UNIVERSITY OF HERTFORDSHIRE

Definitive Module Document

1 Module CODE	2 Titles: Short: Intro to Man Tech Long: Introduction to Manufacturing Technology			
1AAD0017				
3 Credit Points:	**4 ECTS Points:**	**5 Level:**	**6 Location:**	**7 Date first offered:**
15	7	1	UH HATFIELD	01/09/2004

8 Semester(s) in which the Module is approved to run: A

9 Home Department: AAD Aerospace, Automotive & Design

10 Departments Contributing to Teaching:					
AAD 100%	0%	0%	0%	0%	0%
0%	0%	0%	0%	0%	0%

Total: 100 %

11 Module Aims:

The aims of this module are to enable students to . . .

* acquire basic workshop practice skills
* manufacture a number of artifacts using a range of production processes
* be aware of the influence of production processes on product design and manufacture

12 Intended Learning Outcomes:

12a Knowledge and Understanding

Successful students will typically . . .

* appreciate the capabilities of a range of production techniques
* understand the factors that influence process selection in relation to product design sales requirements

12b Skills and Attributes

Successful students will typically . . .

* interpret engineering drawings for component and assembly manufacture
* apply a range of production processes to the manufacture of given component and assembly drawings
* identify production processes for the manufacture of a selection of products or sub-assemblies taking into account quantities required

13 Modes of Delivery:

Delivery Mode:	Hours per	Lecture	Seminar/ Tutorial	Workshop/ Prac/Group	Indep	Fieldwork/ Prof Prac	Total hours:
Classroom-based		10	0	27	113	0	150

14 Module Content:

14a Module Content: (for publication, max 150 words)

This module introduces the student to a range of production processes and practice used commonly in the manufacture of products. Students develop a hands-on appreciation of production techniques including turning, milling, fabrication and assembly using manual and computer controlled plant and machinery. Transferable skills are developed in the application of the processes used to the manufacture of a range of products and sub-assemblies taking into account design and supply requirements.

14b Module Content details: (supporting Learning Outcomes, max 250 words)

The intended learning outcomes are facilitated through a combination of approaches to learning and teaching, typically this will include lectures and workshop activities. These activities will be supported by the module team and by encouraging the students to access a variety of resources, eg Studynet, academic texts.

The module is taught through a series of workshop based practical sessions supported by lectures on the interpretation of engineering drawings for manufacture and lectures on a number of manufacturing processes and their application.

The hands-on practical sessions are intended to develop the student's appreciation of the techniques, capabilities and limitations of a range of commonly available production processes that support product manufacture. Students will be assessed by their ability to manufacture a range of artifacts from engineering drawings and by the submission of a logbook recording the work undertaken. Students will be made aware of aspects of Health & Safety legislation prior to commencing workshop practice.

The lectures cover an introduction to;
Casting Process; typically covering sand, shell moulding, gravity, high-pressure, centrifugal and investment casting processes.
Forming Processes; typically covering forging, rolling cold heading and forming, drawing and extrusion processes.
Machining Processes; typically covering turning, milling, planning/shaping, drilling/remaining, broaching and grinding processes.
Plastic & composite processes; typically covering injection, compression, transfer, blow, rotational moulding, vacuum forming and continuous extrusion.
Joining processes; typically covering manual metal arc, metal inert gas, tungsten inert gas, resistance, friction and gas welding techniques.
Lectures for many processes are supplemented by the use of videos.

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15 Language of Delivery: English **16 Language of Assessment:** English

17 Assessment Details

17a Assessment: (weighting and compulsory information, max 50 words)

Coursework: 50 % Exam 50 %

17b Further details: (max 200 words)

Typically, assessment will consist of:
A logbook of practical work undertaken
An unseen examination
Overall pass required, subject to a maximum grade of E2 if not both coursework and examination are passed. A reasonable attempt at both elements of the assessment is required for the attainment of an overall pass.
Each assessment satisfies a selection of the learning outcomes.

18 Pre and Co Requisite Pre req: ☐ ☐ ☐
Note: tick if optional Co req: ☐ ☐ ☐ Prohibited:

19 Subject Board of Examiners: BUS/MGMT/QUAL COURSES (AADE)

20 Programmes on which this Module is offered

*	EIA	Aerospace Engineering degree
*	EIASE	Aerospace Systems Engineering Degree
*	EIM	Mechanical Engineering Degree
*	EIME	BEng (Hons) Manufacturing Engineering
*	EICAE	BEng (Hons) Computer Aided Engineering
*	EIMENG	MEng Engineering
*	EIV	B.Eng(Hons) Automotive Engineering Degree
*	EITM	BSc Hons Technology with Management

