appreciate main objectives of learning this subject: a. Develop the ability to interpret / read simple digital circuits / Printed Circuit Boards (PCBs). b. Identify situations where Mechatronics can be applied for automation. c. Select components and develop the logic & arrangement for simple mechatronic systems. 2. Strengthen know how for basic electrical and electronics engineering , theory of machine and machine design concepts.	2
Study and demonstration	02	Elements of mechanical, pneumatic and hydraulic actuation systems.	6
	03	Elements of electrical actuation systems.	
	04	Working of all types of sensors, electronics components & devices.	
	05	Three working mechatronic systems.	
Performance	06	Prepare the logic gate base digital circuit on given input conditions and confirm the desired output.	2
	07	Perform and correlate input and output for Analog to Digital Conversion (ADC) and Digital to Analog Conversion (DAC).	2
	08	Input required parameters and confirm the desired output-with microprocessor, micro controller and programmable logic controller (PLC).	4
	09	Design , prepare and test four simple mechatronic system for given set of conditions/parameters/requirements in a batch.	8
Download and seminar	10	a) Prepare and present seminar individually in your batch. (Seminar topic has to be given by teacher).	4

presentation, (Copy downloaded content and seminar of whole batch In one /one set of CD/DVD)		b) Download individually visual aids, movies, content and other related content for the given case/situation. (Case/situation has to be given by teacher)Present and discuss the same in your batch.	
Industrial visit	11	Visit at least two related industries.	-
Assignments (Home Assignment)	12	Solve the given tutorials and assignments. One assignment must be on preparation of chart / diagram / poster / graph / drawing / etc on half imperial size of drawing sheet.(For subject Mechatronics).	-
		Total	28

Notes:

A. FOR STUDENTS.

a. It is advised that student download this copy of syllabus and plan to achieve the objectives of learning this subject.
b. Attach copy of syllabus as part of term work.

B. FOR STUDENTS AND SUBJECT TEACHER/S.

a. Term work report content of each experience should also include following.
    i. Experience description / data and objectives.
    ii. Skill/s which is / are expected to be developed in student after completion of experience.
    iii. Steps / procedure to execute experience.
b. Term work report of student of regular mode should exclude Distance Learning manual, photocopies, printed content(except visual aids), etc. Focus should be on developing the termwork as original efforts of students.
c. Term work content of industrial visit report should also include following.
    i. Brief details of industry visited.
    ii. Type ,location, products, rough layout, human resource, etc of industry.
    iii. Details, description and broad specifications of machineries/ processes observed.
    iv. Safety norms and precautions observed.
    v. Student's own observation on Industrial environment, productivity concepts, quality consciousness and quality standards, cost effectiveness ,culture and attitude.
    vi. Any other details / observations asked by accompanying faculty.
d. Term work should also include experience logbook duly certified by subject teachers.

e. Term work is to be defended (along with term work) with practical examination by external and internal examiners .Practical examination will include followings:
    i. Viva
    ii. Interpret/read given simple PCB.
    iii. Design , prepare and test the simple mechatronic system for given set of conditions/parameters/requirements.
    iv. Perform any one experience from experience number 6 and 7.

Reference Books:

1.	Mechatronics	HMT(TMGH).
2.	Mechatronics	W.Bolton(Pearson Education).

GUJARAT TECHNOLOGICAL UNIVERSITY

DIPLOMA IN MECHANICAL ENGINEERING

SEMESTER- VI

Subject Name: **Advance Industrial Engineering. (Elective –II)**
Subject Code: **2361923**

Sr. No.	Subject Content	Hrs.
1	**PROCESS PLANNING.** 1.1 Know the objectives of learning this subject. 1.2 Need, Scope & importance of Advance Industrial Engineering (AIE) in industries. 1.3 Need of attitude, knowledge & skill required for application of AIE. 1.4 Process planning- introduction and concept. 1.2 Process planning organization. 1.3 Information required for process planning. 1.4 Process planning procedure. 1.5 Working drawing. 1.6 'Make or buy' decision and factors affecting it. 1.7 Process selection and factors affecting it. 1.8 Machine capacity & analysis of it. 1.9 Process and equipment selection procedure, process sheet description. 1.10 Selection of material, jigs, fixtures, tools, other special attachment, cutting tools, gauges, etc. 1.11 Process analysis. 1.12 Types of process planning-manual, automated and generative methods with their merits. 1.13 Information on various Computer Aided Process Planning (CAPP),packages available in market. **Note** : Question/s to prepare process planning of given component (application type) of 6-8 marks out of total 70.	7
2	**QUALITY CONTROL AND STATISTICAL QUALITY CONTROL (QC & SQC).** 2.1 Evaluation of quality definitions 2.2 Evaluation of quality concepts (Demings principles, Juran's message, Malcolm Baldridge Award, Shingo's zero defect, Philip B. Crosby's philosophy, Feigenbaum's total quality control, Ishikwawa's company-wide quality control) 2.3 Definitions of quality policy, quality management, quality systems, quality control, (QC) quality circle, quality assurance (QA), and	6

