GUJARAT TECHNOLOGICAL UNIVERSITY

Diploma in Mechatronics Engineering

Semester: 4

Subject Name **PLANT MAINTENANCE AND SAFETY**

Sr. No.	Course content
1.	**INTRODUCTION TO MAINTENANCE ENGINEERING** 1.1 Need, Scope & importance of plant maintenance and safety in industries. 1.2 Need of attitude, knowledge & skill required for shop floor maintenance tasks in industries. 1.3 Definition and aims of maintenance engineering. 1.4 Primary and secondary functions and responsibilities of maintenance department. 1.5 Types of maintenance. 1.6 Maintenance cost and its relation with replacement economy. 1.7 Service life of equipment.
2.	**TRIBOLOGY** 2.1 Wear : Types, causes and effects. 2.2 Friction and its effect. 2.3 Wear reduction methods. 2.4 Lubricants and Lubrication procedure. 2.5 Bearing types and application.
3.	**CORROSION AND ITS PREVENTION** 3.1 Corrosion, factors affecting the corrosion. 3.2 Types of corrosion. 3.3 Corrosion prevention methods.
4.	**RECOVERY METHODS FOR THE EQUIPMENT MAINTENANCE** 4.1 Recovery, methods of recovery. 4.2 Selection of recovery methods. 4.3 Life of Machine tools and equipment.
5.	**PLANNING AND SCHEDULING OF MAINTENANCE ACTIVITIES** 5.1 Fault tracing, activities in fault finding. 5.2 Decision tree. 5.3 Sequence of fault finding activities shown as decision tree. 5.4 Draw a decision tree for mechanical and Hydraulic equipments.
6.	**MAINTENANCE , BREAKDOWN MAINTENANCE** 6.1 Types of fault in Machine tools. 6.2 Periodic inspection. 6.3 Degreasing, cleaning and repairing scheme. 6.4 Overhauling of components. 6.5 Repair complexities and its use. 6.6 Breakdown maintenance-causes, strategies to attend, remedial

	actions, types of spares to be stored , examples. 6.7 Maintenance of pumps, compressors and D.G. sets.
7.	**PREVENTIVE MAINTENANCE** 7.1 Preventive maintenance. 7.2 Steps and need of preventive maintenance. 7.3 Advantages. 7.4 Two major divisions of activities. 7.5 Frequency cycle. 7.6 Program and schedule of preventive maintenance. 7.7 Repair complexity. 7.8 Typical forms for preventive maintenance. 7.9 Aids to a good preventive maintenance, its type and effect on preventive maintenance.
8.	**INDUSTRIAL SAFETY** 8.1 Accident : causes, types, results and control. 8.2 Safety awareness. 8.3 Safety color code. 8.4 Mechanical and electrical hazards. 8.5 Methods of safe guarding the machine and equipment. 8.6 Fire prevention and fire fighting methods. 8.7 Safety training. 8.8 Duties of safety inspector, boiler inspector and fire officer.
9.	**CONDITION MONITORING** 9.1 Concept, need, scope and applications of condition monitoring.
10.	**RECONDITIONING AND RETROFITTING OF MACHINE TOOLS** 10.1 Reconditioning : advantages, process, features and fundamental activities. 10.2 Retrofitting : concept, need and application.
11.	**INSTALLATION AND TESTING OF INDUSTRIAL EQUIPMENT** 11.1 Foundation :effect and design, foundation materials, size and plan of foundation. 11.2 Erection and application of erection equipment. 11.3 Testing and aligning methods used for industrial equipment.

LABORATORY EXPERIENCES:

Experience Type	Experience Number	DESCRIPTION OF LABORATORY EXPERIENCE
PREPERATORY ACTIVITY	1	a. Wear, corrosion, erosion and friction. b. Types and standards/designations of various lubricants. c. Terminology related to various geometrical symbols, precision , accuracy and alignment.