21 Previous Module this Module replaces: 1AAD0002.

22 Comments:

SIGNATURES: **Head of Department -** PR Butler Date: 13/7/04
Faculty Registrar - Date: 19/7/04
Associate Dean Academic - F. Verdi Date: 16/7/04

FACULTY OF ENGINEERING AND INFORMATION SCIENCES

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UNIVERSITY OF HERTFORDSHIRE

Definitive Module Document

1 Module CODE	2 Titles:	
1AAD0018	Short: Mat & Elec Science	
	Long: Materials and Electrical Science	

3 Credit Points:	4 ECTS Points:	5 Level:	6 Location:	7 Date first offered:
15	7	1	UH HATFIELD	01/09/2004

8 Semester(s) in which the Module is approved to run: A

9 Home Department: AAD Aerospace, Automotive & Design

10 Departments Contributing to Teaching:

AAD 100%	0%	0%	0%	0%	0%
0%	0%	0%	0%	0%	0%

Total: 100 %

11 Module Aims:

The aims of this module are to enable students to . . .

* develop an understanding of the scientific principles, general properties and appropriate uses of engineering materials for given engineering environments.
* develop an understanding of the fundamental principles of electrical circuits and the characteristics and properties of electromechanical machines.

12 Intended Learning Outcomes:

12a Knowledge and Understanding

Successful students will typically . . .

* be able to identify the structure of metals, polymers and ceramics, explain relationships with mechanical and physical properties and recognise their use and limitations in engineering environments.
* be able to explain electronic principles, analogue and digital circuits and review the operation of electromechanical machines.

12b Skills and Attributes

Successful students will typically . . .

* select materials for applications based on the behaviour of the major classes of engineering materials
* select appropriate mechanical testing procedures for the evaluation of engineering materials.
* use electronic test equipment to measure electrical properties of practical systems.

13 Modes of Delivery:

Delivery Mode:	Hours per	Lecture	Seminar/ Tutorial	Workshop/ Prac/Group	Indep	Fieldwork/ Prof Prac	Total hours:
Classroom-based		39	13	4	94	0	150

14 Module Content:

14a Module Content: (for publication, max 150 words)

This course encompasses (i) electrical science (fundamental concepts of electrical units and relationships, basic AC & DC circuit theory, digital systems and electro-mechanical machines) and (ii) engineering materials (classification of materials, mechanical and physical properties, structure of materials, testing, materials selection for metals, polymers and ceramics.

Please refer to the teaching plan for a more detailed description.

14b Module Content details: (supporting Learning Outcomes, max 250 words)

Materials.

1. Classification of materials - metals polymers & ceramics, composites, natural materials. Summary of common physical and mechanical properties and the relative properties of the classes of materials.
2. Structure of materials - atomic and/or molecular bonding in each class of material, periodic table; crystalline structures of metals, alloys and cements/concrete; defects in crystals.
3. Properties and evaluation of materials - elastic and plastic deformation, tensile & compressive strengths, modulus, ductility, toughness, hardness, fatigue strength, specific properties, corrosion resistance.
4. An introduction to practical materials, their properties and selection: metals (Steels, cast-irons, aluminium and its alloys, copper and its alloys); polymers (Thermoplastics, thermosets, elastomers); Ceramics (general & engineering ceramics and semiconductor materials.)

Electrical Science

1. Fundamental concepts; electric and magnetic fields; conduction and resistance; units of volts, amps and watts; circuit symbols, basic circuit elements, EMF and PD, resistance, inductance, capacitance and their units; voltage and current relationships; power and energy.
2. DC circuit theory; resistors and capacitors in series/parallel, Kirchoff's laws, voltage and current dividers; 1st order transient response.
3. AC circuit theory; single-phase generation; sine, square, triangle waveforms, Fourier concept; frequency, period, rms, and peak; the behaviour of discrete R, L and C circuit elements; introduction to phasor diagrams and their manipulation. Series RLC circuits and resonance.
4. Introduction to digital systems; basic logic functions, gates and truth tables.
5. Machines and transformers; electro-mechanical energy conversion and power flow through a machine; 3-phase basics. Introduction to ac and dc machines and their applications.

Attendance. Full attendance and participation is anticipated in order to gain full benefit from the stated programme.

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15 Language of Delivery: English **16 Language of Assessment:** English

17 Assessment Details

17a Assessment: (weighting and compulsory information, max 50 words)

Coursework: 40 % Exam 60 %

17b Further details: (max 200 words)

Typically, assessment will consist of:

Two assessed laboratory, essay or phase test assignments, one from each of the titular component sections and valued at 20% each.

A written examination comprising unseen questions from each section.

Overall pass required, subject to a maximum grade of E2 if not both coursework and examination are passed.

