

Liverpool John Moores University

Title: Availability, Reliability and Maintainability Analysis
Status: Definitive
Code: **7542RTC** (120375)
Version Start Date: 01-08-2019

Owning School/Faculty: Maritime and Mechanical Engineering
Teaching School/Faculty: Risktec Solutions

Team	Leader
Alan Wall	Y

Academic Level: FHEQ7 **Credit Value:** 10 **Total Delivered Hours:** 16.5
Total Learning Hours: 100 **Private Study:** 83.5

Delivery Options

Course typically offered: Semester 1

Component	Contact Hours
Lecture	8
Online	.5
Tutorial	8

Grading Basis: 40 %

Assessment Details

Category	Short Description	Description	Weighting (%)	Exam Duration
Essay	AS1	An essay question comprising several component parts, based around a case study, up to 4,000 words long.	95	
Test	AS2	Individual and group activities e. g. quiz, forum,	5	

Aims

To demonstrate expertise in Availability, Reliability and Maintainability (ARM) assessment methods and how to apply them to improve maintenance management, maintainability and reliability.

Learning Outcomes

After completing the module the student should be able to:

- 1 Apply the analysis methodologies to systems and sub-systems, including both design and operation restrictions, to determine the Availability, Reliability and Maintainability of these Systems.
- 2 Critically review and balance the requirements of the design for ARM and safety.
- 3 Logically deduce how ARM results for a system may be improved.
- 4 Categorise and determine ARM requirements / processes for a project.

Learning Outcomes of Assessments

The assessment item list is assessed via the learning outcomes listed:

4000 word essay	1	2	3	4
individual and group work	3	4		

Outline Syllabus

Introduction to Availability, Reliability and Maintainability (ARM):

Definition of Terms

Importance of ARM

Defining the Mission

ARM Targets and Target Apportionment

Availability and Safety – Potential Conflicts

Differences Between Safety and ARM

Claims on Repair

ARM Planning and Choice of Methodology

ARM Planning

Interpreting ARM Targets

Incorporating ARM Into the Design

Choice of Methodology

Dealing with ARM Shortfalls

ARM Assessment Methods – Deterministic

Failure Modes, Effects and Criticality Analysis (FMECAs)

Categorising Component Failures

Limitations of FMECA

Functional Block Diagrams

Numerical ARM Assessment Techniques

Parts Counts

Fault Tree Analysis

Reliability Block Diagrams

Critical and Life Limited Items

Critical Items – Novel, Expensive, Difficult to Repair

Limited Life Items

Maintainability and Maintainability Demonstrations

Incorporation of Maintenance into Design
Reliability Centred Maintenance (RCM)
Definitions of RCM
Processes, Requirements and Limitations
Methods of Improving Reliability

Learning Activities

A combination of lectures, exercises and supported self study.

Notes

The module aims to enable students to apply correctly the appropriate ARM methodologies to a project to ensure that ARM is included within the design and that the ARM targets are met.

The module also illustrates how ARM activities should be planned, and targets set.

It also discusses the concept of critical and life limited items and the use of reliability centred maintenance strategies to reduce maintenance costs.

Finally the module considers the trade-offs between ARM and safety requirements, as well as discussing how ARM shortfalls may be addressed.

Assessment is in the form of an essay combined with activities (e.g. exercises, discussions, etc.). The delivery modes for the module elements are explained below.

Lecture (using slides and notes): will be delivered by classroom based teacher (face to face) or online self-study (distance learning) or mixture of the two (blended learning).

Tutorial/Activities (exercises and reviews): will be delivered by classroom based teacher (face to face) or online activities with teacher feedback/virtual classroom (distance learning) or mixture of the two (blended learning).

Tutor supported online: will be delivered by email support prior to assessment submission (face to face) or tutor feedback activities, virtual classrooms and email support (distance learning) or mixture of the two (blended learning).