	SQC 2.4 Difference between quality & quality control. 2.5 Tools to achieve quality (QC, SQC, QA, TQC, TQM, Quality function deployment (QFD),quality system standards (ISO 9000, BS 14000). 2.6 Industrial applications (interpretation and analysis) of control charts (for variables and attributes). **Note** : Question/s to interpret and analyze of given control chart data (application type) of 6-8 marks out of total 70.	
3	**TOTAL QUALITY MANAGEMENT (TQM).** 3.1 TQM – introduction, philosophy concept, definition and principles. 3.2 TQM – importance with respect to employee leadership, customer satisfaction, quality, etc. 3.3 Methods to achieve. **Note:** Question/s to analyze given related short case (application type) of 4-6 marks out of total 70.	5
4	**TOTAL QUALITY CONTROL (TQC).** 4.1 TQC – evaluation of concept, results and benefits, challenges, method to built, applications. 4.2 QC versus TQC. 4.3 TQC versus TQM.	4
5	**QUALITY FUNCTION DEPLOYMENT (QFD).** 5.1 QFD – rational, concepts (system and house of quality), 5.2 QFD – methodology – building of planning and deployment matrix and development of process plans, control charts and operating instruction sheets. 5.3 Benefits of QFD. 5.4 Narrate various applications of QFD. **Note:** Question/s to build QFD matrix of given data (application type) of 4-6 marks out of total 70.	6
6	**ISO 9000.** 6.1 ISO 9000 – introduction, need, scope & field of applications, importance, features, terminology used. 6.2 Series of ISO 9000 standards 6.3 Steps in developing and implementation of ISO 9000. 6.4 Registration for ISO 9000, its validity, certifying bodies. 6.5 Advantages and implications of ISO 9000.	4

7	**JUST IN TIME (JIT) MANUFACTURING.** 7.1 JIT - Logic, concept, meaning, definitions & advantages. 7.2 JIT - Japanese practices 7.3 Basic elements of JIT. 7.4 Kanban systems in JIT. 7.5 Frame work for implementation of JIT. 7.6 Applications of JIT such as leveling, production, pull system introduction, product design, process design and bill of material implications, purchasing, etc. (in brief) 7.7 Impact of JIT. **Note** : Question/s to analyze given related short case (application type) of 4-6 marks out of total 70.	6
8	**REENGINEERING.** 8.1 Reengineering – nature, principles, process 8.2 Process redesign techniques and tools. 8.3 Reengineering and continuous improvement. 8.4 Integrated reengineering and process improvement.	4
	Total	42

Notes:

A. FOR STUDENTS.

a. It is advised that student download this copy of syllabus and plan to achieve the objectives of learning this subject.

B. FOR PAPER SETTER/MODERATOR.

a. Refer GTU syllabus and do not take reference of previous TEB question papers.
b. Ask the questions from each topic having marks weightage proportionate to hours allotted to that topic.
c. Optional questions must be asked from the same topic. That is weightage of compulsory attendance part of questions will be equal to proportionate to hours allotted to each topic.
d. Marks ratio of knowledge: comprehension: application types questions must be 30:30:40 respectively.
e. Submit solution / answer keys along with distribution of marks in each question for the paper being submitted.

Reference Books:

1	Industrial engineering and management	Dr. O. P. Khanna, Dhanapatrai & sons, Delhi.
2	TQM and ISO 14000	Dr. K.C.Arora, S.K. Kataria & Sons. (Topic 3)
3	ISO 9000 Path to TQM	R.Subburaj, Allied publuication (Topic 3)
4	Total quality management	Feigenbaum
5	Statistical quality control	E.L.Grant (McGH publication
6	Total quality control essentials	Servsingh soin (McGH Newyork)
7	Quality function deployment	Ronald G. Ray (TMH publishers 1996)
8	Production and operation management	Chase/Aquilano- (Irwin publisher

Additional Reference Books:

1	Statistical quality control	R. C. Gupta, Khanna publications 1993
2	Manufacturing planning & control systems	Thomas E. Wollmann, William L. Bery D. Clay Whybark, Galgotia publi. Pvt.Ltd., Delhi.
3	Just in time manufacturing	M G Korganker Makmilan India Ltd.
4	ISO 9000 family standards.	
5	Statistical quality control	A. Zaide (PHI Publisher)
6	Quality function deployment	A Kao Vogi (Productivity press Cambridge 1990)
7	Quality function deployment	Bossert J.I. (ASQC quality press, Wisconsin USA 1991)
8	JIT – Approach, Concepts & implementation	AICTE
9	Quality control using advance SQC techniques and modern machines for inspections	AICTE
10	Quality management	AICTE

GUJARAT TECHNOLOGICAL UNIVERSITY

DIPLOMA IN MECHANICAL ENGINEERING

SEMESTER- VI

Subject Name: **Advance Industrial Engineering Practice**
(Elective Practice –II)
Subject Code: **2361924**

NOTE:- Following are the minimum experiences required, but the college can do more experiences if possible.

