3PE41: RELIABILITY, MAINTENANCE & SAFETY ENGINEERING
CREDITS – 4 (LTP: 3,0,1)

Course Objective:
To understand and implement maintenance strategies, schedule and principles, to achieve better maintainability, reliability, and availability of equipment, systems, machineries and infrastructure. To also focuses on various safety engineering aspects like understanding hazards, quantifying risk, design for Safety, investigating accident, safety education and training.

Teaching and Assessment Scheme:

Teaching Scheme (Hours per Week)			Credits	Assessment Scheme				Total Marks
				Theory Marks		Practical Marks		
L	T	P	C	ESE	CE	ESE	CE	150
3	0	2	4	60	40	20	30	

Course Content:

Unit No.	Topics	Teaching Hrs.
1.	**CONCEPTS OF RELIABILITY:** Introduction, Need, Basic Elements of Reliability, Measurement of Reliability, Cost of Reliability, Maintenance & Reliability, Maintainability, MTBF, MTTR, Maintenance action Rate, Failure Mode Effect & Criticality Analysis (FMECA), Hazard Analysis, System Reliability- Series, Parallel and Mix Problem.	15
2.	**MAINTENANCE ENGINEERING:** Introduction, Maintenance Objectives, Maintenance cost, Benefits and Limitations of failure statistics, Types of Maintenance, Preventive Maintenance system, Preventive versus Breakdown Maintenance, Maintainability and availability, Condition based maintenance system, Basic Maintenance decisions, Maintenance performance measurement.	15
3.	**INDUSTRIAL SAFETY AND SAFETY ACTS:** Introduction to the development of industrial safety and management**,** Accident preventions, protective equipment's and the Acts, Safety Acts, safety and maintainability design, Tools for safety analysis. Safety audit and planning for safety.	12
	Total	**42**

List of References:

1. E Balaguruswamy, "*Reliability Engineering*", Tata McGraw Hill
2. L. S Srinath, "*Reliability Engineering*", East-West Press
3. Srivastava, S.K., "*Maintenance Engineering*", S. Chand and Co.
4. Bhattacharya, S.N., "*Installation, Servicing and Maintenance*", S. Chand and Co.
5. Dr A K Gupta, "*Reliability, Maintenance and Safety Engineering*", University Science Press.
6. Willie Hammer, "*Occupational Safety Management and Engineering*", Prentice Hall.
7. White, E.N., "*Maintenance Planning*", Documentation, Gower Press.
8. Garg, M.R., "*Industrial Maintenance*", S. Chand and Co.

9. Higgins, L.R., "*Maintenance Engineering Hand Book*", 5th Edition, McGraw Hill.
10. Armstrong, "*Condition Monitoring*", BSIRSA.
11. Davies, "*Handbook of Condition Monitoring*", Chapman and Hall.
12. Ray Asfahl, C., "*Industrial Safety and Health Management*", 5th Edition, Prentice Hall.
13. S.C.Mishra, "*Reliability and Maintenance Engineering*", New Age Publishing house

Course Outcomes (COs):

At the end of this course students will be able to:

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