18 Pre and Co Requisite Pre req: ☒ ☒ ☒

Note: tick if optional Co req: ☐ ☐ ☐ Prohibited:

19 Subject Board of Examiners:

20 Programmes on which this Module is offered

*	EICAE	BEng (Hons) Computer Aided Engineering
*	EIME	BEng (Hons) Manufacturing Engineering
*	EITM	BSc Hons Technology with Management
*	EIV	B.Eng(Hons) Automotive Engineering Degree
*	EIM	Mechanical Engineering Degree
*	EIASE	Aerospace Systems Engineering Degree
*	EIA	Aerospace Engineering degree
*	EIMENG	MEng Engineering

21 Previous Module this Module replaces: 1AAD0004

22 Comments:

SIGNATURES: **Head of Department -** P R Butler Date: 15/7/04

Faculty Registrar - Date: 19/7/04

Associate Dean Academic - F Wardle Date: 16/7/04

FACULTY OF ENGINEERING AND INFORMATION SCIENCES

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Definitive Module Document

1 Module CODE	2 Titles: Short: Aero Tech & Bus Long: Aerospace Technology and Business
1ACM0026	

3 Credit Points:	4 ECTS Points:	5 Level:	6 Location:	7 Date first offered:
15	7	1	UH HATFIELD	01/09/2001

8 Semester(s) in which the Module is approved to run: A

9 Home Department: AAD Aerospace, Automotive & Design

10 Departments Contributing to Teaching:	AAD	100 %	0 %	0 %	0 %
	0 %	0 %	0 %	0 %	0 % **Total: 100 %**

11 Module Aims:

The aims of this module are to enable students to . . .

* acquire a basic understanding of the design & performance of an aircraft and its main components.
* appreciate the significance of aircraft operations .
* acquire an understanding of the management and business practices relevant to an engineering product
* develop the responsibilities associated with working in and contributing to a team

12 Intended Learning Outcomes:

12a Knowledge and Understanding

Successful students will typically . . .

* recognise the basic relationships between the design of an aircraft and its functional and performance aims.
* recognise the significance of aircraft operations
* identify the ethical and social issues of a business and its impact on a customer
* identify and translate customer needs into a design, through the application of management and business techniques

12b Skills and Attributes

Successful students will typically . . .

* investigate, collate and present technical information on aspects of aircraft design.
* apply and appraise appropriate mathematical techniques to a business

UNIVERSITY OF HERTFORDSHIRE

Definitive Module Document

13 Modes of Delivery:

Delivery Mode:	Hours per	Lecture	Seminar/ Tutorial	Workshop/ Prac/Group	Indep	Fieldwork/ Prof Prac	Total hours:
Classroom-based		31	6	6	107	0	150

14 Module Content:

14a Module Content: (for publication, max 150 words)

Technology
The basic design of an aircraft to achieve its functional and performance aims.
Aircraft operations.

Business
Students on this course will work within a business team and will develop professional responsibilities as individuals and as team members. The course balances lectures with team work and gives the student an understanding of the ethical and social issues of a business and its impact on the customer. Management and business practices and techniques are introduced through the design and development of a product and supporting lectures.

14b Module Content details: (supporting Learning Outcomes, max 250 words)

Technology
The basic design of an aircraft to achieve its functional and performance aims.
Airframe, flight control systems, cockpit and undercarriage
Hydraulic, fuel, cabin air, electrical and weapons systems.

The selection of materials for aerospace applications.Aircraft operations covering flight plans and air traffic control.
The technology material contributes to coverage of the PPL ground school

Business
Identify alternative organisational forms, legal requirements to publish accounts and aspects of employment law.
Identify the ethical and social issues of a business and its impact on a customer
Customer values, ethics and social issues through case studies and videos
Identify and translate customer needs into a design, through the application of management and business techniques
Market research, questionnaire design, forecasting, company set up, product costing
Recognise the professional responsibilities of working within a team
Communication methods, appraise individual performance within a team

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15 Language of Delivery: English **16 Language of Assessment:** English

17 Assessment Details

17a Assessment: (weighting and compulsory information, max 50 words)

Coursework: 100 % Exam 0 %

17b Further details: (max 200 words)

Typically, assessment will consist of:

- Phase test (15%)
- Group presentations (including peer assessment) (25%)
- Study skills assignment (10%)
- Business group report (50%)

18 Pre and Co Requisites: Note: tick if optional

Pre req:	☐	☐	☐	☐
Co req:	☐	☐	☐	☐
Prohibited:				

19 Subject Board of Examiners: AERO/CIVIL/MECH L1 COMMON

20 Programmes on which this Module is offered

*	EIMENG	MEng Engineering
*	EIASE	Aerospace Systems Engineering Degree
*	EIA	Aerospace Engineering degree

21 Previous Module this Module replaces:

22 Comments:

Signatures:

Head of Department - P R Fuller Date: 15/7/04

Faculty Registrar - Date: 19/7/04

Associate Dean Academic - Date: 16/7/04

FACULTY OF ENGINEERING AND INFORMATION SCIENCES

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Definitive Module Document

1 Module CODE	2 Titles:			
2AAD0001	Short: CAE and Structures Long: Computer Aided Engineering & Structural Mechanics			
3 Credit Points:	**4 ECTS Points:**	**5 Level:**	**6 Location:**	**7 Date first offered:**
15	7	2	UH HATFIELD	01/09/2003

8 Semester(s) in which the Module is approved to run: A

9 Home Department: AAD Aerospace, Automotive & Design

10 Departments Contributing to Teaching:					
AAD 100%	0%	0%			
0%	0%	0%	0%	0%	0%

Total: 100 %

11 Module Aims:

The aims of this module are to enable students to . . .

* develop an understanding of fluid mechanics
* gain experience in the use of CAD solid modelling software
* give an appreciation of the potential of solid modelling as a design tool
* extend the understanding of engineering and scientific principles appropriate to mechanical engineering
* provide an understanding of fundamental mechanics concepts and structural behaviour when subjected to combinations of types of loading

12 Intended Learning Outcomes:

12a Knowledge and Understanding

Successful students will typically . . .

* appreciate the governing equations of fluid mechanics and their formulation in a CFD code
* show an understanding of the principles of mechanics for bending & torsion

12b Skills and Attributes

Successful students will typically . . .

* construct solid models of prismatic parts
* demonstrate an ability to envisage and model a part that satisfies a given brief
* obtain and analyse results of a CFD simulation for a practical engineering application
* apply the basic principles of structural analysis in determining the behaviour of simple structures

13 Modes of Delivery:

Delivery Mode:	Hours per	Lecture	Seminar/ Tutorial	Workshop/ Prac/Group	Indep	Fieldwork/ Prof Prac	Total hours:
Classroom-based		22	23	3	102	0	150

14 Module Content:

14a Module Content: (for publication, max 150 words)

CAE: This part of the course introduces the students to two CAE systems, CAD solid modelling and Computational Fluid Dynamics (CFD). Each of these comprise 25% of the course. The CAD component gives introductory skills in solid modelling and shows the benefits and potential of 3D models in the design process. The CFD component introduces the concept of discretisation of the governing equations of fluid mechanics and covers setting up simple flow scenarios and geometries. Analysis is carried out with a view to parameters affecting result sensitivity.

MECHANICS: This part of the course includes shear force-bending moment diagrams, beam theory, combined loading conditions, direct stress/strain, shear stress/strain, torsion of shafts, bending stresses in beams with unsymmetrical sections, and power transmission.

14b Module Content details: (supporting Learning Outcomes, max 250 words)

The CAD component entails learning to use a solid modeller to build accurate and robust prismatic parts and simple assembly models. The CFD component of the course covers: an introductory lecture covering the concepts of discretisation, mesh and numerical sensitivity and the rationale of turbulence models; tutorial sessions on a commercial CFD package to familiarise the students with the process of setting up a simulation; a group open-ended assignment to model and analyse results from a choice of simple flow scenarios.

Mechanics:
1. Further studies on shear force and bending moment diagrams, second moment of area, engineers theory of bending, beam theory, combined bending and direct loading.
2. Bending stresses in beams with unsymmetrical sections.
3. Torsion of shafts, power transmission using circular shaft.
4. Thermal stressing.

UNIVERSITY OF HERTFORDSHIRE

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15 Language of Delivery: English **16 Language of Assessment:** English

17 Assessment Details

17a Assessment: (weighting and compulsory information, max 50 words)

Coursework: 50 % Exam 50 %

Separate passes are required in both the coursework and examination elements of assessment

17b Further details: (max 200 words)

Typically, assessment will consist of:

1 CAD modelling assignment 20%
1 CFD Assignment 20%
1 Mechanics laboratory 10%
1 Mechanics Examination 50%

18 Pre and Co Requisite Note: tick if optional

Pre req:	☒	☒	☒
Co req:	☐	☐	☐ Prohibited:

19 Subject Board of Examiners:

20 Programmes on which this Module is offered

*	EICAE	BEng (Hons) Computer Aided Engineering
*	EIV	B.Eng(Hons) Automotive Engineering Degree
*	EIM	Mechanical Engineering Degree
*	EIASE	Aerospace Systems Engineering Degree
*	EIA	Aerospace Engineering degree
*	EIMENG	MEng Engineering

21 Previous Module this Module replaces: 2ACM0058

22 Comments:

SIGNATURES: **Head of Department -** P R Butler Date: 15/7/04

Faculty Registrar - Date: 15/7/04

Associate Dean Academic - F. Vendl Date: 16/7/04

FACULTY OF ENGINEERING AND INFORMATION SCIENCES

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Definitive Module Document

1 Module CODE	2 Titles: Short: An. Tech. 2 Long: Analytical Techniques 2			
2PAM0022				
3 Credit Points:	**4 ECTS Points:**	**5 Level:**	**6 Location:**	**7 Date first offered:**
15	7	2	UH HATFIELD	01/09/2004

8 Semester(s) in which the Module is approved to run: A

9 Home Department: PAM Physics, Astronomy & Mathematics

10 Departments Contributing to Teaching:

PAM 100%	0%	0%	0%	0%	0%
0%	0%	0%	0%	0%	0%

Total: 100 %

11 Module Aims:

The aims of this module are to enable students to . . .