LABORATORY EXPERIENCES :			
Experience Type	**Experience Number**	**Description of Laboratory Experience**	**Hrs.**
Preparatory	01	1. Appreciate main objectives of learning this subject: a. Develop the ability to prepare the process plan of given component. b. Interpret and analyse control charts. c. Appreciate the need to be quality conscious. 2. Recall and strengthen know-how for orthographic projections , various machining processes and various mathematical & statistical fundamentals.	2
Performance	02	Physically collect an assembly having 6-8 components , prepare orthographic drawings and prepare process planning of components .	6
	03	Interpretation and analysis of control charts (variables and attributes) for given industrial data.	6
	04	Quality Function Deployment-building of planning and deployment matrix for given data.	4
Reports	05	Prepare report based on visit/case study of ISO 9000 industry. Include requirements to get ISO-9000, various documentations , etc.	4
Download and seminar presentation, (Copy downloaded content and seminar of whole batch In one /one	06	a) Prepare and present seminar individually in your batch. (Seminar topic has to be given by teacher). b) Download individually visual aids, movies, content and other related content for the given case/situation. (Case/situation has to be given by teacher)Present and discuss the same in your batch. c) Each student should prepare and present one case which focus on improvement of productivity or utilization of resources or implementation of JIT/TQM/TQC/ISO-9000 .	6

set of CD/DVD)			
Assignments (Home Assignment)	07	Solve the given tutorials and assignments. One assignment must be on preparation of chart / diagram / poster / graph / drawing / etc on half imperial size of drawing sheet.(For subject AIE).	-
		Total	28

Notes:

A. FOR STUDENTS.

a. It is advised that student download this copy of syllabus and plan to achieve the objectives of learning this subject.
b. Attach copy of syllabus as part of term work.

B. FOR STUDENTS AND SUBJECT TEACHER/S.

a. Term work report content of each experience should also include following.
    i. Experience description / data and objectives.
    ii. Skill/s which is / are expected to be developed in student after completion of experience.
    iii. Steps / procedure to execute experience.
b. Term work report of student of regular mode should exclude Distance Learning manual, photocopies, printed content(except visual aids), etc. Focus should be on developing the termwork as original efforts of students.
c. Term work content of industrial visit report should also include following.
    i. Brief details of industry visited.
    ii. Type ,location, products, rough layout, human resource, etc of industry.
    iii. Details, description and broad specifications of machineries/ processes observed.
    iv. Safety norms and precautions observed.
    v. Student's own observation on Industrial environment, productivity concepts, quality consciousness and quality standards, cost effectiveness ,culture and attitude.
    vi. Any other details / observations asked by accompanying faculty.
d. Term work should also include experience logbook duly certified by subject teachers.
e. Term work is to be defended (along with term work) with practical examination by external and internal examiners .Practical examination will include followings:
    i. Viva
    ii. Preparing process plan for given component.
    iii. Interpretation of given control charts.
    iv. Solving /analysing given problems/cases.

Reference Books:

1	Industrial engineering and management	Dr. O. P. Khanna, Dhanapatrai & sons, Delhi.
2	TQM and ISO 14000	Dr. K.C.Arora, S.K. Kataria & Sons. (Topic 3)
3	ISO 9000 Path to TQM	R.Subburaj, Allied publuication (Topic 3)
4	Total quality management	Feigenbaum
5	Statistical quality control	E.L.Grant (McGH publication
6	Total quality control essentials	Servsingh soin (McGH Newyork)
7	Quality function deployment	Ronald G. Ray (TMH publishers 1996)
8	Production and operation management	Chase/Aquilano- (Irwin publisher

Additional Reference Books:

1	Statistical quality control	R. C. Gupta, Khanna publications 1993
2	Manufacturing planning & control systems	Thomas E. Wollmann, William L. Bery D. Clay Whybark, Galgotia publi. Pvt.Ltd., Delhi.
3	Just in time manufacturing	M G Korganker Makmilan India Ltd.
4	ISO 9000 family standards.	
5	Statistical quality control	A. Zaide (PHI Publisher)
6	Quality function deployment	A Kao Vogi (Productivity press Cambridge 1990)
7	Quality function deployment	Bossert J.I. (ASQC quality press, Wisconsin USA 1991)
8	JIT – Approach, Concepts & implementation	AICTE
9	Quality control using advance SQC techniques and modern machines for inspections	AICTE
10	Quality management	AICTE

GUJARAT TECHNOLOGICAL UNIVERSITY

DIPLOMA IN MECHANICAL ENGINEERING

SEMESTER- VI

Subject Name: **Operations Management (Elective-II)**
Subject Code: **2361925**

Sr. No.	Subject Content	Hrs.
1	**INTRODUCTION TO OPERATIONS MANAGEMENT (OM).** 1.1 Know the objectives of learning this subject. 1.2 Need, Scope & importance of OM in industries. 1.3 Need of attitude, knowledge & skill required for application of OM. 1.4 Operations management : concept, meaning, definition, overview, scope and importance 1.5 Optimization: concept, meaning, definition, need and scope.	2
2	**LINEAR PROGRAMMING.** 2.1 Introduction, importance, application. 2.2 Various terms, and their meaning. 2.3 Canonical form of LPP. 2.4 Mathematical formulation of the problem. 2.5 Graphical solution. 2.6 Slack & surplus variable. 2.7 Simplex method, simplex method for requirement, approximation, equality, variable unrestricted in sign for maximization and minimization (for 2 variables and maximum 3 constrains). **Note** : Problem questions (analytical and graphical both-application type) of 10-12 marks out of 70.	9
3	**TRANSPORTATION TECHNIQUES.** 3.1 Introduction, importance, applications. 3.2 Transportation techniques: initial feasible solution, vocal's approximation method, stepping stone method, row column cost method, MODI method for balanced problem (for maximum 4 sources and 4 destinations). 3.3 Simple transshipment problems. **Note**: Problem questions (application type) of 6-8 marks out of 70.	7

