## *IE 438 Engineering Reliability and Maintenance 3(3,1,1)*

<table>
<tr><td>Catalog Data</td><td colspan="4">Introduction to maintenance function and types of maintenance, introduction to the concept of reliability, failure distributions, reliability characteristics, estimation of system reliability both for the independent and dependent cases, maintenance workload analysis and calculations; capacity planning of maintenance resources; maintenance work scheduling; maintenance audit and the measurement of maintenance work performance; and finally the computerized maintenance management systems (CMMS).</td></tr>
<tr><td>Prerequisite</td><td colspan="4">IE 314</td></tr>
<tr><td>Co-requisites</td><td colspan="4"></td></tr>
<tr><td>Level</td><td colspan="4">10</td></tr>
<tr><td>Textbook</td><td colspan="4">1. An Introduction to Reliability and Maintainability Engineering, by C. E. Ebeling, McGraw-Hill (1997).<br>2. Planning and Control of Maintenance Systems: Modeling and Analysis, Duffuaa; A. Raouf and J. Campbell, John Wiley & Sons, (1999).</td></tr>
<tr><td>Reference</td><td colspan="4">1- Introduction to Reliability Engineering, 2nd Edition, by E. E. Lewis, Wiley, (1996).<br>2- Maintenance Engineering: A Modern Approach, Burren, CRC press, (2004).</td></tr>
<tr><td>Learning Objectives</td><td colspan="4">The objective of the course is to provide the students with the fundamental concepts, the necessary knowledge and the basic skills related to systems reliability and systems maintenance function. The course intends to expose the students to the concept of reliability and to help them learn the techniques of estimating reliability and related characteristics of components/ systems. Moreover, it exposes them to the necessary engineering techniques used for analyzing, planning and controlling maintenance systems</td></tr>
<tr><td>Topics (classes)</td><td></td><td>Topic</td><td>Week</td><td>Contact, hr</td></tr>
<tr><td></td><td>1.</td><td>Maintenance function and objectives</td><td>(1)</td><td>[4]</td></tr>
<tr><td></td><td>2.</td><td>Types of maintenance</td><td>(1)</td><td>[3]</td></tr>
<tr><td></td><td>3.</td><td>Introduction to the concept of reliability</td><td>(1)</td><td>[3]</td></tr>
<tr><td></td><td>4.</td><td>Failure distributions</td><td>(1)</td><td>[5]</td></tr>
<tr><td></td><td>5.</td><td>Constant Failure Rate Model</td><td>(1)</td><td>[5]</td></tr>
<tr><td></td><td>6.</td><td>Time-Dependent Failure Models</td><td>(1)</td><td>[5]</td></tr>
<tr><td></td><td>7.</td><td>Systems Reliability</td><td>(1)</td><td>[5]</td></tr>
<tr><td></td><td>8.</td><td>Systems Maintainability</td><td>(1)</td><td>[5]</td></tr>
<tr><td></td><td>9.</td><td>Maintenance workload analysis</td><td>(2)</td><td>[7]</td></tr>
<tr><td></td><td>10.</td><td>Maintenance resources planning</td><td>(2)</td><td>[7]</td></tr>
<tr><td></td><td>11.</td><td>Maintenance works scheduling</td><td>(1)</td><td>[4]</td></tr>
<tr><td></td><td>12.</td><td>Maintenance performance measures</td><td>(1)</td><td>[3]</td></tr>
<tr><td></td><td>13.</td><td>Computerized maintenance management systems (CMMS) (MAXIMO Software)</td><td>14(labs weeks)</td><td>[14]</td></tr>
<tr><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>Laboratory Topics</td><td colspan="4">Maintenance Lab and CMMS lab (Maximo)</td></tr>
<tr><td>Project work</td><td colspan="4">Group projects on real life maintenance system - Students are asked to use the MAXIMO software in their projects</td></tr>
<tr><td>Computer Usage</td><td colspan="4">Computer use covers course topics</td></tr>
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| **Learning outcomes** | 1) Understand the maintenance function and its objectives and know how to prepare report about the maintenance function ***[a]***<br>2) Gain the necessary knowledge about the types of maintenance and know how to use them when design maintenance systems ***[a]***<br>3) Gain the necessary knowledge about failure distributions and apply failure analysis techniques ***[a, k]***<br>4) Estimate components reliability both for the independent & dependent cases as well as related characteristics ***[k]***<br>5) Estimate systems reliability both for the independent & dependent cases as well as related characteristics and design systems for better reliability ***[c, k]***<br>6) Estimate systems maintainability as well as related characteristics and design systems for better maintainability ***[c, k]***<br>7) Understand and apply different methods of maintenance workload analysis ***[k]***<br>8) Gain the necessary knowledge about the maintenance resources planning and apply various planning techniques ***[a, k]***<br>9) Know different ways for scheduling maintenance works and know how to use them ***[k]***<br>10) .Gain the necessary knowledge about maintenance performance measures and apply various maintenance performance techniques ***[k]***<br>11) Understand the computerized maintenance management systems and learn how to use MAXIMO Software by conducting term project ***[g, k]*** |
| **Estimated Category Content** | Engineering Analysis: 3 credit hour or 100%. |
| **Prepared by** | *Dr. Basel Shadid , Dr. Adel Al-Shayea* |
| **Preparation Date** | 30/5/2012G |