* enhance and develop the students understanding of the mathematical techniques required for engineering
* use the language of mathematics in the description of engineering problems

12 Intended Learning Outcomes:

12a Knowledge and Understanding

Successful students will typically . . .

1 recognise multiple integrals

2 recognise Laplace transforms and Fourier series

3 recognise numerical techniques for solving ordinary differential equations

12b Skills and Attributes

Successful students will typically . . .

4 evaluate line and multiple integrals

5 obtain Fourier series

6 apply Laplace transforms

7 use a suitable software applications package to solve engineering problems

13 Modes of Delivery:

Delivery Mode:	Hours per	Lecture	Seminar/ Tutorial	Workshop/ Prac/Group	Indep	Fieldwork/ Prof Prac	Total hours:
Classroom-based		39	8	5	98	0	150

14 Module Content:

14a Module Content: (for publication, max 150 words)

The module follows on from Analytical Techniques 1 (1PAM0013) to provide further mathematical techniques required for applications in Engineering disciplines. The module includes numerical methods for ordinary differential equations, Laplace transforms, Fourier series, line and double integrals, as well as s using a suitable software applications package to solve engineering problems. Emphasis is put on techniques and applications rather than complete mathematical rigour.

14b Module Content details: (supporting Learning Outcomes, max 250 words)

Knowledge and understanding are achieved through the delivery of lectures/tutorials/interactive practical sessions. Problem sheets in tutorials allow students to practice and refine their skills. The courseworks and the end-of-module examination are used to assess the Learning Outcomes.

Refer to the teaching plan for a more detailed description.

The examination assesses LO1 - 6
The coursework assesses a selection of LO's 1 - 6, plus LO7.

UNIVERSITY OF HERTFORDSHIRE

Definitive Module Document

15 Language of Delivery: English **16 Language of Assessment:** English

17 Assessment Details

17a Assessment: (weighting and compulsory information, max 50 words)

Coursework: 40 % Exam 60 %

The coursework comprises:

1 piece of coursework 20%
1 workbook 20%

17b Further details: (max 200 words)

Overall pass required, subject to a maximum grade of E2 if not both coursework and examination are passed.

18 Pre and Co Requisite Note: tick if optional

Pre req: 1PAM0013 ☐ ☐ ☐
Co req: None ☐ ☐ ☐ Prohibited: None

19 Subject Board of Examiners: MATHEMATICS LEVEL 2 COURSES

20 Programmes on which this Module is offered

	IDCATUG	Credit Accumulation & Transfer Scheme - Undergraduate
	EIV	B.Eng(Hons) Automotive Engineering Degree
	EIMENG	M Eng Engineering
	EIM	Mechanical Engineering Degree
	EIEE	Electrical and Electronic Engineering Degree
	EIASE	Aerospace Systems Engineering Degree
*	EIA	Aerospace Engineering degree

21 Previous Module this Module replaces: 2MAT0021

22 Comments:

SIGNATURES: **Head of Department -** Ala Dawn Date: 31/07/04

Faculty Registrar - Date: 1/4/04

Associate Dean Academic - F. Hardy Date: 31/3/04

FACULTY OF ENGINEERING AND INFORMATION SCIENCES

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Definitive Module Document

1 Module CODE	2 Titles: Short: Control Systems Long: Control Systems
3AAD0007	

3 Credit Points:	4 ECTS Points:	5 Level:	6 Location:	7 Date first offered:
15	7	3	UH HATFIELD	01/09/04

8 Semester(s) in which the Module is approved to run: A

9 Home Department: AAD Aerospace, Automotive & Design

10 Departments Contributing to Teaching:

AAD 100%	0%	0%	0%	0%	0%
0%	0%	0%	0%	0%	0%

Total: 100 %

11 Module Aims:

The aims of this module are to enable students to . . .

* further develop their ability to analyse the performance of control systems
* design controllers to modify the performance of control systems.

12 Intended Learning Outcomes:

12a Knowledge and Understanding

Successful students will typically . . .

* identify whether a system satisfies a desired performance specification

12b Skills and Attributes

Successful students will typically . . .