4	**ASSIGNMENT TECHNIQUES.** 4.1 Introduction, importance and applications. 4.2 Technique for solution, Hungarian method, modified matrix.(for maximum activities) 4.3 Maximization problem. **Note**: Problem questions (application type) of 4-6 marks out of 70.	4
5	**REPLACEMENT THEORY AND SEQUENCING PROBLEMS.** 5.1 Introduction, importance and applications. 5.2 Various terms, their meanings & definitions, cost of "Keeping it on" and "replacing", examples. 5.3 Replacement by alternative equipment, 5.4 Sequencing problems: introduction, heuristic problem solving, sequencing problems, sequencing problems for n jobs and 2 machines & n jobs and 3 machines(n= no. of jobs should not be more than 4). **Note:** Problem questions (application type) of 4-6 marks out of 70.	6
6	**INVENTORY MANAGEMENT** 6.1 Introduction, need, applications. 6.2 Various terms, their meaning and definitions. 6.3 Inventory models, their derivations and examples. **Note**: Problem questions (application type) of 4-6 marks out of 70.	6
7	**SYNCHRONOUS MANUFACTURING.** 7.1 Concept, meaning, importance of synchronous manufacturing. 7.2 Hocky-stick phenomena. 7.3 Performance measurement-types, importance, applications (This includes financial, operational, productivity, efficiency, utility, etc.) 7.4 Unbalanced capacity-reasons, effects and strategies to balance. 7.5 Bottlenecking-reasons, effects and strategies to reduce. 7.6 Basic manufacturing building blocks. 7.7 Methods for control in synchronous manufacturing.	4
8	**WASTE MANAGEMENT AND COST CONTROL APPROACHES.** 8.1 Waste: types & reasons. 8.2 Reasons to eliminate waste. 8.3 Sources of waste & methods to minimize / eliminate waste in mechanical engineering industry, examples/ situations.	4

	8.4 Cost control: concept, need and significance. 8.5 Cost control methods : Approaches, examples/ situations suitable for mechanical engineering situation.	
	Total	42

Notes:

A. FOR STUDENTS.

a. It is advised that student download this copy of syllabus and plan to achieve the objectives of learning this subject.

B. FOR PAPER SETTER/MODERATOR.

a. Refer GTU syllabus and do not take reference of previous TEB question papers.
b. Ask the questions from each topic having marks weightage proportionate to hours allotted to that topic.
c. Optional questions must be asked from the same topic. That is weightage of compulsory attendance part of questions will be equal to proportionate to hours allotted to each topic.
d. Marks ratio of knowledge: comprehension: application types questions must be 20:30:50 respectively.
e. Submit solution / answer keys along with distribution of marks in each question for the paper being submitted.

Reference Books:

1. Production & operations management	Chase and Aquilano (Lrwin publication)
2. Operations management: Problems and model	Elwood S. Buffa (John Willy & sons)
3. Operations research	S.D.Sharma
4. Operations research	N.R. Dave, Manglani (C. Jamnadas & co.)
5. Production and operations management	Everette, Adam Jr., Ronald J. Ebert (PHI publi.)
6. Operations research	Taha H.A. (PHI publication)

Additional Reference Books:

1. Principles of operation research	Harvey M.Wagner
2. Operations research	M.M.Metwally, H.U.Tama schke, G.R.West (J.K.Publishers)

3. Productivity Engineering & Management	Sumenath (TMGH publication)
4. Purchasing and inventory control	K.S.menon (Wheeler publisher)
5. Production and inventory control	George W.Plosse (PHI publication)

GUJARAT TECHNOLOGICAL UNIVERSITY
DIPLOMA IN MECHANICAL ENGINEERING
SEMESTER- VI

Subject Name: **Operations Management Practice (Elective Practice -II)**
Subject Code: 2**361926**

NOTE:- Following are the minimum experiences required, but the college can do more experiences if possible.

LABORATORY EXPERIENCES :			
Experience Type	**Experience Number**	**Description of Laboratory Experience**	**Hrs.**
Preparatory	01	1. Appreciate main objectives of learning this subject: a. Develop the ability to analyse the objectives and constraints for given situation / task. b. Develop the ability to use available resources optimally. c. Appreciate the need of higher mental ability and skill level to work with complex systems. 2. Recall and strengthen know-how for various mathematical and statistical fundamentals.	2
Problem solving (Each student should be given different data / values for same kind of problem/s)	02	Maximization problem solution using simplex method. (one each for requirement, approximation and equality for 2 variables & max. 3 constraints)	4
	03	Minimization and maximization problem solving using graphical method (2 problems).	4
	04	Transportation problem solving (for max. 4 sources and 4 destinations).	2
	05	Transshipment problem solving – simple.	2
	06	Assignment problem solving (for max. 4 activities).	2
	07	Replacement problem solving	2
	08	Sequencing problem solving (for max. 4 jobs and 3 machines).	2
	09	Inventory model calculations & problem solving(For two inventory models).	4

