GUJARAT TECHNOLOGICAL UNIVERSITY

INDUSTRIAL ENGINEERING
TOTAL PRODUCTIVE MAINTENANCE
SUBJECT CODE: 2161506
B.E. 6th SEMESTER

Type of course: Core

Prerequisite: Basic knowledge of maintenance engineering and management.

Rationale: This subject will entail the primary focus of constant improvement in the overall equipment effectiveness (OEE) as it relates to equipment and capital assets. TPM focuses on getting managers, maintenance personnel and equipment users all working together to prevent equipment problems and reduce expenditures. By giving ownership and responsibility of equipment and processes to the right employees, equipment breakdowns are reduced. TPM brings maintenance into focus as a necessary and vitality important part of the business. TPM is used at all levels of the organization.

Teaching and Examination Scheme:

Teaching Scheme			Credits	Examination Marks						Total Marks
L	T	P	C	Theory Marks			Practical Marks			
				ESE (E)	PA (M)		ESE (V)		PA (I)	
					PA	ALA	ESE	OEP		
4	0	2	6	70	20	10	20	10	20	150

Content:

Sr. No.	Content	Total Hrs	% Weightage
1	Introduction to TPM concept, Objectives and functions, Reliability Centered Maintenance (RCM), Maintainability prediction, Availability and system effectiveness, Maintenance cost.	**9**	14
2	Developing the TPM Implementation Plan, Preventive Maintenance, Minimal repair, Maintenance types, Balancing PM and breakdown maintenance, PM schedules: deviations on both sides of target values, PM schedules: functional characteristics, Replacement models.	**12**	19
3	Zero breakdowns – Zero Defects and TPM, Maximizing equipment effectiveness, Autonomous maintenance program, Pillars of TPM, TPM small group activities, TPM organization - management decision - educational campaign – creation of organizations – establishment of basic policies and goals-formation of master plan, TPM implementation, Maintenance Inventory Controls, Improving Maintenance Efficiency and Effectiveness.	**18**	28
4	Human factors in maintenance, Maintenance manuals, Maintenance staffing methods, Queuing applications, Simulation, Spare parts	**15**	23

	management, maintenance planning and scheduling Condition Monitoring Techniques, Vibration Monitoring, Signature Analysis, Wear Debris Monitoring, Expert systems , Corrosion Monitoring and Control.		
5	Maintenance Management Information Systems, Capacity Assurance Technicians, Total Economic Maintenance, Team-Based Maintenance. The Future of TPM, Maintaining the TPM Vision.	**10**	16

Suggested Specification table with Marks (Theory):

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. Tina Kanti Agustiady, Elizabeth A. Cudney, 'Total Productive Maintenance : Strategies and Implementation Guide', Productivity Press, 2015.
2. Kern Peng, 'Equipment Management in the Post-Maintenance Era: A New Alternative to Total Productive Maintenance (TPM), Productivity Press, 2012.
3. David J. Sumanth, 'Total Productivity Management (TPmgt) : A Systematic and Quantitative Approach to Compete in Quality, Price and Time', Productivity Press, 1997.
4. Fumio Gotoh, Masaji Tajiri, 'Autonomous maintenance in Seven Steps : Implementing TPM on the ShopFloor', Productivity Press, 1999.
5. Japan Institute of Plant Maintenance, 'Autonomous maintenance for Operators', Productivity Press, 1997.
6. Mishra, R. C., Pathak, K., 'Maintenance Engineering and Management', 2nd Edition, Prentice – Hall of India.
7. Venkatraman K., 'Maintenance Engineering and Management', 2nd Edition, Prentice – Hall of India.
8. Gopalakrishnan, P. and Banerji, A.K., 'Maintenance and Spare Parts Management', Prentice – Hall of India.
9. Goto, F., 'Equipment planning for TPM Maintenance Prevention Design', Productivity Press.
10. Shirose, K., "Total Productive Maintenance for Workshop Leaders", Productivity Press.

Course Outcome:

After learning the course the students should be able to:

1. Understand how TPM improves operations by preventing equipment breakdowns; prevention of product defects and rejects; improving equipment effectiveness and efficiency; involving and training operators in equipment maintenance.
2. Understand the usage of tools for TPM implementation and able to identify and eliminate loss through TPM implementation.
3. Understand the roles and responsibilities of a TPM implementation organization and the critical issues.
4. Understand the economic side to TPM.

List of Experiments:

1. Study of basics of TPM.
2. Study of Reliability centered maintenance (RCM)
3. Study of Preventive maintenance
4. Study of TPM implementation plan
5. Study of overall equipment effectiveness (OEE)
6. Study of Human factors in maintenance
7. Study of Human factors in maintenance
8. Study of Maintenance Management Information Systems
9. Case study – 1
10. Case study - 2

Design based Problems (DP)/Open Ended Problem:

1. Design of preventive maintenance schedule for an industry in surrounding area.
2. Design of autonomous maintenance program for an industry in surrounding area.

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.