* evaluate the dynamic performance of a control system
* design a controller to improve the performance of a control system.
* use a computer to simulate the performance of a control system

13 Modes of Delivery:

Delivery Mode:	Hours per	Lecture	Seminar/ Tutorial	Workshop/ Prac/Group	Indep	Fieldwork/ Prof Prac	Total hours:
Classroom-based		24	12	6	108	0	150

14 Module Content:

14a Module Content: (for publication, max 150 words)

1. Root Locus Methods - Revision of rules for drawing root locus plots and design of controllers
2. Open Loop Frequency Response - Open Loop testing, Nyquist diagrams, Bode Plots. System Identification using asymptotic approximations.
3. Closed Loop Frequency Response - Nichols Chart. Nyquist Stability Criterion, Closed Loop frequency response performance specification. Controller design.
4. Non-Linear Systems - Sources of non-linearity in systems, stability of non-linear systems, Describing Functions.
5. Digital Root Locus - Difference Equations and z transforms. Stability and the z plane. A/D and D/A converters and the Zero Order Hold model, adaptation of Root Locus drawing rules. Controller design.

Students are expected to make use of Matlab and the Control Systems Laboratory to support their studies.

14b Module Content details: (supporting Learning Outcomes, max 250 words)

Lectures

1. Revision of Root Locus Methods - Drawing rules, dominant loci.
2. Controller Design using Root Locus - Lead and Lag controllers
3. Nyquist Plots - Frequency Response Testing, Gain and Phase Shift, Nyquist Plots of Complex Systems
4. Bode Plots - Gain vs Frequency, Phase vs frequency, TF Ident
5. Closed loop Frequency Response - Nyquist Stability Criterion, Nichols Chart and Closed Loop Performance
6. Controller Design using Frequency Response Methods
7. Modelling Non-Linear Systems - input vs output curves, describing functions
8. Stability of Non-linear Systems - Limit cycle prediction using Nyquist and Nichols
9. Introduction to Digital Control - Z Transforms & Digital Time Response
10. A/D and D/A Converters and the digital equivalent transfer function- Zero Order Hold model, Gp(z) using Z transform tables
11. Digital Root Locus - Z plane, drawing digital root locus plots, first order digital controllers

Tutorials
Students will receive a tutorial each week to support the lectures above. Some of these tutorials will be assessed.

Practicals
Students will be introduced to the use of Matlab to design controllers and simulate control system performance so that they can use Matlab either within the faculty or the LRC on an open access basis.
Students will be introduced to practical equipment in the Control Systems laboratory which they can then use on a open access basis.

UNIVERSITY OF HERTFORDSHIRE

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15 Language of Delivery: English **16 Language of Assessment:** English

17 Assessment Details

17a Assessment: (weighting and compulsory information, max 50 words)

Coursework: 40 % Exam 60 %

Passes in both (i) coursework and (ii) overall performance are required

17b Further details: (max 200 words)

Typically, assessment will consist of:

- One 3-hour end-of-course examination (60%) - learning outcome(s) assessed (a), (b) and (c)
- One 2-hour computer based phase tests (20%) - learning outcome(s) assessed (a), (b), (c) and (d)
- One laboratory based assignment (10%) - learning outcome(s) assessed (a), (b), (c) and (d)
- Several minor tutorial based assignments (10%) - learning outcome(s) assessed (a), (b) and ©

18 Pre and Co Requisites Pre req: ☐ ☐ ☐

Note: tick if optional Co req: ☐ ☐ ☐ Prohibited:

19 Subject Board of Examiners: AERO/CIVIL/MECH ENG L2/3

20 Programmes on which this Module is offered

* EIM Mechanical Engineering Degree
* EIASE Aerospace Systems Engineering Degree
* EIMENG MEng Engineering

21 Previous Module this Module replaces: 3ACM0013

22 Comments:

SIGNATURES: **Head of Department -** PA Butler Date: 15/7/04

Faculty Registrar - Date: 15/7/04

Associate Dean Academic - F. Neale Date: 16/7/04

FACULTY OF ENGINEERING AND INFORMATION SCIENCES

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UNIVERSITY OF HERTFORDSHIRE

Definitive Module Document

1 Module CODE	2 Titles: Short: MECH & PROP OF MATLS Long: MECHANICS & PROPERTIES OF MATERIALS
3ACM0003	

3 Credit Points:	4 ECTS Points:	5 Level:	6 Location:	7 Date first offered:
15	7	3	UH HATFIELD	22/09/1997

8 Semester(s) in which the Module is approved to run: A

9 Home Department: AAD Aerospace, Automotive & Design

10 Departments Contributing to Teaching:

AAD 100%	0%	0%	0%	0%	0%
0%	0%	0%	0%	0%	0%

Total: 100 %

11 Module Aims:

The aims of this module are to enable students to . . .