Download, seminar presentation, (Copy downloaded content and seminar of whole batch In one /one set of CD/DVD)	10	a) Prepare and present seminar individually in your batch. (Seminar topic has to be given by teacher). b) Download individually visual aids, movies, content and other related content for the given case/situation. (Case/situation has to be given by teacher)Present and discuss the same in your batch. c) Each student should present one case which focus on improvement of productivity and utilization of resources.	4
Assignments (Home Assignment)	11	Solve the given tutorials and assignments. One assignment must be on preparation of chart / diagram / poster / graph / drawing / etc on half imperial size of drawing sheet.(For subject OM).	-
		Total	28

Notes:

A. **FOR STUDENTS**.

a. It is advised that student download this copy of syllabus and plan to achieve the objectives of learning this subject.
b. Attach copy of syllabus as part of term work.

B. FOR STUDENTS AND SUBJECT TEACHER/S.

a. Term work report content of each experience should also include following.
    i. Experience description / data and objectives.
    ii. Skill/s which is / are expected to be developed in student after completion of experience.
    iii. Steps / procedure to execute experience.
b. Term work report of student of regular mode should exclude Distance Learning manual, photocopies, printed content(except visual aids), etc. Focus should be on developing the termwork as original efforts of students.
c. Term work content of industrial visit report should also include following.
    i. Brief details of industry visited.
    ii. Type ,location, products, rough layout, human resource, etc of industry.
    iii. Details, description and broad specifications of machineries/ processes observed.
    iv. Safety norms and precautions observed.
    v. Student's own observation on Industrial environment, productivity concepts, quality consciousness and quality standards, cost effectiveness ,culture and attitude.
    vi. Any other details / observations asked by accompanying faculty.

d. Term work should also include experience logbook duly certified by subject teachers.
e. Term work is to be defended (along with term work) with practical examination by external and internal examiners .Practical examination will include followings:
    i. Viva
    ii. Solving given problems.

Reference Books:

1. Production & operations management	Chase and Aquilano (Lrwin publication)
2. Operations management: Problems and model	Elwood S. Buffa (John Willy & sons)
3. Operations research	S.D.Sharma
4. Operations research	N.R. Dave, Manglani (C. Jamnadas & co.)
5. Production and operations management	Everette, Adam Jr., Ronald J. Ebert (PHI publi.)
6. Operations research	Taha H.A. (PHI publication)

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3. Productivity Engineering & Management	Sumenath (TMGH publication)
4. Purchasing and inventory control	K.S.menon (Wheeler publisher)
5. Production and inventory control	George W.Plosse (PHI publication)

GUJARAT TECHNOLOGICAL UNIVERSITY

DIPLOMA IN MECHANICAL ENGINEERING

SEMESTER- VI

Subject Name: **Foundary Technology (Elective-II)**
Subject Code: **2361927**

Sr. No.	Subject Content	Hrs.
1	**INTRODUCTION.** 1.1 Know the objectives of learning this subject. 1.2 Need, Scope & importance of Foundary Technology (FT) in industries. 1.3 Need of attitude, knowledge & skill required for application of FT. 1.4 Moulding materials. 1.5 Moulding sand-properties & testing. 1.6 Moulding strength & its testing. 1.7 Hardening & coating of moulds. 1.8 Parting compounds. 1.9 Oil-oxygen process of making of cores and moulds.	6
2	**MOULD DESIGN.** 2.1 Gating system & design. 2.2 Parameters in pouring. 2.3 Riser & its design. 2.4 Pouring basin 2.5 Chills 2.6 Exothermic compound.	6
3	**CASTING FORMATION.** 3.1 Solidification of casting for extensively used metals. 3.2 Nucleation. 3.3 Growth of dendrites. 3.4 Segregation 3.5 Progressive & Directional solidification 3.6 Control of solidification.	6
4	**CASTING PROCESSES.** 4.1 Types, process, parameters, merits, demerits, features and applications of various casting processes such as: - Shell moulding - Investment casting	13

	- Centrifugal casting - Die-casting - Magnetic moulding - Vacuum moulding - Ceramic mould casting - Continuous casting - Frozen mercury moulding (Mercast process) **Note** : Question/s to select/justify process/es and specify parameters etc. of given data (application type) of 16- 18 marks out of total 70.	
5	**CASTING DESIGN.** 5.1 Functional design. 5.2 Design for metal flow. 5.3 Dimensional tolerance. 5.4 Economic consideration. **Note** : Question/s to flow design/ dimensional tolerance of given data (application type) of 5-6 marks out of total 70.	**4**
6	**CASTING DEFECTS.** 6.1 Defects. 6.2 Inspection. 6.3 Analysis of casting defects. 6.4 Quality control. **Note** : Question/s to analyse defects of given data (application type) of 4-5 marks out of total 70.	**5**
7	**FOUNDARY MANAGEMENT.** 7.1 Mechanisation & modernisation 7.2 Quality control systems 7.3 Use of computers.	**2**
	Total	**42**

Notes:

A. FOR STUDENTS.

a. It is advised that student download this copy of syllabus and plan to achieve the objectives of learning this subject.

