

MODULE SPECIFICATION FORM

Module Title:	Stability and Control	Level:	6	Credit Value:	10
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Module code: (if known)	ENG606	Cost Centre:	GAAE	JACS2 code:	H441
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Semester(s) in which to be offered:	2	With effect from:	July 2015
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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
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Originating Academic area:	Engineering and Applied Physics	Module Leader:	Z Chen
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Module duration (total hours)	100	Status: core/option/elective (identify programme where appropriate):	Free-standing 10-credit component comprising half of ENG615 (Flight Stability, Control and Compressible Aerodynamics).
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%
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Programme(s) in which to be offered: Engineering European Programme (Non Award Bearing)	Pre-requisites per programme (between levels):	None
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Module Aims: To develop an understanding of the basic principles of Aircraft Flight Dynamics, Longitudinal and Lateral Dynamic Stability, Control and Guidance, including current and emerging developments.
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<p>Expected Learning Outcomes</p> <p><u>Knowledge and Understanding:</u> At the completion of this module, the student should be able to:</p> <ol style="list-style-type: none"> 1. Apply the equations of motion of a rigid Aircraft referred to moving axes; develop and apply Aerodynamic Derivatives for Longitudinal and Lateral Dynamic Stability; (KS 3) 2. Analyse aircraft performance using aircraft flying and handling qualities specifications; (KS 3) 3. Design aircraft stability augmentation systems, attitude control systems and guidance systems. (KS 3) <p><u>Key skills for employability</u></p> <table border="0"> <tr> <td>1. Written, oral and media communication skills,</td> <td>7. Intercultural and sustainability skills</td> </tr> <tr> <td>2. Leadership, team working and networking skills</td> <td>8. Career management skills</td> </tr> <tr> <td>3. Opportunity, creativity and problem solving skills</td> <td>9. Learning to learn (managing personal and professional development, self management)</td> </tr> <tr> <td>4. Information technology skills and digital literacy</td> <td>10. Numeracy</td> </tr> <tr> <td>5. Information management skills</td> <td></td> </tr> <tr> <td>6. Research skills</td> <td></td> </tr> </table>	1. Written, oral and media communication skills,	7. Intercultural and sustainability skills	2. Leadership, team working and networking skills	8. Career management skills	3. Opportunity, creativity and problem solving skills	9. Learning to learn (managing personal and professional development, self management)	4. Information technology skills and digital literacy	10. Numeracy	5. Information management skills		6. Research skills	
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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 B) of the examination of ENG615.)

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 delivered by a set of structured lectures backed up by tutorials on material provided in standard notes issued to students on Moodle at the start of the module. Individual study time will be used for the reading of set texts, working on tutorials and private investigations. Relevant video material will be used to strengthen topics from within the module.

Syllabus outline:

Equations of motion of a rigid aircraft referred to moving axes: General dynamic equation for a rigid aircraft referred to moving axes. Equation of motion for small disturbances of a symmetric aircraft. Axis system to be used in stability analysis. Apply the non-dimensional form of the equations of motion.

Longitudinal and lateral aerodynamic derivatives of an aircraft: Derivatives due to: force-velocity, pitching moment, rates of change, sideslip, rate of roll, rate of yaw. Non-dimensional forms of derivatives. Apply the general solution of the equations of motion. Dynamic stability criteria. Analyse the roots of the characteristic equation. Stability aspects of high speed aircraft.

Handling and Flying Qualities: Definitions and main difference between handling and flying qualities. Flying qualities specifications of aircraft performance. Stability analysis.

Aircraft Flight Control Systems Design: Stability Augmentation Systems. Pitch attitude control. Roll attitude control. Flight path control and guidance.

Bibliography:

Essential reading: _____

McLean, D. (1992) *Automatic Flight Control Systems*, Prentice Hall.

Recommended reading:

McCormick, B.W. (2006) *Aerodynamics, Aeronautics and Flight Mechanics*, John Wiley and Son.

Roskam, J. (2003) *Airplane Flight Dynamics and Automatic Flight Controls*, DAR Corporation.

McRuer, D.T. et al. (1973) *Aircraft Dynamics and Automatic Control*, Princeton University Press.