GUJARAT TECHNOLOGICAL UNIVERSITY

SUBJECT: Industrial safety and Maintenance Engineering

SUBJECT CODE: 2174105

B.E. 7th Semester

Type of course: Department Elective

Prerequisite: None

Rationale: This subject focuses on applying engineering concepts to the optimization of equipment, procedures, and departmental budgets to achieve better maintainability, reliability, and availability of equipment. Maintenance, and hence maintenance engineering, is increasing in importance due to rising amounts of equipment, systems, machineries and infrastructure. The subject also focuses on various safety engineering aspects like understanding hazards, quantifying risk, design for Safety, investigating accident, safety education and training.

Teaching and Examination Scheme:

Teaching Scheme			Credits	Examination						Total Marks
L	T	P	C	Theory Marks			Practical Marks			
				ESE (E)	PA (M)		PA (V)		PA (I)	
					PA	ALA	ESE	OEP		
3	1	0	4	70	20	10	30	0	20	150

L- Lectures; T- Tutorial/Teacher Guided Student Activity; P- Practical; C- Credit; ESE- End Semester Examination; PA- Progressive Assessment

Content:

Sr. No.	Topics	Teaching Hrs.	Module Weightage
1	**Introduction:** Importance of maintenance, functions of maintenance, type of maintenance, including total productive maintenance and its implementation, organization of maintenance.	8	12
2	**Wear and service life of equipment:** (i) Methods of assembly and fitting – assembly of keyed joints, splined joints, fixed joints, assembly of ball and roller bearings, repairs and assembly of gears. (ii)Wear of machines- types and reasons of wear, defects due to wear of equipment, corrosion and its prevention. (iii)Recovery and strengthening of machine elements various methods of recovery and increasing service life.	12	20%
3	**Maintenance of Production Equipment:** Maintenance and repair of shafts, bearings, spindles, couplings and clutches, gears, bed services and link mechanisms..	10	16%
4	**Restoring The Guide Ways of Machine Tools:** Test of repaired equipment, fault-tracing sequence in fault tracing, drawing decision tree.	8	12%

5	**Planning and Scheduling Maintenance Work:** Factors involved in effective planning of maintenance work, Various methods of scheduling work, Categorization of plant/equipment for the purpose of priorities, VAIN analysis. Maintenance cost &replacement economics, Types of cost, Maintenance cost, Methods of cost comparisons, Factors in equipment Replacement, MAPI methods, Economics, Concept of maintainability.	18	28%
6	**Safety Engg.** Background of Industrial safety, Accident Causation, Industrial hazards, Accident investigation, prevention, Safety education, Safety consideration in design of equipment, Legal aspects of Ind. Safety	8	12%

Distribution of Theory Marks					
R Level	U Level	A Level	N Level	E Level	C Level
30%	**40%**	**10%**	**10%**	**5%**	**5%**

Legends: R: Remembrance; U: Understanding; A: Application, N: Analyze and E: Evaluate C: Create and above Levels (Revised Bloom's Taxonomy)

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

Reference Books:

1. Maintenance Engineering and management by R.C. Mishra & K. Pathak, PHI publication
2. Maintenance Engineering and management by K. VenkatRamana, PHI publication
3. Maintenance of Ind. Equipments-by Gellery & Pakelts, MIR publications
4. Ind. Maintenance by H.P. Garg, S. Chand & company
5. Maintenance Engg. Handbook, by Morrow
6. Modern Maintenance Management, by Miller & Blood

Course Outcomes:

After learning the course the students should be able to

1. Understand the principles, functions and practices adapted in industry for the successful
2. management of maintenance activities.
3. Understand the different maintenance categories like Preventive maintenance, condition monitoring and repair of machine elements.
4. Understand safety engineering aspects in industry.

Open Ended Problems:

1. Design of maintenance management system for a surrounding industry

List of Open Source Software/learning website: www. nptel.ac.in

Active Learning Assignments: Preparation of power-point slides, which include videos, animations, pictures, graphics for better understanding theory and practical work – The faculty will allocate chapters/ parts of chapters to groups of students so that the entire syllabus to be covered. The power-point slides should be put up on the web-site of the College/ Institute, along with the names of the students of the group, the name of the faculty, Department and College on the first slide. The best three works should submit to GTU.