B. FOR PAPER SETTER/MODERATOR.

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b. Ask the questions from each topic having marks weightage proportionate to hours allotted to that topic.
c. Optional questions must be asked from the same topic. That is weightage of compulsory attendance part of questions will be equal to proportionate to hours allotted to each topic.
d. Marks ratio of knowledge: comprehension: application types questions must be 30:30:40.
e. Submit solution / answer keys along with distribution of marks in each question for the paper being submitted.

Reference Books:

1. Principles of Metal casting	Heine, Loper Resenthal Tata McGraw Hill publishing Co.Ltd.
2. Principal of Foundry Technology	P.L.Jain Tata McGraw Hill
3. Fundamentals of metal Casting Technology	P. C. Mukharjee Tata McGraw Hill
4. Foundry Engineering	Banza, Agarwal Manghanani Khanna Publishing Ltd.
5. Foundry Technology	M.Lal Dhimpat Rai & Sons.

Additional Reference Books:

1. Foundry Engineering	Taylor Fleming Woolf Wiley Eastern Ltd.
2. Foundry Practice	Salmon Simons ELBS & ISSU pitmun.
3. Manufacturing Technology	Malik Ghosh Affiliated East-west Press Pvt.Ltd.

GUJARAT TECHNOLOGICAL UNIVERSITY

DIPLOMA IN MECHANICAL ENGINEERING

SEMESTER- VI

Subject Name: **Foundary Technology Practice (Elective Practice -II)**
Subject Code: **2361928**

NOTE:- Following are the minimum experiences required, but the college can do more experiences if possible.

LABORATORY EXPERIENCES :			
Experience Type	**Experience Number**	**Description of Laboratory Experience**	**Hrs.**
Preparatory	01	1. Appreciate main objectives of learning this subject: a. Read and interpret given pattern and casting drawings. b. Develop the skill to design and prepare pattern and mould for given simple casting. c. Familiarize with various molding materials and processes. 2. Recall and strengthen know-how for orthographic projections , various pattern allowances and various casting methods.	2
Demonstration and study	02	Interpretation of various industrial casting and pattern drawings.	2
	03	Casting defects – types , causes and remedies.	2
Performance	04	Determine green strength , dry strength, permeability , clay content and moisture content of given molding sand sample.	4
	05	Prepare the mould using given single piece pattern.	2
	06	Prepare the mould using given two piece pattern.	4
	07	Measure the mould hardness with hardness tester.	2
	08	To determine the grain size and distribution of sand by Taylor sieve analysis.	2
Reports	09	Prepare a report on any one given advance casting process. Specifically include working principle, specifications of equipments used and applications with process parameters. Separate process will be	2

		assigned to each student by teacher.	
Download and seminar presentation, (Copy downloaded content and seminar of whole batch In one /one set of CD/DVD)	10	a) Prepare and present seminar individually in your batch. (Seminar topic has to be given by teacher). b) Download individually visual aids, movies, content and other related content for the given case/situation. (Case/situation has to be given by teacher)Present and discuss the same in your batch. c) Each student should prepare and present one case which focus on advance welding and cutting process.	6
Industrial visit	11	Visit at least two related foundries.	-
Assignments (Home Assignment)	12	Solve the given tutorials and assignments. One assignment must be on preparation of chart / diagram / poster / graph / drawing / etc on half imperial size of drawing sheet.(For subject FOUN.TECH.).	-
		Total	**28**

Notes:

A. FOR STUDENTS.

a. It is advised that student download this copy of syllabus and plan to achieve the objectives of learning this subject.
b. Attach copy of syllabus as part of term work.

B. FOR STUDENTS AND SUBJECT TEACHER/S.

a. Term work report content of each experience should also include following.
    i. Experience description / data and objectives.
    ii. Skill/s which is / are expected to be developed in student after completion of experience.
    iii. Steps / procedure to execute experience.
b. Term work report of student of regular mode should exclude Distance Learning manual, photocopies, printed content(except visual aids), etc. Focus should be on developing the term work as original efforts of students.
c. Term work content of industrial visit report should also include following.
    i. Brief details of industry visited.
    ii. Type ,location, products, rough layout, human resource, etc of industry.
    iii. Details, description and broad specifications of machineries/ processes observed.
    iv. Safety norms and precautions observed.

v. Student's own observation on Industrial environment, productivity concepts, quality consciousness and quality standards, cost effectiveness ,culture and attitude.
vi. Any other details / observations asked by accompanying faculty.

d. Term work should also include experience logbook duly certified by subject teachers.
e. Term work is to be defended (along with term work) with practical examination by external and internal examiners .Practical examination will include followings:
   i. Viva.
   ii. Interpretation of given pattern and castings drawing.
   iii. Preparing mould for given simple pattern.

