Manufacturing Reliability

**Prerequisite:** Basic understanding of statistical methods

**Description:** This course covers major topics in Reliability and Maintainability Engineering. The first part of the course introduces students to fundamental reliability concepts and metrics such as lifetime distributions, hazard/failure rates, and mean-time-to-failure. Students will learn to evaluate the reliability of single components as well as multi-component systems. An important part of reliability analysis is data analysis. Student will be introduced to various methods for analyzing failure data, different types of data censoring, and different types of reliability lifetime testing strategies.

The second part of the course focuses on management and planning of maintenance activities. Students will be exposes to the main types of maintenance programs: corrective, preventive, and predictive. The course will then explore the goals, benefits, and challenges of Total Productive Maintenance (TPM). A thorough treatment of the underlying principles of TPM, such as Overall Equipment Effectiveness (OEE), a key index that measures manufacturing productivity. Students will be introduced to a sequential framework for successful implementation of TPM.

**Class Text:** “An Introduction to Reliability and Maintainability Engineering”, Charles E. Ebeling

**Learning Outcomes:**

Students will:

* understand basic concepts of component reliability, failure distributions, and mean time to failure.
* develop skills for evaluating reliability of complex systems
* understand how to develop reliability test plans
* understand various types of maintenance models including preventive and predictive models.
* develop skills for analyzing various types of failures data including censored and uncensored data.

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| **Topics** | 1. Basic Reliability Models  * Reliability function * Mean time to failure * Hazard rate function |
|  | 1. Failure Models  * Constant failure rate models: Exponential model * Time-dependent failure rate models: Weibull, Normal, Lognormal, Gamma |
|  | 1. System Reliability  * Series systems * Parallel systems * Series/Parallel systems * System structure function, minimal cuts, and minimal paths |
|  | 1. Reliability Testing  * Burn-in testing * Accelerated testing * Reliability growth testing * Identifying failure and repair distributions |
|  | 1. Maintainability  * Maintenance Policies: Corrective, Preventive, and Predictive * Failure Analysis: Fault Tree Analysis, and Failure Mode and Effects Analysis * System Availability |
|  | 1. Total Productive Maintenance (TPM)  * Introduction to TPM concepts * Pillars of TPM * Overall equipment Effectiveness * Implementation of TPM |

**Grading Policy:**

Homeworks 25%

Quizzes 25%

Exam 1 25%

Exam 2 25%

**Grading scheme:**

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| **Grade** | **Range** |
| A | 90% to 100% |
| B | 80% to 90% |
| C | 70% to 80% |
| D | 60% to 70% |
| F | Below 60% |

**Learning Accommodations:**

If needed, we will make accommodations for students with documented disabilities. These accommodations must be arranged in advance and in accordance with the ADAPTS office (http://www.adapts.gatech.edu).

**Academic Honor Code:**

*All course participants (instructor, teaching assistants, and students) are expected and required to abide by the Georgia Tech Honor Code. Please familiarize yourself with the code, and use it to guide your conduct. Specifically, you must do your own work in all homeworks and exams.*

For any questions involving these or any other Academic Honor Code issues, please visit [www.honor.gatech.edu.](http://www.honor.gatech.edu)