MODULE SPECIFICATION

Module Code:	ENG6AD

Module Title:	Maintenance & Safety System

Level:	6	**Credit Value:**	20

Cost Centre(s):	GAME	JACS3 **code**: HECoS code:	H714 100202

Faculty	FAST	**Module Leader:**	F Mansour

Scheduled learning and teaching hours	24 hrs
Guided independent study	176 hrs
Placement	0 hrs
Module duration (total hours)	200 hrs

Programme(s) in which to be offered (not including exit awards)	Core	Option
BEng (Hons) Industrial Engineering Design (Mechanical)	✓	☐
BEng (Hons) Industrial Engineering Design (Electrical & Electronic)	✓	☐
BEng (Hons) Production Engineering	✓	☐
BEng (Hons) Low Carbon Energy, Efficiency and Sustainability	✓	☐

Pre-requisites
None

Office use only

Initial approval: 11/09/19 Version no:1

With effect from: 11/09/19

Date and details of revision: Version no:2

Approved on 21/09/20 for addition of BEng Low Carbon Energy, Efficiency and Sustainability

Module Aims
Upon completion of the module, students should be able to analyse existing plant, operations and maintenance procedures and produce a critical appraisal of the system in respect to efficiency, inherent safety, environmental considerations (including carbon footprint), and controllability. Also the student should acquire the ability to develop the design of plant equipment and associated maintenance strategies for given process requirements.

Intended Learning Outcomes

Key skills for employability

KS1	Written, oral and media communication skills
KS2	Leadership, team working and networking skills
KS3	Opportunity, creativity and problem solving skills
KS4	Information technology skills and digital literacy
KS5	Information management skills
KS6	Research skills
KS7	Intercultural and sustainability skills
KS8	Career management skills
KS9	Learning to learn (managing personal and professional development, self-management)
KS10	Numeracy

	At the end of this module, students will be able to	Key Skills	
1	Critically analyse data relating to throughput/production and determine factors effecting efficiency	KS4	
2	Scrutinise associated performance and safety standards of a plant asset in its normal operating environment, whilst considering the impact on the overall system and safety should failure occur.)	KS3	
3	Conceptually evaluate a number of plant monitoring technologies in the context of improving reliability.	KS5	
4	Employ thorough analysis and reasoning, in order to justify a particular maintenance methodology for a given set of circumstances.	KS2	

Transferable skills and other attributes

Decision making, Leadership,
Evaluation and analysis skills, problem solving,
Networking.

Derogations
A derogation from regulations has been approved for this module which means that whilst the pass mark is 40% overall, each element of assessment (where there is more than one assessment) requires a minimum mark of 30%.

Assessment:

Indicative Assessment Tasks:

Case studies and assignments totalling 100%.

A typical assignment may be; devise methodologies to collect and assimilate data relating to plant/device failure over a period of time (own workplace). Information required would include; device, make, model, location normal operating parameters, parameters at time of failure, symptoms of failure, effects on process, down time whilst failed and repaired, failure mode and classification, estimated costs (not just components).

Upon completion of the data collection period the student should analyse the data and draw conclusions and recommendations relating to the rate of failure and current maintenance strategies. The student would hand in a series of tables (data) and a report explaining the reasoning and purpose behind the type of data collected and table construction, a thorough analysis of the information along with conclusions.

Assessment number	Learning Outcomes to be met	Type of assessment	Weighting (%)	Duration or Word count (or equivalent if appropriate)
1	1,2,3,4	Portfolio	100	4000

Learning and Teaching Strategies:

Presentation will be through a series of lectures, tutorials, works visits and assignments using suitable computer packages where appropriate.

Case Studies will be used to promote student's research and investigative skills. Identifying critical aspects of system and analysing good/weak aspects of system design.

Problem Based Learning – Part of this module will be dedicated to PBL. The problem will be based upon certain aspects of a system design, whereby the students, in small groups, will provide a solution to a design problem. This learning process will be facilitated by the module leader.

Syllabus outline:

- Examine the structure, management and operational implications of a number of maintenance strategies, such as; preventative, predictive, reactive and reliability centred maintenance (RCM).

- Complete case studies of failure rates, failure modes, circumstances and conditions, symptoms of failure prior to and after the event, impact on the plant/process.

- Investigate system risk tolerance and produce probabilistic and quantitative system risk assessments, apply an analysis of risks with respect to IEC 61508, IEC 61511 and relevant HSE guidelines.

- Damage limitation and redundant systems, to include an analysis on the effects of system/component redundancy on the overall reliability, maintainability, robustness environmental issues and economics of the process.

- Assess methods of engineering condition monitoring in terms of theory, practice and implementation when applied to a number of given scenarios. To include evaluations of intrusive and non intrusive methods such as; thermometry, vibration analysis, fibrescope, endoscope, radiography, fluorescent penetrant, potentiometric titration, UV and IR Spectroscopy, flux density for air gap eccentricity, automatic analysis of diagnostic and historical data.

Bibliography:

Essential reading

Kelly. A. (2006) *Maintenance Systems and Documentation*; Butterworth-Heinemann,

Other indicative reading

R. Keith Mobley (2004) Maintenance Fundamentals of Plant Engineering; Butterworth-Heinemann

Frank Helmus (2008) Process Plant Design*;* Wiley VCH.

Narayan, V. (2012), *Effective Maintenance Management: Risk and Reliability Strategies for Optimizing Performance*. 2nd ed. New York: Industrial Press.