

MODULE SPECIFICATION FORM

Module Title: Calculus	Level: 4	Credit Value: 10
-------------------------------	-----------------	-------------------------

Module code: ENG424 (if known)	Cost Centre: GAME	JACS2 code: G160
--	--------------------------	-------------------------

Semester(s) in which to be offered: 2	With effect from: July 2015
--	------------------------------------

Office use only: To be completed by AQSU:	Date approved: July 2015 Date revised: Version No: 1
---	--

Existing/New: Existing	Title of module being replaced (if any): N/A
-------------------------------	--

Originating Academic area: Engineering and Applied Physics	Module Leader: B Klaveness
---	-----------------------------------

Module duration (total hours) 100	Status: Free-standing 10-credit component comprising first half of ENG461 (Engineering Mathematics). core/option/elective (identify programme where appropriate):
Scheduled learning and teaching hours 36	
Independent study hours 64	
Placement hours 0	

Percentage taught by Subjects other than originating Subject (please name other Subjects):	0%
--	-----------

Programme(s) in which to be offered: Engineering European Programme (Non Award Bearing)	Pre-requisites per programme (between levels): None
--	--

Module Aims: <ul style="list-style-type: none"> To extend mathematical knowledge to cover calculus including second order differential equations. To further develop an analytical approach to the derivation of functions and expressions. To develop the application of mathematical principles in the solution of engineering problems, including the use of computer software.
--

Expected Learning Outcomes <u>Knowledge and Understanding:</u> At the completion of this module, the student should be able to: <ol style="list-style-type: none"> Use differentiation and integration processes including second order differential equations. Select and apply appropriate calculus techniques to the solution of mathematical and engineering problems. Use mathematical modelling software to apply the mathematical techniques of 1 and 2 in solving engineering problems. (KS 3, 4) <u>Key skills for employability</u> <table style="width: 100%; border: none;"> <tr> <td style="width: 50%; border: none;"> <ol style="list-style-type: none"> Written, oral and media communication skills, Leadership, team working and networking skills Opportunity, creativity and problem solving skills Information technology skills and digital literacy Information management skills Research skills </td> <td style="width: 50%; border: none;"> <ol style="list-style-type: none"> Intercultural and sustainability skills Career management skills Learning to learn (managing personal and professional development, self management) Numeracy </td> </tr> </table>	<ol style="list-style-type: none"> Written, oral and media communication skills, Leadership, team working and networking skills Opportunity, creativity and problem solving skills Information technology skills and digital literacy Information management skills Research skills 	<ol style="list-style-type: none"> Intercultural and sustainability skills Career management skills Learning to learn (managing personal and professional development, self management) Numeracy
<ol style="list-style-type: none"> Written, oral and media communication skills, Leadership, team working and networking skills Opportunity, creativity and problem solving skills Information technology skills and digital literacy Information management skills Research skills 	<ol style="list-style-type: none"> Intercultural and sustainability skills Career management skills Learning to learn (managing personal and professional development, self management) Numeracy 	

Assessment:

Please indicate the type(s) of assessment (eg examination, oral, coursework, project) and the weighting of each (%). **Details of indicative assessment should also be included.**

Assessment is by means of a formal examination covering all outcomes. It is an unseen time-constrained one with a fixed number of questions, typically five, where students are required to answer only three out of the five possible. (This corresponds to 'Assessment 2' of ENG461.)

Assessment number	Learning Outcomes to be met	Type of assessment	Weighting	Duration (if exam)	Word count (if coursework)
Assessment One:	1, 2, 3	Examination	100%	2hrs	

Learning and Teaching Strategies:

The module will be presented to the students through a specified series of lectures, supported by problem-solving practice carried out in interactive tutorials. These tutorials will be supported by practice using computer software both in tutorial time and by directed study outside the classroom.

Formative assessment takes place throughout the module during tutorials and feedback is given during these tutorials.

Syllabus outline:

Differentiation: Products, quotients, implicit and parametric differentiation, use of logs for complex products and quotients, applications;

Integration: Methods of substitution, partial fractions and by parts. Definite indefinite integrals, applications;

First Order Differential equations: Linear first order differential equations; separation of variables, use of integrating factor. Second order with zero input - three types of solutions;

Second Order Differential Equations with Constant Coefficients: Method of undetermined coefficients for finding particular integrals. Transient and steady state solutions. Applications to damped vibrations and resonance. Introduction to finite difference methods for ordinary differential equations;

Applications: contextualising the application of the topics considered in this module to make them relevant to the chosen technology specialism.

Software: mathematical modelling software to support other elements of this module, emphasising potential as an analytical tool.

BibliographyEssential reading:

Croft, A. et al. (2008) *Engineering Mathematics*, 3rd Edn., Prentice-Hall.

Singh, K. (2011) *Engineering Mathematics through Applications*, 2nd Edn., Palgrave Macmillan.

Glyn, J. (2010) *Modern Engineering Mathematics*, 4th Edn., Prentice-Hall.

Recommended reading:

Bird, J. (2010) *Engineering Mathematics*, 6th Edn., Newnes.

Stroud, K. (2007) *Engineering Mathematics*, 6th Edn., Palgrave Macmillan.

Key Website References:

mathcentre - Mathematics resources: <http://www.mathcentre.ac.uk/>;

sigma – Network for excellence in mathematics/statistics support: <http://sigma-network.ac.uk/>;

Engineering Maths First-Aid Kit:

<http://www.nationalstemcentre.org.uk/elibrary/collection/1287/engineering-maths-first-aid-kit>;

HELM – Helping Engineers Learn Mathematics: <http://www.lboro.ac.uk/research/helm/>;

Khan Academy: <http://www.khanacademy.org/>;

Mathematics Learning Support Centre at Loughborough University: <http://mlsc.lboro.ac.uk/resources.php>.