* extend the student's knowledge of the analysis of structural components subjected to complex stress/strain fields.
* enable students to select materials and their processing in a design situation, by matching properties of specific materials with engineering requirements.
* provide an understanding of the possible modes of failure of engineering materials during service.

12 Intended Learning Outcomes:

12a Knowledge and Understanding

Successful students will typically . . .

* identify the types, properties and manufacture of composite materials
* recognise modes of failure in engineering materials
* identify the response of components to complex stresses.

12b Skills and Attributes

Successful students will typically . . .

* examine existing designs and actual components in engineering situations, using methods such as finite element analysis, photoelasticity, non-destructive testing and fractography.
* limit the occurrence of failure in materials by appropriate modelling, design and materials selection.
* apply analytical methods to structural components subjected to complex stress/strain fields.

13 Modes of Delivery:

Delivery Mode:	Hours per	Lecture	Seminar/ Tutorial	Workshop/ Prac/Group	Indep	Fieldwork/ Prof Prac	Total hours:
Classroom-based		44	4	8	94	0	150

14 Module Content:

UNIVERSITY OF HERTFORDSHIRE

Definitive Module Document

14a Module Content: (for publication, max 150 words)

1.Plate theory: bending of thin plates subjected to pressure loading.
2.Elasticity & Plasticity
3.Composite Materials
4.Viscoelasticity: creep and relaxation
5.Fracture and Fatigue
6.Corrosion
7.Non-Destructive Testing

14b Module Content details: (supporting Learning Outcomes, max 250 words)

1.Plate theory: bending of thin plates subjected to pressure loading.

2.Elasticity & Plasticity
Equilibrium and compatibility conditions for a continuum. Plane stress and plane strain. Stress analysis using photoelastic techniques. Use of strain gauges, computer reduction of laboratory data. Finite Elements: Introduction to basic elements in FE systems and appreciation of their characteristics. Simple problems. Stress concentrations: use of FE systems to evaluate simple stress concentrations; comparison with data sheets and photoelasticity results. Yield criteria for ductile materials. Plastic bending and torsion; residual stresses.

3.Composite Materials
Particle- and fibre-reinforced materials. Theories of strengthening and the micromechanics of fibre-reinforced materials. Types of material, their manufacture and applications. Strength of bonded joints. sandwich panels.

4.Viscoelasticity: creep and relaxationDefinition, stages and theories of creep deformation. Linear and non-linear models for creep behaviour. Relaxation. Steady-state creep laws. Mechanism of creep fracture. Testing and presentation of data. Alloys and ceramics for creep resistance.

5.Fracture and Fatigue
Characteristics and mechanisms of fracture. Ductile and brittle modes of fracture, shear and cleavage modes. Griffith theory, the importance of critical defect size, fracture mechanics. Importance of temperature on mode of fracture, materials for low temperature service. Fatigue S-N data, effects of mean stress, surface finish and environment. Fatigue life prediction, cumulative damage concept. Damage tolerance, prediction of crack propagation under realistic loading.

6.Corrosion
Dry corrosion: mechanisms, oxidation laws, limitation. Aqueous corrosion: mechanisms, localised acceleration. Corrosion prevention: Materials selection, design, cathodic protection, coatings.

7.Non-Destructive Testing
Defects arising during manufacture and service, their causes and prevention. Methods of detecting defects, their uses and limitations.

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Definitive Module Document

15 Language of Delivery:	English	16 Language of Assessment:	English

17 Assessment Details

17a Assessment: (weighting and compulsory information, max 50 words)

Coursework: 40 % Exam 60 %

17b Further details: (max 200 words)

Typically, assessment will consist of:·

Group assignment on materials failure (12%)·
Report from one of two laboratory sessions (8%)·
FE analysis from a laboratory session(10%)·
Structural analysis assignment (10%)·
End of course examination (60%)

Passes in both (i) coursework and (ii) overall performance are required

18 Pre and Co Requisite					
Note: tick if optional	Pre req:	☐	☐	☐	
	Co req:	☐	☐	☐	Prohibited:

19 Subject Board of Examiners: AERO/CIVIL/MECH ENG L2/3

20 Programmes on which this Module is offered

*	EIASE	Aerospace Systems Engineering Degree
*	EIV	B.Eng(Hons) Automotive Engineering Degree
*	EIM	Mechanical Engineering Degree
*	EIA	Aerospace Engineering degree
*	EIMENG	MEng Engineering

21 Previous Module this Module replaces:

22 Comments:

SIGNATURES: **Head of Department -** Date: 15/7/04

Faculty Registrar - Date: 19/7/04

Associate Dean Academic - Date: 16/7/04

FACULTY OF ENGINEERING AND INFORMATION SCIENCES

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Definitive Module Document

1 Module CODE	2 Titles:	
3ACM0011	Short: AERODYNAMICS	
	Long: AERODYNAMICS	

3 Credit Points:	4 ECTS Points:	5 Level:	6 Location:	7 Date first offered:
15	7	3	UH HATFIELD	22/09/1997

8 Semester(s) in which the Module is approved to run: A

9 Home Department: AAD Aerospace, Automotive & Design

10 Departments Contributing to Teaching:

AAD 100%	0%	0%	0%	0%	0%
0%	0%	0%	0%	0%	0%

Total: 100 %

11 Module Aims:

The aims of this module are to enable students to . . .

