PRIFYSGOL glyndŵr UNIVERSITY

MODULE SPECIFICATION FORM

Module Title:	**Computational Fluid Dynamics (CFD)**	Level:	**6**	Credit Value:	**10**

Module code: (if known)	**ENG682**	Cost Centre:	**GAME**	JACS2 code:	H440

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:	**New**	Title of module being replaced (if any):	**Computer Analytical Tools B (ENG664)**

Originating Academic area:	**Engineering and Applied Physics**	Module Leader:	**S. Monir**

Module duration (total hours)	100	**Status:** core/option/elective (identify programme where appropriate):	**Free-standing 10-credit component comprising half of ENG619 (Aerodynamics and CFD).**
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 processes involved in the application of computer-based modelling and analysis software and practical experience at deriving solutions for engineering tasks.
This module aim to develop industry-standard software techniques to model and solve aeronautical, mechanical and automotive engineering problems.

Expected Learning Outcomes

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

1. Identify and describe the main areas where computational analysis can be applied and the key stages associated with practical CFD analysis; *(KS 5)*
2. Define the key stages involved with utilising design variables in performing design sensitivity and optimisation studies; utilise CFD techniques to analyse practical design problems;
3. Define current industrial practice with respect to the application of analysis and simulation methods. *(KS 4)*

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 a coursework on CFD and is assessed via a series of developmental exercises modelling air flow around different objects, such as aerofoil, cooling fan and lorry, investigating the aerodynamic behaviours and comparing the simulation data with experimental results. Each stage would be evaluated on a week-by-week basis as the exercise develops. It covers all outcomes.
(This corresponds to the 'coursework' element of ENG619.)

Assessment number (use as appropriate)	Learning Outcomes met	Type of assessment	Weighting	Duration (if exam)	Word count (if coursework)
Assessment One:	1, 2, 3	Coursework	100%		2000

Learning and Teaching Strategies:

The CFD module will take the form of practical exercises, using specialist software, supported by introductory lectures and demonstrations.

Syllabus outline:

CFD Software: Introduction to Computational Fluid Dynamics (CFD) and its role as an enabling technology in a 'time to market strategy' using ANSYS Gambit and Fluent;

Model Definitions: definition of geometry and mesh set-up; selection of models; specifications of boundary conditions;

Case Study; interpretation of results;

CFD Analytical Activities: further development of theoretical concepts in fluid mechanics applicable to CFD; studies of fluid flows in cases of 2-D and 3-D modelling; boundary layer theory and turbulence modelling.

Bibliography:

Essential reading:
Houghton, E.L. and Carpenter, P.W. (2006) *Aerodynamics for Engineering Students*, Butterworth-Heinemann.

Recommended reading:
Versteeg, H. K. and Malalasekera, W. (2007) A*n introduction to computational fluid mechanics*. 2nd Edn., Oxford: Longman
Chung, T.J. (2011) *Computational Fluid Dynamics*. 2nd Edn., Cambridge: Cambridge University Press