DEMONS TRATION AND STUDY	2	Assembly and disassembly of given case. Observe rules, sequence of disassembly operations, cleaning , inspection, measuring deviations , recovery methods ,testing and assembling.
	3	Hydraulic drive of a machine tool and enumerate the salient points of maintenance aspect.
	4	Use of fire fighting equipment.
	5	Foundation for any one from the following: (a) Machine tool (b) Compressor (c) I.C. engine.
	6	D.G. set maintenance aspects.
	7	Decision tree for fault finding for any two from followings: - Bicycle - Boiler - Electric motor - D.G.sets - I.C. Engine -Compressor- Hydraulic pump.
	8	Recovery methods.
PERFOR MANCE	9	Measure amount of wear on given components.
	10	Maintenance of any two from tailstock, chuck, feedbox, indexing head and other such devices.
	11	Attend reported break down machine.
	12	Prepare a test chart of a newly installed or repaired machine tool.
CASE STUDY	13	Select appropriate recovery method for given case. Put your observations, findings and justifications.
	14	Prepare a planning and scheduling of maintenance activities for typical workshop by using computer.
	15	Prepare a preventive maintenance schedule of the typical workshop.
	16	Given situation/accident conditions select the first aid treatment given to victimized.
SEMINAR PRESENT ATION AND GROUP DISCUSSI ON	17	a) 10 minutes individual seminar presentation on given topic. b) Group discussion on given topic.
SCHOOL WITHIN SCHOOL	18	Guiding / Sharing /Mentoring the know-how by meritorious students to lower performing students.

SELF LEARNING AND LITURAT URE SURVEY	19	1. Contact with field expert ,seniors, alumni and get further know-how individually or in a group. 2. Read /Refer related book / magazine / article / literature / Product Pamphlets-catalogues and share the content. 3. Surf internet and download related movies/articles and share the content. 4. Visit individually any exhibition/industry and share the content.
PAPER SOLUTION	20	Given model paper by concerned teacher,(Not old papers), prepare solution.
ASSIGNMENT	21	Solve given assignments.
INDUSTRIAL VISIT	22	Collect information and prepare a report regarding tribology practice (lubrication methods, bearings etc.) in various industries (Industrial visit) for various machineries , also collect information and prepare report on condition monitoring techniques adopted in industry.

NOTES :

1. Prepare term work report for each experience.
2. Term work report content of each experience should also include following. (As applicable).
   a. Experience description / data and objectives.
   b. Skill/s which is / are expected to be developed in student after completion of experience.
   c. Drawing of experience / setup with labels/nomenclature to carry out the experience
   d. The specifications of machines / equipments / devices / tools / instruments /items/elements which is / are used to carry out and to check experience.
   e. Process parameters / setup settings' values applied to carry out experience.
   f. Steps / Process description to execute experience.
   g. Information on recent machines / equipments / devices / tools / instruments /items available in market to carry out the experience. h. Problems occurred/faced ,their causes and solution/s applied.
   i. Special / Additional notes or remarks.
3. Distance Learning manual, photocopies, printed content, etc. are not permitted in Term work report of student of regular mode. Focus should be on developing the term work as original efforts of students.
4. Term work content of industrial visit report should also include following.

a. Brief details of industry visited.
b. Type ,location, products, rough layout, human resourse, etc of industry.
c. Details, description and broad specifications of machineries/processes observed.
d. Safety norms and precautions observed.
e. Student's own observation on Industrial environment, culture and attitude.
f. Any other details / observations asked by accompanying faculty.

5. Term work includes experience logbook duly certified by subject teacher.

REFERENCES BOOKS:

(1)	Maintenance Engineering Handbook	Higgins & Merrow
(2)	Maintenance Engineering	H.P.Garg
(3)	Maintenance of Machine Tools	Gilbirg & Merrow
(4)	Handbook of Machine Foundation	P. Shrinivasulu C.V. Vaidyanathan
(5)	Pump Handbook	Karassik, Krutzch, Fraser, M. G.H.
(6)	Occupational Safety Management and Engineering	Willie Flammer
(7)	Foundation Engineering Handbook	Winterkorn, Hans
(8)	Foundation Design and Practice	Seelye, Eiwyne
(9)	Pump-Hydraulic Compressors	Audels
(10)	Safety and good house keeping	N.P.C.(Dr.A.N.Saxena)
(11)	Safety Education	W. Wayne Worick
(12)	Factory Act 1948	
(13)	Boiler Act 1951(I.B.R.)	
(14)	Erection and Installation of	Mir Publication Metallurgical Plant
(15)	Corrosion handbook.	