PRIFYSGOL

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UNIVERSITY

MODULE SPECIFICATION FORM

Module Title:	**Application Toolkit**		Level:	**5**	Cedit Value:	**10**

Module code:	**ENG539**	Cost Centre:	**GAME**	JACS2	**G160**
(if known)				code:	

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

Office use only:	Date approved:	July 2015
To be completed by AQSU:	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 second half of ENG537 (Engineering Mathematics).**
Scheduled learning and teaching hours	36	core/option/elective	
Independent study hours	64	(identify programme where appropriate):	
Placement hours	0		

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

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

Module Aims:

To further develop knowledge of functions suitable for solving mathematical and engineering problems;
To demonstrate a repertoire of problem-solving skills and an ability to generalise and transfer ideas, appropriate to engineering applications of mathematical concepts;
To evaluate the solutions found with respect to mathematical and engineering problems;
To develop an ability to analyse experimental data for linear trends and statistical properties;
To analyse and model practical engineering problems using mathematical modelling software.

Expected Learning Outcomes

Knowledge and Understanding:
At the completion of this module, the student should be able to:

1. Solve Partial Differential Equations (PDEs);
2. Apply complex analysis to engineering applications;   *(KS 3)*
3. Manipulate linear algebra;
4. Use statistical methods to collect and analyse data for experimental work, batch production and quality control, including the use of probability to predict performance.   *(KS 10)*

Key skills for employability
     1. Written, oral and media communication skills,
     2. Leadership, team working and networking skills
     3. Opportunity, creativity and problem solving skills
     4. Information technology skills and digital literacy
     5. Information management skills
     6. Research skills

     7. Intercultural and sustainability skills
     8. Career management skills
     9. Learning to learn (managing personal and professional development, self management)
     10. Numeracy

Assessment: *please indicate the type(s) of assessment (e.g.: examination, oral, coursework, project) and the weighting of each (%).*

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 ENG537.)

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

Learning and Teaching Strategies:

The module will be presented to students through lectures, tutorials, and computer-based laboratory investigations. The tutorials and computer-based laboratory investigations will be used for students to practice problem solving to reinforce the lecture material and to provide individual attention where needed.

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

Syllabus outline:

Solve Partial Differential Equations: Method of separation of variables. Laplace, wave, heat conduction and Schrodinger equations. Initial and boundary value problems. Application of Fourier series to the solution of PDEs..

Apply Complex Numbers to Engineering Applications: Cauchy-Riemann equations. Conformal mappings, bilinear mappings. Impedance and admittance loci. Joukowski transformation. Contour integration, residues.

Linear Algebra: Matrices and their properties, manipulation and applications, involving determinants, inverses, Gaussian elimination, eigenvalues and eigenvectors. Applications to systems of first order differential equations (control theory). Vector Analysis. Scalar and vector fields. Line integrals and gradient. Double integrals, repeated integrals, surface integrals. Grad, div, curl. Stoke's and Gauss's theorems.

Probability and Statistics: (Chosen to suit the requirements of the cohort)

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

Bibliography:

Essential reading:
Jordan, D. & Smith, P. (2008) *Mathematical Techniques: An Introduction for the Engineering, Physical, and Mathematical Sciences*, 4th Edn., Oxford: Oxford Univerity Press.
Asmar, N. H. (2002*) Applied Complex Analysis with Partial Differential Equations*, 2nd Edn., Harlow: Pearson Education Ltd.

Recommended reading:
James, G. (2010) *Advanced Modern Engineering Mathematics*, 4th Edn., Harlow: Pearson Education Ltd.
Kreyszig, E. (2011) *Advanced Engineering Mathematics*, 10th Edn., Chichester: John Wiley & Sons Ltd.
Croft, A. & Davison, R. (2010) *Mathematics for Engineers*, 3rd Edn., Harlow: Pearson Education Ltd.
Stroud, K.A. (2011) *Advanced Engineering Mathematics*, 5th Edn., Basingstoke: Palgrave McMillan.

Key Website References:
mathcentre - Mathematics resources: http://www.mathcentre.ac.uk/;
sigma – Network for excellence in mathematics and 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 Lear 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.