Reference Books:

1. Principles of Metal casting — Heine, Loper Resenthal Tata McGraw Hill publishing Co.Ltd.
2. Principal of Foundry Technology — P.L.Jain Tata McGraw Hill
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GUJARAT TECHNOLOGICAL UNIVERSITY

DIPLOMA IN MECHANICAL ENGINEERING

SEMESTER- VI

Subject Name: **Hydraulic and Pneumatic Devices (Elective-II)**
Subject Code: **2361917**

Sr. No.	Subject Content	Hrs.
1	**CONTROL SYSTEMS.** 1.1 Know the objectives of learning this subject. 1.2 Need, Scope & importance of Hydraulic and Pneumatic Devices (HPD). 1.3 Need of attitude, knowledge & skill required for application of HPD. 1.4 Control system-concept, definition , need, important terminology used. 1.5 Open loop and close loop control systems-block diagrams, differences and applications. 1.6 Servo control system-concept and application.	3
2	**FUNDAMENTALS OF HYRAULICS.** 2.1 Hydrostatic and hydrodynamic-concept and definitions. 2.2 Laws governing fluid flows-Pascal's law, continuity equation and Bernoulli's theorem. 2.3 Flow through pipes-types, pressure drop in pipes. 2.4 Working fluids used in hydraulic systems-types, properties, designation, standards and selection criteria. 2.5 Hydraulic systems-concept, application areas, advantages and limitations.	3
3	**HYDRAULIC ELEMENTS.** 3.1 Hydraulic pipes-types, materials, designations and standards, properties, pressure ratings and selection criteria. 3.2 Piping layout – concept, guiding rules/norms/traditions. 3.3 Hydraulic pump- types, construction, working, mounting methods, applications and selection criteria. 3.4 Control valves – types, designations, standards, working, mounting methods, applications and selection criteria. 3.5 Actuators- types, designations, standards, working, mounting methods, applications, synchronization and selection criteria. 3.6 Other elements, fittings and accessories-types (such as strainers, filters, distributors, manifold, accumulator, coolers, heat exchangers, hoses, connectors, oil reservoir, oil purifier, oil level and pressure indicators, seals, etc.), designations, standards, working, mounting methods, applications and selection criteria.	5

	Note: Application type question/s of 4-6 marks out of 70.	
4	**HYDRAULIC CIRCUIT.** 4.1 Concept, meaning and ISO symbols used. 4.2 Basic hydraulic circuits-types, circuit diagrams, working and applications. 4.3 Logic circuits-types, symbols and truth tables. 4.4 Guiding rules/norms/steps/methods for designing hydraulic circuit. 4.5 Simple circuit design(at least two design based on given problems/situation and based on selection and arrangement of elements)-circuit diagram, list of elements with specifications, working, metering in and metering out control circuits. **Note**: Application type question/s (designing simple circuit)of 4-6 marks out of 70.	6
5	**HYDRAULIC DEVICES, INSTALLATION AND MAINTENANCE.** 5.1 Hydraulic devices-types(automotive hydraulic brake , material handling trolley/forklift, power pack, hydraulic jack, automotive power steering), working diagram, hydraulic circuit, working, major elements and their specifications, controls, performance variables/criteria, applications, general guidelines for operation. 5.2 Installation of hydraulic devices (covered in 5.1 above)-need, pre-preparation, connection methods for hydraulic circuit, procedure and testing. 5.3 Common troubles ,its causes and preventive/post remedial actions for hydraulic devices covered in 5.1 above. 5.4 Need for preventive maintenance and maintenance schedule for hydraulic devices, general guidelines for maintenance. 5.5 Critical spares and their need/importance for their stock for hydraulic devices. 5.6 Instruments/methods for common fault finding. **Note**: Application type question/s of 4-5 marks out of 70.	5
6	**FUNDAMENTALS OF PNEUMATICS.** 6.1 Compressible fluid flow-properties, applicable laws(Boyel's, Charles', Lussac's combined) , mass flow rate. 6.2 Compressible fluids-types, properties and applications. 6.3 Pneumatic systems-advantages and limitations.	2
7	**PNEUMATIC ELEMENTS.** 7.1 Pipe-materials, types, standards and designations, properties, applications. 7.2 Piping layout-concept, loop systems, guiding rules/norms/traditions,	5

	pressure drop. 7.3 Air compressor-types and selection criteria. 7.4 Air receiver-specification, working, capacity control. 7.5 Driers-types, working and selection criteria. 7.6 Pneumatic cylinders-types, cushion assemblies, types of mounts, construction materials, lubrication, installation and maintenance. 7.7 Air motors-types and working. 7.8 Pneumatic valves-types, standards and designations, working, mounting methods, applications and selection criteria. 7.9 Other fittings/elements and accessories-types and sub-types(such as filters, pressure regulator, lubricator, mufflers), working, standards and designations applications and selection criteria. **Note**: Application type question/s of 4-6 marks out of 70.	
8	**PNEUMATIC CIRCUIT.** 8.1 Concept, meaning and ISO symbols used. 8.2 Guiding rules/norms/steps/methods for designing pneumatic circuit. 8.3 Basic pneumatic circuits- types, circuit diagrams, working and applications. 8.4 Simple circuit design(at least two design based on given problems/situation and based on selection and arrangement of elements)-circuit diagram, list of elements with specifications and working. **Note**: Application type question/s (designing simple circuit)of 4-6 marks out of 70.	6
9	**PNEUMATIC DEVICES, INSTALLATION AND MAINTENANCE.** 9.1 Pneumatic devices-types,(pneumatic brake, air suspension system of automotive, pneumatic drill) working diagram, hydraulic circuit, working, major elements and their specifications, controls, performance variables/criteria, applications, general guidelines for operation. 9.2 Safety and cleanliness for pneumatic devices. 9.3 Installation of pneumatic devices mentioned at 9.1 above,- need, pre-preparation connection method for pneumatic circuit. 9.4 Common troubles ,its causes and preventive/post remedial actions for pneumatic devices covered in 9.1 above. 9.5 Need for preventive maintenance and maintenance schedule for pneumatic devices, general guidelines for maintenance. 9.6 Critical spares and their need/importance for their stock for pneumatic devices. 9.7 Instruments/methods for common fault finding. **Note:** Application type question/s of 4-6 marks out of 70.	5