* further develop their ability to analyse the aerodynamics of an aircraft

12 Intended Learning Outcomes:

12a Knowledge and Understanding

Successful students will typically . . .

* identify critical issues in the aerodynamic design of an aircraft

12b Skills and Attributes

Successful students will typically . . .

* evaluate the relative importance of general flow mechanisms for aircraft aerodynamics
* evaluate the appropriateness of different analytical, experimental and numerical methods
* use Computational Fluid Dynamics (CFD) commercial software and linearised methods to simulate basic flows
* use post-processing software to extract information from complex CFD simulations

13 Modes of Delivery:

Delivery Mode:	Hours per	Lecture	Seminar/ Tutorial	Workshop/ Prac/Group	Indep	Fieldwork/ Prof Prac	Total hours:
Classroom-based		26	16	8	100	0	150

14 Module Content:

14a Module Content: (for publication, max 150 words)

1. Field Theory - An introduction to potential flow analysis

2. Navier-Stokes, Euler and Boundary Layer equations - An introduction to the equations and their area and range of application

3. Transonics and Supersonics - Prandtl-Glauert transformation and linearised theory

4. Hypersonics - Newtonian Theory and Similarity Laws

5. Turbulence and turbulence modelling - Introduction to time averaging of Navier-Stokes and Boundary-Layer equations. Derivation of Reynolds stresses. Introduction to turbulence modelling

6. Introduction to CFD - Introduction to discretisation methods and gridding. Simple solution methods

7. Helicopter aerodynamics - Introduction to rotor aerodynamic

14b Module Content details: (supporting Learning Outcomes, max 250 words)

1. Field Theory - Potential flow analysis. Application of methods through examples and tutorials

2. Navier-Stokes, Euler and Boundary Layer equations - Derivation of terms and appreciation of underlying physics. Especial importance is placed on the convective terms. Order of magnitude approach to simplify Navier-Stokes equations. Introduction to different forms of equations. Use of tutorials, examples and course work to reinforce understanding.

3. Transonics and Supersonics - Calculation of critical Mach numbers and introduction to transonic wing design and supercritical sections as well as complete configurations. Evaluation of methods and physical appreciation through tutorials, examples and laboratory experiments.

4.Hypersonics - Introduction to real gas effects and applications of calculation methods to re-entry vehicles through the use of tutorials and examples.

5. Turbulence and turbulence modelling - Introduction to mixing length models and their application. Introduction to inner law variables and the 'law-of-the-wall'. Definition of turbulent kinetic energy and rate of dissipation of turbulence. Introduction to two equation models. Reinforcement of understanding through coursework tutorials and examples.

6.Introduction to CFD - Use of spreadsheets to understand basic numerical methods and introduction to concepts of stability and effects of numerical errors. Introduction to commercial CFD software and commercial post processors. Use of software in tutorials and coursework.

7.Helicopter aerodynamics - Need for blade flapping - simplified blade flapping equation and solutions for symmetric and asymmetric coning. Use of collective and cyclic pitch controls. Descriptive treatment of Helicopter Forward Flight and limitations to forward speed. Tutorials.

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Definitive Module Document

15 Language of Delivery: English **16 Language of Assessment:** English

17 Assessment Details

17a Assessment: (weighting and compulsory information, max 50 words)

Coursework: 40 % Exam 60 %

17b Further details: (max 200 words)

Typically, assessment will consist of:
1 mid course assessment test
1 Computational Fluid Dynamics assignment
1 Transonic/ supersonic laboratory
One 3-hour end-of-course examination

Passes in both (i) coursework and (ii) overall performance are required.

18 Pre and Co Requisite Pre req: ☐ ☐ ☐
Note: tick if optional Co req: ☐ ☐ ☐ Prohibited:

19 Subject Board of Examiners: AERO/CIVIL/MECH ENG L2/3

20 Programmes on which this Module is offered

* EIASE Aerospace Systems Engineering Degree
* EIMENG MEng Engineering
* EIA Aerospace Engineering degree

21 Previous Module this Module replaces:

22 Comments:

SIGNATURES: **Head of Department -** PR Buller Date: 15/7/04
Faculty Registrar - Date: 19/7/04
Associate Dean Academic - F. Hendl Date: 16/7/04

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