PRIFYSGOL
glyndŵr
UNIVERSITY

MODULE SPECIFICATION FORM

Module Title:	**Analytical Techniques***	Level:	**4**	Credit Value:	**10**

Already Validated as part of main BEng programme, 2012

Module code: (if known)	**ENG575**	Cost Centre:	**GAME**	JACS2 code:	**G160**

Semester(s) in which to be offered:	**1** (*2 Ord*)	With effect from:	**July 2015**

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: core/option/elective (identify programme where appropriate):	**Core**
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: **MEng/ BEng(Hons) Renewable Energy and Sustainable Technology**	Pre-requisites per programme (between levels):	**None**

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 to mathematical and engineering problems;
- 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. Use partial differentiation for analysing functions of two variables;
2. Apply mathematical methods of Fourier series and Laplace transform theory to solve engineering problems;

(KS 10, 3)

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

Assessment One: is by means of an examination covering outcomes 1 and 2. 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.

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

Grounding work: Revision of partial differentiation, total differentials, and partial fractions.

Analyse Functions of Several Variables: Minimum, maximum and saddle points of functions of 2 independent variables. Change of variables, inverse functions and Jacobians.

Define and Apply Fourier Series: Full-range and half-range series. Even and odd functions. Coefficients in exponential form of complex numbers. Elementary properties. Numerical harmonic analysis.

Laplace Transforms: The (one-sided) Laplace transform and its existence, standard functions and use of look-up tables. Use of Laplace transforms in solving simple ODEs with constant coefficients and given boundary conditions. The solution of slightly more complicated ordinary differential equations with given initial or boundary conditions - constant coefficient equations, simultaneous equations, some equations with non-constant coefficients, equations with discontinuous forcing terms.

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.
James, G. (2010) *Advanced Modern Engineering Mathematics*, 4th Edn. Harlow: Pearson Education Ltd.

Recommended Reading:
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.