

**GUJARAT TECHNOLOGICAL UNIVERSITY****Syllabus for Bachelor of Vocation (B.Voc), 2nd Semester****Branch: Production Technology****Subject Name: Maintenance & Safety Engineering****Subject Code: 21120302****With effective
from academic
year 2021-22****Type of course:** Engineering Science**Prerequisite:** Zeal to learn the subject

Rationale: This course provides basic knowledge and skills regarding maintenance problems, their causes and remedies in industries. This course also provides information about wear, corrosion, lubrication, preventive maintenance; decision tree to diagnose faults, important provisions of factory act, alignment of equipment etc. Maintenance of equipment in industries is very critical issue to ensure quality and quantity of production.

Teaching and Examination Scheme:

Teaching Scheme			Credits C	Examination Marks				Total Marks
L	T	P		Theory Marks		Practical Marks		
				ESE (E)	PA (M)	ESE (V)	PA (I)	
3	0	0	3	50	0	0	0	50

Sr. No.	Topic	No. of Hours	Weightage %
01	Fundamentals of Maintenance Engineering Definition and aim of maintenance engineering. Primary and secondary functions and responsibility of maintenance department. Types of maintenance. Types and applications of tools used for maintenance. Maintenance cost & its relation with replacement economy. Service life of equipment.	8	20
02	Maintenance Systems Planned and Un-Planned maintenance, Breakdown Maintenance, Corrective maintenance, Opportunistic Maintenance, Routine maintenance, Preventive maintenance, Predictive maintenance, Condition based maintenance, Introduction to Total Productive Maintenance: Concepts, Tools and Procedure.	8	20
03	Reliability & Maintainability Definition, reliability function, Mean failure rate, mean time to failure (MTTF), mean time between failures (MTBF), hazard rate curve. Bathtub curve, Conditional Reliability Analysis of Downtime, repair time distribution, stochastic point processes	10	25
04	Fault tracing Fault tracing-concept and importance. Decision tree-concept, need and applications. Sequence of fault finding activities, show as decision tree. Draw decision tree for problems in machine tools, hydraulic, pneumatic, automotive, thermal and electrical equipments like: i) Any one machine tool, ii) Pump, iii) Air compressor, iv) Internal Combustion engine, v) Boiler, vi) Electrical motors. Types of faults in machine tools and their general causes.	8	20
05	Safety engineering Fundamentals of industrial safety, Safety policy and safety terminology,	6	15



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Different types of safety systems and equipment, Safety targets, standards, objectives, Accident: causes, types, results and control. Mechanical and electrical hazards-types, causes and preventive steps/procedure. Describe salient points of Factories act 1948 for health and safety.		
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Distribution of marks weightage for cognitive level:

Distribution of Theory Marks					
R Level	U Level	A Level	N Level	E Level	C Level
10	20	20	-	-	-

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) Reliability, Maintenance and Safety Engineering by A. K. Gupta, Laxmi Publications (P) Ltd
- 2) Maintenance Engineering by Sushil Kumar Srivastava, S. chand Publications.
- 3) Maintenance Engineering by H.P.Garg, S Chand and Company
- 4) Industrial Safety, Blake R.B., Prentice Hall, Inc., New Jersey, 1973

Course Outcome:

Sr. No.	CO statement	Marks % weightage
CO 1	Demonstrate the maintenance and recognize troubles in mechanical elements.	20
CO 2	To understand different maintenance system	20
CO 3	To understand Reliability and Maintainability concepts	25
CO 4	To understand concept of decision trees to diagnose faults in equipment.	20
CO 5	Understand safety engineering aspects in industry.	15

List of Open Source Software/learning website:

<https://nptel.ac.in/>