PRIFYSGOL glyndŵr UNIVERSITY

MODULE SPECIFICATION FORM

Module Title:	**Vibration Analysis**	Level:	**6**	Credit Value:	**10**

Module code: (if known)	**ENG608**	Cost Centre:	**GAME**	JACS2 code:	H143

Semester(s) in which to be offered:	**1**	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):

Originating Academic area: **Engineering and Applied Physics**	Module Leader: **Z. Chen**

Module duration (total hours)	100	**Status:** core/option/elective (identify programme where appropriate):	**Free-standing 10-credit component comprising half of ENG620 (Vibration Analysis and Complex Structures).**
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: **Enginering European Programme** (Non Award Bearing)	Pre-requisites per programme (between levels):	**None**

Module Aims:

To develop an understanding of free vibration and forced damped vibration in two degree of freedom systems. To understand the concept of vibration control, to appreciate methods used in the analysis of multi-degree of freedom systems and continuous systems.

Expected Learning Outcomes

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

1. Analyse different vibrating systems from first principles;
2. Control or minimise vibrations;
3. Select from a range of analysis methods and possible solutions to suit differing practical and design situations; (KS 5)

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 (%).*

Assessment is by means of an examination covering all outcomes. It is an unseen time-constrained exam. (This corresponds to one-half (part A) of the examination of ENG620.)

Assessment number (use as appropriate)	Learning Outcomes met	Type of assessment	Weighting	Duration (if exam)	Word count (if coursework)
Assessment One:	1, 2, 3	Examination	100%	2 hr	

Learning and Teaching Strategies:

The module will be presented to students through a series of lectures, tutorials and case studies utilising laboratory equipment where appropriate. Use of computer packages, including specially developed computer aided packages from within the department, will be used to aid learning.

Syllabus outline:

Vibration systems and modelling: Free vibrations, calculation of natural frequencies and dynamic deflections etc, determination of modal shapes. Systems incorporating damping and forced vibrations, dynamic stiffness coefficients.

Vibration control: Concept of vibration absorbers, undamped vibration absorbers, merits of damped vibration absorbers.

Multi-degree of freedom systems: Solution by eigenvalues and eigenvectors, matrix iteration etc, modal shapes, orthogonality of principal modes.

Beam elements: Determination of mass matrix and stiffness matrix, beams subjected to differing constraints and loading conditions.

Vibration Measurement: Practical measurement of displacement, velocity and acceleration. Measurements in frequency domain by spectral analysis.

Bibliography:

Essential reading:

Rao, S.S. (2011) *Mechanical Vibrations*, 5th Ed., Pearson Ed Asia.

Recommended reading:

Benaroya, H. (2009) *Vibration: Analysis, Uncertainties, and Control*, 3rd Edn., CRC Press

Petyt, M. (2010) *Introduction to Finite Element Vibration Analysis*, 2nd Edn., Cambridge University Press

Inman, D.J. (2008) *Engineering Vibrations*, 3rd Edn., Pearson.

Wowk, V. (2009) *Machinery Vibration: Measurement and Analysis*, McGraw-Hill.