PRIFYSGOL glyndŵr UNIVERSITY

MODULE SPECIFICATION FORM

Module Title: **Mechanics of Solids and Machines**	Level: **4**	Credit Value: **10**

Module code: **ENG402** (if known)	Cost Centre: **GAME**	JACS2 code: **H142**

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): N/A

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 first half of ENG458 (Mechanical Science).**
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 gain an understanding of the basic principles of stress and strain analysis and of engineering dynamics, and then to apply the theory to practical situations

Expected Learning Outcomes

Knowledge and Understanding:

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

1. Solve problems involving the basic principles of stress and strain analysis relating to simple and compound bars, loaded beams, bending and torsion. *(KS 10)*
2. Solve problems involving the basic principles of engineering dynamics relating to angular motion, linear and angular kinetic energy and simple harmonic motion.
3. Apply basic principles to practical design problems.

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 mean of a programme of coursework and laboratory exercises spread throughout the module. (This corresponds to 'Assessment 2' of ENG458.)

A typical laboratory exercise is the analysis of a T section beam under a varying load. Strain gauge readings would be taken to determine strain and hence stress values and these would then be checked using classical bending theory. The student would then produce a written report of the findings.

Assessment number	Learning Outcomes to be met	Type of assessment	Weighting	Duration (if exam)	Word count (if coursework)
Assessment One:	1, 2, 3	Coursework	100%		1500

Learning and Teaching Strategies:

The module will be delivered by a set of structured lectures backed up by tutorials. Laboratory work and computer simulation packages will be utilised where appropriate to aid the learning process.

Syllabus outline:

Direct Stress, Direct Strain and Shear Stress: Direct stress and direct strain; Young's Modulus of Elasticity; Shear stress; Modulus of Rigidity.

Compound Bars: Definition of a compound bar; Stresses and deformation due to uni-axial loads at uniform temperature.

Shear Force and Bending Moment Diagrams: Shear force and bending moment diagrams for simply supported and cantilever beams subjected to different loading conditions.

Simple Bending Theory: Centroid, first moment of area and second moment of area; Simple bending equation; Application to rectangular, circular and idealised I-section beams; Section modulus; Selection of appropriate beams for given loading using standard section handbooks.

Simple Torsion Theory: Simple torsion equation; Relationship between torque and power; Solve problems involving torsion in solid and hollow shafts.

Angular Motion: Equations for angular motion with constant angular acceleration; Application to practical engineering problems; Relationship between applied torque, angular acceleration and moment of inertia; Radius of gyration; Angular acceleration of discs and flywheels; Static and dynamic balancing; Solution of problems involving out of balance forces by analytical and graphical means.

Linear and Angular Kinetic Energy: Expressions for linear and angular kinetic energy; Problems including flywheels and lift systems.

Vibrations: Simple harmonic motion; Simple pendulums and spring mass systems; Concept of resonance and resulting problems.

Bibliography

Essential Reading:

Hibbeler, R.C. (2011) *Engineering Mechanics: Statics*, 13th Edn., Prentice Hall.

Hearne, E.J. (2004) *Mechanics of Materials,* (Butterworth Heineman)

Recommended Reading:

Bolton, W. (2006) *Mechanical Science*, (Blackwell Publishing.)

Tooley and Dingle (2004) *Higher National Engineering*, (Elsevier)