**SECOND SEMESTER 2015-2016**
**Course Handout Part II**

Date: 13/01/2016

In addition to Part-I (General Handout for all courses appended to the timetable) this portion gives further specific details regarding the course.

**Course No.** : **MSE G513**
**Course Title** : **Maintenance Engineering**
**Instructor–In-Charge** : **Rajesh P Mishra**

## 1. Objective and Scope of the Course:

The objective of the course is to understand the concepts of maintenance and their importance in a plant. Its aim is to improve maintenance processes and technologies within today's business constraints to achieve high plant availability. All major process elements are covered, including maintenance basis, work planning, work management, continuous improvement and corrective action. The course deals with both the mechanical and management aspects of maintenance. In the initial part management aspects like maintenance policies, different types of maintenance systems and estimation of maintenance costs is covered. Second part covers the maintenance of commonly used mechanical equipments like bearings, couplings, power transmission, pumps, valves, compressors etc.

## 2. Text Book:

T.1 B.S. Dillon: Engineering Maintenance: A Modern Approach, CRC Press, New York, Washington, D.C. 2002

T.2 Charles E. Ebeling: An introduction to Reliability and maintainability engineering, edition 2000, Fourteen reprint 2011, TMH, New Delhi

## 3. Reference Books :

R.1. Lindley R. Higgins and R. Keith Mobley: Maintenance Engineering Handbook - 7th ed. Mcgraw-Hill, 2002.

R.2. S.K. Srivastava: Industrial Maintenance Management, S.Chand & Co, New Delhi, 1998

R.3. Alakesh Manna : Reliability and Maintenance Engineering, I.K. International Publishing house Pvt. Ltd., New delhi, 2011

R.4. M. Tajiri and F Gotoh: TPM Implementation: A Japanese Approach, McGraw-Hill, New York, 1992

**4. Course Plan :**

| Lec. No. | Objective | Topics | Section No, Chapter No. |
|---|---|---|---|
| 1-2 | Introduction | Introduction to the theory and practice of maintenance, Maintenance and Maintenance Engineering Objectives, Maintenance Terms and Definitions | T1, Ch. 1 |
| 3-5 | Maintenance Management and Control | Maintenance Management by objectives, Elements of Effective Maintenance Management, Maintenance Project Control Methods, Maintenance Management Control Indices | T1, Ch 3 |
| 6-10 | The Horizons of Maintenance Management | Preventive Maintenance: Elements, Program and Principle for PM, MPMT, MDPMT, MXPMT, PM Markov Model<br>Corrective Maintenance, Reliability Centered Maintenance | T1, Ch 4-6 |
| 11-12 | Inventory Control in Maintenance | Inventory Purposes, Types and Basic Maintenance, ABC Classification Approach for maintenance inventory control, Inventory control models, Safety stock | T1, Ch-7 |
| 13-14 | Quality and Safety in Maintenance | Need for Quality Maintenance Processes, Quality control charts for use in maintenance, Post-Maintenance Testing, Safety and Maintenance Tasks | T1, Ch-9 |
| 15-17 | Maintenance Costing | Maintenance labor and material cost estimation, Maintenance cost estimation models, Maintenance cost-related indices, Cost data collection | T1, Ch-10 |
| 18-21 | Reliability | Fundamentals of reliability, Why reliability engineering ?, applications and benefits, complexity of products, world industrial competition and reliability engineering | T2 Ch-1 |
| 22-26 | The Failure distribution | The five important analytical functions in reliability engineering, Reliability function, Mean time to failure,<br>Hazard rate function, Bathtub curve, conditional Reliability | T2 Ch 2 |
| 27-29 | Constant failure rate model | The exponential reliability function, Failure modes, Applications, The two parameter exponential distribution, poisson process, Redundancy and the CFR Model | T2 Ch 3 |
| 30-32 | Reliability of systems | Serial Configuration, Parallel Configuration, | T2 Ch 5 |

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|---|---|---|---|
| | | Combined Series-parallel systems, Complex configuration | |
| 33-34 | Physical Reliability Models | Covariate models, Static Models, Dynamic Models, Physics of failure models | T2 Ch 7 |
| 35-36 | Maintainability | Analysis of downtime, The repair-time distribution, system repair time, reliability under preventive maintenance, State-dependent systems with repair | T2 Ch 9 |
| 37-40 | Availability | Concepts and Definitions, exponential availability model, System availability, inspection and repair availability model | T2 Ch11 |

**5. Evaluation scheme and schedule:**

| Component | Duration | % Weightage | Date & Time | Remarks |
|---|---|---|---|---|
| Mid Semester | 90 min. | 30 | 17/3 4:00- 5:30 PM | Closed book (CB) |
| Test/Quiz | | 10 | Common hour | CB/OB |
| Project | | 25 | | |
| Comprehensive | 3 hours | 35 | 11/5 AN | CB/OB |

6. **Chamber Consultation Hour:** To be announced in the class

7. **Notices:** Notices concerning the course will be displayed on the Mechanical Engg notice board only.

8. **Make-up Policy:** Make-up will be permitted only for genuine cases with prior permission and no *makeup will be given for surprise quiz*.

**Instructor-In-Charge**

**MSE G513**