

Module Title:	Maintenance and Safety Systems	Level:	6	Credit Value:	20
----------------------	--------------------------------	---------------	---	----------------------	----

Module code:	ENG667	Is this a new module?	YES	Code of module being replaced:	ENG627
---------------------	--------	------------------------------	-----	---------------------------------------	--------

Cost Centre:	GAME	JACS3 code:	H650
---------------------	------	--------------------	------

Trimester(s) in which to be offered:	1, 2 & 3	With effect from:	September 16
---	----------	--------------------------	--------------

Faculty:	FAST	Module Leader:	James Robinson
-----------------	------	-----------------------	----------------

Scheduled learning and teaching hours	60 hrs
Guided independent study	140 hrs
Placement	0 hrs
Module duration (total hours)	200 hrs

Programme(s) in which to be offered	Core	Option
BEng (Hons) Industrial Engineering	<input checked="" type="checkbox"/>	<input type="checkbox"/>
BEng (Hons) Renewable & Sustainable Engineering	<input type="checkbox"/>	<input checked="" type="checkbox"/>

Pre-requisites
None

Derogations
None

Office use only

Initial approval June 16

APSC approval of modification 19/11/19

Have any derogations received SQC approval?

Version 3

Yes No

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	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. (may include IEC 61508, IEC 61511 and relevant HSE guidelines)	KS3	
3	Evaluate a number of plant monitoring technologies in the context of improving reliability	KS5	
4	Through analysis and reasoning be able to justify a particular maintenance methodology for a given set of circumstances	KS2	

Assessment:

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 (if exam)	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

Anthony Kelly (2006) Maintenance Systems and Documentation; Butterworth-Heinemann,
V. Narayan, (2004) Risk and Reliability Strategies for Optimizing Performance; Industrial Press Inc.,U.S

Other indicative reading

R. Keith Mobley (2004) Maintenance Fundamentals of Plant Engineering; Butterworth-Heinemann
Frank Helmus (2008) Process Plant Design; Wiley VCH,