10	**HYDROPNEUMATICS.** 10.1 Introduction, elements, working and applications. 10.2 Types of feed. 10.3 Introduction to integration of hydraulic/pneumatic circuit with microprocessor/microcontroller/programmable logic controller (PLC).	2
	Total	**42**

Notes:

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Reference Books:

1.	Mechatronics	W.Bolten (Pearsons)
2.	Hydraulic and Fluid mechanics and Hydraulic machineries	Abdula Sharrif and others (Dhanapatrai publications)
3.	Hydraulic & Hydraulic machineries	TTTI,Madras.
4.	Automatic process control	Donald P. Eckman(Wiely Eastern)
5.	Hydraulic machines including fluidics	Dr.Jagdishlal(metropolitine book co., NewDelhi.
6.	Industrial pneumatic control	Z.J.Lansky(Marcel Dekker,Inc.

Additional Reference Books:

1.	Fluid power design handbook	Frank Yeaple
2.	Process control	Peter Harriott(TMGH)

GUJARAT TECHNOLOGICAL UNIVERSITY

DIPLOMA IN MECHANICAL ENGINEERING

SEMESTER- VI

Subject Name: **Hydraulic and Pneumatic Devices Practice (Elective Practice -II)**

Subject Code: **2361918**

NOTE:- Following are the minimum experiences required, but the college can do more experiences if possible.

LABORATORY EXPERIENCES :			
Experience Type	**Experience Number**	**Description of Laboratory Experience**	**Hrs.**
Preparatory	01	1. Appreciate main objectives of learning this subject: a. Read/interpret given hydraulic/pneumatic circuit. b. Operate , maintain and assemble simple hydraulic and pneumatic devices/elements. c. Identify and rectify simple and common troubles of hydraulic and pneumatic devices. 2. Strengthen know how for fundamental fluid mechanics units and systems.	2
Study and demonstration	02	Major hydraulic elements and at least three devices.	2
	03	Major pneumatic elements and at least three devices.	2
	04	Computer based hydraulic and pneumatic system circuit designs.	2
Performance	05	Test various logic circuits for hydraulics and pneumatics.	2
	06	Design, assemble and operate hydraulic system, based on given simple system requirement (Design mainly include selection and arrangement of elements).	4

	07	Design, assemble and operate pneumatic system, based on given simple system requirement (Design mainly include selection and arrangement of elements)	4
	08	Take any two hydraulic devices/elements (eg. Power pack, cylinder, hydraulic jack, hydraulic brake), make system diagram, dismantle and assemble them.	6
	09	Take any two pneumatic devices/elements (eg. Pneumatic brake, cylinder, air suspension, pneumatic drill), make system diagram, dismantle and assemble them.	
Download and seminar presentation, (Copy downloaded content and seminar of whole batch In one /one set of CD/DVD)	10	a) Prepare and present seminar individually in your batch. (Seminar topic has to be given by teacher). b) Download individually visual aids, movies, content and other related content for the given case/situation. (Case/situation has to be given by teacher)Present and discuss the same in your batch.	4
Industrial visit	11	Visit at least two related industries.	-
Assignments (Home Assignment)	12	Solve the given tutorials and assignments. One assignment must be on preparation of chart / diagram / poster / graph / drawing / etc on half imperial size of drawing sheet.(For subject Mechatronics).	-
		Total	28

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   iii. Steps / procedure to execute experience.

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c. Term work content of industrial visit report should also include following.
    i. Brief details of industry visited.
    ii. Type ,location, products, rough layout, human resource, etc of industry.
    iii. Details, description and broad specifications of machineries/ processes observed.
    iv. Safety norms and precautions observed.
    v. Student's own observation on Industrial environment, productivity concepts, quality consciousness and quality standards, cost effectiveness ,culture and attitude.
    vi. Any other details / observations asked by accompanying faculty.
d. Term work should also include experience logbook duly certified by subject teachers.
e. Term work is to be defended (along with term work) with practical examination by external and internal examiners .Practical examination will include followings:
    i. Viva
    ii. Interpret/read given simple hydraulic/pneumatic circuit.
    iii. Design , prepare and test the simple hydraulic/pneumatic circuit for given set of conditions/parameters/requirements.

Reference Books:

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