GUJARAT TECHNOLOGICAL UNIVERSITY

Program Name: Master of Engineering

Level: PG

Subject Code: ME03069011

Subject Name: Industrial Safety

w. e. f. Academic Year:	2024 - 25
Semester:	3
Category of the Course:	MOPEC - 01

Prerequisite:	Nil
Rationale:	Safety is a major issue in any industry. Awareness about safety helps students from any major accidents. Different rules regulation of safety helps students apply it in industry for performance and productivity improvements. Knowledge of Maintenance, its type and application gives better work environments and helps industry from major shutdown. Different maintenance tools and techniques for different situations and industry equipment's help students to apply it in real life industry problems. The present course encompasses safety management practices in the industrial sector that aim to protect workers, machinery and facilities.

PO

No	Program Outcomes
01	Engage in critical thinking and research to develop solutions to multifold real-world problems.
02	Communicate effectively with the engineering community at large level on complex design tasks & write and present technical reports.
03	Demonstrate a high level of professionalism in handling multidisciplinary and complex engineering problems.
04	Plan, assess, create, integrate, carry out, and oversee complex engineering projects in a sustainable local and global context.
05	Address societal issues by offering technologically advanced, reasonably priced solutions while upholding high standards of ethics and professionalism.

Course Outcome:

After Completion of the Course, Student will be able to:

No	Course Outcomes	RBT Level
01	Understand the concepts of Industrial safety and Engineering maintenance	R, U

02	Apply different tools and techniques for engineering maintenance.	A, N
03	Implement fault tracing concepts and decision trees for different equipment	N
04	Analyze periodic and preventive maintenance.	N
05	Evaluate different techniques for reducing wear and corrosion of an equipments.	N, E

**Revised Bloom's Taxonomy (RBT)*

Teaching and Examination Scheme:

Teaching Scheme (in Hours)			Total Credits L+T+ (PR/2)	Assessment Pattern and Marks				Total Marks
				Theory		Tutorial / Practical		
L	T	PR	C	ESE (E)	PA / CA (M)	PA/CA (I)	ESE (V)	
3	0	0	3	70	30	-	-	100

Course Content:

Unit No.	Content	No. of Hours	% of Weightage
1.	**Industrial Safety:** Accident, causes, types, results and control, mechanical and electrical hazards, Hazard identification techniques (e.g., HAZOP, FMEA, etc.) types, causes and preventive steps/procedure, describe salient points of factories act 1948 for health and safety, washrooms, drinking water layouts, light, cleanliness, fire, guarding, pressure vessels, etc., Safety color codes. Fire prevention and firefighting, equipment and methods, ISO - 45001	10	25
2.	**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 relationship with replacement economy, Service life of equipment	7	10
3.	**Wear, Corrosion and their Prevention:** Wear- types, causes, effects, wear reduction methods, lubricants-types and applications, Lubrication methods, general sketch, working and applications, i. Screw down grease cup, ii. Pressure grease gun, iii. Splash lubrication, iv. Gravity lubrication, v. Wick feed lubrication vi. Side feed lubrication, vii. Ring lubrication, Definition, principle and factors affecting the corrosion. Types of corrosion, corrosion prevention methods	8	15

4.	**Fault Tracing:** Fault tracing-concept and importance, Fault tree and event tree analysis (qualitative & quantitative), 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 equipment's 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.	10	25
5.	**Periodic and Preventive Maintenance:** Periodic inspection concept and need, degreasing, cleaning and repairing schemes, overhauling of mechanical components, overhauling of electrical motor, common troubles and remedies of electric motor, repair complexities and its use, definition, need, steps and advantages of preventive maintenance. Steps/procedure for periodic and preventive maintenance of – (i) tools, (ii) Pumps, (iii) Air compressors, (iv) Diesel generator (DG) sets, Program and schedule of preventive maintenance of mechanical and electrical equipment, advantages of preventive maintenance. Repair cycle concept and importance.	10	25
	Total	**45**	**100**

Suggested Specification Table with Marks (Theory):

Distribution of Theory Marks (in %)					
R Level	**U Level**	**A Level**	**N Level**	**E Level**	**C Level**
30	**20**	**20**	**20**	**10**	**--**

Where R: Remember; U: Understanding; A: Application, N: Analyze and E: Evaluate C: Create (as per Revised Bloom's Taxonomy)

(a) Books:

References/Suggested Learning Resources:

1. Maintenance Engineering Handbook, Higgins & Morrow, Da Information Services.
2. Maintenance Engineering, H. P. Garg, S. Chand and Company.
3. Pump-Hydraulic Compressors, Audels, McGraw Hill Publication
4. Foundation Engineering Handbook, Winterkorn, Hans, Chapman & Hall London
5. ISO:45001, International Standards for Occupational Health and Safety
6. Industrial Safety and Health Management, C. Ray Ashfal, David W. Reiske, Prentice Hall, 6th edition
7. Industrial Safety Management, J. Maiti, Pradipkumar Ray, Springer Nature Singapore Pte Ltd.
8. Industrial Safety, Blake R.P., 3rd Edition, Prentice Hall Inc., New Jersey, 2006.
9. Industrial Safety Management, Deshmukh. L.M., 3rd Edition, Tata McGraw Hill, New Delhi, 2008.

10. Safety, Health and Environmental Management Systems, R.K Jain and Sunil Rao, Industrial 4th Edition, Khanna Publishers, Delhi 2006.
11. Chemical Hazards and Safety, Shrikant Dawande., 2nd Edition, Khanna Publishers, 2012.
12. Chemical Process Safety: Fundamentals with applications, Daniel A.Crowl, Joseph F. Louvar, 3rd Edition, Prentice Hall Inc., New Jersey, 2011.
13. Principles of Industrial Safety Management understanding the WS of Safety at Work, Akhilkumar Das, PHI Publication

(b) List of Open-source software: (May not be open source but useful for the subject):

(c) List of MOOC Course link :

https://nptel.ac.in/courses/110105094

(d) List of Experiments/Tutorials:

Minimum 20 problems from above topics.

Assignment work on

- Causes, types and control of accidents
- Types of Hazards and its interactions with industrial environment
- Types of maintenance and applications of tools to be used for the maintenance.
- Wear, corrosion and their prevention
- Fault tree and event tree analysis (qualitative & quantitative)
- decision tree for problems in machine tools,
- Methods of periodic and preventive Maintenance for various equipments

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