# GAUTAM BUDDHA UNIVERSITY

**Course Name: MAINTENANCE – Maintenance Fundamental Course**

**Course Credit: 04**

**Total Contact Hours: 60**

***Learning Objective*****:** *The aim of the course is to provide a general basic knowledge about scientific theory and application of maintenance engineering for industrial assets, infrastructure buildings, etc in a life cycle perspective.*

***Learning Outcomes*****:** *After completion of the course, participants will be able to:*

*-define, reflect and identify the most suitable maintenance strategy for their industrial/engineering assets*

*-understand the factors influencing the need of maintenance*

*- Calculate operating reliability of their engineering assets*

*--identify best available maintenance technologies for their assets*

*- perform LCC analysis, etc*

***Teachers/lecturer****: D. Kumar (Coordinator/Main Instructor, Uday Kumar, Jyoti Sinha and Adithya Thaduri)+ others as required*

| -S No | Topics | Total Hours: 60 |
|---|---|---|
| 1 | **Introduction and Basic concepts (Uday Kumar /Adithya Thaduri)** | **12** |
| | Historical perspective, Trends and overview of Maintenance Engineering and Management : Introduction to Maintenance Engineering: What is this thing called maintenance ? Why maintenance is needed? Relation between Reliability, Quality and Maintenance.<br><br>Factors and events causing /influencing the need for maintenance. Definition of Maintenance, CEN Standard, and Maintenance Terminology, Function, Fault, and Failures, | 4 |
| | Maintenance Costs : Direct costs and Indirect costs | 2 |
| | Maintenance need analysis in a life cycle perspective, | 2 |
| | Reliability Engineering Basic Concepts and models, reliability analysis tools and industrial software packages | 4 |

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| **2** | **Maintenance Objective, Strategy and Action plan (D Kumar)** | **8** |
| | Corrective Maintenance (CM), Preventive Maintenance, Condition based Maintenance | 2 |
| | Maintenance Organisation, External and Internal Organization Outsourcing Full service maintenance ,Partial Service or Total Care Solution, Power by the hour | 2 |
| | RCM ,& TPM | 4 |
| **3** | **Technology for Maintenance and Predictive Maintenance (D. Kumar)** | **4** |
| | Technology –an overview, technology to assess the state of an item .Direct method and Indirect method, testing vs monitoring | 2 |
| | Sensor Technologies, Classification of Sensors, Sensor selection,Sensors used in maintenance, Smart sensors, Wireless sensors | 2 |
| **4** | **State testing/monitoring Technologies and Predictive Maintenance(Jyoti Sinha)** | **4** |
| | Destructive Testing and Non Destructive Testing : Radio graphic Testing, Ultra sonic testing, Liquid colour penetrant testing and Eddy current testing/monitoring | 4 |
| **5.** | **Introduction Maintenance and Health Data storage and emerging Technology (Adithya Thaduri)** | **2** |
| | Data collection, storage, transmission, Server, Cloud storage etc, Diagnostic , AI, ML, IIo,T | 2 |
| **6** | **Examples of Maintenance Technologies deployed in Industries (Adithya Thaduri)** | **4** |
| | Component (bearing) , Plant –Wind Turbine, Railway Infrastrucure, Trains, pipelines | 4 |
| **7** | **LCC & Life Cycle Co sting (D. Kumar)** | **4** |
| **8.** | **Maintenance Management (D.Kumar)** | **12** |
| | Maintenance Organisation Centralized or decentralized or Hybrid Maintenance organization for a Manufacturing plant, Railway Network or Household equipment | **2** |
| | External or internal Outsourcing or Inhouse, Leasing of equipment | 2 |
| | Maintenance planning Scheduling and Control , | 2 |
| | Spare parts planning and location of stores/ware house | 2 |
| | Maintenance Performance Measurement | 4 |
| **9** | **Computerized maintenance management system-(Adithya Thaduri)** | **2** |
| **10** | **Course Review (All Teachers)** | **2** |